000

960001

A.O. | C.C. | E.O.
22 DEC 1986
DEPT. OF MINES
No. 12.969/00

BILLITON AUSTRALIA

ELECTROLYTIC ZINC COMPANY OF AUSTRALIA
LITTLE RIVER (RESOURCES) PTY LTD

ROSEBERY EAST JOINT VENTURE, E.L. 1/62 WEST TASMANIA

PROGRESS REPORT ON EXPLORATION FOR THE PERIOD ENDING 22nd DECEMBER, 1986

OPEN FILE

Authors: J.P. Randell
J.G. Purvis
N.Hungerford

Report No: 08.3412

Copy No : 2

001

960002

LIST OF CONTENTS

SUMMARY

CONCLUSIONS & RECOMMENDATIONS

1.0 INTRODUCTION

2.0 TENEMENT STATUS

3.0 PREVIOUS WORK

4.0 REGIONAL SETTING

5.0 EXPLORATION OBJECTIVES

6.0 GRIDDING SURVEY

7.0 GROUND GEOPHYSICAL SURVEYS

- 7.1 UTEM Survey
- 7.2 Sirotem Survey
- 7.3 CSAMT Survey

8.0 BULK CYANIDE LEACH (BCL) SURVEY

- 8.1 Objectives
- 8.2 Procedure
- 8.3 Results
- 8.4 Discussion

9.0 MT. BLACK LOCALITY

- 9.1 Location and Previous Work
- 9.2 Geological Mapping and Petrology
- 9.3 Ground Geophysics
  - 9.3.1 UTEM Survey
  - 9.3.2 Sirotem Detailing Survey
  - 9.3.3 Geological Assessment of the Anomalies
- 9.4 Auger and Rock Chip Geochemistry
- 9.5 Discussion

10.0 MT. SALE LOCALITY

- 10.1 Location and Previous Work
- 10.2 Geological Mapping
- 10.3 Ground Geophysics
- 10.4 Auger and Rock Chip Geochemistry
- 10.5 Discussion

11.0 LANGDONS LOCALITY

11.1 Location and Previous Work
11.2 Known Mineralization
11.3 Geological Mapping, Rock Chip Sampling and Petrology
11.4 Ground Geophysics
11.5 Discussion

12.0 CUTTY SARK

12.1 Introduction
12.2 Geology

12.2.1 Drillhole 71R and Vicinity
12.2.2 Hanging Wall Volcaniclastics
12.2.3 Andesitic Lava Unit
12.2.4 Footwall Volcanics
12.2.5 Quartz Feldspar Porphyry
12.2.6 Structure

12.3 Sampling
12.4 Geophysics
12.5 Discussion

13.0 SOUTH HERCULES

13.1 Introduction
13.2 Geology

13.2.1 Stratigraphy
13.2.2 Structure
13.2.3 Mineralization and Sampling Results

13.3 Ground Geophysics
13.4 Discussion

14.0 SOUTH STITT

14.1 Introduction
14.2 Geology
14.3 Rock Sampling Results
14.4 Ground Geophysics
14.5 Discussion

15.0 HENTY FAULT ZONE

15.1 Introduction
15.2 Geology and Target Models
15.3 Results of Core Sampling
15.4 Geophysical Surveys
15.5 Discussion

16.0 REFERENCES

003

LIST OF FIGURES

Figure No.	Title	Scale	Plan No.
1	Project Location Plan	1:500,000	MT24/1159
2	JV Contract Area	1:100,000	-
3	Regional Geology	1: 50,000	LJ50/1055
4	Dighem Enhanced Magnetics	1: 50,000	LJ50/1023
5	Dighem Magnetic & Conductive Trends	1: 50,000	LJ50/1051
6	Grid Plan	1: 50,000	LJ50/1052
7	1985/86 TEM Grids	1: 50,000	LJ50/1029
8	1985/86 TEM Grids with Anomalies	1: 50,000	LJ50/1029
9	Cross Section on 1209mN (3966'N) with IP & CSAMT	1: 5,000	LJ50/1033
10	Cross Section on 1372mN (4550'N) with IP & CSAMT	1: 5,000	LJ50/1034
11	Bulk Leach Sampling & Known Mineralization	1:100,000	LJ50/1014
12	Bulk Cyanide Leach Survey: Sample Locations & Significant Results	1: 20,000	LJ50/1058
13	Location of Work Areas	1:100,000	LJ50/1020
14	Mt Black Locality - Geological Geochemical & Geophysical Compilation	1: 5,000	LJ50/1010
15	Mt Black Locality - Geological Interpretation	1: 5,000	LJ50/1017
16	Mt Black Locality - Dighem Aeromagnetic Map (Enhanced)	1: 5,000	LJ50/1022
17	Mt Black Locality - Geophysical Trend Map	1: 5,000	LJ50/1019
18	Mt Sale Locality - Geological Geophysical & Geochemical Plan	1: 5,000	LJ50/1039
19	Langdons Locality - Geological Mapping & Geochemical Compil.	1: 5,000	LJ50/1040
20	Langdons Locality - Geological Interpretation	1: 5,000	LJ50/1041
21	Cutty Sark-Bobadil - Interpreted Geology	1: 5,000	LJ50/1050
22	Cutty Sark Area - Geological Section Drillhole CS1, Section 11500'N	1: 1,000	LJ50/1028
23	Cutty Sark Area - Geological Section Drillhole 71R, Section 7150'N	1: 1,000	LJ50/1025
24	Rosebery Mine Host Horizon Position (Lees)	1: 25,000	LJ50/1057
25	Rosebery Mine Host Horizon Position (Purvis)	1: 25,000	LJ50/1048
26	Longitudinal Projection of Rosebery Mine Host Horizon	1: 10,000	LJ50/1049
27	Schematic Section along the Southern Shore of Lake Rosebery Cutty Sark Area	1: 5,000	LJ50/1053

28	Cutty Sark - Grid Map with Drillholes	1:	5,000	LJ50/1046
29	Cutty Sark - Dighem Enhanced Aeromagnetics	1:	5,000	
30	Cutty Sark Area - Geological Cross Section with IP, CSAMT & Magnetics	1:	5,000	LJ50/1035
31	South Hercules - Interpreted Geology based on Lees (1985) with modification	1:	5,000	LJ50/1056
32	South Hercules Area - Geological Section Drillhole H1103	1:	500	LJ50/1036
33	South Hercules Area - Sirotem Grids	1:	5,000	
34	South Stitt Geology	1:	5,000	LJ50/1016
35	South Stitt Geophysical Compilation	1:	5,000	LJ50/1037
36	South Stitt Enhanced Magnetics	1:	5,000	LJ50/1032
37	South Stitt Resistivity	1:	5,000	LJ50/1031
38	Henty Fault Zone	1:	50,000	LJ50/1054
39	Murchison Area - Geophysical Map	1:	10,000	LJ50/1045

005

LIST OF APPENDICES

APPENDIX	TITLE
I	UTEM Survey Profiles & Geophysical Interpretation
II	CSAMT Survey, Interpretation Report
III	Bulk Cyanide Leach & Stream Sediment Analyses
IV	Petrological Descriptions from Various Localities
V	SIROTEM Survey Profiles
VI	Rock Chip Geochemistry
VII	Auger Assay Results - Mt Black Locality
VIII	Auger Sampling, Mt Sale Locality
IX	Cutty Sark Locality - Diamond Drill Re-logs 71R, CS1
X	Cutty Sark Locality - Petrological Descriptions
XI	Cutty Sark Locality - Rock Chip Assays
XII	SIROTEM Down Hole Survey CS 1
XIII	South Hercules - Drill Re-logs H 1102, 1103
XIV	South Hercules - Rock Chip Sampling Results
XV	South Hercules - Sirotem Profiles
XVI	South Stitt - Petrological Descriptions
XVII	South Stitt - Geochemical Rock Sample Ledger
VIII	Henty Fault Zone - Drill hole Re-logs & Assays
XIX	Henty Fault Zone - Murchison Grid Geophysics

006

SUMMARY

This report details exploration procedures and results carried out on EL 1/62 by Billiton Australia from August 1985 to November 1986. A portion of this licence (89 square Kilometres) is the subject of a joint venture between Billiton Australia, Electrolytic Zinc Company of Australasia and Little River (Resources) Pty. Ltd. whereby Billiton, as manager, may earn 50% equity in the project until the expiry date of the licence, 22nd January 1988.

Exploration on the licence has been discontinuously carried out since 1962 by several explorers resulting in several generations of basic geological, geochemical and geophysical methods being carried out. More recently, modern geophysical techniques have been utilized to explore the licence for buried massive base metal sulphide deposits.

The prime target for exploration within the Rosebery East Joint Venture is a massive base metal (Pb, Zn, Cu), precious metal (Au, Ag) sulphide body of both the Rosebery and Hellyer types. More specifically within the JV area, the northern strike extent of the Rosebery sequence and the southern strike extent of the Hercules horizon are considered highly prospective for additional mineralization that may be expected to show

characteristics similar to Rosebery - Hercules. East of and stratigraphically above the Rosebery horizons, the andesitic lava sequence of the Mt Sale Volcanics is considered to exhibit lithological and stratigraphic similarities to the host volcanics at Hellyer. A second and equally important target can therefore be envisaged by analogy with the Hellyer massive base metal sulphide deposit.

A subordinate exploration target has been that of both gold mineralization genetically associated with but spatially distal from massive base metal sulphide mineralization and gold mineralization of the hydrothermal and/or epithermal type.

A decision to saturate the licence with a ground geophysical survey to explore for deep buried massive base metal sulphide bodies necessitated the construction of one coherent accurate grid. A total of 161 line kilometres of gridding was completed to facilitate this work. The UTEM method was chosen to more adequately service the requirements of a ground geophysical survey and to this end, twenty two loops were laid and surveyed. Only two genuine bedrock conductors were defined while several lesser fault related anomalies were followed up. Detailing of the two ?bedrock anomalies using SIROTEM resulted in definition of only one genuine bedrock conductor, that to date remains untested.

008

A bulk cyanide leach survey was carried out on 46 sample sites carefully selected from within the licence. Initial sampling resulted in several anomalous sites (gold as well as base metals) but a follow up check survey failed to reproduce these values. It is considered that variable but high effluent discharge rates are a possible cause for this discrepancy and it is proposed to carry out additional test work in the summer months.

At the Mt. Black locality, detailed geological mapping, rock chip and auger sampling has identified an area of clustered chlorite alteration zones in the vicinity of a sequence of intermediate subaerial ash flows and subaqueous andesitic lavas with intercalated silty sediments. Anomalous geochemical values have not been obtained nor is the presence of a UTEM bedrock conductor recognised. This area is of geological interest and a limited deep bedrock test programme is recommended to more completely map the alteration zones and to determine levels of surface elemental depletion.

Several weak UTEM conductors at Mt. Sale have been shown to be related to discordant subvolcanic andesitic dykes one of which carries strongly anomalous (6.6 g/t Au) but very localized gold values. Extensive sampling failed to recognise a consistent distribution of gold levels and it has been concluded that the mineralization is confined to late stage vug fillings within the dykes and is not of economic importance.

009

The Langdons mineralization is of the fissure fill Farrell style and is not considered to show sufficient potential to be of interest. However, the mineralized ?Devonian veins are localized within a Cambrian sequence of coarse pyrroclastic breccias capped by strongly altered (siliceous, chloritic, sericitic) andesitic lavas and cherty, sandy sediments. Rock chip and auger sampling has detected only marginally anomalous base metal values but severe surficial leaching is evident and may account for the lack of anomalous geochemistry. A UTEM conductor was not detected over the Langdons locality but, as with Mt. Black, the geological interpretation is of interest. It is recommended that deep bedrock testing be carried out across the wide zone of alteration to more accurately map the alteration types and to determine the actuality of elemental surficial depletion.

At the Cutty Sark locality, considerable detailed mapping, sampling and drill hole re-logging has been carried out to correlate the northern Rosebery mine stratigraphy with that observed near Bastyan Dam. It is concluded that the Rosebery Host Rocks strike northwards and are present within the Cutty Sark area and that a northerly plunge of less than 35° has taken the prospective rocks down to depths in excess of 500m below surface. A new separate subbasin containing massive sulphide is indicated to occur within the Host Rock horizon in the vicinity of the northern boundary of EL 1/62. The likely position of this massive sulphide body is down-plunge to the north. Drilling of this target within EL 1/62 is impossible due to the proximity of the Bastyan Dam.

The Getty drillholes CS1 and CS2 intersected the Hangingwall Volcaniclastics on the eastern limb of an anticline but neither hole reached the Host Rock position near the anticlinal axis. It is recommended that hole CS1, which is still open, be extended to pass through the Host Rock position.

The prospectivity of the South Hercules locality is dependant upon the extension of the Hercules Mine host rocks south into EL 1/62. Only a small proportion of this sequence outcrops within the licence but an interpreted southerly plunge implies a subsurface extension. Geological mapping, rock chip sampling, drill hole re-logging and SIROTEM surveying has been carried out to explore the buried extensions for massive base metal sulphides. The Sirotem survey has shown there is no massive sulphide body in the buried host rocks down to 100m below surface. Also the restricted tonnage potential and weak mineralization intersections in EZ drillholes, indicate that a justifiable stratiform gold exploration target for Shell does not exist within the Host Rocks on EL 1/62.

The hydromorphic origin ascribed to the West Hercules Pb-Zn soil anomalies may not be valid and they could be reflecting bedrock mineralization. These extensive and strong anomalies need to be evaluated in detail.

Geological mapping and limited rock chip sampling at South Stitt has indicated that good potential exists for stratiform gold and/or massive base metal sulphide deposits along the Henty

Fault Zone. Although work to date has not resulted in anomalous geochemistry much of the area is covered by glacial scree. Systematic soil and rock chip sampling, supported by IP, ground magnetics and geological mapping is recommended to be carried out over the southern portion of the area.

Only limited exploration has been carried out on the Henty Fault Zone and has included geological mapping, old drill hole re-logging and sampling, limited geophysical surveying and the commencement of a diamond drill hole.

The principal target sought along the Henty Fault Zone is stratiform gold within the Farrell Slate sequence immediately east of the fault. This model is based on the occurrence at GoldField's Henty Prospect, located on the fault 4km south of the southern boundary of EL 1/62. The Henty Prospect is similar to several other stratiform gold occurrences in the Mt. Read Volcanics, and all of them are associated with massive sulphide bodies. It is clear that the hydrothermal systems capable of producing stratiform gold mineralization are also capable of producing massive sulphides, and these form an important secondary target for the exploration programme along the Henty Fault Zone.

An intersection of 4m @ 3.3 g/t Au in MRP 233 is the strongest gold mineralization known along the Henty Fault Zone outside of GoldField's Henty Prospect. The mineralization confirms:

a) the prospectivity of the Farrell Slate sequence east of the fault

b) the prospectivity of the Henty Fault within EL 1/62.

It is recommended that follow-up drilling be undertaken in the vicinity of hole MRP 233 and that the programme of old drillcore sampling, assaying and relogging should be completed, and new drilling undertaken directly on target zones outlined by this work.

013

CONCLUSIONS AND RECOMMENDATIONS

BULK CYANIDE LEACH SURVEY

The bulk cyanide leach (BCL) survey has produced ten sites of anomalous gold and/or pathfinder geochemistry within the licence area. Repeatability of these anomalies has not been achieved by a subsequent survey, a fact that is attributed to very high effluent discharge rates from the sampled sites.

It is recommended that these sites be sampled again during summer when discharge is lowest to test this conclusion. It is also suggested that an orientation survey be carried out over a known auriferous mineralized body outside of contaminating influences to restore confidence in the method as a regional prospecting tool.

MT BLACK LOCALITY

Extensive rock chip sampling, auger "C" horizon sampling and UTEM surveying has failed to detect the presence of either outcropping, subcropping or blind base metal mineralization. However the strong localized alteration observed in several areas together with the interpreted paleo environment suggest that the locality is conceptually interesting from the viewpoint of VMS style massive sulphide mineralization.

This geological anomalism warrants further attention both by way of further definition and by way of geochemical upgrading. It is recommended that deep bedrock testing be carried out on several lines to more accurately map the lithological and alteration-type variation present and to ascertain geochemical signatures of these fresh bedrock samples. Further work is considered to be entirely dependant upon positive results from this survey.

MT SALE LOCALITY

UTEM surveying has not detected any bedrock conductor nor has geological mapping or geochemical sampling upgraded the potential of this area. Anomalous gold values in selected rock chip samples are due to late stage local concentrations in secondary vugs contained within a subvolcanic intrusive. Their distribution is local and it is considered that the mineralization has little economic significance.

No additional work is recommended for this area.

LANGDONS LOCALITY

Widespread silicification with lesser chloritization, sericitization and quartz vein stockworking occurs in an area of ?ignimbritic andesites overlain by a subaqueous sequence of

cherty, sandy sediments and andesitic lavas. Coarse pyroclastic breccia in the north western portion of the area may imply a near vent origin and while the alteration itself may be at least partly of Cambrian age, later ?Devonian hydrothermal activity may account for the expression of the Langdons mineralization.

Geochemical anomalism is evident from surface sampling at the Langdons workings themselves but only marginally anomalous values were recorded from samples taken outside of this environment. Severe surface leaching is obvious in the area and it is concluded that this phenomenon may account for the poor geochemical record.

It is concluded that a signficant geological anomaly is present which requires further attention and it is recommended that a fence line shallow drill test programme be implemented to define the alteration envelope extent and to substantiate claims of geochemical depletion. Further deep drill testing will be required should encouraging geological and/or geochemical trends become evident.

CUTTY SARK

1. The Rosebery Host Rocks strike northwards and are present within the Cutty Sark area. A northerly plunge of less than 35° has taken the prospective rocks down to depths in excess of 500m below surface.

2. A new, separate subbasin containing massive sulphide is indicated to occur within the Host Rock horizon in the vicinity of the northern boundary of EL 1/62. The likely position of this massive sulphide body is down-plunge to the north. Drilling of this target within EL 1/62 is impossible due to the proximity of the Bastyan Dam.

3. A major anticlinal axis coincides with the Host Rock position immediately east of the Bastyan Dam. The Cutty Sark area is predominantly covered by the quartz-phyric reworked volcaniclastics of the Rosebery deposit Hangingwall sequence which comprise the west and east limbs of the fold.

4. The Getty drillholes CS1 and CS2 intersected the Hangingwall Volcaniclastics on the eastern limb of the anticline. Neither hole reached the Host Rock position near the anticlinal axis. It is recommended that hole CS1, which is still open, be extended the 200m necessary to pass through the Host Rock position.

017

SOUTH HERCULES

1. The work done this year confirms that the potential of the South Hercules area for massive sulphides and stratiform gold deposits, is centred on down-dip and down-plunge extensions of the Hercules Host Rocks. These rocks extend sub-surface beneath much of the northern part of the South Hercules area.

2. A Sirotem survey has shown there is no massive sulphides in the buried host rocks down to 100m below surface.

3. Restricted tonnage potential and weak mineralization intersections in adjacent EZ drillholes, indicate that a justifiable stratiform gold exploration target for Shell does not exist within the Host Rocks on EL 1/62.

4. The hydromorphic origin ascribed to the West Hercules Pb-Zn soil anomalies may not be valid and they could be reflecting bedrock mineralization. These extensive and strong anomalies need to be evaluated in detail.

018

960019

SOUTH STITT

1. Sufficient encouraging geological features have been identified to indicate further searching for stratiform gold and/or massive sulphide deposits along the Henty Fault Zone is justified, particularly in the southern part of the South Stitt area. These features include altered, weakly pyritic siliceous volcaniclastic sediments and cherts, which are similar rocks to those hosting GoldField's stratiform gold body 4km south of the South Stitt area.

2. Although work to date has not detected anomalous precious or basemetal values in the prospective unit east of the Henty Fault Zone, this unit remains largely unseen and untested.

3. Systematic soil and rock sdampling, supported by IP, ground magnetics and geological mapping, is recommended over that part of the prospective sequence exposed at the southern end of the South Stitt area.

019

HENTY FAULT ZONE

1. The 4m @ 3.3 g/t Au intersected in MRP 233 is the strongest gold mineralization known along the Henty Fault Zone outside of GoldField's Henty Prospect. The mineralization confirms:

a) the prospectivity of the Farrell Slate sequence east of the fault

b) the prospectivity of that section of the Henty Fault within EL 1/62.

2. It is recommended that follow-up drilling be undertaken in the vicinity of hole MRP 233.

3. The programme of old drillcore sampling, assaying and relogging should be completed, and new drilling undertaken directly on target zones outlined by this work.

960021

020

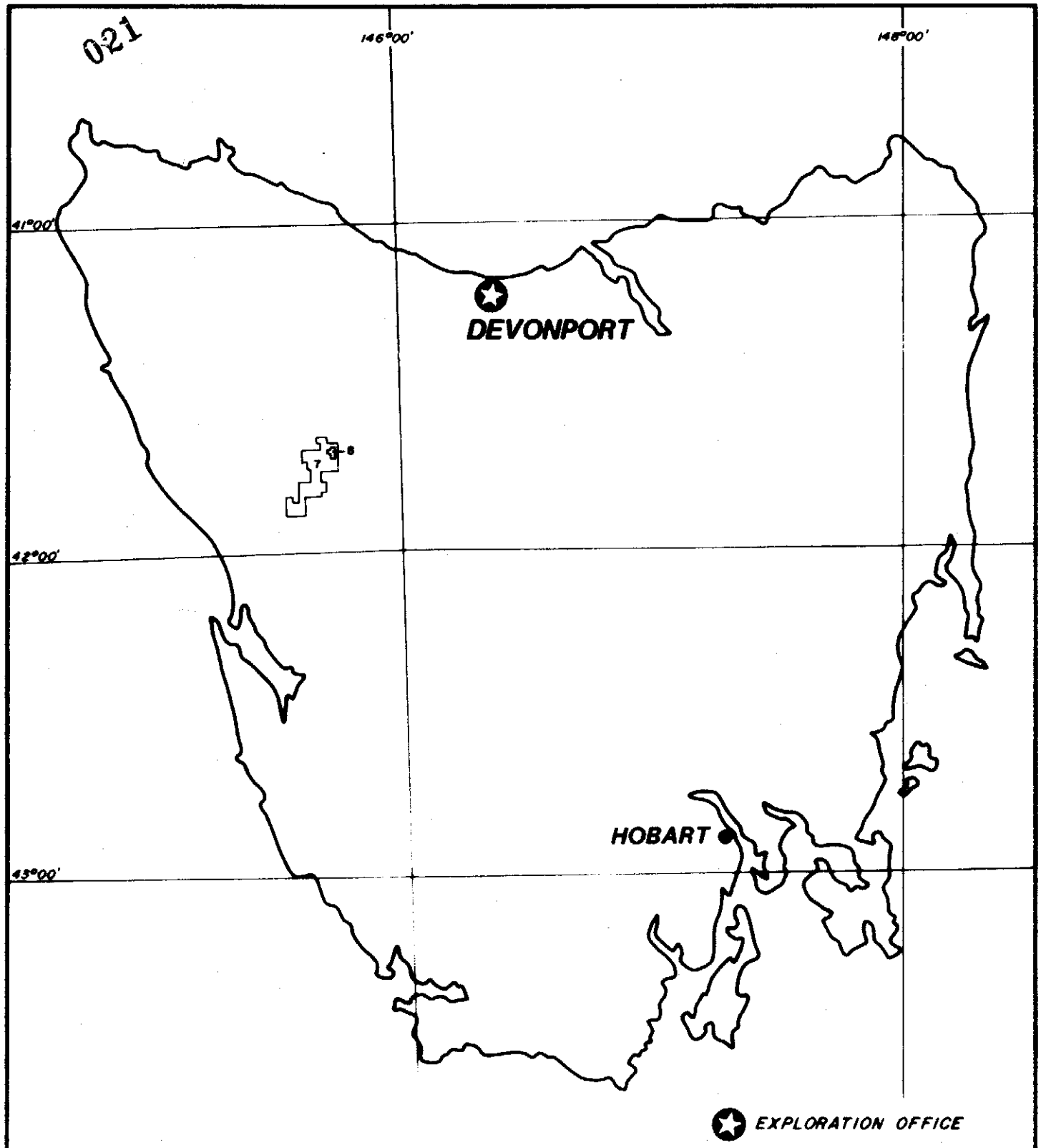
1.0 INTRODUCTION

The Rosebery East Joint Venture ground surrounds the eastern edge of the Rosebery mine lease (M.L. 53M/55) at Rosebery on the west coast of Tasmania (see Figure 1).

This report summarizes exploration carried out on the licence from the period of August 1985 to December 1986 by Billiton Australia. Personnel involved in this work and who jointly present this report are J. Randell (JR), J.G. Purvis (JGP) and N. Hungerford (NH).

Exploration completed is reported on an individual area and author basis whereby details of work completed, results achieved and discussion of results is presented in each section.

960022



7. ROSEBERY EAST J.V. E.L. 1/62
8. FARRELL J.V. M.L. 11066M, M.L. 91M/74

Billiton Australia

TASMANIA

PROJECT LOCATION PLAN

Author D.B.H. Date 6/86 Scale 1:1500000
Drawn H.M.R. Office AHO Revised Date
Drawing No. MT24/1159 Fig No. 1

2.0 TENEMENT STATUS

Exploration licence 1/62 consists of one irregular block that partially encloses the Rosebery mine lease.

The Mt. Black EL 1/62 of 170 sq km was granted to the EZ Company in 1962. Since 1978, the EL was the subject of a Joint Venture between EZ Company and Getty Oil Development Corporation. The agreement allowed GODC to earn a 40% interest in 138 sq km of the EL but did not include the 32 sq km Rosebery Mine Lease. EZ was the operator of the Joint Venture from April 1978 to November 1983.

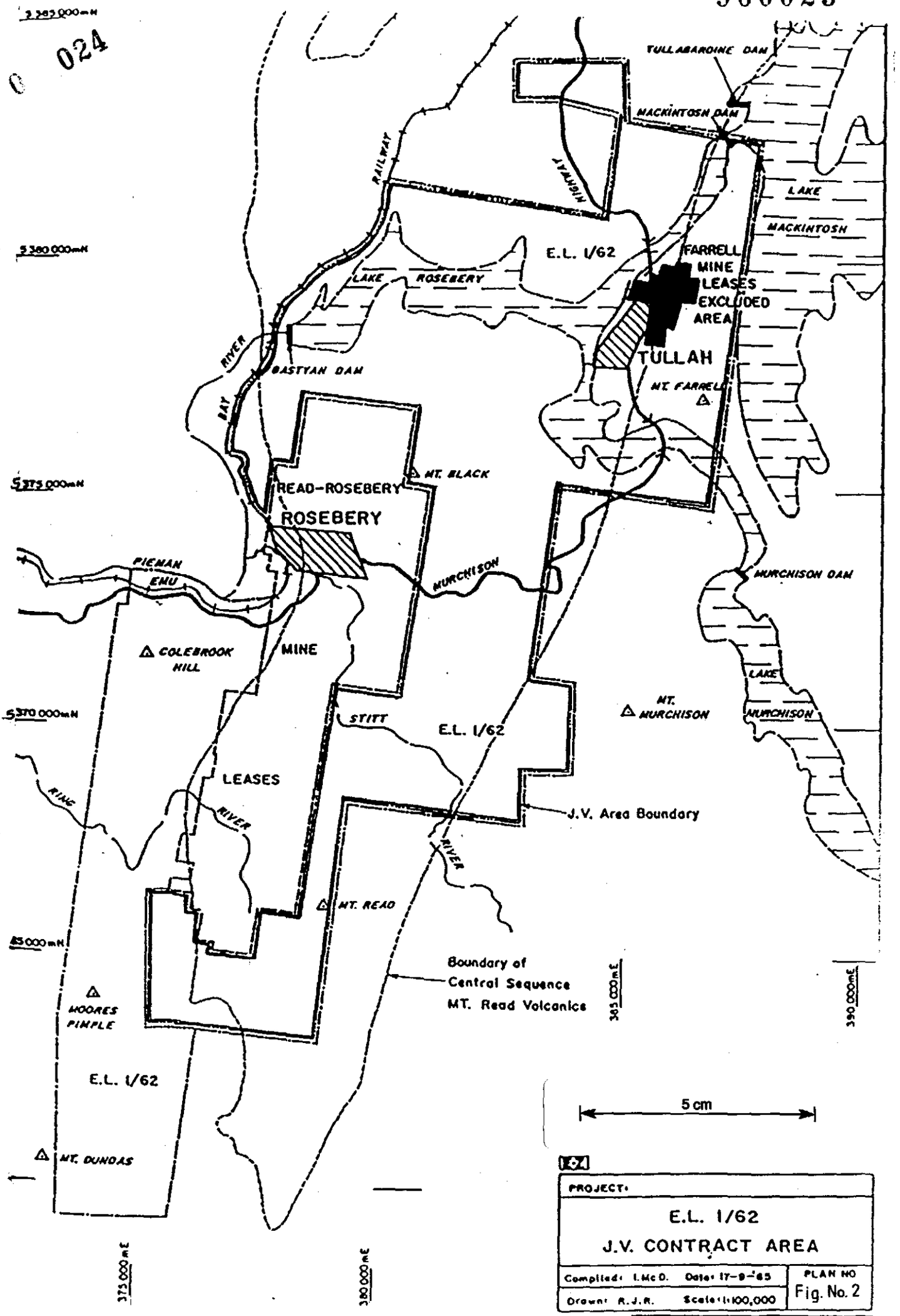
In November 1983, the Mt. Black Joint Venture Supplementary Agreement divided the 138 sq km Joint Venture area into a 22 sq km 'Tin Area', known as the Colebrook Project area (operated by EZ), and a 116 sq km 'Lead-Zinc Area' known as the Rosebery East Project Area (operated by GODC). However, during 1984 GODC was taken over by Texaco at which time the Rosebery East area was put up for tender.

In January 1985, EL 1/62 was reduced to 125 sq km as required by Mines Department regulations. This reduction was from the Rosebery East Project Area which then covered 103 sq km. During 1985, negotiations with prospective buyers resulted in acquisition of the Rosebery East area by Little River Goldfields N.L. who now hold a 50% equity in the project with EZ Co.

On the 26th October 1985, a new agreement was formulated between The Shell Company of Australia Limited and Little River (Resources) Proprietary Limited and Electrolytic Zinc Company of Australasia Limited. Under the terms of this agreement, Shell may earn a 50% equity in the Rosebery East area until 22nd January 1988. At this time, under Mines Department regulations, the entire licence must be relinquished.

The location and description of the joint venture is diagrammatically represented in Figure 2 but note that the area of the licence differs from the GODC Rosebery East project, being 89 sq km (c.f. GODC JV area 103 sq km).

960025



PROJECT:	
E.L. 1/62 J.V. CONTRACT AREA	
Compiled: I.Mc D. Date: 17-9-'85 Drawn: R.J.R. Scale: 1:100,000	PLAN NO Fig. No. 2

3.0 PREVIOUS WORK

The original lease holders, EZ Co., have carried out extensive basic exploration on the licence over the period 1962-1978. Their work has included stream sediment sampling, extensive gridding (1 km spaced lines), geological mapping, rock chip sampling and petrology, auger 'C' horizon sampling of selected areas, IP coverage of a large portion of the licence and diamond drilling. Results and discussion of the work to 1978 are not presented here but contained in EZ Co. annual progress reports lodged with the Department of Mines.

More recent exploration carried out by the EZ/GODC joint venture has included Dighem coverage of the entire EL, geological mapping and rock chip sampling, petrology, VLF and Max-Min EM, selected IP coverage, auger 'C' horizon geochemistry and diamond drilling. GODC have separated the licence into individual work areas and have reported each separately, a system that will be adopted in this report. Details of their work on EL 1/62 are not presented here but may be ascertained by reference to the following reports.

960027

026

Report No.	Company	Period/Title	Author
131	EZ Co.	Report on work undertaken to 30th June 1979	J.Mill
134	EZ Co.	Report on work undertaken 30th June 1979-30th June 1980	J. Mill et al
142	EZ Co.	Progress Report on Activity July 1980-June 1981.	I.McDonald
144	EZ Co.	Progress Report on Activity 1st July 1981-15th Dec. 1981	I.McDonald et al
148	EZ Co.	Progress Report on Activity 15-12-81 to 4-5-82.	I.Mathieson et al
152	EZ Co.	Review of Rosebery East JV April, 1982.	Milovanovic
158	EZ Co.	Progress Report on Exploration Activity 5th May 1982 to 20th November 1982.	I.Mathieson et al
T173	EZ Co.	Progress Report on Exploration 4th May-15th Nov 1983.	I.McDonald
	GODC	Rosebery East Exploration Progress Report Aug. 1983 to June 1984.	F.Fitzgerald et al
	GODC	Rosebery East Exploration Progress Report July 1984 to December 1984.	F.Fitzgerald et al
	GODC	Rosebery East Exploration Progress Report Jan-Aug 1985.	J.G. Purvis

027

4.0 REGIONAL SETTING(JR,NH)

The Mt. Read Volcanics comprise a belt of calc-alkaline Middle to Late Cambrian rhyolitic to dacitic volcanics and minor intrusives (85%), with lesser andesites and minor basaltic rocks (10%) and intercalated sediments (5%). They unconformably overlie the Precambrian basement to the east and are flanked on the west by trough sedimentary sequences, intruded by mafic to ultramafic bodies.

Although geological knowledge of the volcanics in general remains inadequate, they appear to comprise three main sequences. The central belt, which includes rhyolitic to dacitic lavas, ash flows, pyroclastics, and minor intrusives, is exposed at numerous localities along the West Coast Range. The western belt comprises a laterally variable sequence of felsic to intermediate tuffs and agglomerates; some felsic, intermediate, and mafic lavas; and some sedimentary units. The Tyndall Group and correlatives essentially comprise volcaniclastic facies, which locally unconformably overlie the former sequences.

The volcanics have been extensively altered and mineralized and, in places, are strongly cleaved. Deformation in the Late Cambrian (Jukesian Orogeny) preceded deposition of the Ordovician Owen Conglomerate and Gordon Limestone, and the Siluro-Devonian Eldon Group sandstones and siltstones. A major orogeny (Tabberabberan Orogeny) in

028

the mid-Devonian resulted in widespread folding and faulting.

The Central Volcanics are chiefly composed of massive rhyolites and dacites with lesser andesites, minor basalt and sediments. The southernmost outcrop of the volcanics are generally acid or acid-intermediate feldspar-phyric lavas and tuffs, with some minor interbedded fine grained sediments. Cambrian granites occur within the pile, and it is thought that these intrusives represent the root systems to the volcanics. To the north, and north of the Henty Fault, the volcanics are represented by feldspar-phyric lavas and pyroclastics. Sediments occur in the western portion of the sequence, but are scarce in the central and eastern areas. The northern area is distinguished from that in the south by the abundance of andesitic volcanics and absence of granite. The andesites form within an area of about 25 km^2, with the mineral deposits of Que River and Hellyer located at the northernmost limit of the andesites. They are flanked to the east by the Farrell Slate, the contact of which is formed by the Henty Fault. West of the volcanics, massive acid lavas crop out. These too are feldspar phyric, with the felspar phenocrysts present in a siliceous ground mass. The subaqueous sediments and pyroclastics, which host the Rosebery mineralization, form the western most units of the Central Volcanics. In the area of the mine these have a faulted contact to the west with the sediments of the Stitt Formation. Further north,

near Hellyer, the volcanics appear to have a conformable contact with the western sediments.

Structural information within the volcanics is limited as outcrops are generally massive and bedding/facing criteria is absent. At Rosebery, the volcanics dip and face to the east. However, westerly and horizontal dips have been measured east of the mine. The Henty Fault Zone has been shown to be folded at Mt. Lyell, indicating that post Cambrian folding has influenced the volcanics. This is demonstrated at Hellyer, where the deposit forms at the crest of an anticline. Thus the relative stratigraphic positions of the various volcanic piles is uncertain. However, lead isotope ratios do suggest that the mineralization decreases in age from south to north which in turn indicates a progressive younging of the volcanics in that direction.

The volcanics in the vicinity of the Rosebery and Hercules deposits are chiefly feldspar phyric felsic tuffs and ash flows (Primrose Pyroclastics) and rhyolite/dacite lavas (Mt. Black Volcanics). The eastern portion of the Mt. Black volcanics have been termed Mt. Sale Volcanics locally as the lavas are predominantly of andesitic composition. These lavas form a large lobate lens of maximum width 4 kms east of Mt. Black and length in excess of 15 kms.

030

960031

The Rosebery host sequence is atypical of much of the central belt of the Mt. Read Volcanics as it contains quartz-phyric tuffs and breccias in the hanging wall of the ore horizon.

A black shale/carbonate sedimentary package constitutes the actual host rocks to mineralization at Rosebery, and this package is locally developed southwards, including at the Hercules mine. A more extensive development of meta-sediments occurs to the east - the Farrell Slates.

Exploration licence 1/62 covers both the immediate strike extensions of the Rosebery-Hercules line and a large proportion of the hanging wall Mt. Black and Mt. Sale Volcanics. The Henty Fault transects the eastern portion of the licence from north to south and part of the Farrell Slates sequence is included in the licence. (Figure 3).

A considerable amount of geophysical data covers the Rosebery East JV, much of it susceptible to regional studies. As yet, only a start has been made on using this large data base. Unfortunately only part of the data are on digital tape, namely the Mines Department aeromagnetics. The Dighem data, potentially very useful for structural and alteration studies, are not available on digital computer tape. In 1987 the Mines Department gravity data base will be available, and together with aeromagnetic and Landsat data image processing studies can then be carried out.

031

Geochemical data in digital form could also be useful but due to variations in leaching and sample collection these results could be misleading.

Figure 4 and Figure 5 show the Dighem aeromagnetic (filtered) and resistivity interpretation plans respectively at 1:50,000.

The Mines Department aeromagnetics has been recontoured but is of less use over a more restricted area due to its wide line spacing (500m) relative to the Dighem aeromagnetics (250m). In a regional sense (i.e. compared with the rest of the Dundas Trough) the Mt. Black volcanics are weakly magnetic and in terms of magnetic signature are similar to the Hellyer-Que River volcaniclastic pile. Also recent regional geological work by Corbett et al (1986) does not indicate a difference between the Mt. Black volcanics and those further north in the Mt. Black area. There is however a difference in magnetite content suggesting either different volcanic type and/or a different thermal (metamorphic) history, leading to the production or destruction of magnetite.

The detailed Dighem aeromagnetics shows some distinct trends on the contour map (Figure 4). There are suggestions of folds within the volcanics and clear indications of cross-cutting faults generally roughly eat-west. These faults are also apparent on the Mines Department aeromag,

032

which itself shows some not shown on the Dighem plan. In particular a major WNW-ESE break occurs through Chester and Farrell mines, roughly along the line of Lake Rosebery (formerly Pieman River). Another major trend is SSW-NNE through Rosebery and west of Hellyer. This is essentially a northern extension of the southern part of the Rosebery Fault.

Some alteration zones (those containing magnetite) are apparent on the aeromagnetics. In particular the Mt. Black magnetite-chlorite zone is indicated as 2 or 3 anomalies at about 81,000E, 76,000N. (see Section 9). Other magnetic trends are presumably lithological and have been detailed on the EZ ground magnetics from which dips can be interpreted. A major magnetic trend that may have important structural and stratigraphic significance occurs in the Rosebery hanging wall rocks and strikes north crossing the Pieman River about 1200 metres east of the Pieman Dam. Its nature has not been clearly identified to date although magnetic units 400-500 metres into the hanging wall volcanics have been intersected in drill holes on the Mine Lease.

Figure 5 is a plan of the major Dighem shallow conductive zones (from the resistivity contours). It excludes many anomalies due to power-lines and Lake Rosebery.The Mt. Black alteration zone is indicated, plus several other features, some of which have not yet been identified on the ground. Generally the known glacials are

033

not very conductive although at South Stitt and the Murchison Valley they are a major, if not the only, contributor to the conductive zones. The Dighem resistivity contours were calculated using the high-frequency EM primary field which eccentuates poorer conductors such as alteration zones or carbonaceous shales. (Bedrock EM conductors are discriminated by the use of different frequencies and coil configurations in the bird). Rosebery open-cut is a clear conductor as are the Farrell slates ±sulphides between Tullah and Sterling Valley. The only major area of unexplained Dighem conductors occurs around the northern boundary of the Rosebery Mine Lease (Robbies Creek or 20A area). These are also in the vicinity of the major N-S magnetic anomaly mentioned above and could be due to alteration.

960035

034

5.0 EXPLORATION OBJECTIVES(JR)

The prime target for exploration within the Rosebery East joint venture is a massive base metal (Pb Zn Cu), precious metal (Au Ag) sulphide body of both the Rosebery and Hellyer types. More specifically within the JV area, the northern strike extent of the Rosebery sequence and the southern strike extent of the Hercules horizon are considered highly prospective for additional mineralization that may be expected to show characteristics similar to Rosebery - Hercules. East of and stratigraphically above the Rosebery horizons, the andesitic lava sequence of the Mt. Sale Volcanics is considered to exhibit lithological and stratigraphic similarities to the host volcanics at Hellyer. A second and equally important target can therefore be envisaged by analogy with the Hellyer massive base metal sulphide deposit.

A subordinate exploration target has been that of both gold mineralization genetically associated with but spatially distal from massive base metal sulphide mineralization and gold mineralization of the hydrothermal and/or epithermal type. Discussion of these models is presented in a report by J.G. Purvis (1984) titled 'Gold Potential of Mt. Black E.L. 1/62'.

The overall thrust of exploration carried out during 1986 has been split between: 1) assessment of the Mt. Sale

035

Volcanics (JR, NH 60%); 2) assessment of the immediate strike extensions of the Rosebery-Hercules orebodies (JGP, NH 30%); 3) assessment of the gold potential of the Henty Fault Zone (JGP, NH 10%).

- Mt. Sale Volcanics: Despite broad traversing by EZ and blanket coverage by GODC utilizing Dighem, it was considered that good potential remained for the discovery of non-outcropping base metal mineralization by virtue of the conclusion that:

  a) The exploration carried out within the andesites probably only tested the ground to a depth of 50-80 metres.

  b) The structure of the area is such that the volcanics may be complexly folded, and any prospective host units may not crop out.

  c) The presence of fuchsite at Hellyer is considered to be related to the mineralogy of the hangingwall basalts rather than a necessary alteration product of the sulphides.

  It was therefore necessary to employ a blanket technique to seek deposits at depths in excess of 100 metres below surface. A combined programme of ground EM utilizing UTEM and geological mapping, rock chip

036

960037

sampling and auger 'C' horizon geochemistry was selected as the most suitable range of methods to apply. Due to fixed short time constraints remaining in which to explore, it was necessary to plan and execute these programmes prior to the commencement of the 1986/87 field season to enable drilling to be carried out at this time.

- Rosebery - Hercules strike extensions: Considerable work had been carried out by GODC in these areas but it was considered that a detailed review of this work was in order in view of the obvious excellent potential for additional mineralization. A combination of careful and detailed geological observation/interpretation together with additional geophysical support was proposed and carried out in these areas. Licence expiry time constraints again dictated a pre-summer 1987 conclusion to this work.

- Gold potential: Significant gold intersections have been identified, in EL 9/66 to the south, immediately east of the Henty Fault Zone within silicified, fine grained tuffaceous rocks. Sulphides are often associated with the gold, but some of the best inter- sections occur within sulphide poor zones, character- ised by strong silicification. In this area, gold also

037

occurs in association with rhyolite lava domes. The domes are characteristed by chlorite-haematite-magnetite veining and several have been recognised been south of the Henty Fault Zone. Little work has been carried out in 1/62 for occurrences of these types.

At Pinnacles, to the north, gold occurs within cherty exhalites in a similar setting to the Rosebery mineralization. A similar environment is present in the Cutty Sark area in EL 1/62.

In the former case, the initial approach has been to re-log and assay the numerous drill holes that have tested the Henty Fault Zone primarily for Farrell-style fissure lead-zinc-silver mineralization. These holes had not been assayed for gold and therefore an initial exercise has been to establish whether elevated gold values occur within the sequence close to the fault. Encouragement here would be followed up by diamond drilling.

960039

038

6.0 GRIDDING SURVEY(JR)

At the commencement of the joint venture the licence was poorly serviced as far as a comprehensive grid was concerned. EZ Co. had established a regular 1 km spaced grid pattern across the entire licence and had cut small infill grids on selected areas. Later, GODC had extended some of these local grids and cut additional lines.

The decision by BAUS to saturate the licence with a ground geophysical survey necessitated the construction of one coherent accurate grid that would enable easy access by ground crews and be totally related to the standard AMG system. Characteristics of the initial grid, cut in November 1985 - February 1986 in Areas A, B and C (see Figure 6) are outlined below:

(i) All lines are cleared for single file access.

(ii) Cross lines are pegged at 50m intervals and regularly flagged.

(iii) Base lines are pegged at 100m intervals and regularly flagged.

(iv) Access lines/tracks are regularly flagged.

(v) All pegs are marked with easting and northing grid co-ordinates.

(vi) All pegged lines are slope corrected.

(vii) All lines should have an accuracy of 10 metres.

(viii) Natural bush pegs are only used.

039

In mid-1986, additional gridding was carried out in Areas D and E to facilitate extra ground geophysical work. Also a small grid was cut west of Mt. Sale to enable follow up ground geophysics.

Details of the gridding contracts are summarized below:

Grid Area	Location	Line kms	Contractor	Timing
A	N of Murchison Hwy and Tullah	25	W.Purton	Nov 85-Jan 86
B	Mt Black-Mt Sale & S to Murchison Hwy	75	G.Mallinson	Nov 85-Feb 86
C	S of Murchison Hwy	35	W.Purton	Nov 85-Jan 86
D	S & E of Bastyan Dam	21	G.Mallinson	Jul-Aug 86
E	S of Hercules Mine	2.5	BAUS	Aug 86
F	W of Mt Sale	2.5	G.Mallinson	June 86
	TOTAL	161 Line Kms		

960041

040

7.0 GROUND GEOPHYSICAL SURVEYS (NH)

7.1 UTEM Survey

In order to explore for a concealed massive Pb/Zn orebody at a depth in the range 100 to 300 metres, it was decided to utilise a modern time-domain EM system (TEM). Ore-bodies such as Rosebery, Hellyer and Que River have a sufficient conductivity contrast with their host rocks (100 to 1000 times) so as to produce strong EM anomalies. Other electrical/electromagnetic techniques such as IP, Dighem and VLF have been used by previous explorers in this area in the past but their success has been mainly limited to detecting shallow alteration zones and faults. The original reason for their use was based on the assumption that mineralization at depth would have an associated out-cropping conductive sediment band (such as the black shale unit in the Rosebery mine hanging wall). Such an association may not always occur however and folding could mean that any distinctive alteration lateral to an orebody might not outcrop. Hence the use of a TEM system. There are two main types of TEM system available at present: impulse response (e.g. SIROTEM, EM-37) and step response (e.g. UTEM). This refers to the receiver response to the primary field and in theory affects the relative response of bodies with differing conductivity. There are other differences between the systems but the major criteria for the

041

final choice were predominantly practical, i.e. ease of loop laying (in this very rugged area), size of loops (to minimise the number required), noise rejection (power lines surround the JV area) and portability and weather proofing of the receiver. UTEM III, having been designed for cold and wet climates, and fulfilling the other criteria as well as being a well-proven and successful TEM system, was then selected for the vast majority of the TEM work over Rosebery East.

The surveying was carried out by Lamontagne Geophysics in two stages (see Fig.7 of TEM grids):

late '85-early '86 : loops 1 to 15; 112 line kms
mainly 20 channel receivers

late '86 : loops 18, 19, 20; 24 line kms all 10 channel receiver

Base frequencies, which determine receiver channel times, varied between 36 and 25Hz depending on the local power line noise. Receiver channels are from about 0.025 msecs to 12.8 msecs, with binary spacing. The formulae for the 20 channel times are as follows:

ch. 1 = (2 + 2)/(8 x freq)

ch. (n+1) = $^1/_2$ x ch (n)

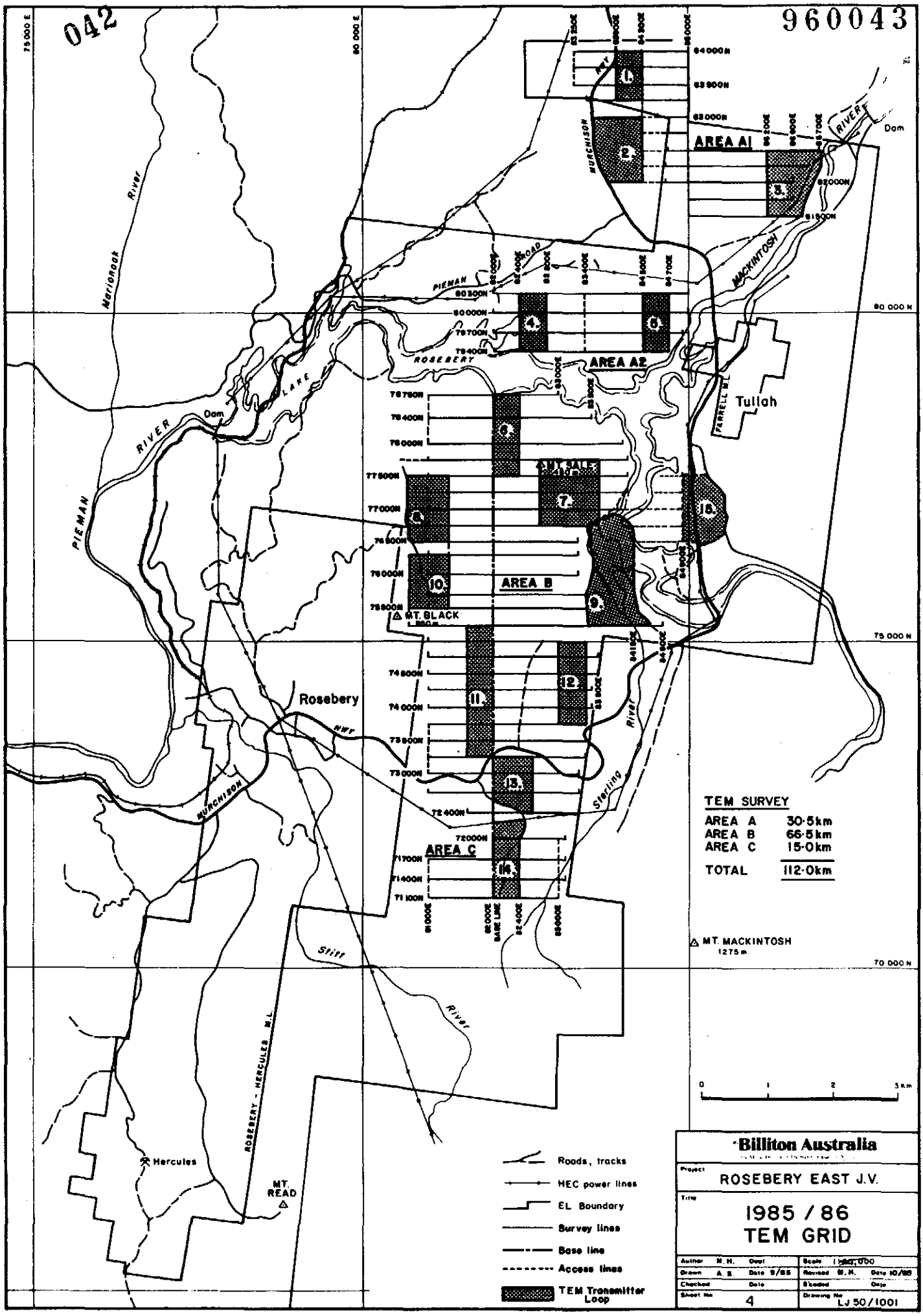

042
960043
AREA A1
AREA A2
AREA B
AREA C
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.
16.
Dam
Tullah
Rosebery
MT. BLACK
MT. MACKINTOSH
1275m
MT. READ
Hercules
ROSEBERY - HERCULES M.L.
PIEMAN ROAD
MACKINTOSH
HURCHISON
Sterling
River
Stitt
Marionoch River
Pieman River
LAKE
NWY
FARRELL M.L.
TEM SURVEY
AREA A 30·5km
AREA B 66·5km
AREA C 15·0km
TOTAL 112·0km
Roads, tracks
HEC power lines
EL Boundary
Survey lines
Base line
Access lines
TEM Transmitter Loop
Billiton Australia
Project
ROSEBERY EAST J.V.
Title
1985 / 86
TEM GRID
Author M. H.
Drawn A. S
Checked
Sheet No 4
Date 9/85
Scale 1:50,000
Revised M. H.
Date 10/85
Drawing No LJ 50/1001

Fig. No.7

5 cm

043

The locations of the UTEM transmitter loops were mainly determined on practical aspects, i.e. access had to be possible to at least one corner of the loop from a road or the lake so as to place the heavy transmitter and generator. As much as possible loops were also situated to couple electromagnetically with any previously known zones of alteration or IP anomalies detected by EZ. However, it is acknowledged that there could be situations where conductors have not been detected due to poor coupling and/or low signal: noise ratio.

The former particularly may occur with a vertical conductor in the centre of the loop, and the latter where stations are at a distance further from the loop than the loop width, or near power lines. The lack of geological outcrop has also led to generally poor geological control over the optimum placing of the loops (i.e. in relation to dips and prospective lithologies).

Appendix 1 includes an initial assessment of the UTEM anomalies, loop by loop. None of the anomalies can be definitely interpreted as bedrock conductors since they are shallow and poorly conductive. On the assumption that they may be the updip expression of deep mineralization, the best UTEM anomalies have been auger sampled. The geochemical results have predomi-

nantly been discouraging and are discussed below for their respective localities.

Fig.8 indicates the locations of the UTEM anomalies, the most interesting of which are: 8A, 8B, 7A, 9A, 10B, 10A, 20A. Some of these appear to be related to the Mt. Black alteration zone (Section 9). Of all the anomalies from the first stage of the UTEM surveys only 8A was considered to have a possible deep bedrock source. The subsequent detailed follow-up of this anomaly is discussed in Section 9. The second stage of UTEM surveying indicated anomaly 20A which is discussed under Section 12.

7.2 SIROTEM Survey

Sirotem surveys were carried out for loops 8A, 20A, 21, 22 which are all small detailing loops. The advantage of Sirotem in these cases is that the primary field is greater for small loops due to higher currents in the transmitter loops than used by UTEM (which usually compensate with large loops). The other advantage is that Shell has access to more computer software for modelling Sirotem and EM-37 than UTEM, so that any anomalies detected can be more precisely determined for depth and position prior to drilling.

Results from these Sirotem loops are discussed under their respective localities (see below).

045

960046

7.3 CSAMT Surveys

The CSAMT (Controlled Source Audio-Magneto Telluric) technique utilises an electromagnetic field from a distant (e.g. 6 kms) source transmitted at a variety of frequencies from (in these surveys) 4096 to 16Hz. Although really a tool for deep soundings to 1 kilometre or more through horizontally layered rock, the technique can also be employed to detect lateral inhomogeneities in the conductive structure of the earth, e.g. an orebody.

Initially two test lines (Fig. 7, 9, 10) were surveyed across the northern most extension of the Rosebery ore-body at which depth the host horizon is the order of 200-300 metres deep. The CSAMT lines successfully detected the mineralization. Subsequently a long CSAMT line was run north of the Rosebery mine lease from the Bobadil area across the Cutty Sark alteration zone to the Mt. Black ridge.

The results are discussed by Zonge Engineering (the Contractor) in Appendix II. Major drawbacks to the use of CSAMT include the high cost of surveying and difficulty of interpretation of anomalies. The latter may result in the additional need to do a detailed TEM survey to better define the anomaly.

8.0 BULK CYANIDE LEACH (BCL) SURVEY(JR)

8.1 Objectives

The Bulk Cyanide Leach (BCL) gold technique has been used by Billiton Australia since 1983 in reconnaissance exploration and has successfully identified known gold mineralization of any significance in all surveys conducted. It has in addition discovered a number of previously unknown gold anomalies which are currently under investigation or have been examined. The technique was brought to Australia by Bill Griffin, an Amax metallurgist who established Perth Metallurgical Laboratories (PML) to conduct BCL analyses. It involves the collection of a 5 kg sample sieved to a coarse mesh size (-6mm), to which is added 5 kg of dilute cyanide for up to 36 hours, before a 2 litre aliquot is decanted off and mixed with 3 grams of zinc powder, and left for 8 hours. The 3g of Zn is filtered off and Zn + paper filter are despatched to AMDEL for aqua regia digest/AAS Au determination together with Cu and Ag. Calculations then determine original sample parts per billion (ppb) levels. Detection limit is + 50ppt (parts per trillion) and total cost is in the order of $20.00. The technique costs approximately double that of prepared fire assay and triple that of prepared aqua regia/AAS gold analyses on 50 gram charges. It has been modified over the last two years

with Australian Laboratory Services using activated carbon instead of zinc and most recently by Pilbara who use DIBK (an iso butyl ketone) instead. These modifications are leading to quicker and therefore cheaper analyses which are now around $17.50 sample. Further modifications and refinements are foreseen in the next few years.

The BCL technique is a qualitative rather than quantitative technique because cyanide does not dissolve all gold bearing compounds and because of time restrictions in analysis, it does not totally leach gold from grains above a certain size (samples are not crushed or pulverized).

The decision to carry out a BCL survey over the Rosebery East licence was made early in 1986 as it was considered that: a) the model volcanogenic massive sulphide deposit (Rosebery, Que River, Hellyer) contains gold credits of high economic significance (2.3-3.2 g/t Au). Feeder structures associated with the mineralization may be expected to be long lived features in which later hydrothermal fluid movement up and along the structure may result in partial remobilization of particular ore mineral associates viz gold. Hence a buried massive sulphide deposit may manifest itself geochemically as a leakage anomaly.

048

b) stratabound and/or hydrothermal epigenetic gold systems may well be associated with favourable long lived structures (e.g. Henty Fault Zone) in association with cherty exhalatives and/or brittle fractured hosts. As a large proportion of the licence is covered by either temperate rain forest or glacial cover, a broad reconnaissance technique may be useful in delineating areas of interest.

c) the method had not been attempted before within the licence and indeed, little work had apparently been carried out elsewhere on the West Coast.

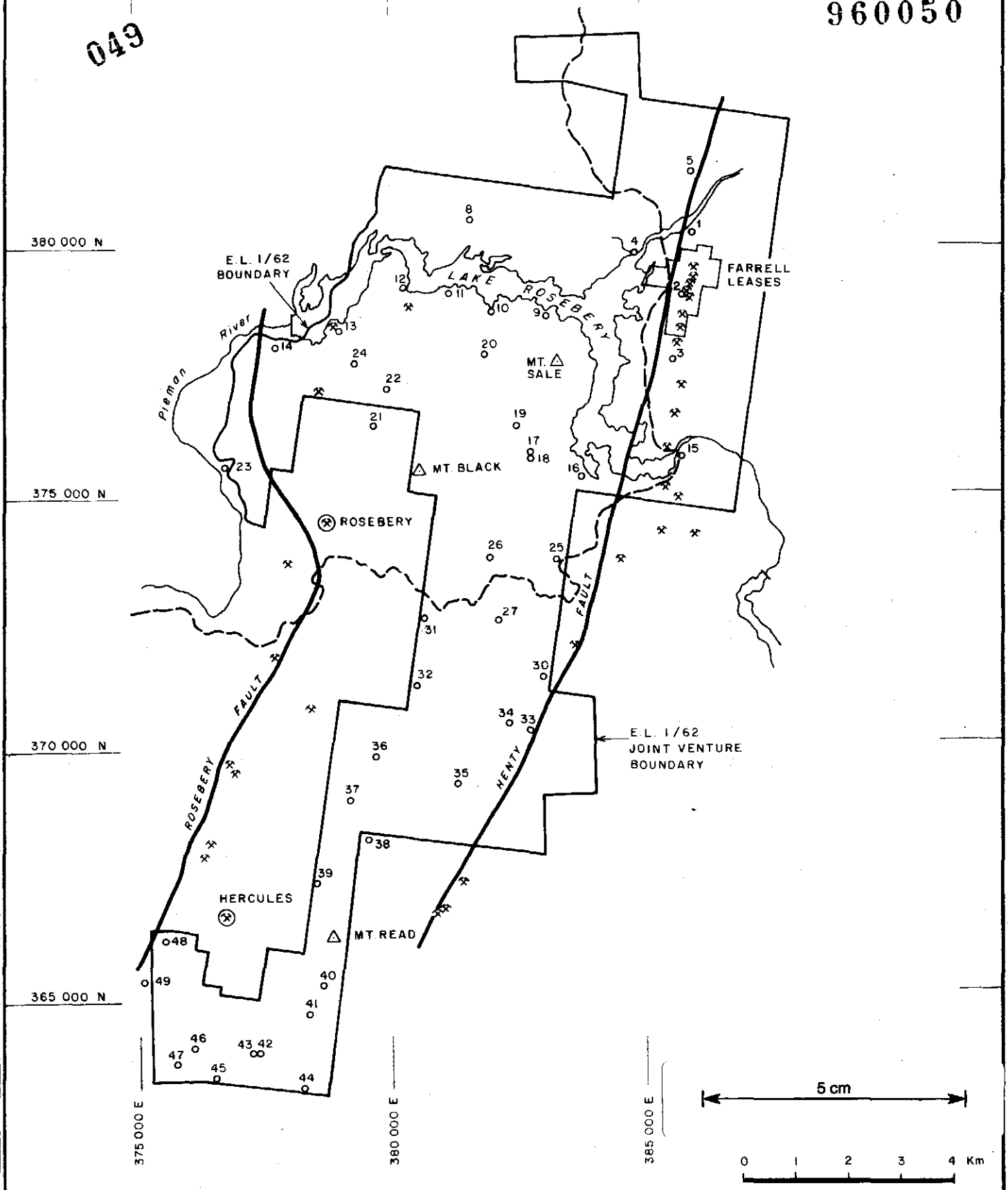
8.2 Procedure

Previous experience has dictated the need to pick sample sites that covered similar drainage areas. A catchment size of 2+/-0.5 sq km was therefore chosen and 52 sites were originally selected from aerial photographs as being suitable collection points. Of these, only 46 sites were actually sampled, the remainder being unsuitable due to poor stream definition or inadequate sample present. (Figure 11).

At each sample point, approximately 7 kg of sieved (-1/4") stream sediment was collected together with another 4 kg sample of sieved (-1/4") sediment. Only

960050

049



10 Bulk leach sample site

× Pit, digging, prospect

⊗ Mine, operating

NB. There is no sample 7, 28, 29

Billiton Australia

ROSEBERY EAST J.V.

BULK LEACH SAMPLING AND KNOWN MINERALIZATION

JR 3/86 1:100,000 approx
AS AHO

LJ 50 / 1014

050

960051

sediment from the active portion of the stream was collected and care was taken to avoid possible trap sites. (Sampling of trap sites must be avoided because of the extreme sensitivity of the method. Any 'trapped' gold would necessarily produce large and non-representative anomalies). Water and some organic matter was present in all samples and no attempt was made to filter or tamper with the sample.

The 7kg samples were allowed to settle at which time the clear water on top was decanted off before the remainder was despatched for analysis of Au. The 4kg samples were dried and sieved into four fractions (-20# to +40#; -40# to +80#; -80# to +120#; -120#) before despatch to the laboratory where analysis for Au, Ag, Cu, Pb, Zn, As, Ba, Sn, Cd was carried out. The sieved samples were collected to enable better definition of any BCL anomalies by providing associated pathfinder element anomalism. Four sieved fractions were initially chosen to test the variability of response of the analysed elements versus the particle size of the sample.

A follow up survey was carried out at sample sites that produced anomalous geochemistry in the initial survey. A bulk 7kg sample was collected in a similar fashion as before but only a -20# to 40# and -120#

960052

051

sample was collected to test pathfinder anomalism. This decision was reached after a preliminary examination of earlier results (see below).

8.3 Results

Analytical results are presented in Appendix III and it is apparent that, from a subjective assessment only, elemental backgrounds are as follows:

Element	Background
BCL Au	0.1 ppb
Au q	0.02 ppm
Cu	5 ppm
Zn	25-35 ppm
Ag	1 ppm
As	7-15 ppm
Ba	150-180 ppm
Pb	15-30 ppm
Sn	4-6 ppm
W	10 ppm

A subjective classification of these results (Table 1) indicates a group of 28 sample sites that show anomalous geochemistry in one or more of the analysed elements. This group is summarized below in Table 2 and shown in Figure 12.

052

960053

TABLE 1: BCL Geochemistry
(Subjective Classification)

SAMPLE	Cu				Zn				Ag				Au				As				Ba				Pb				Sn				W				BCL Au
SITE	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	
1																																					*
2	*	*	+	*	*	*	*	*	*	*	*	*					*	*	*	*					*	*	*	*								*	*
3	+	+	+		*	+	*	*	*	*	*	+							+						*	*	*	*									+
4											+																										
5											+																										
6																																					
7																																					
8																*																					
9											+																				*						
10																																					
11													*																								
12																													+								
13																																					
14																															+						*
15																																					+
16																														+	*	*					
17																														+							
18																																					
19																															+						
20																																					
21																																	*				
22																																					
23																																					
24													*																		+						
25	+				+		+																														+
26																																					
27																																					
30	+				+																																
31																																					
32											+																										
33																																					*
34																																					
35																																					
36																																					
37																																					
38	+																																				
39																																					
40																																					
41					+	+	+																+				*										
42					+																																
43																																					
44																					+																
45	+																+	+	+	+					+	+											
46																			+	+			+	+													
47																																					
48	*	+	+		*	*	*	+	+	+	+	+					+		+	+	+	+		+	+	*	*	*									
49	+				+			+				+					+																				

* = Anomalous
\+ = Of Interest

A -20 +40#
B -40 +80#
C -80 +120#
D -120#

053

TABLE 2: Initial BCL Anomalies

SAMPLE SITE	BCL Au	INDICATORS
1	3.8	N.A.
2	3.3	Cu Pb Zn Ag As W
3	0.6	Pb Zn Ag (Cu As)
4	N.A.	(Ag)
5		(Ag)
8		Au only
9		Sn (Ag)
11		Au only
12		(Sn)
14	1.7	(Sn)
15	0.9	N.A.
16	N.A.	Sn
17		(Sn)
19		(Sn)
21		W
24		Au Sn
25	0.6	(Cu Zn)
30	N.A.	(Cu Zn)
32		(Ag)
33	5.3	N.A.
38	N.A.	(Cu)
41		Pb (Zn Ba)
42		(Zn)
44		(Ba)
45		(Cu Pb As)
46		(As Ba)
48		Cu Pb Zn (Ag As Ba)
49		(Cu Zn Ag As)

N.A. Not anomalous ( ) Marginally Anomalous

054

Further selection was made to cull those responses that showed marginal anomalism in one or two indicator elements with no anomalous BCL gold response. A final test of anomalies that warrant further attention was produced by incorporating this criteria and is summarized below(Table 3).

TABLE 3: Final BCL Survey Anomalies

Priority	Sample Site	Location	Geochemistry		Geology
			BCL Au (ppb)	Indicators (ppm)	
1	2	Farrell	3.3	Cu 200, Pb 3.15% Zn 1950, Ag 160, As 580, W 70	Fissure Pb Zn fill in black shales & volcaniclastics
2	1	North Farrell	3.8	N.A.	As above
2	14	North Bobadil	1.7	Sn 36	Vein Pb Zn show at Maces No.2 lode
2	33	South Stitt adj. to Henty Fault Zone	5.3	N.A.	Ignimbrites, andesitic lavas, epiclastics
3	3	South Farrell	0.6	Pb 4000, Zn 7700 Ag 10, Cu 48, As 95	As for samples 1,2
3	15	Murchison River	0.9	N.A.	As for samples 1,2,3
3	25	Murchison Hwy. West of Sterling Valley	0.6	Cu 18, Zn 190	Andesitic lavas
4	8	North of Lake Rosebery	N.A.	Au 0.08	Andesitic-dacitic lavas
4	11	East Langdons	N.A.	Au 0.08	Silicified andesitic lavas
4	24	South Langdons	N.A.	Au 0.12, Sn 65	As above

These ten sample sites were re-sampled several months later in order to reproduce the anomalies and give confidence to the results and interpretation. Samples were taken from the same location and identical collection procedures employed although only two size fractions (-20+40#, -120#) were collected for indicator analysis. A comparison of these two sets of analyses is given below in Table 4. Note that three duplicate samples were taken as 'standards' to test any variance in the analytical procedure.

8.4 Discussion

The results of the initial survey were viewed encouragingly as the technique apparently differentiated background responses clearly from anomalous values. They indicated some degree of association of Au with base metals and As, Ag, W, Sn but more importantly, they show a strong geological association with the area immediately east of the Henty Fault Zone. Note also that the strongest BCL anomaly occurs in the South Stitt area on the HFZ. Other areas of interest are Langdons (samples 11 and 24) and North Bobadil (sample 14). Results of the varied size fraction analysis indicated that the coarsest fraction (-20+40#) has detected a greater number of anomalies in a wider range of elements while the finest fraction (-120#) shows a greater enhancement of anomalous levels especially in Cu Pb Zn Ag. It was suggested then that

057

960058

TABLE 4: Comparison of initial BCL survey anomalies with a follow up survey

SURVEY SAMPLE	BCL Au (ppb)	Au (ppm)		Cu (ppm)		Pb (ppm)		Zn (ppm)		Ag (ppm)		As (ppm)		Ba (ppm)	
Mesh Size		-20 +40	-120	-20 +40	-120	-20 +40	-120	-20 +40	-120	-20 +40	-120	-20 +40	-120	-20 +40	-120
Original	3.8	<0.02	<0.02	7	7	4	60	14	44	<1	<1	<2	6	110	210
Repeat	<0.1	<0.01	<0.01	6	5	8	36	18	70	<1	1	4	3	120	145
Original	3.3	<0.02	<0.02	60	200	9000	3.15%	1150	1950	32	160	330	500	350	340
Repeat	0.1	0.02	<0.01	29	63	3000	7100	350	430	14	70	21	<2	280	260
Original	0.6	<0.02	<0.02	16	48	1600	4000	2100	7700	3	10	36	95	155	250
Repeat	0.1	<0.01	<0.01	11	21	1100	2800	550	2000	2	7	40	31	135	180
Original	<0.1	<0.02	0.08	<2	2	<4	22	5	12	<1	<1	4	6	75	65
Repeat	0.4	<0.01	0.25	4	3	<4	<4	24	6	<1	<1	3	5	65	65
Original	<0.1	<0.02	<0.02	<2	4	4	16	14	16	<1	<1	5	8	470	240
Repeat	<0.1	<0.01	<0.01	3	8	8	22	14	26	<1	1	4	2	490	280
Original	1.7	<0.02	<0.02	<2	6	8	26	10	22	<1	<1	5	12	270	230
Repeat	0.1	<0.01	0.17	4	3	8	26	9	12	<1	<1	9	8	210	210
Original	0.9	<0.02	<0.02	<2	5	4	18	7	14	<1	<1	2	4	100	210
Repeat	0.2	<0.01	0.02	3	3	20	40	3	14	<1	<1	3	8	230	400
Original	<0.1	0.12	<0.02	<2	6	8	260	14	20	<1	<1	7	10	350	270
Repeat	4.8	<0.01	0.05	5	8	8	24	8	22	<1	1	4	7	400	310
Original	0.6	<0.02	<0.02	14	18	50	55	180	190	<1	<1	16	9	250	170
Repeat	<0.1	0.02	0.02	14	14	55	48	155	170	2	1	10	7	220	170
Original	5.3	<0.02	<0.02	<2	4	16	260	18	26	<1	<1	12	16	190	155
Repeat	<0.1	<0.01	<0.01	4	3	8	10	16	14	<1	<1	14	12	190	105

Standard

Duplicate 1 0.5
2 0.5
3 0.6

sampling of both fractions will provide results of the greatest width (elemental range) and depth (relative level).

Comparison of results from both surveys is disconcerting in view of the lack of quantitative agreement between identical samples. Repeatability of results in a qualitative sense has not been demonstrated either; anomalies recorded on the initial survey do not re-appear in the follow up. Seasonal differences provide the only plausible explanation if one accepts the credibility of the survey method. That is, streams sampled in the follow up survey contained considerably more effluent than several months earlier when the initial sampling was carried out. It is therefore possible that either a) previously deposited sediment was washed away permitting only recent sediment to settle, or b) the sample collected from the more active stream was depleted in fines and hence would be unlikely to contain fine particulate gold. Either explanation would necessitate confining survey times to mid summer when streams were at the lowest discharge rate and when available sediment was permitted accumulation time.

Comment is necessary in regard to the reliability and accuracy of the method. Experience by BAUS elsewhere has indicated that problems can be experienced in reproducing anomalous values quantitatively. Poor sampling procedures and the gold 'nugget effect' have been proposed to account for this variability but nevertheless, the method has the ability to consistently indicate the presence or absence of anomalies in a particular survey. The reliability therefore appears to be good although the quantitative accuracy has limitations. Questions may arise as to the effect of organic matter in the sample as far as the solubility of gold is concerned. However, gold is taken up in solution by carbon only in its activated form and in the natural state, fireburn areas are the only risk. Laboratories safeguard this possibility by skimming off all organic matter during the course of the initial cyanide dissolution phase of the process and hence consider that there is little likelihood of this problem occurring.

9.0 MT. BLACK LOCALITY (JR & NH)

9.1 Location & Previous Work

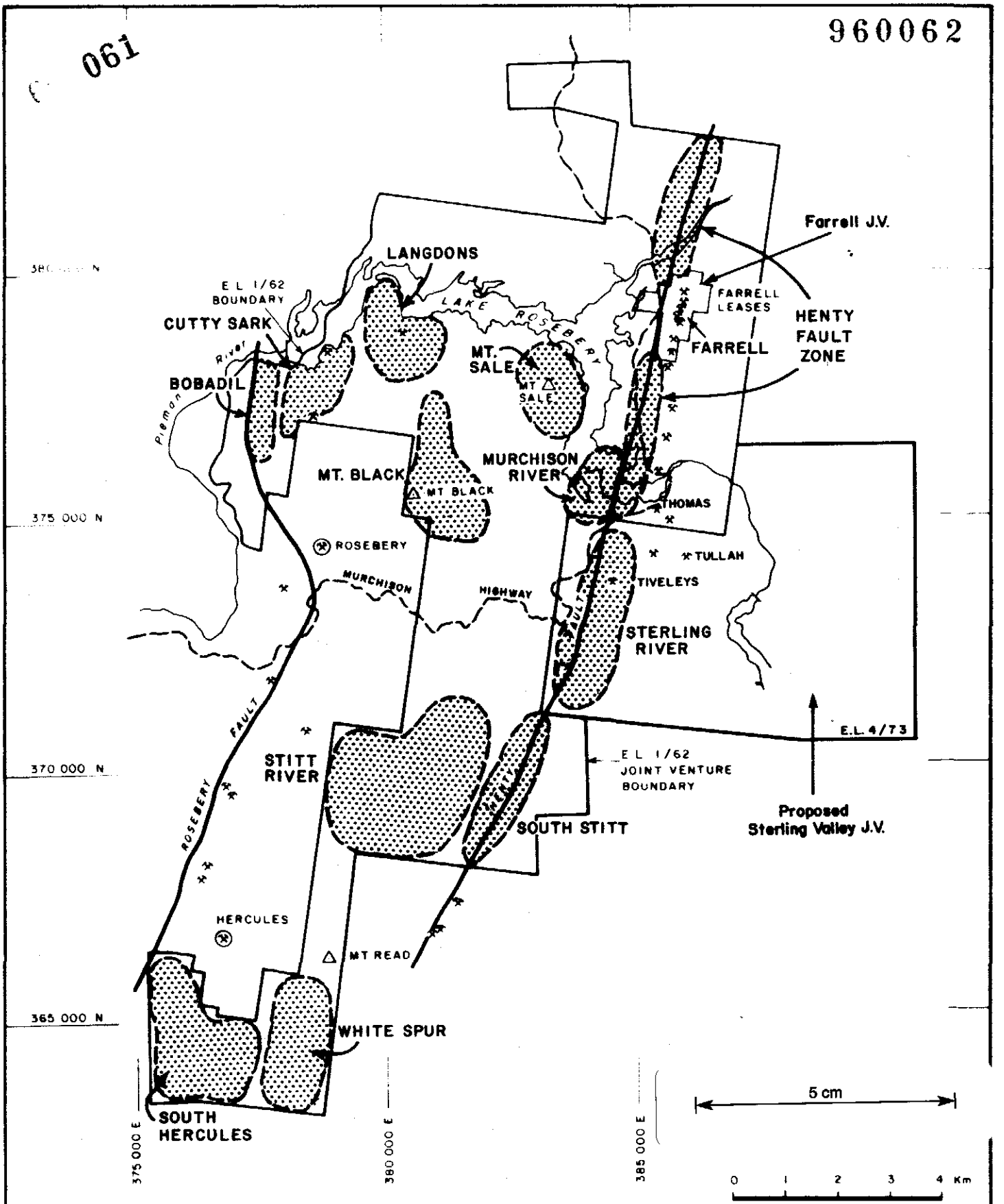
Exploration carried out immediately east of Mt. Black (see Figure 13) has followed up work previously commenced by both EZ Co. and GODC. Preliminary traverse mapping, reconnaissance IP and some "C" horizon geochemistry was undertaken by EZ Co. while GODC selected this area as one requiring detailed work. A close spaced grid was cut over an area of 3km x 1km and detailed (1:5,000 scale) geological mapping, rock chip sampling, petrological work, VLF EM and auger "C" horizon geochemistry carried out.

9.2 Geological Mapping & Petrology

Traversing along existing grid lines together with petrological examination of specific rock samples (see Appendix IV and GODC report July-December, 1984) has enabled a geological interpretation of the local environment to be formulated. (see Figure 14 and 15). On the Mt. Black track (377 000N 380 700E), a thin (2m) epiclastic has been discontinuously traced over 700m. It is dominantly of volcanic ash origin but with a silty character and at one locality contains cherty interbeds. A moderate easterly dip, NNE strike and SE

960062

061



× Pit, digging, prospect

⊗ Mine, operating

Billiton Australia

ROSEBERY EAST J V.

LOCATION OF WORK AREAS

J R | 3/86 | 1:100,000 approx

A S | AHO

LJ 50 / 1020 | 13

062

facing is observed. The presence of true fiamme at and above this stratigraphic level indicate subaerial deposition for much of the volcanic pile although the presence of cherty sub units suggest periods of subaqueous deposition.

At 376 000N 381 500E, cherty sediments are flanked by silty and sandy tuffaceous epiclastics (total strike length 1 km). Faulting has been interpreted to account for local offsets in bedding trends. A 150m wide (stratigraphically) chlorite-hematite-magnetite alteration zone occurs beneath the cherty sediments (but not the silty/sandy tuffs) and only trace pyrite is noted. Fiamme have been observed at one outcrop immediately below the volcanic hiatus and the presence of oxides (as opposed to sulphides in a reducing environment) may again indicate a high degree of subaerial volcanism.

Stratigraphically above (500m) the main chlorite-magnetite zone at 376 000N 382 000E, a thin hematite-magnetite chert occurs in association with a poorly developed chlorite alteration envelope. Quartz veining transects the sediment and rare pyrite is observed. No other paleo-environmental evidence exists but one may speculate a similar situation as for the main chlorite-magnetite zone.

063

The siliceous chloritic magnetic alteration breccias are thought to represent local fissure fill zones only and may be confined to subvolcanic intrusives (see sample 21969, Appendix IV), as observed elsewhere within the andesites.

9.3 Ground Geophysics

Interpretation of the Dighem aeromagnetic data (Figure 16) suggests that folding along a N-S axis may be present across the zone of alteration on Mt. Black. A north plunging anticline is inferred and there is evidence to suggest a faulted truncation of the structure (see Figure 17).

9.3.1 UTEM Survey

This area was covered by the UTEM loops 8 and 10 reported in Appendix I. Previous geophysical work by EZ and Getty (IP, Dighem, VLF) concentrated on the pyrite-magnetite-chlorite alteration zone on the top western side of Mt. Black. The UTEM surveys were designed to investigate this zone also but no strong bedrock conductors were detected. The only anomaly worthy of note in the area was 8A which is about 1.5 kms NNE of the alteration zone. As noted in Appendix I this is a late channel anomaly that could be due to noise.

064

960065

9.3.2 SIROTEM Detailing Survey

Detailing of anomaly 8A was required and subsequently a 750 x 400m fixed loop Sirotem survey was carried out. The loop was placed over the UTEM anomaly on the assumption that the latter had a shallow dip. Sirotem was used in this instance since the transmitter and batteries are more portable than the UTEM transmitter and generator, and there was no road or lake access to the grid. Nominal loop sides were along 377 750N, 377 250N, 381 600E and 382 000E. The Sirotem profiles are presented in Appendix V, and it is quite evident that no bedrock conductor exists at depth, thus confirming the UTEM anomaly as being due to noise (spherics and power-line). The area is evidently very resistive judging from the fast trasient decay. The first 5 channels have a strong positive response due to recording during the turn-off of the transmitter at the end of each cycle. The loop resistance was about 17.5 ohms and a current of 5.5 amps was used.

9.3.3 Geological Assessment of the Anomalies

Geological mapping of all anomaly areas was carried out in conjunction with auger sample logging. Float is minimal and outcrop rare but some tentative

065

960066

logging of "C" horizon clays enabled additional information to be gathered. (see Figure 14).

Anomaly 6B is a strike extensive (1.25 kms) anomaly that is coincident with a magnetic high at its southern extremity. Mapping on one line indicated that the source may be fault related chloritic-magnetite breccia although on the northern lines, there is no surface indication of the source.

Anomaly 7A is only recorded on two lines and no surface indications of a possible source were evident from mapping or auger chip sampling.

Anomaly 8A is also only recorded on two lines but its characteristics were originally interpreted to be that of a deep bedrock conductor. Detailing work failed to confirm this interpretation but in the meantime, significant geological work was carried out. Detailed ground traversing of lines 377 000N to 378 000N was carried out both over the anomaly position and over the interpreted up dip projection of the source (viz 381 000E - 381 300E). Silicified andesites are the predominant rock type with a strong feldspar phyric component. No evidence of pyroclastic texture was observed nor were epiclastic or sediment lithologies apparent. An unusual vegetative feature is apparent

from lines 377 250N northwards and enclosed by co-ordinates 381 000E - 381 300E. Approximately 20% outcrop occurs and all is intensely silicified and leached massive andesitic lava. This zone extends north to and including the Langdons locality (see Section 11.0) and is a geobotanical anomaly i.e.

- Thick rainforest is replaced by boggy soils and grasses, despite the topographical high.

- the intensity of silica alteration is higher than observed elsewhere.

- rare fiamme-like textures are observed possibly indicating a subaerial paleo environment.

The negative results from the recent Sirotem detailing survey have however made redundant all the previous geological work and no further follow up is planned.

9.4 Auger & Rock Chip Geochemistry

Auger "C" horizon samples have been collected across identified UTEM anomalies, usually at 25 metre spacings. Where outcrop occurs, rock chip samples have been collected. All samples have been submitted to the

laboratory unsieved as it is considered that the sampling horizon is that of weathered bedrock (not soils developed over bedrock). Analysis for Cu Pb Zn Ag Au As Ba has been routinely carried out (see Appendix VI).

Details of UTEM anomalies tested by auger geochemistry are given below: (see Appendix VII)

ANOMALY	LINES DETECTED	LINES AUGERED	TRAVERSE (25m spacing)	No.of SAMPLES	ORDER No.
7A	377500N	377500N	382000E-382350E	12	08339
	377250N	377250N	382000E-382275E	9	08339
8A	377500N	377750N	381000E-382000E	41	08345
(incl.	377250N	377500N	381000E-382000E	37	08339/08345
6B)	376750N	377250N	381325E-381750E	13	08339
		377000N	381800E-382100E	13	08339
		376750N	381850E-382150E	11	08338/08339
9A	376000N	376000N	382700E-382950E	11	08339
	375700N	375700N	382700E-383000E	13	08338
	375500N	375500N	382650E-382950E	13	08339
	375250N	375250N	382500E-382800E	13	08339
	375000N	375000N	382600E-382900E	13	08339
10B	376000N	376000N	381700E-382050E	13	08338/08339
	375700N	375700N	381800E-382200E	17	08338
	375500N	375500N	381800E-382100E	13	08338
	375250N	375250N	381800E-382100E	13	08339
		375000N	381800E-382100E	13	08338
			TOTAL	268	

960069

068

Some follow up was carried out where visually anomalous values were received from the initial phase of auger sampling. A preliminary sizing analysis was also taken. Details are tabulated below.

ANOMALY	REPEATED LINES	TRAVERSE (10m intervals)	No of SAMPLES	ORDER No.
10B	376000N	381700E-381850E	16	08345
	Ditto	Ditto (-80#)	Ditto	Ditto
9A	376000N	382700E-382900E	21	08345
	Ditto	Ditto (-80#)	Ditto	Ditto

Visual assessment of these results has indicated no obviously anomalous responses except those listed below viz

10B	376000N 381750E	0.18 ppm Au
9A	376000N 382750E	360 ppm Cu
"	376000N 382800E	140 ppm Cu

Follow up augering at 10 metre centres failed to reproduce the magnitude of these anomalous values or to define any consistent width to the anomalies. No further work was carried out as a consequence.

960070

069

Rock chip sampling has been carried out whilst mapping and results are presented in Appendix VII. GODC had previously carried out sampling with little success and selective sampling by BAUS did little to change this. The alteration zones at Mt. Black carry no anomalous levels of base metals, gold or indicators (As Ba Mo Sb Hg) and of the 17 samples collected, peak values of only 115 ppm Cu, 145 ppm Pb, 220 ppm Zn, 1 ppm Ag, 0.01 ppm Au, 115 ppm As, 900 ppm Ba, 10 ppm Sn, 50 ppm W were obtained.

9.5 Discussion

Geologically the Mt. Black locality is an interesting area by virtue of the variable paleoenvironment. It is suggested that it is an east facing sequence of moderate easterly dip and NNE strike that varies stratigraphically from subaerial dacitic lavas west of Mt. Black to ?subaqueous andesitic lavas east of Mt. Black. The boundary is diffuse and marked by periods of submergence as evidenced by thin cherty and silty sediment horizons intercalated with the lavas. The sediments occur over a stratigraphic thickness of 1.5 kms but are thin and poorly developed. Further to the north at Langdons, similar sediments are observed and although these horizons cannot be traced along strike for any great distance it is possible that they are generally time equivalents.

070

960071

The overall lack of anomalous geochemistry is disappointing in view of the interpreted reconstruction of the paleo-environment. It leads one to conclude that either the system here is geochemically inactive or that severe leaching or non dispersive mineralization is present. The first conclusion is in agreement with both geochemical and geophysical facts known to date. However the latter conclusions are possibilities that have not been adequately explained although one needs to acknowledge that the UTEM survey has not detected significant mineralization.

071

960072

10.0 MT. SALE LOCALITY (JPR & NH)

10.1 Location & Previous Work

The Mt. Sale work area mainly includes that area east of Mt. Sale to the lake shore (see Figure 13).

EZ Co. have carried out a detailed IP survey over a small area near the NE lake shore together with geological mapping. Follow up work is not recorded. GODC surveyed the area with Dighem as part of their blanket survey of the entire licence and several low order anomalies were recorded. Getty report some follow up of their "Mt. Sale" area but the location of this appears to be different from the BAUS locality. More over the coordinates are wrongly labelled adding to the confusion. In any event, their work is limited to line clearing and initial mapping investigations only.

10.2 Geological Mapping

Work has concentrated on following up UTEM anomalies east of Mt. Sale and little traversing outside of these limits has been carried out. Medium to coarse feldspar phyric andesitic lava predominates with rare intermediate lithic tuff. Outcrop is typically sparse but no other lithological types are present (see Figure 18). Dips or facings have not been observed in any of the work although it has been assumed that an east

072

facing and dipping sequence is present.

960074

073

10.3 Ground Geophysics

UTEM anomalies in this area are discussed in Appendix I under loops 6 and 7. They are all weak and shallow conductors. The UTEM loops are designed to couple with known IP anomalies but no bedrock conductors were detected at the IP response.

10.4 Auger & Rock Chip Geochemistry

Auger sampling has been carried out over anomalies 6A, 6C and 7B. Anomaly 7A response is thought to be due to glacial scree and hence no further work was carried out on this anomaly.

Auger sample locations (and rock chips where auger work was not appropriate) are shown on Figure 18 whilst results are contained in Appendix VIII. Results from samples taken over anomalies 6A and 6C are non-anomalous while weakly anomalous (0.07, 0.08 ppm) Au values were returned from two non-coincident samples on anomaly 7B.

074

During the course of examination of the Anomaly 6C, rock chip sampling of a fine disseminated pyrite-magnetite bearing andesite revealed anomalous gold and arsenic levels (Appendix VI sample 21918; 6.6 ppm Au, 5450 ppm As). A small grid was cut along strike from this location at 378100N, 377900N and geological mapping, extensive rock chip sampling (23 samples) carried out. Petrological work (see Appendix IV, sample 21964, 65) and mapping indicate that the host lithology is probably a subvolcanic dyke of trachy-andesitic composition that strikes at 350° AMG and has a width of probably no more than ten metres. Results of the repeat rock chip sampling failed to confirm the anomalous geochemistry and it is therefore concluded that the initial high assays are due to local concentrations of the metals into late stage cavities. The distribution of this mineralization is not widespread and is not considered to be of economic significance.

10.5 Discussion

All interpreted UTEM conductors in the Mt. Sale area are considered to be near surface and of unlikely bedrock origin. Follow up geological mapping and auger

sampling has failed to define any anomalous responses and it is considered that no economic significance can be attached to these areas. Similarly, anomalous gold and arsenic rock chip values from a thin intermediate dyke at Anomaly 6C are restricted in distribution to small vugs within the rock itself and as such are also of little economic importance.

No further work is planned at the Mt. Sale locality.

11.0 LANGDONS LOCALITY (JPR & NH)

11.1 Location & Previous Work

The work area is situated on the southern edge of Lake Rosebery to the east of Bastyan Dam (see Figure 13) at AMG co-ordinates 379 000N, 380 000E.

Previous work by EZ Co. was confined to limited geological mapping and some IP surveying east of the Langdons mine. Mapping carried out prior to the filling of Lake Rosebery has provided some useful lithological descriptions and locations and has aided the geological interpretation of the area. GODC had planned to carry out some initial investigation but the demise of the company in late 1983 did not permit such work to be carried out.

11.2 Known Mineralization

The Langdons workings consist of one short (15m) adit into the hillside with subsequent stoping through to the surface adjacent to the access track. The stope strikes at 090° Mag and dips 60° north. One other small gouging occurs 200 metres to the north west but has had no significant development carried out.

960078

077

Petrological work carried out on some of the dump material from the main Langdons workings (see samples 21970-72, Appendix IV) indicate that the host is a feldspar phyric andesite in which silicification, chloritization and brecciation have altered the original composition. Quartz, siderite, galena, pyrite, arsenopyrite have infilled the breccia matrix and it is considered that the mineralization style is typical of fissure fill mineralization, similar to Farrell and possibly of Devonian age. Lead isotope work has not been carried out, however, to confirm this latter interpretation.

Examination of the dump material indicates the presence of several different mineralization types although their style is similar. Mineralized samples vary from dense black hematitic rocks with cherty fragments, siderite and galena to chloritic siliceous network veined (galena, hematite, siderite) samples. Analyses of these types indicates that the strongly oxidised samples contain high levels of base metals (24% Pb, 2.2% Zn) while cherty, chloritic and blebby mineralized samples contain anomalous gold (4.8 ppm Au) (see Appendix VI, Figure 19).

078

960079

It is suggested that development of mineralization at Langdons is local only as well defined shoots do not appear to be present nor does a consistent grade distribution seem apparent. An estimated total production of only 200 tons ore seems likely from the main workings.

11.3 Geological Mapping, Rock Chip Sampling & Petrology

Re-establishment of an old EZ Co. grid was carried out prior to geological mapping of a small area around the Langdon's Mine (see Figure 19). Extensive rock chip sampling (samples 21930-63, Appendix VI) was carried out whilst mapping and regularly spaced (10 metre) samples were collected from the access track from the workings to 330 metres west and 500 metres east to the lake shore (samples L10W-330W, L10E-500E; Appendix VI).

Outcrop is poor to moderate in the map area but all is severely bleached. Low swampy grasses and bowra cover much of the area. Mapping has identified two chert/sandstone horizons stratigraphically above (assuming an E facing) the Langdons workings (see Figure 20). The western unit is mapped only in two locations, one of which now underlies Lake Rosebery, the second coinciding with the small gouging to the

079

northwest of the main workings. The eastern sediment is much more continuous in outcrop but it is interpreted to be transversely offset by NE faulting. Dips vary from 55° - 80°W while one facing data set indicate an east facing and therefore local overturning of the sequence. Andesitic lavas are the predominant rock type that occur above and below the sediment horizons but of importance is the recognition of various alteration and textural types. Alteration is expressed as silicification, chloritization, sericitization, carbonation and quartz vein stockworking is also noted. Many of the rocks are texturally massive fine feldspar phyric lavas but in the footwall of the western sediment, a large area of coarse pyroclastic breccia is developed. This breccia is considered to be the equivalent of that observed to the north on the Pieman Road at AMG co-ordinates 380 200N, 380 000E. To the south of the area of pyroclastic breccia and west of Langdons limited outcrops of fiamme bearing lavas are observed. Their identification is subjective but close similarities to true fiamme also observed on the Pieman Road (AMG co-ordinates 381 000N, 379 500E) would tend to confirm this interpretation.

960081

030

Rock chip sampling results from both mapping and road traversing are generally low with typical background values of 5-10 ppm Cu, 10 ppm Pb, 25 ppm Zn, 500 ppm Ba, 10 ppm As, 1 ppm Ag, 0.01 ppm Au. However, several marginally anomalous samples were recorded viz

Sample	Geochemistry of Interest
21932	155 ppm Zn
21934	145 ppm Zn, 200 ppm Pb
21935	105 ppm Zn
L 60W	145 ppm Pb
L160W	420 ppm Zn, 120 ppm Pb
L230W	145 ppm Pb
L 10E	130 ppm Pb
L470E	0.08 ppm Au

Samples 21932, 34, 35 are located 100 metres to the north of the Langdons diggings while L60W, 160W, 230W, 10E occur immediately west of the diggings. Sample L470E is located on the track approximately 50 metres above the lake shore. The samples all occur in

081

areas of mapped alteration and although only marginally anomalous, the degree of leaching must be borne in mind when interpreting these results. Also the track traverse samples are ten metre composites not selected rock chips.

11.4 Ground Geophysics

Results of the UTEM survey over this area are discussed under loop 19 in Appendix I. Although the loop was situated to couple with the Langdon;s mineralization no bedrock conductor was detected. Previous IP surveys by EZ has shown chargibility but not resistivity anomalies confirming the disseminated and fairly widespread nature of mineralization in the alteration zone(s).

11.5 Discussion

The Langdons locality is a geological anomaly and despite little geochemical or geophysical optimism, it is considered that the area warrants further attention. The recognition of a well developed pyroclastic breccia (?vent) coupled with strong pervasive alteration and weak base metal mineralization would suggest a hydrothermally active regime. The presence of several sedimentary (?chemical exhalites) units accompanying this alteration would suggest periods of submergence for the volcanic pile during accumulation. The

960083

082

equivalent of this environment may be represented at Mt. Black locality where cherty and silty sediments are associated with localized hydrothermal expressions.

The weak geochemical response may be interpreted to be due to the severe and complete leaching of the more mobile elements from the surface profile. Residual elements such as Pb may be the only indicator of deeper bedrock mineralization beneath the weathered surface; a profile that is anticipated to be less than 10 metres deep.

It is recommended that future work be concentrated by deep bedrock testing to obtain fresh samples for alteration identification and to determine whether the geochemical pattern may be upgraded to define deep drill targets.

083

960084

12.0 CUTTY SARK (JGP)

12.1 Introduction

The prospectivity of the Cutty Sark area centres on the extension of the Rosebery Mine Host Rocks north of the Mine Lease. Although there are minor showings of mineralization within the Rosebery Mine Hanging Wall Volcaniclastics which comprise most of the Cutty Sark area, (e.g. the Cutty Sark workings), these are of no economic significance.

The area has been spasmodically explored by EZ over the years with mapping, geochemistry and geophysical surveys including IP and magnetics. Their results apparently gave them insufficient encouragement to do any drilling. EZ concluded that the Rosebery Host Rocks did not extend into the Cutty Sark area.

Getty took over exploration in 1982 and carried out a systematic programme of mapping, rock chip sampling and UTEM. This work received considerable impetus from the discovery of large boulders of basemetal massive sulphides in a volcanic mass debris flow deposit on the banks of the Pieman River. (In

1979 the HEC had uncovered a 8.5m x 1m raft of basemetal massive sulphide within reworked volcaniclastics a little further to the west, while excavating the foundations of the Bastyan Dam).

The Getty programme concluded in mid 1984 with the drilling of two diamond drillholes (CS1 and CS2 totalling 848m). The holes intersected only minor sulphides in relatively weakly altered Hangingwall reworked volcaniclastics.

Shell commenced work in February 1986. The main thrust was directed at a detailed geological evaluation of this complex area, to determine if the Rosebery Host Rocks are present or not. This evaluation comprised field mapping of critical exposures, extensive rock chip and drillcore sampling, and relogging of Getty drillhole CS1 and EZ drillhole 71R (on the Mine Lease). The geological work was complemented by UTEM and CSAMT surveys, and a general re-evaluation of both the EZ and Getty geophysical results (see Section 12.4).

12.2 Geology

For an outline of the stratigraphy and rock types at Cutty Sark see the legend on the Geological Plan - Figure 21. See also Figures 22-25 and Appendix IX.

085

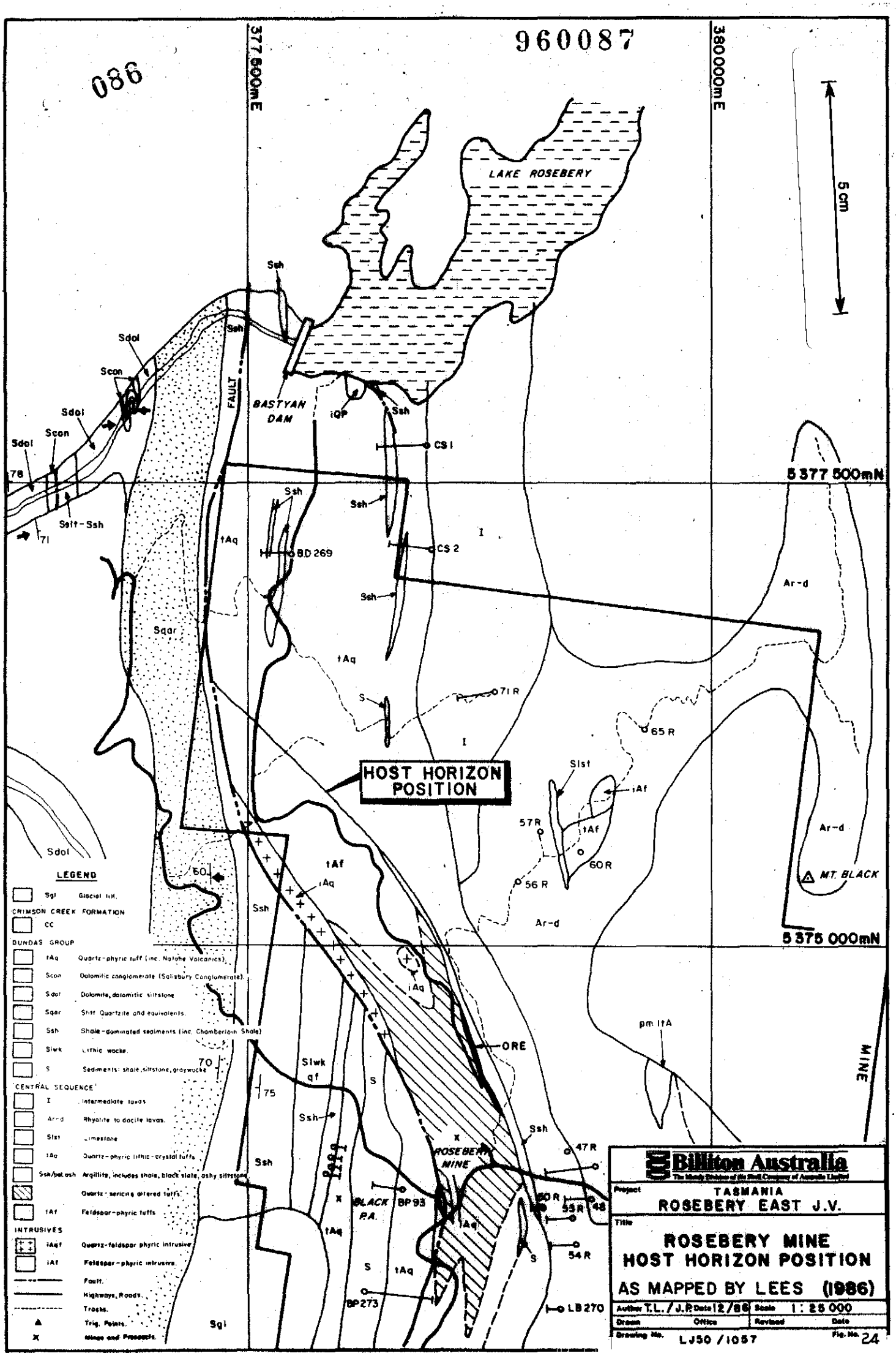
960086

Evaluation of the geology at Cutty Sark is made difficult by lack of exposure and glacial cover in the critical zones. Before describing the geology of the Cutty Sark area itself, it is necessary to discuss drillhole 71R at the northern end of the Mine Lease, which is vital to the interpretation.

12.2.1 Drillhole 71R & Vicinity

Green (1983), Corbett (1981), and Lees (1986), all interpret the Rosebery Host Rocks (or more correctly, the contact between the Footwall and Hangingwall volcanic sequences), as trending NW from the Mine into the Rosebery Thrust and not extending into the Cutty Sark area (see Figure 24) This interpretation places the Cutty Sark area entirely within the Hangingwall sequence and therefore of low prospectivity. These workers all use the presence or absence of quartz phenocrysts in the volcanics to map the important contact - the Hangingwall Volcaniclastics are characteristically coarsely quartz-phyric, while the Footwall Volcanics are feldspar-phyric and supposedly completely devoid of quartz crystals.

This interpretation ignores the fact that all mappable units in the stratigraphy, both at the Mine and north of the Mine, strike northwards



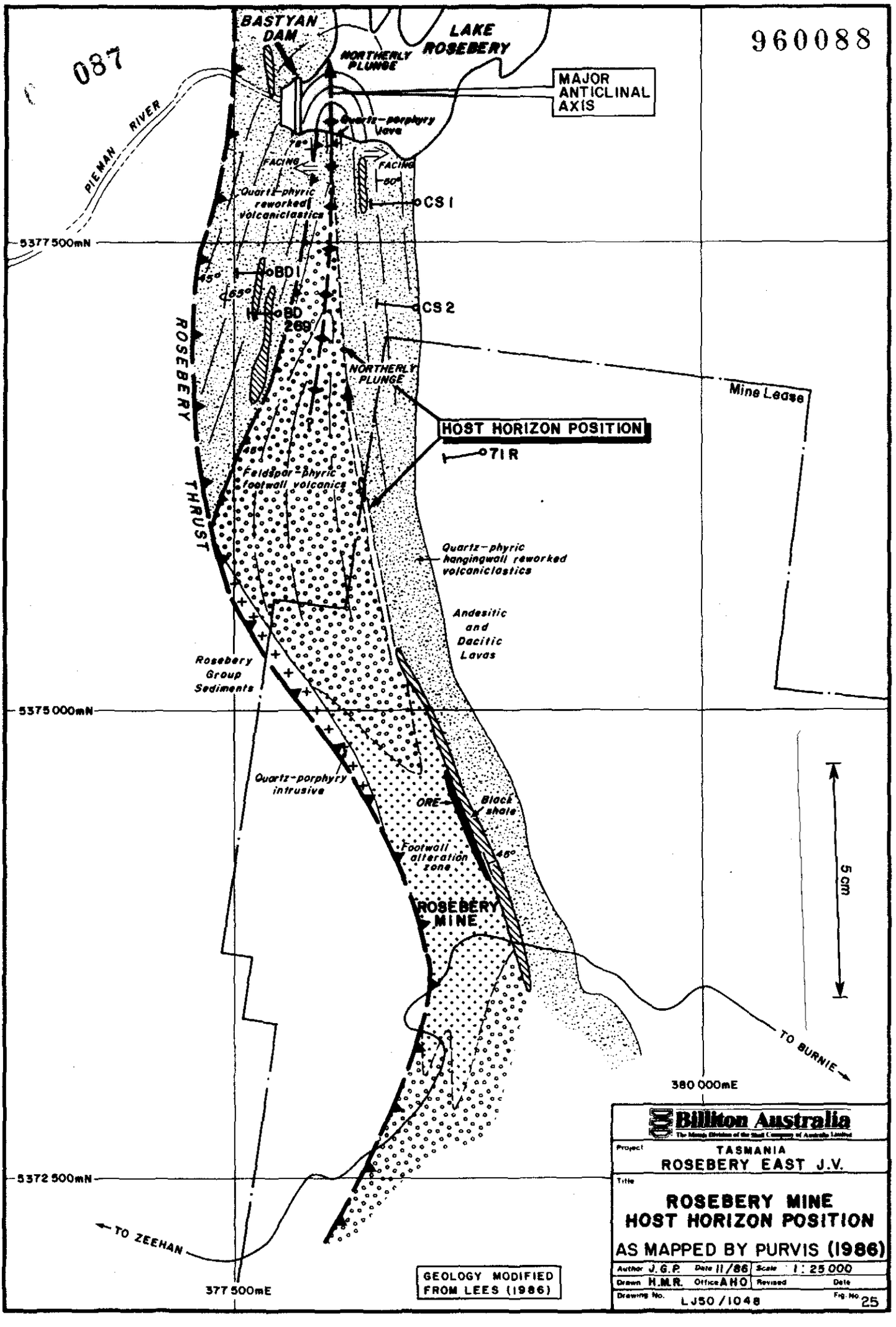
Billiton Australia
The Minerals Division of the Shell Company of Australia Limited

Project: TASMANIA
ROSEBERY EAST J.V.

Title:
ROSEBERY MINE
HOST HORIZON POSITION
AS MAPPED BY LEES (1986)

Author T.L. / J.P.	Date 12/86	Scale 1 : 25 000
Drawn	Office	Revised / Date

Drawing No. LJ50 /1057 Fig. No. 24


960088
087
BASTYAN DAM
LAKE ROSEBERY
NORTHERLY PLUNGE
MAJOR ANTICLINAL AXIS
PIEMAN RIVER
Quartz-porphyry lava
FACING
FACING
Quartz-phyric reworked volcaniclastics
CS 1
5377500mN
BD 1
BD 289
CS 2
ROSEBERY THRUST
NORTHERLY PLUNGE
Mine Lease
HOST HORIZON POSITION
71R
Feldspar-phyric footwall volcanics
Quartz-phyric hangingwall reworked volcaniclastics
Andesitic and Dacitic Lavas
Rosebery Group Sediments
5375000mN
Quartz-porphyry intrusive
ORE
Black shale
Footwall alteration zone
ROSEBERY MINE
5cm
TO BURNIE
380000mE
5372500mN
TO ZEEHAN
377500mE
GEOLOGY MODIFIED FROM LEES (1986)
Billiton Australia
Project
TASMANIA
ROSEBERY EAST J.V.
Title
ROSEBERY MINE
HOST HORIZON POSITION
AS MAPPED BY PURVIS (1986)
Author J.G.P. Date 11/86 Scale 1:25000
Drawn H.M.R. Office AHO Revised Date
Drawing No. LJ50/1048 Fig. No. 25

960089

088

parallel to the Rosebery Thrust. This direction is confirmed by the trend of geophysical responses (see Section 12.4). The postulated NW trend of the Host Rocks is therefore quite anomalous in the local geological context.

More importantly, the above interpretation is incompatable with the results obtained by EZ's drillhole 71R drilled in 1975 near the northern edge of the Mine Lease, and 950m from the northern limit of the Rosebery deposit. This 719m hole was relogged in considerable detail during the Shell programme (see Appendix IX and Figure 23).

Hole 71R intersected a fairly standard Rosebery Mine stratigraphy including a 30m interval of typical Host Rocks (cherty tuffaceous sediments. Unfortunately, in 71R the Host Rocks are poorly sulphidic and contain only trace base and precious metal values). Dip of the stratigraphy in the hole is very regular at around 45° east, the same dip as at the Mine.

If the Host Rock unit in 71R is extrapolated up the regular 45° dip, it plots on surface over 500m east of the position preferred by Lees et al. The access track to 71R provides a good section across the sequence in this vicinity, and a thin zone of tuffaceous sediments outcrops in the extrapolated position of the Host Rock horizon (see Figure 21). While this exposure lacks the width, alteration and cherty character of the typical Host Rocks, it marks a change from massive feldspar-phyric volcanics to the west to quartz-phyric reworked volcaniclastics to the east - further evidence that it occupies the Host Horizon position. Stratigraphically up-sequence to the east, the reworked quartz-phyric volcaniclastics and other volcanic units outcropping on the surface correlate well (albeit with some facies variations), with the units overlying the Host Rocks in 71R. The exception is the black shale unit (see below). Notable among the sequence overlying the tuffaceous sediment exposure is a volcaniclastic mass-flow unit containing large clasts and rafts of black shale up to 2m long. This unit is characteristic of the lower part of the Hangingwall Volcaniclastics between 71R and the Rosebery Mine. Below the tuffaceous sediment exposure the massive volcanics (lavas and possible ignimbrites), are overwhelm-

960091

ingly feldspar-phyric although there are rare small quartz phenocrysts in places. Although these rocks have been mapped by previous workers as part of the Hangingwall Volcaniclastics, they can be assigned to the Footwall Volcanics on the basis of both lithology and mineralogy.

As can be seen in Figure 23, the 60m wide black shale unit in hole 71R (the northern extension of the black shale overlying the Host Rocks at the Rosebery Mine), lenses out before reaching the surface. This, and the change in character of the Host Rocks between the hole and the surface exposure 750m up-dip, is an expression of the northerly plunge which is evident at the northern end of the Rosebery orebody. The northern-most exposure of the black shale unit on surface is at 5 375 400mN, 378 400mE (3900'N, 250'W Rosebery Mine Grid), at an RL of 400m and about 1 km south of the intersection in 71R which is at an RL of -125m. This indicates a maximum angle for the northerly plunge of 35° (the angle is probably around 20° - see Fig. 26).

091

960092

Hole 71R provides one final piece of conclusive evidence regarding the geological interpretation of the Host Rock position north of the Mine. The bedding angles in the hole are consistently at a high angle to long core axis (minimum 75°/LCA, average 80-85°/LCA), which gives very good control on both the strike and dip of the sequence. While 'fixing' the east dip at around 45°, these angles also show that the hole (directed approximately 250° AMG) was essentially

perpendicular to strike - indicating that the sequence here strikes slightly west of AMG north. If the interpretation by Lees, Green and Corbett were correct, 71R should have intersected the sequence at quite an oblique angle to strike.

Also, to join the intercept in 71R with their interpreted surface plot of the Host Rocks requires an east dip of under 25°. Clearly, the results in 71R show that this is not the case.

To summarize, hole 71R indicates:

1. The typical Rosebery Mine sequence, including Host Rocks, is present near the northern boundary of the Mine Lease.
2. This sequence is dipping east at 45° and striking northwards into the Cutty Sark area.
3. A northerly plunge of less than 35° is taking the prospective rocks away to depths in excess of 500m below surface.

12.2.2 Hanging Wall Volcaniclastics

The outcropping rocks at Cutty Sark mainly belong to the Rosebery Mine Hangingwall Volcaniclastics. These comprise subaqueously-deposited, reworked, quartz-feldspar-crystal-lithic volcaniclastics ranging from coarse breccias to true crystal tuffs. There are numerous intercalated lenses of bedded tuffaceous sediments including grey to black siltstones and shales. The sequence is characterised by large volcanic quartz crystals (averaging 4-5mm), although feldspar crystals are always common and there are sections which are almost wholly feldspar-phyric. Drillhole CS1 (see Figure 22 and Appendix IX) provides an excellent section through the Hangwall sequence. Petrological descriptions of rocks within the sequence are given in Appendix X.

093

Mass transport and rapid deposition by debris flow pulses are indicated by the facies morphology of the Hangingwall sequence. The volcaniclastics are generally poorly sorted and lacking bedding. Near the Bastyan Dam there are deformed rafts of tuffaceous sediments up to 3m wide and at least 20m long, and a cluster of at least 5 rafted lenses of pyritic and basemetal massive sulphides, the largest being 8.5m long and 1m wide. (Their approximate position beneath Lake Rosebery is shown on Figure 21). 300m to the east there is a 10m thick exposure of volcanic breccia containing clasts of pyritic and basemetal massive sulphides up to 2m diameter (FitzGerald 1984). This exposure is now usually 3m beneath the surface of Lake Rosebery, but was examined and sampled during a period of low lake level in March 1986. The massive sulphides are sphalerite-rich and contain low levels of gold, silver, tin and arsenic. (Sample values ranged up to 35.5% Zn, 0.08% Pb, 20g/t Ag, 0.25 g/t Au, 0.1% Sn and 0.07% As). These boulders and the rafted sulphide lenses near the dam may occur at the same stratigraphic level (see Section 12.2.6). The derivation of the sulphide lenses and clasts is unknown but a source to the north is favoured - see discussion in Section 12.5.

094

The Hangingwall Volcaniclastics contain persistent but minor disseminated and vein pyrite as well as traces of basemetal sulphides, and there are several very small old prospector's diggings in these rocks. The sulphides tend to be concentrated in the tuffaceous sediment horizons. Alteration in the volcaniclastics is characterised by weak-moderate sericitisation, albitisation and silicification, with lesser chloritisation and carbonatisation. Minor fuchsite is present in places. Thick veins of quartz-ankerite chlorite are associated with the silicification in the southern abutment of the Bastyan Dam.

12.2.3 Andesite Lava Unit

The Hangingwall Volcaniclastics are conformably overlain along the eastern side of the Cutty Sark area by an andesitic lava unit, probably comprising several flows. The rock is massive, feldspar-phyric and commonly magnetic. It is generally weakly to moderately sericitised and chloritised, but there are local patches of strong chloritisation and silicification associated with disseminated and vein pyrite-chalcopyrite mineralization. The strongest of these zones are at the old Cutty Sark workings (several adits) and

095

Hawksbury working (small shaft). Samples taken from the dumps of these workings contained up to 4.5% Cu, 34 g/t Ag, 0.95 g/t Au and 0.53% Bi. These occurrences are of no economic significance. Welded felsic ignimbrite units occur in places along the eastern and western margins of units the andesitic lava unit and Fitzgerald (1984) has mapped an ignimbrite within the lava near the Hawksbury workings. These would suggest that the lava(s) was erupted subaerially.

12.2.4 Footwall Volcanics

In the south-western part of the Cutty Sark area massive feldspar-phyric volcanics of the Rosebery Footwall sequence are exposed, particularly along the lower part of the access track to hole 71R. The western-most rocks are volcaniclastic and contain sparse small lithic clasts, possible flattened pumice and rare small quartz crystals. There rocks do not appear layered or reworked and a pyroclastic (ignimbritic?) origin is favoured. To the east there is a massive, highly feldspar-phyric unit which lacks lithics and quartz crystals, and is probably a lava. Alteration in these Footwall rocks is weak, being limited to slight bleaching, sericitisation and chloritisation.

960097

096

12.2.5 Quartz-Feldspar Porphyry

The only other rock type of note in the Cutty Sark area is a 70m wide exposure of quartz-feldspar porphyry within the Hangingwall Volcaniclastics on the southern shore of Lake Rosebery. The porphyry is massive, and characterised by bipyramidal quartz crystals averaging 203mm, with lesser smaller feldspar crystals, in a strongly bleached and sericitised felsic ground mass. It is silicified in places and contains 1-2% disseminated and vein pyrite-arsenopyrite with minor gold values (maximum sample value 0.57g/t Au).

The porphyry has contact relationships with the adjacent volcaniclastics which suggest it is a lava flow rather than an intrusive. On the eastern contact there is a complex zone of apparent soft-sediment disruption of the volcaniclastics, with numerous massive sooty pyrite bands and lenses up to 500mm long and 60mm wide, caught up in both the volcaniclastics and the porphyry. These are clearly thin beds of sulphide 'mud' that

097

have been pulled apart, disrupted and folded while still soft, apparently by the deposition of the porphyry. (Samples of this massive pyrite assayed up to 0.36 g/t Au, 46 g/t Ag and 0.22% As).

There is an identical quartz-feldspar porphyry unit 6m wide at the top of the Host Rock sequence in 71R, whose complex brecciated contacts indicate quenching, also suggesting it is a flow rather than an intrusive.

Because of the similarity between these two quartz-feldspar porphyry units and their apparent flow characteristics, it is considered that the porphyry on the shores of Lake Rosebery, like the one in 71R, essentially marks the position of the Rosebery Host Rocks within the stratigraphy at Cutty Sark.

12.2.6 Structure

Over most of the Cutty Sark area the rock sequence dips and faces east at about 45° and strikes northwards. The overlying andesitic lava appears to be conformable on the Hangingwall Volcaniclastics. However, along the shores of Lake Rosebery a major dip and facing reversal is noted, centred on the quartz-feldspar porphyry lava. To

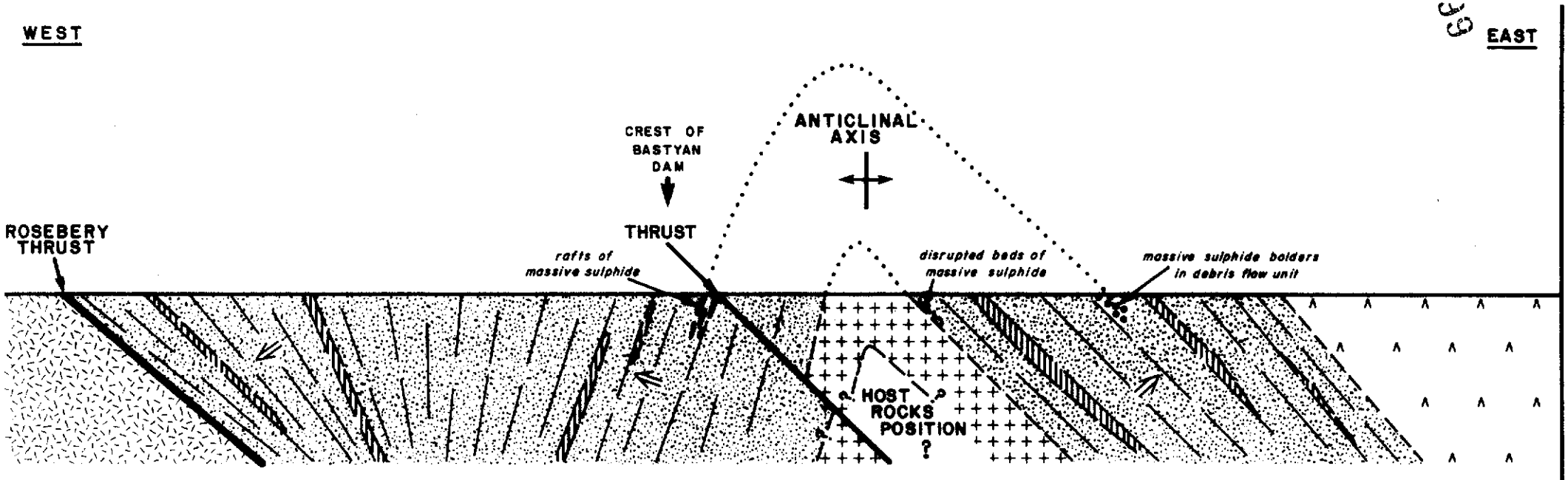
098

the east of the porphyry the Hangingwall Volcaniclastic dip and face east at 45° as determined by holes CS1 and CS2. West of the porphyry the same quartz-phyric volcaniclastics dip steeply west and face west - as shown by several excellent facings exposed in the overflow flume of the Bastyan Dam.

The quartz-feldspar porphyry thus marks the position of a major anticlinal axis and this fold explains why almost all the Cutty Sark area is made up of the Hangingwall Volcaniclastics, as the area covers both limbs of the fold. It also explains why Hangingwall Volcaniclastics occupy the Bobadil area to the west of Cutty Sark, as Bobadil lies on the western limb of the fold and the east dips in this area are apparently due to overturning of the sequence adjacent to the Rosebery Thrust*. The situation is shown diagrammatically in Figure 27. Note, because of the fold the volcaniclastic debris flow unit containing the massive sulphide boulders east of the porphyry could be stratigraphically equivalent to the unit containing the rafts of massive sulphide to the west of the porphyry.

* The Bobadil area has yet to be evaluated in detail.

Fig 5.



ROSEBERY GROUP SEDIMENTS

HANGINGWALL REWORKED VOLCANICLASTICS

QUARTZ FELDSPAR PORPHYRY LAVA

ANDESITIC LAVAS

BLACK SHALE LENSES

FACING

5 cm

0 50 100 150 200 250 m

From Randell et. al (1986)

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project: TASMANIA
ROSEBERY EAST J.V.

Title: SCHEMATIC SECTION ALONG SOUTHERN SHORE OF LAKE ROSEBERY
CUTTY SARK AREA
LOOKING NORTH (approx.5378000mN)

Author J.G.P.	Date 12/86	Scale 1:5000	
Drawn H.M.R.	Office AHO	Revised	Date
Drawing No. LJ50/1053			Fig. No. 27

9601100

100

A north plunge for the fold is evident but no measurements could be made to quantify this. As mentioned, the black shale in 71R has a maximum northerly plunge of 35°, and a prominent set of strong east-dipping joints exposed along the southern lake shore have a northerly plunge of 15°. Plunge reversals are possible and in fact would be of critical importance to the prospectivity of the area. At the lake the anticlinal axis broadly coincides with the interpreted time-stratigraphic position of the Host Rocks. The Host Rocks themselves are not present at surface due to the northerly plunge which has taken them down to considerable depth. (Even at the southern end of the Cutty Sark area only rocks considered facies-equivalents of the Host Rocks are present on surface).

The fold and the northerly plunge determine why the Footwall Volcanics do not continue to the north on surface. The anticlinal axis in the southern part of the Cutty Sark area apparently lies within the Footwall Volcanics well west of the Host Rock position, although it could not be mapped in the field. There is no known repetition of the Host Rock position over the fold axis here, but the western contact between the Footwall Volcanics and the Hangingwall Volcaniclastics of

101

the Bobadil area, is obscured by glacials and complicated by a strong thrust fault. This thrust strikes north and dips 45° east, parallel to the Rosebery Thrust, and is exposed in the Bastyan Flume.

12.3 Sampling

Extensive rock sampling was undertaken at Cutty Sark, primarily for gold. A 300m width of the exposure along the southern shore of Lake Rosebery was chip sampled. Sample locations and most-anomalous results are shown on Figure 21, and results are listed in Appendix XI. In addition, over 170m of core from hole 71R was split and sampled - results are given in Appendix IX.

Eleven rock samples (six from 71R), were submitted for thin section and two, (from the massive sulphide boulders in the volcanic debris flow unit on the shore of Lake Rosebery), for polished section. Results are given in Appendices IX and X.

No significant results were obtained from the geochemical sampling, although there are traces of gold and basemetals in the Hangingwall Volcaniclastics both in outcrop and in 71R. The lack of precious and base metals in the Host Rocks intersected in 71R is extremely disappointing (maximum values obtained: 0.04 g/t Au, 2 g/t Ag, 0.24% Cu).

12.4 Geophysics (see Figures 28 & 29)

Extensive UTEM work had previously been carried out by Getty in 1983 over the Cutty Sark-Bobadil area. Although the transmitter loops were not laid in positions such that noise from the major HEC power line was minimised, it does appear that there is no bedrock conductor present in the Cutty Sark area. A very weak conductive zone was tested by CS2 intersecting no massive sulphides. The Bobadil area west of the power line has not been well surveyed since the transmitter loop lay to the east of the power line.

On the possibility that mineralization could occur in the mine sequence below DDH's CS1 and CS2, downhole Sirotem logging was planned. CS2 was blocked so that only CS1 was logged. The profiles using both early and late times are included in Appendix XII. Although the data is very noisy (due to the proximity of the HEC powerline?) no offhole conductor is evident. The transmitter loop was positioned to couple with a conductor in the interpreted mine sequence beneath the drillhole.

960104

103

A line of CSAMT was carried out along 9900'N (EZ Imperial Grid). This was done to investigate the possibility of mineralization at depth in both Bobadil and Cutty Sark areas, albeit only along one line. The data is presented in Appendix II together with an interpretation report by Zonge. A geophysical cross-section is also shown in Fig. 30. In summary the CSAMT results on this line have only indicated faults and weakly conductive zones either due to alteration or shaley/pyritic lenses within the volcanics. None of these conductive zones resemble the responses over Rosebery itself.

12.5 Discussion

In the stratigraphy north of the Rosebery Mine, the quartz-feldspar porphyry lava is the only primary volcanic rock capable of producing the coarse quartz crystals so characteristic of the reworked Hangingwall Volcaniclastics. It seems the quartz crystals are derived by erosion of such bodies, which were extruded immediately after deposition of the Host Rocks and massive sulphide ores. As the Footwall Volcanics are feldspar-phyric it is apparent that immediately following the period of quiescence marked by the ore deposition, there was a marked change in character in the volcanism. For some reason, the quartz-phyric volcanics were rapidly eroded and only remnants now remain.

960105

104

The 100m thick unit of quartz (-feldspar) crystal tuff overlying the Host Rocks in hole 71R, is traceable southwards to the same stratigraphic position in the northern end of the Rosebery Mine where it is much thinner. The unit is completely absent in the central and southern positions of the Mine (Lees 1983). These observations suggest that the provenance for the quartz-phyric Hangingwall Volcaniclastics was to the north of Rosebery and that the material was transported southwards by various agencies including debris mass-flows.

The thin disrupted beds of massive sulphide on the margin of the quartz-feldspar porphyry on the shores of Lake Rosebery, indicate massive sulphide deposition took place locally in this area of the Host Rock time-stratigraphic horizon. The relative abundance of clasts and rafted lenses of massive sulphide in the same vicinity reinforce this view. Given that the transport direction for the Hangingwall Volcaniclastics was from the north, the evidence suggests the presence of a local site (new sub-basin) of massive sulphide deposition within the Host Rock horizon in the vicinity of the northern boundary of EL 1/62. This event was evidently separate from, but penecontemporaneous with, the sulphide deposition at Rosebery.

The likely position of this massive sulphide body is down the northerly plunge of the anticlinal axis. Unfortunately, much of the target area lies beneath Lake Rosebery and beside the Bastyan Dam wall, where drilling is out of the question.

The Hangingwall sequences intersected by holes CS1 and CS2 (450m apart) are essentially identical. However, it is not possible to correlate individual units in this part of the sequence with the Hangingwall rocks intersected in 71R, 950m south of CS2. This lack of correlation is considered primarily due to the northerly plunge, exacerbating the effect of the obvious facies variations in the Hangingwall sequence.

Both CS1 and CS2 are entirely in the east dipping and facing eastern limb of the anticline. Neither hole reached the anticlinal axis which in the area of the holes is also close to the interpreted Host Rock position.

While it is probable that the true Host Rocks are at depths greater than the level reached by the drillholes due to the northerly plunge, the possibility of plunge variations or reversals cannot be discounted. It is therefore recommended that hole CS1 (which is still open), be extended about 200m to pass through the interpreted Host Rock position.

106

960107

13.0 SOUTH HERCULES

13.1 Introduction

South Hercules comprises the area between the southern boundary of the Mine Lease and the southern boundary of EL 1/62 (see Fig. 13). The prospectivity is almost wholly dependant on the extension of the Hercules deposit Host Rocks, particularly since EZ outlined a body of stratiform gold mineralization in these rocks only 300m north of the EL boundary in 1985. (Current reserves of this body are 290,000 tonnes grading 2.6 g/t Au, 120 g/t Ag, 1.6% Pb and 2.6% Zn).

Only a very small proportion of the Hercules Host Rocks outcrop within the EL, but due to their southerly plunge and moderate easterly dip, they extend sub-surface beneath much of the northern part of the South Hercules area. Although there are numerous old pits and trenches in the area, on widespread minor sulphide showings in a variety of rock types and settings, none are of real significance.

The South Hercules area has a long history of exploration because of its proximity to the Hercules deposit. However only five drillholes have been put down, all within the sedimentary sequence west of the volcanics. Systematic exploration has been concentrated into three periods: 1. 1957-62: RTAE - EZ Joint Venture. Helicopter-borne EM followed by Turam EM, magnetics and gravity.

2. 1969-74: EZ. Turair EM, magnetics, soil geochemistry, gradient array IP and four diamond drillholes (WSP 178, 179, 190 and 191).

3. 1978-82: E.Z.-Getty Joint Venture. Soil sampling, gradient array IP, limited dipole-dipole IP and one diamond drillhole (DCP 235).

In addition, Getty carried out a limited amount of stream traversing and sediment sampling in 1984.

No significant results were achieved by this exploration but it should be noted that little attention was paid to the extension of the Hercules Host Rocks.

108

960109

The Shell programme this year concentrated on the search for massive sulphides and stratiform gold within the Hercules Host Rock extensions. This work included field evaluation of the geological interpretation by Lees (1985a); the relogging and further sampling of holes H 1102 and H 1103 (drilled through the Host Rocks at the southern end of the Mine Lease); examination and sampling of all old workings and known zones of alteration/mineralization; and a SIROTEM survey to explore the buried extensions of the Host Rocks for massive sulphides.

13.2 Geology

The area was not re-mapped during the Shell programme. This would have been unproductive considering the recent mapping by Lees which covered the important northern part of the area. However, his work was supplemented with additional detail where necessary. The likely down-plunge and down-dip disposition of the Host Rocks was delineated (see Fig. 31).

960110

109

13.2.1 Stratigraphy

The South Hercules area is divided by a major angular unconformity into a western volcano-sedimentary sequence (the White Spur Formation), and an eastern altered felsic volcanic sequence. This latter is an east dipping and facing tripartite sequence, broadly comprising in stratigraphic order:

HERCULES HANGINGWALL SEQUENCE	Dacitic and rhyolitic lavas Feldspar and quartz-phyric volcaniclastics, some reworked with tuffaceous sediment lenses Tuffaceous siltstone-shale
HERCULES HOST ROCKS (70m thick)	Feldspar crystal tuff Cherty tuffaceous sediments with carbonate nodules Reworked feldspar-phyric volcaniclastics
HERCULES FOOTWALL SEQUENCE	Tuffaceous sediments & reworked felsic volcaniclastics Feldspar-phyric pumiceous volcaniclastic (ignimbrite?)

The important lower part of the stratigraphy is well shown in the section of hole H 1103 - see Fig. 32.

The Footwall Sequence is very strongly silicified, sericitised, carbonatised and bleached. The rocks have been deformed to quartz-augen and quartz-sericite schists. The upper part of the Footwall Sequence contains epiclastic units which lithologically could be considered part of the Host Rocks, but which have been overprinted by the footwall alteration zone.

110

The Host Rocks are also strongly sericitised, carbonatised, bleached and schistose. They characteristically contain carbonate nodules, which Lees (1985) suggests may be the result of mixing of the hydrothermal fluids and seawater during boiling at or below the seawater/sediment interface. This suggestion fits well with the observed irregular, highly complex and apparently soft-sediment-disrupted texture of the cherty tuffaceous sediment unit of the Host Rocks in holes H 1102 and H 1103. Here, the delicate-edged chert bands and patches have the appearance of having been 'mixed' together in situ with tuffaceous sediment.

The Hangingwall Sequence comprises variable felsic volcanics which are only moderately altered compared to the units lower in the stratigraphy. This alteration is characterised by sericitisation, chloritisation and albitisation. As at Rosebery, the Hangingwall rocks mark the appearance of quartz-phyric volcanics in the sequence.

111

The sedimentary White Spur Formation to the west of the volcanics was only briefly examined during this years work, although the results of the considerable previous exploration over these rocks was evaluated in detail. The White Spur Formation largely comprises volcanic detritus in varying stages of reworking, and derived from the volcanic belt to the east. Sediments range from grey and black shales, through tuffaceous siltstones and sandstones, to crystal tuffs (generally quartz and feldspar-phyric); to coarser volcaniclastics and lithic breccias - possibly deposited as submarine mass flows. Alteration is generally weak.

13.2.2 Structure

Structure plays an important role in determining the prospectivity of South Hercules. A major south-plunging anticline with its axis in the Footwall Sequence limits the southern extent of the Host Rocks. On surface the fold nose is less than 200m south of the ML boundary. The angle of plunge on the fold is not knwon but other folds in the Hercules area have plunges in the range of 10°-30° (Lees 1985a), so the Host Rocks probably extend sub-surface down the fold nose for a considerable distance south of their outcrop.

112

The Host Rocks dip east at 50° beneath the Hangingwall Sequence. Dextral movement on a strong NNW trending fault located 100-200m east of the Host Rocks outcrop, has had the effect of raising the Host Rocks over 100m closer to the surface in the block east of the fault. This increases the amount of the buried Host Rocks which are within range of geophysical surveys.

The Host Rocks are not present on the western side of the anticline as they are cut off by the angular unconformity which divides the volcanics from the White Spur Formation. The anticlinal axis is only about 50m east and parallel to the unconformity. The White Spur Formation faces west and overlies the volcanics to the east. Of the unconformity Lees and Corbett (1986) state: (the basal contact) ... "dips generally west at shallow to steep angles, and shows considerable local relief. The contact transgresses the position of the Hercules shale horizon (sic - Host Rocks), as well as various hangingwall and footwall units, implying significant structural discordance and erosion".

960114

113

13.2.3 Mineralisation & Sampling Results

The Host Rocks contain disseminated pyrite with lesser sphalerite and galena (sulphides typically average 1-3% with zones up to 10%), as well as gold and silver values. North (300m) of the EL boundary EZ have recently outlined within the Host Rocks 290,000 tonnes of stratiform mineralization grading 2.6 g/t Au, 120 g/t Ag, 1.6% Pb and 2.6% Zn. The mineralization occurs in highly altered cherty tuffaceous sediments containing an average of about 7-10% sulphides (py, sp, gn), mainly disseminated but also as thin bands of semi-massive sulphides. Some of the better gold values are associated with local zones of only 2-3% average sulphide content (a feature noted in other occurrences of stratiform gold mineralization in the Mt. Read Volcanics).

In January-February 1986 EZ drilled two holes near the southern end of the Host Rocks outcrop. Hole H 1103 was put down right on the Mine Lease southern boundary and H 1102 was put in 85m further north. These two holes were relogged in detail during the Shell programme and sampled from top to bottom. The area around the holes was mapped and selected rock samples taken for assay. Results are listed in Appendices XIII and XIV. See also Figs. 31 and 32.

Results from both holes showed only low levels of gold, silver and basemetals within the Host Rocks and the adjacent Footwall Sequence. The altered Footwall rocks contain ubiquitous disseminated pyrite and lesser sp-gn-cp, up to a local maximum of about 5% sulphides. The Host Rocks in H 1103 contained maximum values of 0.22 g/t Au over 2m, with peak values for Pb, Zn and Ag at 0.14% Pb, 0.21% Zn and 12 g/t Ag (in non-coincident 2m samples). The underlying altered Footwall rocks contained up to 0.73 g/t Au over 2m (part of a 12m intersection averaging 0.23 g/t Au, with no associated Pb, Zn or Ag). In H1102 the gold results were even worse (maximum value 0.25 g/t Au over 3m in the upper part of the Footwall rocks), but there were consistent low level values for Pb, Zn and Ag in the lower Host Rocks and the Footwall Sequence (best intersection: 21m @ 0.21% Pb, 0.52% Zn, 8 g/t Ag, in the Host Rocks).

The outcrop sampling of the Host Rocks and Footwall Sequence in the vicinity of the drillholes produced an isolated 2.2 g/t Au value from the pyritic Host Rocks over hole H 1103, but no other results of significance.

The Hangingwall Sequence volcanics contain small zones of sulphide mineralization associated with local areas of stronger alteration. The best of these occurrences is at the southern end of the East Hercules line of workings, about 600m east of the Host Rocks outcrop (see Fig. 31). Here, a 60m wide zone of strong chlorite alteration with disseminated pyrite, underlies a 20m zone of strong quartz-sericite-chlorite alteration (including some quartz-augen schist), which contains disseminated pyrite and traces of galena and sphalerite. This alteration zone extends for about 250m within EL 1/62 and continues to the north within the Mine Lease. It locally cuts across the stratigraphy but broadly occurs on the contact between a massive felsic volcanic unit (volcaniclastic or lava), and east-dipping tuffaceous sediment lenses which are cherty in places. However, comprehensive rock sampling of this mineralized zone showed it contains only insignificant traces of gold and basemetals.

It is worth recording that Green (pers comm 1986), has postulated that the East Hercules mineralization may be remobilised sulphides 'leaking' from a syngenetic massive sulphide body at depth within the down-dip extension of the Hercules Host Rocks. The sampling results from this zone within EL 1/62 do not provide any evidence to support this view.

Within the White Spur Formation there are localised patches of stronger sericitisation and silicification associated with minor occurrences of disseminated and vein pyrite-galena-sphalerite. Quartz veins are common and often contain associated massive Fe-oxides which give elevated values for Pb-Zn-Ag, and are presumably at least partly after sulphides. Rock sampling of the mineralized occurrences showed that the Pb-Zn is accompanied by high silver values (maximum assay value 680 g/t Ag) and some arsenic (up to 2300ppm), but is devoid of gold.

Much of the previous exploration at South Hercules has concentrated on the White Spur Formation. This is because the Pb-Zn veins and disseminations give rise to strong soil geochemical anomalies, and the numerous black shale lenses have strong IP signatures (unlike the volcanics to the east which have a subdued IP response despite the presence of sulphides). However, the drilling conducted within the White Spur Formation has shown that the Pb-Zn mineralization is actually very weak and insignificant. The exception here may be the Pb-Zn soil anomalies over the White Spur Formation at West Hercules, which are discussed in Section 13.4.

117

960118

13.3 Ground Geophysics (NH)

A total of 7.2 kms of line were surveyed by Solo Geophysics using Sirotem. Two adjacent loops were used each about 700 x 500 metres in dimension as shown on Fig. 33. The loops were situated to lie on the up-dip side of the prospective volcanic sequences for best coupling with a possible conductor at depth. Early-time Sirotem channels were recorded. The transmitter loop current was kept relatively low (about 1 amp) so as to keep the transmitter turn-off time short in order that the early channels could be recorded without transmitter interference.

The Sirotem profiles are included in Appendix XV. It is evident that noise levels are unusually high, especially for the Hx component. This is presumed to be due to the proximity of the Mt. Read radio transmitter which is 2 to 3 kms to the north-east. Instrument noise tests were carried out and these were satisfactory. 2^{11}(2048) stacks were used to cut down random noise. Unfortunately the high noise level means that conductors at a depth greater than about 100 metres will probably be undetectable.

On the profiles there appear to be no bedrock conductors that warrant further investigation. Background resistivities are high, in agreement with previous IP results (3000-10,000 ohm metres) so that would enable good penetration. A weak broad surficial conductor may occur on line 2800S between 10,450 and 10,650mE. This probably relates to a weakly conductive unit on the gradient array IP on the same line. Chargeability anomalies do occur on the previous IP, (Dobsons Creek Grid) but they do not appear to be related to conductors, and thus have disseminated sulphide sources presumably in alteration zones.

13.4 Discussion

The results of exploration this year at South Hercules have been disappointing, given that geologically South Hercules is one of the more attractive target areas on EL 1/62. With the possible exception of the West Hercules Prospect (see below), the work done confirms that the potential of the area for massive sulphides and stratiform gold deposits, is centred on the down-dip and down-plunge extensions of the Hercules Host Rocks.

The Sirotem survey over the buried Host Rocks did not indicate the presence of any massive sulphides within this unit, although it must be noted that the survey only satisfactorily penetrated 100m below surface instead of the 300m as planned.

The stratiform gold potential of the Host Rocks within EL 1/62 has not been tested by drilling, although consideration was given at one stage during the year to the drilling of a hole 120m south of H1103. While the results from holes 1102 and H 1103 do not give much encouragement that the Host Rocks within the EL will contain a stratiform gold body, it must be acknowledged that some potential for such a body does still exist. As indicated by the grade of the body EZ have located on the Mine Lease, such stratiform gold mineralization could only be mined by opencut methods.

Therefore, calculations were made of the <u>maximum</u> size of deposit that could be present within the Host Rocks on the EL down to 100m below surface, using the same 15m thickness as the EZ body and assuming a 25° plunge angle for the fold. The figure obtained was 4.3 million tonnes.

120

It is concluded that with this restricted tonnage potential and the weak mineralization indications from holes H 1102 and H 1103, a justifiable stratiform gold exploration target for Shell does not exist in this area.

Within the White Spur Formation, strong and extensive Pb-Zn soil anomalies exist at the West Hercules Prospect immediately west of the Mine Lease. Peak values are in excess of 5000ppm Pb and Zn. The anomalies have been ascribed a hydromorphic origin by EZ (and others), supposedly originating from Pb and Zn being carried in solution by groundwater down the steep slopes from the Hercules deposit lying to the east. The anomalies were partially tested by two holes put down in 1974, which intersected only minor mineralization.

There are several factors that suggest the hydromorphic origin theory could be incorrect:

1. The Pb-Zn anomalies parallel the stratigraphy.
2. They show no consistent relationship to topography - the anomalies trend across the contours.
3. There are several separate parallel anomalies - suggesting they may be reflecting underlying units in the stratigraphy.

It is planned to evaluate the West Hercules anomalies in greater detail in the coming year.

121

960122

14. SOUTH STITT (JGP)

14.1 Introduction

The South Stitt area covers a 4km length of the Henty Fault Zone to the west of Mt. Murchison (see Fig. 34). The prospectivity of the area stems principally from the possibility for stratiform gold and/or massive sulphides within volcaniclastic sediments adjacent to the fault zone. This is based on the stratiform gold occurrence at GoldField's Henty Prospect 4km south of the South Stitt area.

Exploration in the South Stitt area has been hampered by the poor access and extensive cover of glacial moraine and Owen Conglomerate scree, which limits the effectiveness of geological mapping and geochemical sampling. From 1978-80 EZ gridded the area on 500m line spacing and carried out ground surveys including alternating lines of dipole-dipole and pole-dipole IP. From 1983-85 Getty Oil Development (in JV with EZ), undertook a major programme of systematic exploration commencing with an airborne DIGHEM survey. This work culminated in the helicopter-supported drilling of two diamond drillholes in mid 1985 (SS1 and SS2 totalling 357m). These holes were directed at geophysical anomalies adjacent to the Henty Fault Zone.

Although no mineralization was intersected they did highlight the presence of cherts, disseminated pyrite and hydrothermal alteration in volcaniclastic sediments east of the fault.

Shell commenced work at South Stitt in January 1986. The area initially was geologically mapped in as much detail as possible. Rock chip samples were taken during this work. Subsequently, all the geophysical results were evaluated in the context of the geological framework.

14.2 Geology

Geological mapping was completed at 1:5,000 scale (see Fig.34). Three rock samples were submitted for petrological examination (see Appendix XVI).

The South Stitt area straddles the Henty Fault Zone which divides two sequences of volcanics of very different character. The area is extensively covered by thick glacial moraine and Owen Conglomerate scree. The prospective volcano-sedimentary sequence east of the Henty Fault Zone, facies equivalent of the Farrell Slates to the north, is only seen on the southern part of the grid and in drillhole SS1.

123

This drillhole intersected steeply east-dipping pyritic and carbonaceous Farrell Slates, intercalated with quartz-porphyritic rhyolite lava, siliceous fine volcaniclastic sediments and cherts. These rocks are moderately hydrothermally altered and weakly pyritic. On the southern-most grid line 68,500mN there are similar silicified, pyritic, volcaniclastic sediments and cherts immediately east of the Henty Fault Zone. Up to 1km strike length of the prospective sequence may be exposed in this vicinity and further work is planned here (see Section 14.5).

The IP detected the carbonaceous and pyritic Farrell Slates intersected by SS1 (the IP anomaly was the reason the hole was drilled). The IP results suggest that a substantial unit of Farrell Slates exists north of a cross-fault near the northern-most line 71,000mN, and that south of this fault the Farrell Slates are absent except for an isolated lens which was drilled by SS1. (see Figure 35 and Section 14.4).

121

East of the prospective sequence and beneath the Owen Conglomerate, there is a thick unit of volcanomict breccio-conglomerate which is clearly a Jukes Breccia/Dora Conglomerate equivalent. It is characterised by abundant angular to rounded clasts of acid volcanics, tuffs and sediments, in a coarse sandy matrix containing volcanic quartz and feldspar crystals. The unit also commonly contains rounded pebbles and cobbles of Precambrian quartzite, which increase in abundance eastwards towards the contact with the Owen Conglomerate.

The breccio-conglomerate is weakly sericitised and has a strong near-vertical schistosity. Within this unit in the upper Sterling River there are undeformed bedded sandstone, siltstone and shale lenses which dip steeply east - paralleling the attitude of the prospective volcano-sedimentary sequence immediately to the west. Mapping by McNaught of Getty in 1984 indicates the Owen Conglomerate also dips steeply east.

The exact contact relationships between the volcanomict breccio-conglomerate and the adjacent rock units is not known, but it is clearly a unit transitional between the volcanics and the Owen. This indicates an east facing for at least the breccio-conglomerate and the Owen.

West of the Henty Fault Zone the volcanic sequence is dominated by felsic lavas and welded ignimbrites. In a zone extending up to 1km west of the fault, these volcanics are intercalated with volcaniclastic sediments and mafic volcanic flows and dykes, which increase in abundance towards the fault. Alteration of this sequence is generally weak and dominantly chloritisation. Very minor disseminated pyrite and chalcopyrite occurs in the sediments, while the mafic volcanics contain magnetite and hematite but no sulphides.

The Henty Fault Zone is cut by several strong NW-trending cross faults within the South Stitt area (see Fig.34). One of these cross structures intersects the Henty Fault Zone in the upper Sterling River valley immediately north of drillholes SS1 and SS2. Another cuts through the prospective eastern volcano-sedimentary sequence where it is exposed on the southern part of the grid. A third structure apparently cuts off the thick sequence of Farrell Slates seen in the Sterling Valley to the north of the South Stitt area. Whether these structures have had any influence on the mineralization of the rocks adjacent to the Henty Fault Zone is a matter of conjecture.

126

960127

14.3 Rock Sampling Results

During the geological mapping, 61 selected rock samples showing signs of mineralization and/or alteration were submitted for analysis. Full results are listed in Appendix XVII.

The precious, basemetal and arsenic values were all of a low tenor. Maximum values were 2160ppm Cu (a chloritic siltstone containing visible chalcopyrite from west of the Henty Fault Zone), 550ppm Pb, 2000ppm Zn and 78ppm As.

The highest gold value of 0.5 g/t Au came from a 200mm wide band of quartz containing minor pyrite and chalcopyrite, within volcaniclastic sediments west of the Henty Fault Zone. This band is conformable with the attitude of the enclosing rocks and it is uncertain whether it is a quartz vein or a recrystallised chert horizon. This sample also gave the only significant silver value - 11 g/t Ag.

127

960128

Elsewhere, only traces of gold were detected (next best value 0.08 g/t Au). It should be noted that the best result of the bulk leach gold stream sediment sampling programme (5.3ppb), came from a site in the upper Sterling River immediately downstream from where the Henty Fault Zone is intersected by a cross-fault.

14.4 Geophysics (NH)

A compilation of ground and aeromagnetic data over the South Stitt area is shown on Figures 35 to 37. Of particular importance is any assistance given by geophysics in locating the Henty Fault Zone. However, in this area the Farrell Slates are not markedly carbonaceous in comparison to their composition in the Sterling Valley area to the north (judging from the lack of IP response). Since there is no obvious conductor immediately east of the Fault, IP/Resistivity and VLF are of little use for tracing the Fault. Aeromagnetic data suggest a weakly magnetic unit exists in the volcanics west of the fault, from which a NW-SE fault can be identified just north of DDH's SS1 and 2. This is confirmed by geological mapping.

Existing IP work is rather sparse with 500 metre line-spacing and 100 metre dipole or pole-dipole. Any weakly pyritic alteration zone of strike-extent less than 400 metres and thickness less than 25 metres would probably be undetectable using the existing survey parameters.

The weak IP anomalies that do occur on the grid can be explained by sediment bands in volcanics that appear to have no economic significance, judging from the low associated geochemistry.

14.5 Discussion

Exploration at South Stitt has been considerably hampered by the extensive cover of glacial moraine and scree. However, sufficient encouraging geological features have been identified to indicate further searching for stratiform gold and/or massive sulphide deposits along the Henty Fault Zone is justified, particularly in the southern part of the South Stitt area.

The prospective volcano-sedimentary sequence east of the fault has been shown at South Stitt to contain siliceous volcaniclastic sediments including some cherts, which are hydrothermally altered and pyritic (albeit weakly). These are all important features of GoldField's Henty Prospect, 4km further south, where the stratiform gold body is hosted by an altered and sulphidic sequence of cherts and cherty volcaniclastic sediments.

A disappointing aspect of the results so far at South Stitt is the lack of anomalous precious and basemetal values in the prospective unit. However, the prospective sequence remains largely unseen and untested by the work to date.

It is planned to carry out systematic soil and rock sampling, supported by IP, ground magnetics and geological mapping, over that part of the prospective sequence exposed at the southern end of the South Stitt area.

130

960131

15.0 HENTY FAULT ZONE (JGP)

15.1 Introduction

The area discussed in this section takes in the Henty Fault Zone north of the Sterling Valley EL (see Fig. 13).

The programme of work along the Henty Fault Zone commenced late in the year and was in active progress at year end. Therefore, only a description of the programme being undertaken and a brief outline of interim results, will be presented here. Full results will appear in the 1987 Annual Report.

Over the years EZ, Getty and others have drilled numerous holes at various targets on and adjacent to the Henty Fault Zone. Many of these holes were not extensively sampled, particularly for gold. The first task of the Shell programme therefore, was to undertake comprehensive sampling and assaying of the old drillcore, with relogging of selected holes. An outline of the results to date is given in Section 15.3. Relogged holes are presented in Appendix VXIII. The aim of this work is to directly outline zones worth drilling along the Fault.

121

In addition, the gold zone intersected by Getty in 1984 in their Murchison River holes (12.9m @ 0.31 g/t Au in MR 1), was followed up by a small Max-Min EM survey which delineated the extension of the sulphidic brecciated shale host horizon. Hole RED 86-1 designed to test this target, was in progress at year end (see Fig. 38).

15.2 Geology & Target Models

The Henty Fault divides two volcanic sequences of markedly different character. To the west there are the massive feldspar-phyric volcanics, mainly lavas, of the Mt. Black Volcanics. These are intercalated with dykes and flows of basic volcanics close to the fault, and there are occasional thin sediment horizons. To the east is the volcano-sedimentary sequence of the Farrell Slates and the quartz-phyric Murchison Volcanics. The Farrell Slates comprise a mixed sequence of black tuffaceous shale-siltstones, quartz or feldspar-crystal tuffs, and coarser reworked volcaniclastics. There are occassional intercalated rhyolite lavas. The sequence is variably sulphidic with widespread disseminated pyrite particularly in the black shales, and hosts the fissure-lode Pb-Ag mineralization typified by the Farrell orebodies.

The principal target sought along the Hnety Fault Zone is stratiform gold within the Farrell Slate sequence immediately east of the fault. This model is based on the occurrence at GoldField's Henty Prospect, located on the fault 4 km south of the southern boundary of EL 1/62. The Henty Prospect is similar to several other stratiform gold occurrences in the Mt. Read Volcanics, and all of them are associated with massive sulphide bodies. It is clear that the hydrothermal systems capable of producing stratiform gold mineralization are also capable of producing massive sulphides, and these form an important secondary target for the exploration programme along the Henty Fault Zone.

The most prospective rocks are the Farrell Slates. In detail, the search is concentrating on outlining the sulphidic siliceous exhalative facies (e.g. cherts) and the quartz-sericite-carbonate alteration zone, which are integral features of the stratiform gold occurrences. In addition, as the results of EZ's exploration in the Sterling Valley show, there are possibilities for significant gold mineralization associated with silicification and quartz-sulphide veining within the Mt. Black Volcanics immediately west of the fault.

960134

15.3 Results of Core Sampling

The core sampling results obtained to date are summarized in Table 5. Locations of the better intersections are shown in Fig. 38. The intersection of 4m @ 3.3 g/t Au in hole MRP 233 (part of a 16.5m zone @ 1.35 g/t Au), is the best intersection along the Henty Fault Zone outside the Henty Prospect. It occurs in an interval of disseminated and semi-massive pyrite-pyrrhotite-arsenopyrite within altered tuffaceous sediments immediately east of the Henty Fault. This intersection will be the subject of follow-up drilling in 1987.

It is worth noting that the mineralization in MRP 233 includes an interval of 1m @ 7.2 g/t Au, which in an original 1981 EZ aqua-regia AAS assay gave only 0.016g/t. The entire 16.5m mineralized zone produced a maximum AAS assay of only 0.416 g/t Au and 12 of the 16 assays were below the limit of AAS detection. This result has confirmed the wisdom of the decision to repeat all original AAS gold results by fire assay.

TABLE 5: OLD HENTY FAULT ZONE HOLES SAMPLED & ASSAYED 1986.
(N.B. Gold determined by Fire Assay)

HOLE No	Total Depth	Drilled by Date	Location	Interval Sampled	Best Intersections from Sampling	Comments
MP 28	403'	EZ 1947	Murchison Mine	0 - 230'	All Au < 0.01 g/t	
MP 30	411'	EZ 1948	Murchison Mine	12 - 411'	4'6" @ 0.07 g/t Au, 22g/t Ag	Relogged by JPR See Appendix XVIII
MP 32	361'	EZ 1948	Murchison Mine	19'8" - 361'	11" @ 0.1g/t Au Also: 7'2" @ 1.95%Zn, 7g/tAg	" " "
MP 70	546'	EZ 1949	Duttons Workings	0 - 546'	All Au < 0.01g/t	" " "
MP 71	594'	EZ 1949	Duttons Workings	52 - 594'	10' @ 0.01 g/t Au	" " "
MP 86	331'	EZ 1951	North of Farrell	35 - 331'	18' @ 0.01 g/t Au	" " "
MP 87	576'	EZ 1951	North of Farrell	11 - 576'	15' @ 0.02 g/t Au	" " "
MP 88	659'	EZ 1951	Duttons Workings	50 - 570'	10' @ 0.03 g/t Au	" " "
TP 133	293'	EZ 1968	North of Farrell	66 - 293'	10' @ 0.02 g/t Au	" " "
TP 135	295'	EZ 1968	North of Farrell	13 - 345'	4'8" @ 0.09 g/t Au	" " "
MRP 212	293.5m	EZ 1979	Murchison River	155 - 221.8m	13.5m @ 0.23 g/t Au	Sampled JGP Nov-Dec '86
MRP 219	140.8m	EZ 1980	Murchison River	108 - 140.8m	1.45m @ 0.50 g/t Au	" " "
MRP 226	211.5m	EZ 1981	Murchison River	158 - 211.5m	1.1m @ 0.21 g/t Au	" " "
MRP 227	155.6m	EZ 1981	Murchison River	124 - 155.6m	1m @ 0.15 g/t Au	" " "
MRP 233	197.7m	EZ 1981	Murchison River	135 - 197.7m	16.5m @ 1.35 g/t Au, incl 4m @ 3.32 g/t Au	" " "

135

15.4 Geophysical Surveys (NH)

Previous EZ and Getty geophysical work has been summarized and commented on by J. Bishop in an EZ report (1980). Following Bishop's report, holes were drilled on magnetic anomalies (MRP 226, 227) in andesitic volcanics immediately west of the HFZ, and on IP anomalies along the HFZ (MRP 233, 212 and 219) which intersected sulphides in and adjacent to the fault. Unfortunately much of the HFZ is now underwater in this area, but it does appear that the main geophysical anomalies closely associated with the fault have now been tested (Fig. 39, plan LJ 50/1045). The IP trend tested by MRP 233, 212 and 219 appears to die out about 300m to the north of MRP 233 from Scintrex gradient array IP data, but this may be due to an increased thickness of glacials over the fault zone.

Approximately 300 metres east of the HFZ a pronounced Dighem resistivity low and moderately magnetic trends occurs. This is clearly related to the Farrell slates, and has an associated strong conductor and chargeability anomaly from dipole-dipole IP surveys carried out by McPhar in 1961. Although some of the response must be due to graphitic/carbonaceous material in the slates, there is probably a considerable per-

136

960137

centage of sulphides present. This conductive trend is covered by glacials of unknown thickness but probably the order of 50 metres. It has only been tested previously at its southern end by DDH's MR 1 and MR 2 (1984) which intersected a quartz-carbonate-sulphide interval in the slates, containing 0.31 g/t Au over 12.9 metres.

These drill holes were targetted on a Max-Min EM conductor south of the Murchison River. This conductor was extended 700m north by Billiton on the north side of the river, and the EM profiles are included (Appendix XIX). Billiton's drill hole RED 86-1 was designed to intersect both magnetic and conductive anomalies. This conductor extends further north towards Farrell and will be detailed in 1987 using Max-Min or IP.

15.5 Discussion

The 4m @ 3.3 g/t Au intersected in MRP 233 is the strongest gold mineralization known along the Henty Fault Zone outside of GoldField's Henty Prospect. The mineralization confirms:

a) the prospectivity of the Farrell Slate sequence east of the fault

b) the prospectivity of the Henty Fault within EL 1/62.

137

960138

It is recommended that follow-up drilling be undertaken in the vicinity of hole MRP 233.

The programme of old drillcore sampling, assaying and relogging should be completed and new drilling undertaken directly on target zones outlined by this work.

REFERENCES

Corbett, K.D. 1981 Stratigraphy and Mineralization in the Mt. Read Volcanics, Western Tasmania. Econ. Geol. V.76, pp 209-230.

Corbett, K.D. & Lees, T.L. 1986 Revised Stratigraphy and Tectonics of the Cambrian Arc and Forearc Sequences, and a Probable Accretionary Complex, in the Rosebery-Lyell Area, Western Tasmania. Aust. Journ. Earth Sciences (in press).

FitzGerald, F.G. 1984 In: EL 1/62 Progress Report August 1983-June 1984. Unpubl. Rep Getty Oil Dev. Co.

Green, G.R. 1983 The Geological Setting and Formation of the Rosebery Volcanic-Hosted Massive Sulphide Orebody, Tasmania. Unpubl. PhD Thesis, Univ. of Tas.

Lees, T.L. 1984 Geology, Geophysics and Geochemistry of the Read-Rosebery Leases and Proposals for Diamond Drilling. Unpubl. EZ Rep No. 170.

Lees, T.L. 1985 Geology of the Hercules Orebody, Tasmania. Unpubl. EZ Rep No. T201.

Lees, T.L. 1985a Various Unpubl. Memos and Maps for EZ Co. - Hercules Area.

Lees, T.L. 1986 Various Unpubl. Memos and Maps for EZ Co. - Cutty Sark and Northern Mine Lease Area.

139

980140

A.G. | C.G. | E.G.
22 DEC 1986
DEPT. OF MINES
REF No. R.1969/86

APPENDIX I

UTEM Survey Profiles & Geophysical Interpretation

OPEN FILE

APPENDIX 1

ASSESSMENT OF UTEM ANOMALIES, 1986, ROSEBERY EAST JV

Loop 1

Noisy data due to power lines (10 channels recorded)

Anomaly 1a : Line 383750N, 84775E
Line 383500N, 84750E
Channel 9 & 8 anomalies

Shallow source possibly due to contact between acid-intermediate and intermediate volcanics. Cherty siltstones are mapped about 1 km north along strike (outside the EL). A weak aeromagnetic anomaly appears to correlate with the intermediate volcanics, but no Dighem anomalies are recorded.

Loop 2

Noisy data due to power lines (10 channels recorded). No bedrock anomalies.

Loop 3

Noisy data at western end of lines due to power lines and distance from Tx loop (10 channels recorded).

Anomaly 3a : Line 382000N, 85950E
Line 381750N, 85700E
Line 381500N, 85850E
Channel 9, 8 & 7(?) anomalies

The shallow source occurs in mapped intermediate volcanics over an area of rugged terrain. An EZ IP anomaly occurs on line 381500N at EZ co-ordinate 85550E (see EZ Report 7/79-6/80, Farm Creek area). EZ follow-up produced no geochemical anomalies, although glacial cover was noted. No aeromagnetic anomalies are recorded here, although a Dighem resistivity low occurs over some of the area perhaps related to glacials, which may be the cause of the UTEM anomalies.

Loop 4

Small loop and adjacent power line caused noisy data more than 500 metres from the loop (20 channels recorded).

Anomaly 4a : Line 38000N, 82150E
Line 379400N, 82075E
Channel 20, 19, 18 anomalies

This weak anomaly occurs over flat ground covered by glacials which could be the cause. This is supported by the coincidence of a Dighem resistivity low. An underlying magnetic anomaly is probably of no significance.

Anomaly 4b : Line 379700N, 83450E
Line 379400N, 83350E
Channel 20, 19, 18. 17 & 16(?) anomalies

BXN:861107

Anomaly 4c : Line 379400N, 83000E

This anomaly is more interesting than 4a, and some replotting has been done. These plots more clearly show anomalous responses on early channels from shallow conductors on line 379400N. No geological mapping has been done in the area although intermediate volcanics are mapped along strike. There are no coincident Dighem anomalies although a weak aeromagnetic anomaly is partly coincident.

Loop 5

Some of these lines are particularly noisy especially the southernmost lines part of which were resurveyed after the return and repair of the 20 channel equipment from Canada. Anomaly 4b is too far from loop 5 to be seen, although there is some suggestion of a response at the western end of lines 379700N and 379400N. The loop is over an aeromagnetic anomaly which has no associated conductor.

Loop 6

The narrow loop meant that the profiles were noisy when more than 1 km away from the loop at the eastern end of the lines. Due to the inaccurate station numbering it is also hard to relate any anomalies to EZ mapping and previous geophysical anomalies.

Anomaly 6a : Line 378750N, 83250E
Line 378400N, 83950E
Line 378000N, 83550E
Line 377750N, 83600E
Line 377500N, 83400E
Channel 18-15 anomalies

This is a broad surficial-type conductor extending over about 1 km strike. Intermediate volcanics are mapped by EZ, and IP anomalies have been recorded but their coincidence to the UTEM anomalies is unknown due to the gridding problems. No Dighem anomalies occur here, so the UTEM source cannot be very shallow (i.e. ¶50 metres). Aeromagnetic and ground magnetic anomalies are nearby but coincident, and there is no clear indication of dip.

Anomaly 6b : Line 378750N, 381700E
Line 378400N, 381650E
Line 378000N, not surveyed
Line 377750N, 381700E
Line 377500N, 381650E (from loop 8)
Line 377250N, 381500E (from loop 8)
Line 377000N, 381450E (from loop 8)
Line 376750N, 381400E (from loop 8)
Line 376500N, 381400E (from loop 8)
Channels 20 to 16 anomalous

This is a shallow sourced strike extensive anomaly that probably marks a fault or contact. There are no coincident geophysical anomalies (IP, resistivity, magnetics) so it is unlikely to be of any economic significance. The loop 6 part may be different from the loop 8 part, - ground checks on lines 378400N and 377500N are

advised. The profiles of lines 378750N and 378400N have been replotted. These show the fast decay of anomaly 6b.

Anomaly 6c : Line 378000N, 383100E

This early channel response is superimposed on regional background and is thus hard to define. It may be related to a prominent isolated deep west dipping magnetic anomaly. There are no coincident Dighem anomalies.

Loop 7

Good quality 20 channel data was obtained from this large loop near Mt Sale.

Anomaly 7a : Line 377750N - not surveyed
Line 377500N, 382200E
Line 377250N, 382175E
Line 377000N - not surveyed
Channel 18, 17, 16 anomalous

This is a complex, weak, probably shallow anomaly with a strike not well defined due to unsurveyed lines, and in an area not previously mapped by EZ (but probably intermediate volcanics). However, a detailed EZ grid was put in over a nearby IP anomaly (best expressed on line 377500N at EZ 382360E) and there may be some relationship between the IP and UTEM anomalies. There is no distinct correlation with the magnetics (although true peg position may alter that). This area requires comprehensive mapping and soil geochem.

Anomaly 7b : Line 377750N, 384050E
Line 377500N 384250E
Line 377250N, 384150E
Line 377000N, not surveyed
Channels 18 to 14

This is a weak, and probably shallow conductor. Due to gridding problems relative to the EZ grid its correlation with EZ data is unclear. However, a weak Dighem EM and aeromagnetic anomaly occurs at AMG 377200N/ 383900E. It is of interest to note that there appears to be a correlation between topography and magnetic intensity in this Mt Sale area, possibly due to the rock type being both siliceous and slightly magnetite bearing. Line 377500N has been replotted to show the possible late-channel conductor. However, it is narrow and probably due to noise (similar to 8a).

Loop 8

This was a large loop thus enabling good signal to noise ratios for readings a kilometre away. A long shallow conductor lies along strike from the magnetite-chlorite alteration zone in the vicinity 376000N, 381500E (EZ co-ords), and is reported under Anomaly 6b. Unfortunately severe location problems for the Utem station numbers occur on the lines off loop 8, and the Utem operators were apparently not clear whether to use Getty or Billiton numbers (or old EZ ones).

Anomaly 8a : Line 377500N, 381825E
Line 377250N, 381700E (?)

BXN:861107

Line 377000N ? (stations missing - peg problem?)
Line 376750N, 382000E (?)
Channels 2-9 anomalous

The anomaly on line 377500N is the most interesting recorded during the present survey, and certainly warrants further TEM detailing. It is of low amplitude such that it could be due to noise. However, it could well be due to a deep (200m+) conductor probably with a shallow dip, and its shape is similar to the Hellyer anomaly although recorded on later channels. The data has been replotted to show the late channesl more clearly. No EZ work has previously been carried out in this area, and it is interesting that other (shallow) Utem anomalies occur nearby. These may be related in some way through a shallower expression of weak mineralisation. There are suggestions of cross-overs above 8a along 381400E but the log-linear plots show how weak these are. Although probably unconnected a Dighem/aeromag anomaly occurs nearby at AMG 377650N, 381470E. This should be ground checked. This Dighem anomaly is unusual in that it indicates a 'magnetite' response.

Anomaly 8b : Line 377250, 381175E
Line 377000, 381175E
Line 376750, 381175E
Line 376500, 381175E
Channels 20-17 anomalous

This shallow and very linear trend may be the surface expression of the Dighem resistivity low which is plotted (on the AMG topo maps) at this location. As far as I know no geological mapping has been carried out over this anomaly. Note that the geological strike is clearly north-south from both the EM and the aeromagnetics, contradicting the present interpretation of geological mapping. The anomaly is the order of 50 metres deep with low conductivity. It is unlikely to be due to massive sulphides but mapping and sampling are required (sampling already by Getty?).

Anomaly 8c : Line 376500, 381825-38200E
A flat lying surficial type conductor.

Loop 9

This loop was considerably smaller than originally intended since it was laid along the lake edge for convenience, and the lake is apparently narrower than appears on the topo maps. As expected the data is noisy when further than 800 metres from the loop, so that any deep conductor might not be detectable, especially with a shallow east dip. The ten channel UTEM system was used on most of the lines read from this loop.

Anomaly 9a : Line 376000N, 382850E
Line 375750N, 382875E
Line 375500N, 382825E
Line 375250N, 382700E
Line 375000N, 382700E (from loop 11)

These early channel anomalies have a shallow possibly surficial source (50-100m). There is almost no geological mapping in this area but intermediate volcanics are probably present. The anomaly is best developed on line 375750N. It should however be

ground checked and sampled on each line since there are coincident IP (chargeability) anomalies on EZ recce gradient array lines which were apparently never followed up by EZ (although pits were dug on line 376000N at EZ 382700, 710 & 720E with presumably no anomalous results probably because of glacial/alluvial cover).

Loop 10

This loop was designed to optimally couple with the chlorite-magnetite alteration zone immediately to the east. 20 channels were recorded and the profiles are relatively noise free (further from power lines than any other loop). Grid numbering problems are evident again causing apparent missing stations on line 376300N.

Anomaly 10a: Line 376300N, 381625E
Line 376000N, ?
Line 375700N, 381600E
Line 375500N, 381475E
Channel 20-17 anomalies

This is a shallow, weak and strike extensive conductor. It may be related to similar trends north and south (6b and 11a). However, on lines 375700N and 375500N it clearly correlates with the alteration zone and associated chargeability anomaly although on 376000N where alteration is most obvious in outcrop no conductor is evident. Its poor conductivity is verified by the gradient array EZ IP profiles which show only a weak resistivity low. It was not recorded on the Dighem EM profiles at this location. However, at its southern end it is coincident with a VLF (Getty) anomaly and strikes towards a weak zone of Pb soil geochem on line 375250N. This end of the anomaly requires field checking.

Anomaly 10b: Line 376000N, 381800E
Line 375700N, 382100E? (end of line)
Line 375500N, 381925E
Line 375250N, 381925E
Line 375000N, ? (edge of loop 11)
Channels 18 to 15 anomalous

This shallow (50-100 metres) anomaly is best expressed on line 375250N where it has a somewhat slower decay indicating a better conductor (see replotted profile). However, it may be very shallow since there is no Dighem EM response. There is also no aeromagnetic anomaly coincident. A chargeability anomaly occurs along strike on line 375000N at 381980E (from EZ gradient IP) but this was only followed up by EZ using limited gradient array IP on short adjacent lines and 3 pits dug on 374900N (see EZ 80/81 Annual report). The EZ geology suggests some sort of a contact between acid and intermediate volcanics and possible limonite after pyrite. Further mapping and sampling is suggested, and more geophysical interpretation is required.

Loop 11

The 20 channel system was used to cover this large loop and the results are of generally good quality.

Anomaly 11a: Line 374750N, 381175E
Line 374500N, 381325E?
Line 374250N, 381300E
Line 374000N, 381250E
Line 373750N, 381225E
Channels 19 to 17 anomalous

The response may be caused by a lithological contact, although its nature is not clear. The anomaly is coincident with a ridge, which could be lithological in origin. There is no direct correlaion with magnetics and no coincident IP anomaly on 374000N. A ground magnetic anomaly at 381350E on 374000N clearly shows a westerly dip at this point (this dip is also indicated at 381300E on 375000N).

Anomaly 11b: Line 374750N, 382475E
Line 374500N, 382350E
Line 374250N, 382200E
Line 374000N, 382200E
Line 373750N, 382250E
Channels 20 to 16 anomalous

Strike extensive, surficial and poor conductor and probably an extension to anomaly 9a. There are no coincident anomalous magnetics or IP response on the old EZ lines (although the gradient array does suggest a resistivity contact at 382320E). Anomaly 11b may indicate a contact between acid rocks to the west and more resistive intermediate ones to the east judging by EZ mapping.

Loop 12

Good quality 20 channel data were recorded from this loop. Line 374500N was re-run using 10 channel software and reproduced the 20 channel response well.

Anomaly 12a: Line 374750E, 382700E
Line 374500E, 382525E
Line 374250E, 382650E
Line 374000E, 382525E
Channels 20 to 18 anomalous

This is a weak surficial conductor, that on line 374000E coincides with a deeper sourced magnetic anomaly (with a probable westerly dip). It may mark the eastern side of the resistive unit mentioned under the discussion on anomaly 11b and thus is unlikely to have any economic significance.

Loop 13

Some of the data from this loop are unsatisfactory due to spikes on various channels at certain stations. Fortunately only two lines were affected and the multiplicity of channels means that the data is just acceptable. A nearby HEC power line also made for noisy late channels far from the loop.

Anomaly 13a: Line 373500N, 383000E?? (loop 12)
Line 373250N, 383000E
Line 373000N, 383050E
Line 372700N, 383050E
Line 372400N, ? (Power line)

BXN:861107

Line 372000N, 383000E? (loop 14)
Line 371700N, 382950E (")
Line 371400N, 382925E (")
Line 371100N, 383000E (")
Channels 20-17 anomalous

This is a long, linear, shallow and poor conductor most probably relating to a fault or contact on the edge of a steep ridge. Its N-S strike means that it is oblique to the Henty Fault. It has no Dighem or aeromag correlation. The anomaly crosses the Murchison highway on line 373000N.

Loop 14

Profiles more than 600 metres from the edges of this small loop (400x1000m) are rather noisy expecially near the power line to the north.

Anomaly 14a: Line 372000N, 381450E
Line 371700N, 381425E
Line 371400N, 381525E
Line 371100N, 381450E
Channels 20-16 anomalous

A shallow conductor somewhat stronger than most of the other weak conductors on the grid. It has no correlation with Dighem or aeromagnetic anomalies. However, it parallels a topographic gradient thus suggesting it is caused by a fault or contact. No obvious source can be seen on the ground.

Anomaly 14b: Line 372000N, 382700E
Line 371700N, 382650E
Line 371400N, 382500E

This anomaly is due to a wide poorly conductive surficial zone, on the side of a steep hill. A line of EZ dipole-dipole IP on line 372200N confirms its shallow cause, but a chargeability anomaly occurs on its eastern edge (at 382880E). There is no aeromagnetic correlation.

Loop 15

This loop was designed to cover the Henty Fault zone on the east side of Lake Rosebery south of Tullah. Despite the presence of a power line along the Murchison Highway which was on one edge of the transmitter loop, the data quality is acceptable.

All the profiles show a thick conductive layer. This may be due to glacial cover which is known to be at least 90 metres thick (in DH MP 89 at about AMG 384900E on line 376750N). However, the thick glacials at Boco (EZ EL 12/72) are not as conductive. The glacials under loop 15 may contain more clays and/or ionic water for some unknown reason. Possibly the adjacent lake has saturated these glacials with water (although the water in Lake Rosebery itself is not as conductive). 1961 McPhar IP data (300 ft dipole-dipole) indicates very conductive and fairy chargeable rocks at depth. Further work is warranted.

The station eastings are incorrect in relation to AMG co-ordinates on lines 377500N, 377250N and 377000N. The near edge of the transmitter loop is along the Murchison Highway at about 385000N AMG.

BXN:861107

Loop 18

Data quality is generally good using a large 1x1.2km Tx loop, although noise is evident on the western side due to power line noise. 10 channels were recorded. Anomalies listed below exclude those which appear to have the same source as anomaly 20a (see Loop 20).

Anomaly 18a: Line 378000N, 380850E
Line 377750N, 380900E
Line 377500N, 380925E

These are weak early channel responses indicative of a surficial conductor which is also indicated on the EZ gradient array IP data on line 378000N (a chargeability anomaly on this line at 380700E was followed up by EZ on their area 3 with short adjacent gradient array lines). Acid volcanics were mapped by EZ over an area which appears to be a vegetation anomaly. No anomalous geochemistry has been recorded.

Anomaly 18b: Line 378000N, 378500E

This anomaly was not recorded on lines to the north or south since they were not surveyed far enough east. However, there does appear to be a cross-over on channels 8, 7, 6? and 5 but the data is noisy on the late channels. Getty UTEM line 12300N (loop 2) does not indicate any coincident substantial anomaly, and a 1978 Gradient array survey only indicates a shallow linear conductive trend. Hence the anomaly must be downgraded.

Loop 19

The western edge of this loop was laid along the edge of Lake Rosebery for easy access. The grid was designed in part to test for mineralisation associated with the workings at Langdon's Pb/Zn workings (AMG 5378825N, 380325E), about 300 metres from the eastern edge of the loop. There is, however, remarkably little UTEM response from this area of alteration. Elsewhere on the grid there are no bedrock responses either, with only surficial responses on the early channels, 10, 9 and 8. Data quality is good.

Loop 20

This loop of 1x1.3kms, by virtue of its size was designed to give a good signal to noise ratio over the grid which included the previously detected CSAMT conductor on line 377300N. In fact beyond about 600 metres from the loop edge data quality is not very good. This is most probably due to the Bastyan Dam HEC power line which runs N-S across the middle of the transmitter loop at about 377750E.

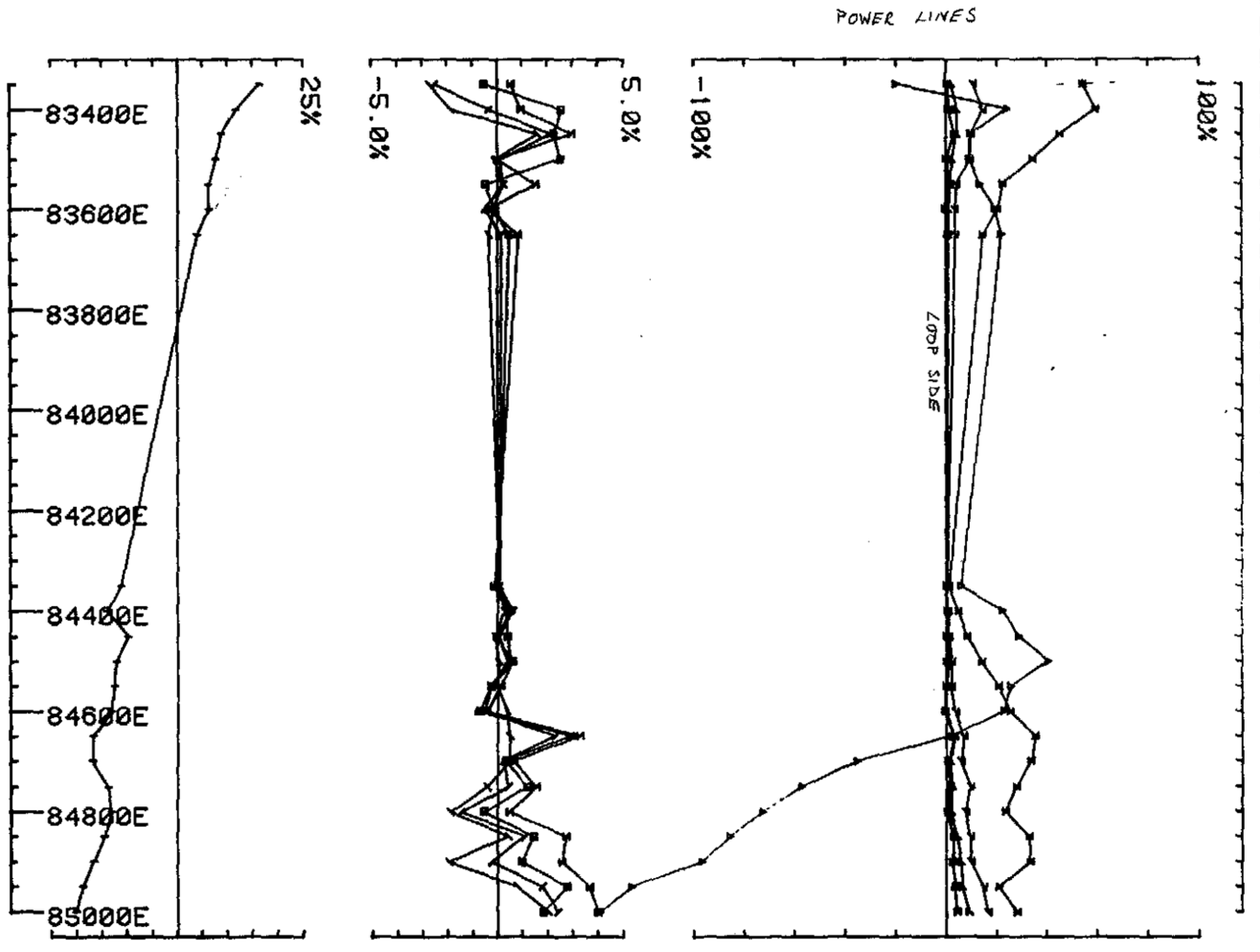
Anomaly 20a This deep conductor is indicated as a late channel cross-over on line 377250N (at 379250E) and on line 377000 (at 379125E). Brief computer modelling and manual interpretation suggest a depth of about 250 metres to the top. The true position of the top of the conductor will be at least 100 metres close to the loop, but a detailing loop is required to fix depth and lateral position more precisely. The anomaly is apparent on lines from loop 18 on the opposite side of conductor although it is of low amplitude.

Anomaly 20b: Line 378000N, 379200E?
Line 377750N, 379325E
Line 377500N, 379150E
Line 377250N, 379225E

There are shallow anomalies that may not correlate line to line. On the two lines 377750N and 377500N the anomaly appears to be caused by a shallow conductive patch. Gradient array IP shows no conductor on line 378000N. However, the conductor on line 377250N may be related to 20a since it occurs over it. It is a moderate-poor conductor at a depth of about 60 metres and correlates with a resistivity low on both CSAMT and gradient array IP. It also coincides with a patch of glacials but these are not usually conductive.

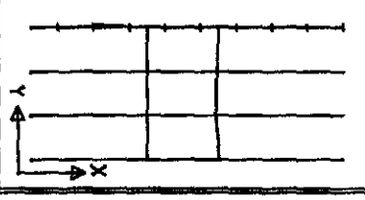
960150

149



5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM ML BR
L84000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

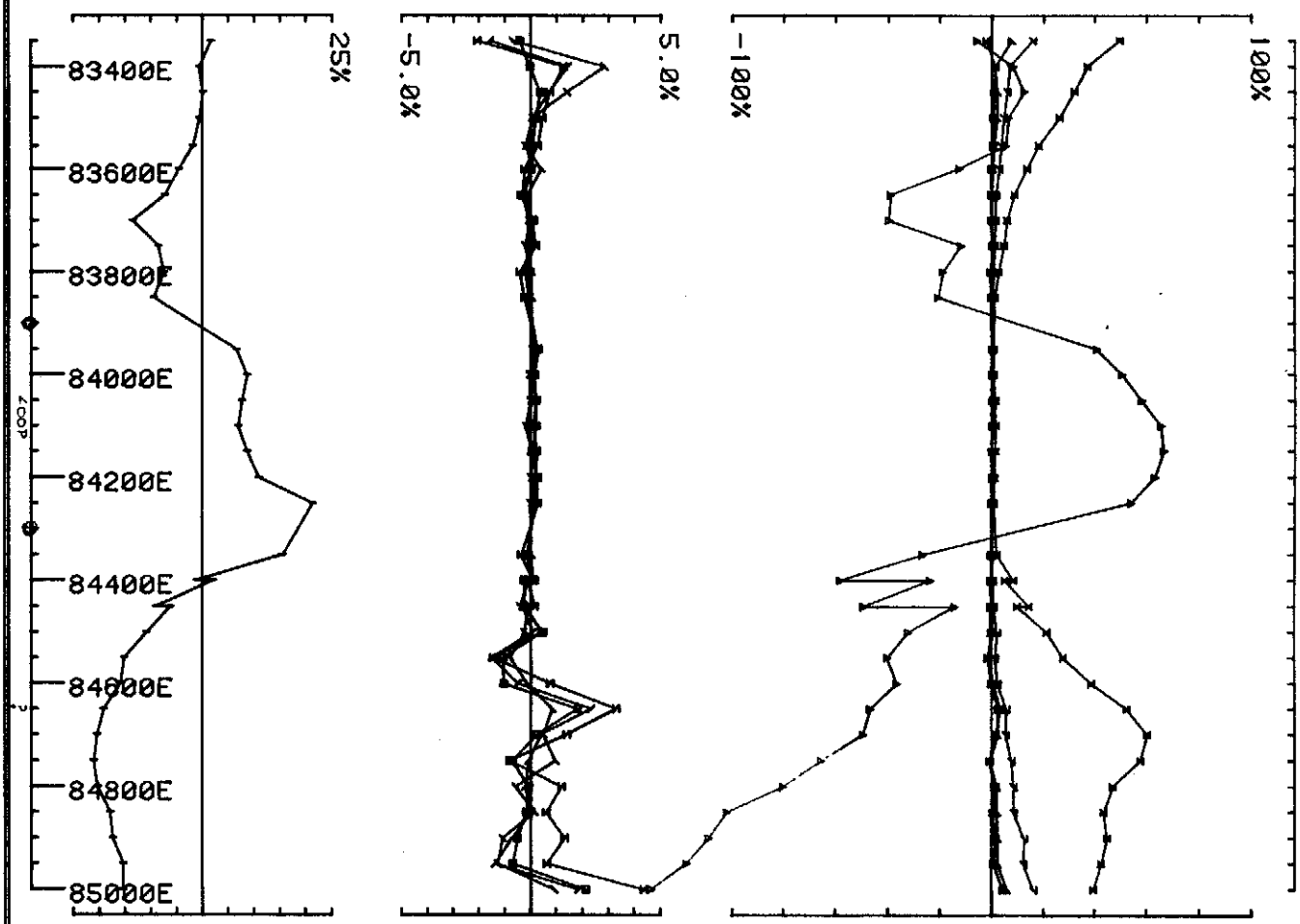


Rosebery East
LOOP 8001
LINE 84000N
Hz

150

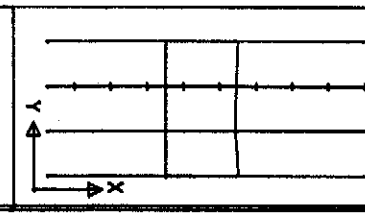
960151

POWER LINES



5 cm

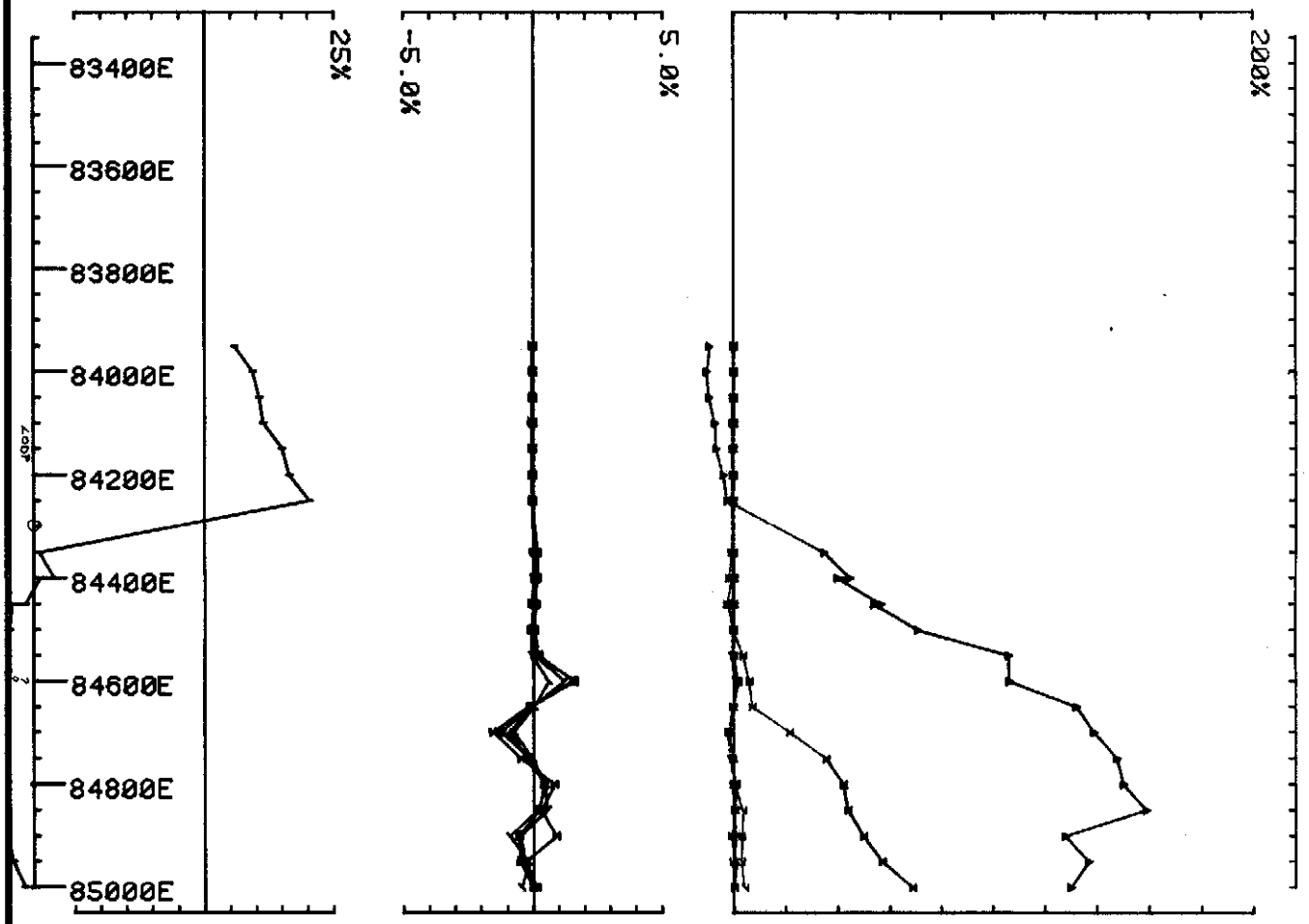
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM ML BR
L83750N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 8001
LINE 83750N
Hz

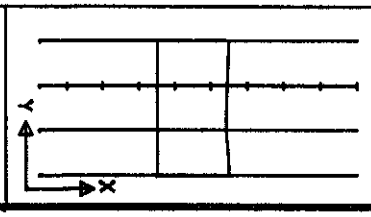
151

960152



5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM ML BR
L83750N Hx COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

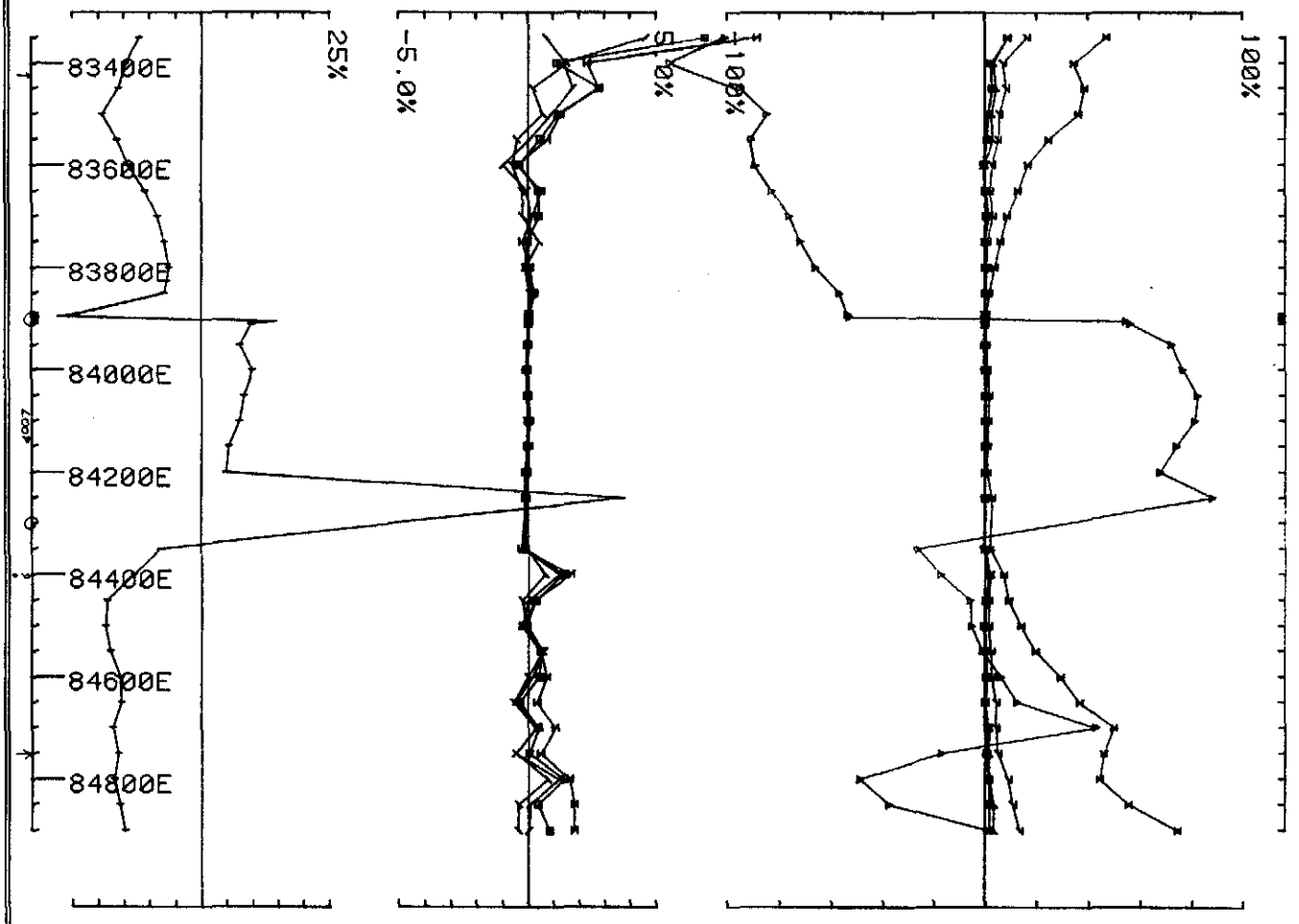


Rb9BBe.p90East
LOOP 9001
LINE 83750N
Hx

960153

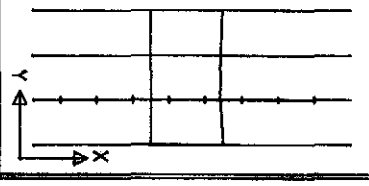
152

POWER LINES



5 cm

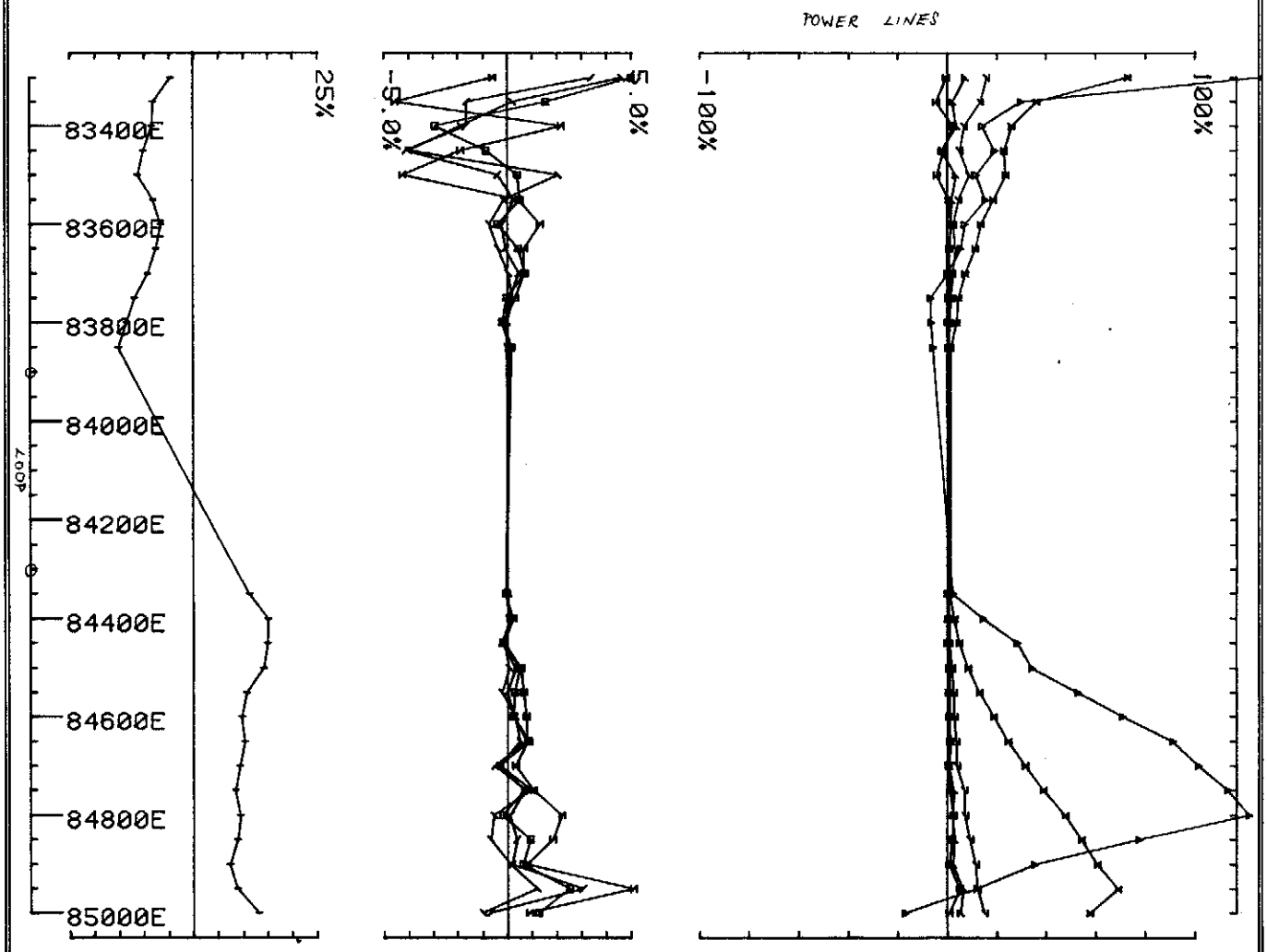
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust.PMM ML BR
L83500N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



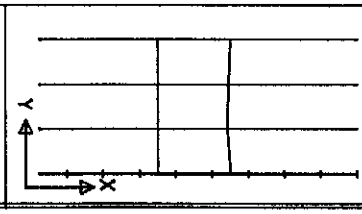
Rosebery East
LOOP 0001
LINE 83500N
Hz

153

960154



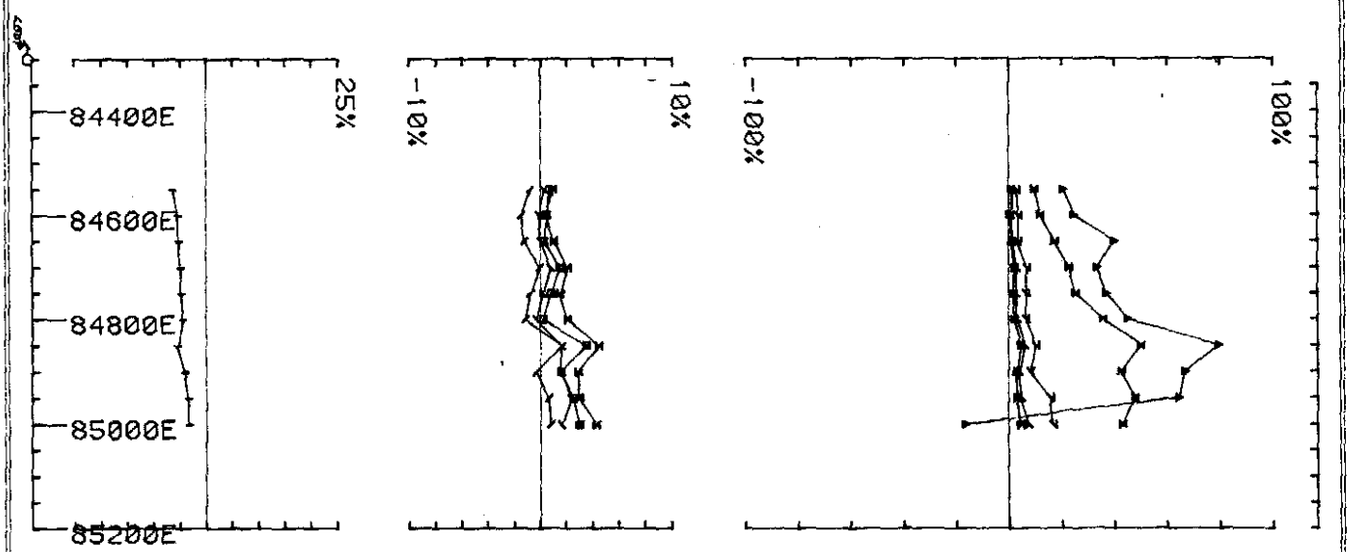
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM ML BR
L83250N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 0001
LINE 83250N
Hz

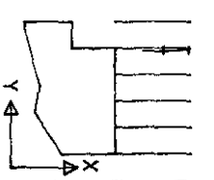
960155

154



5 cm

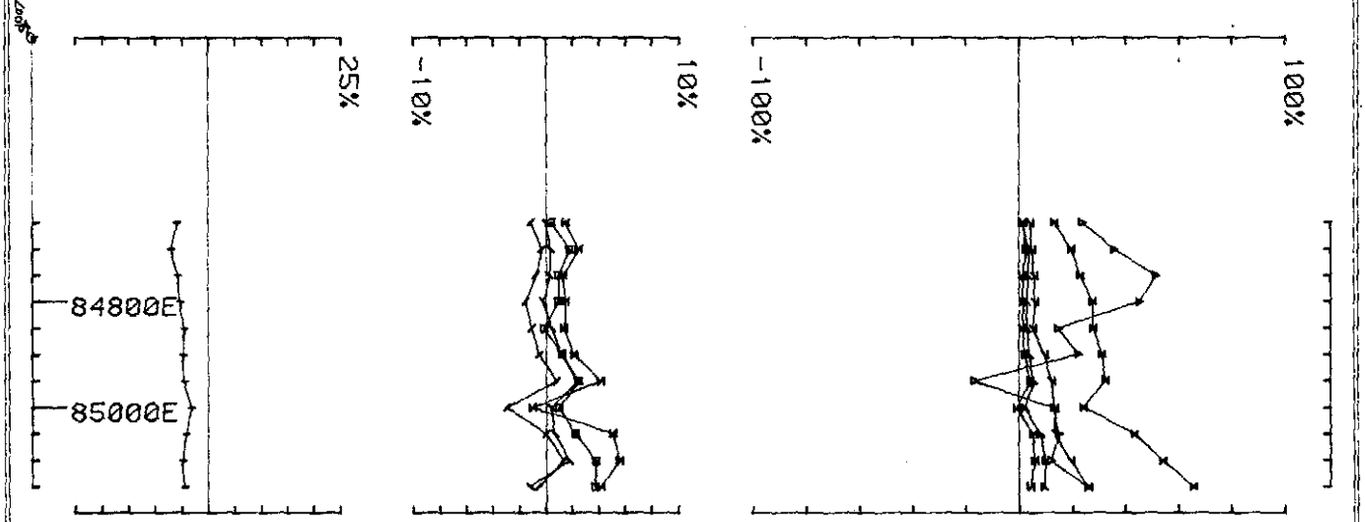
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM JCM ML
L82938N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 0002
LINE 82938N
Hz

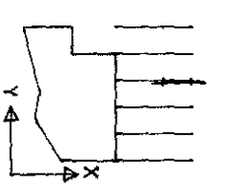
155

960156



5 cm

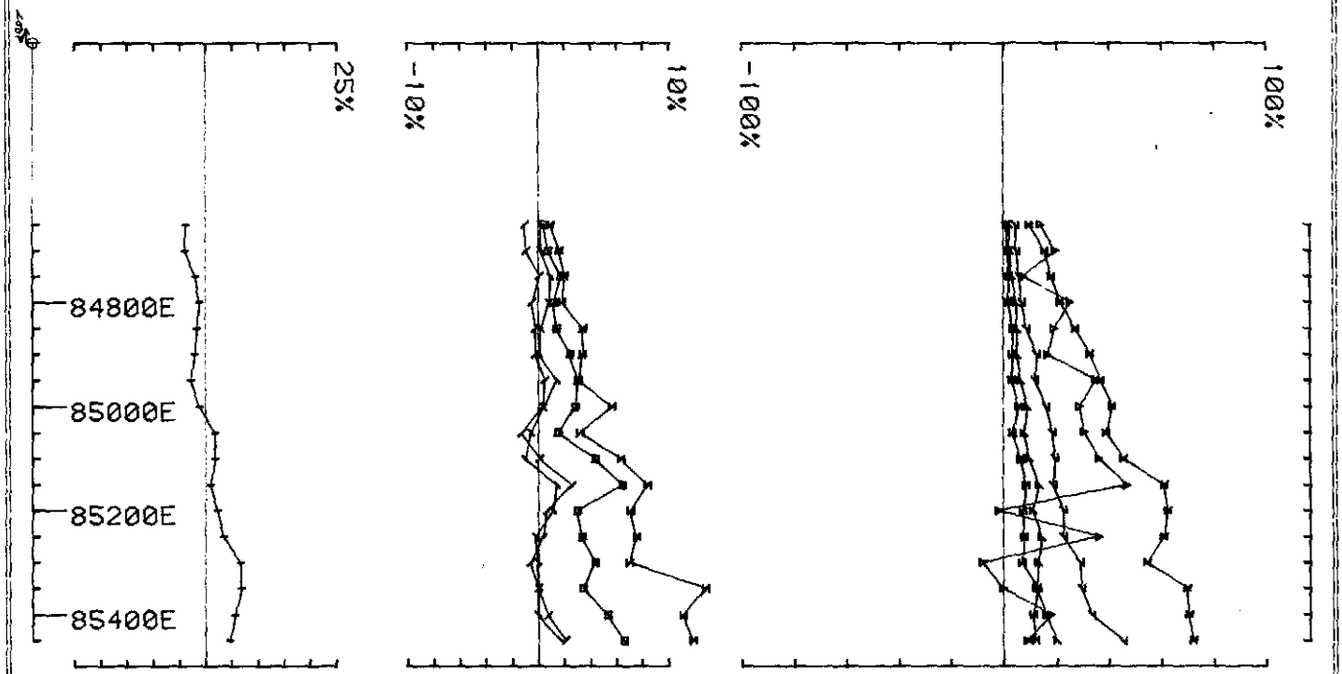
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM JCM ML
L82625N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 0002
LINE 82625N
Hz

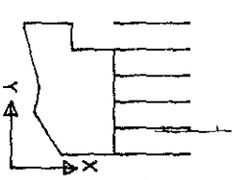
156

960157



5 cm

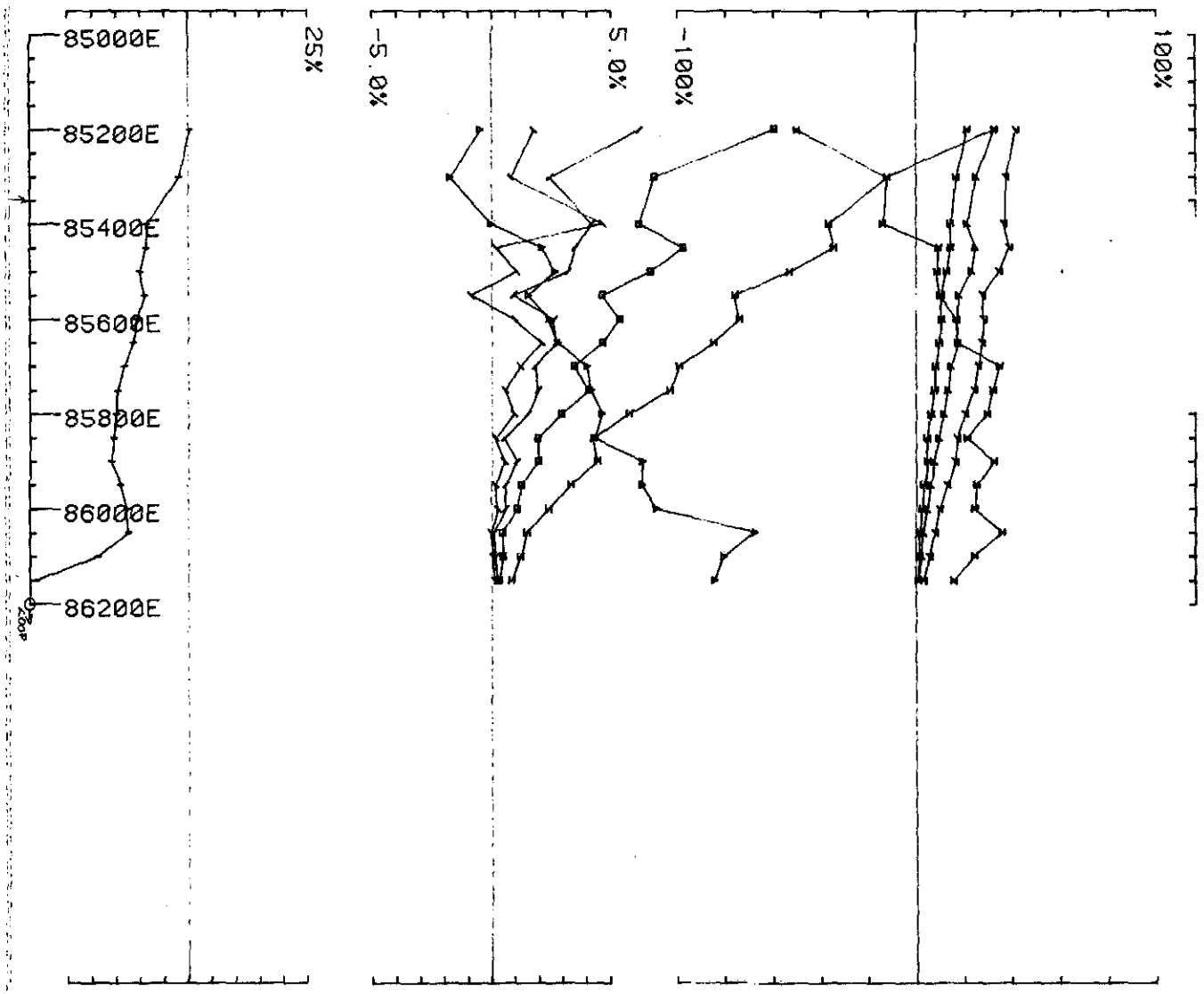
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM JCM ML
L82313N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 8002
LINE 82313N
Hz 23000N

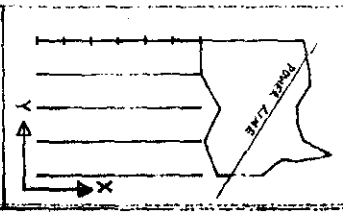
960158

157



5 cm

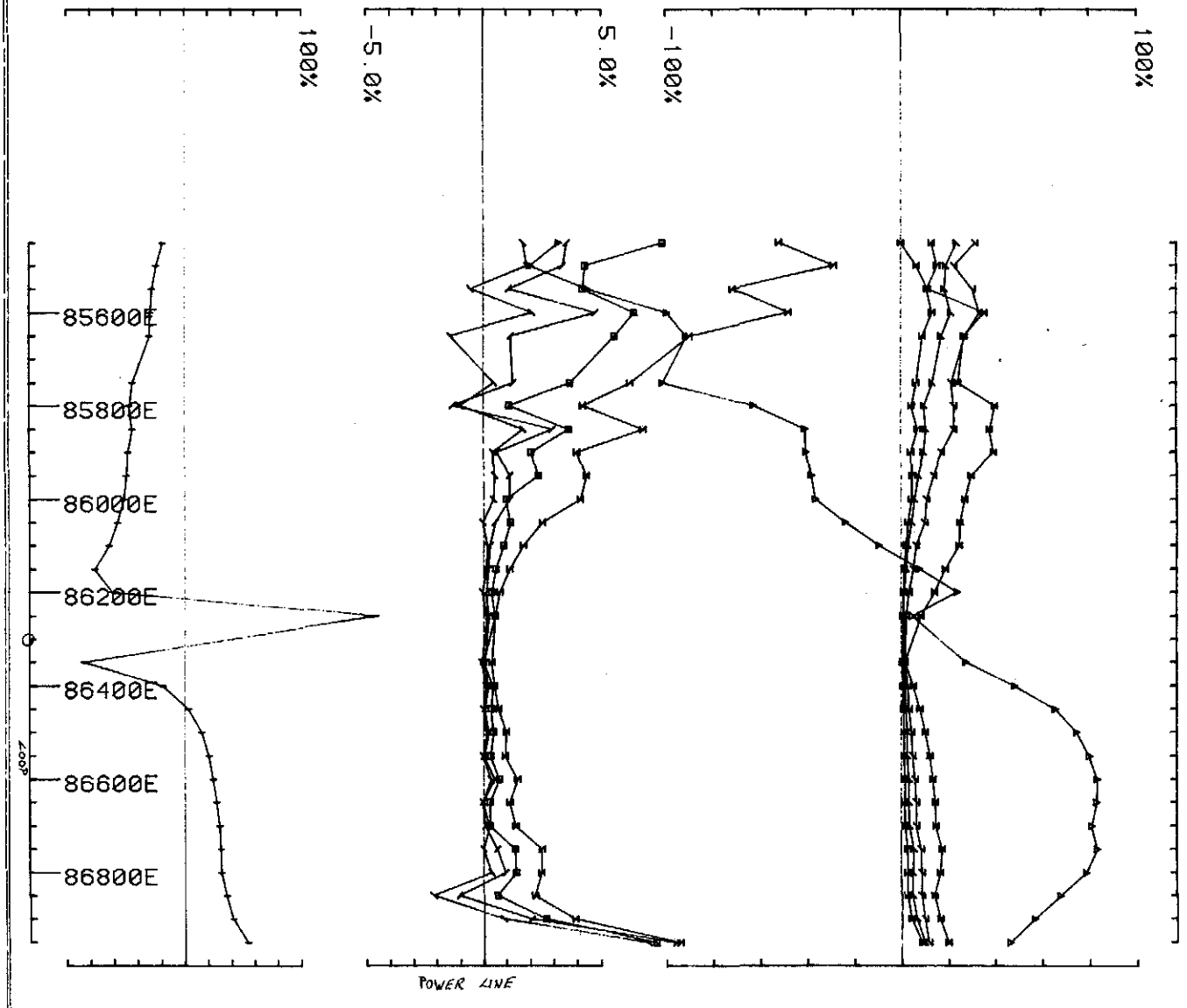
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM JCM ML
L82500N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 0003
LINE 82500N
Hz

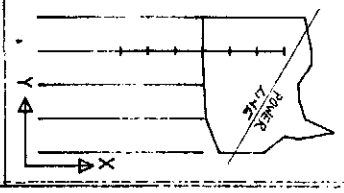
158

960159



5 cm

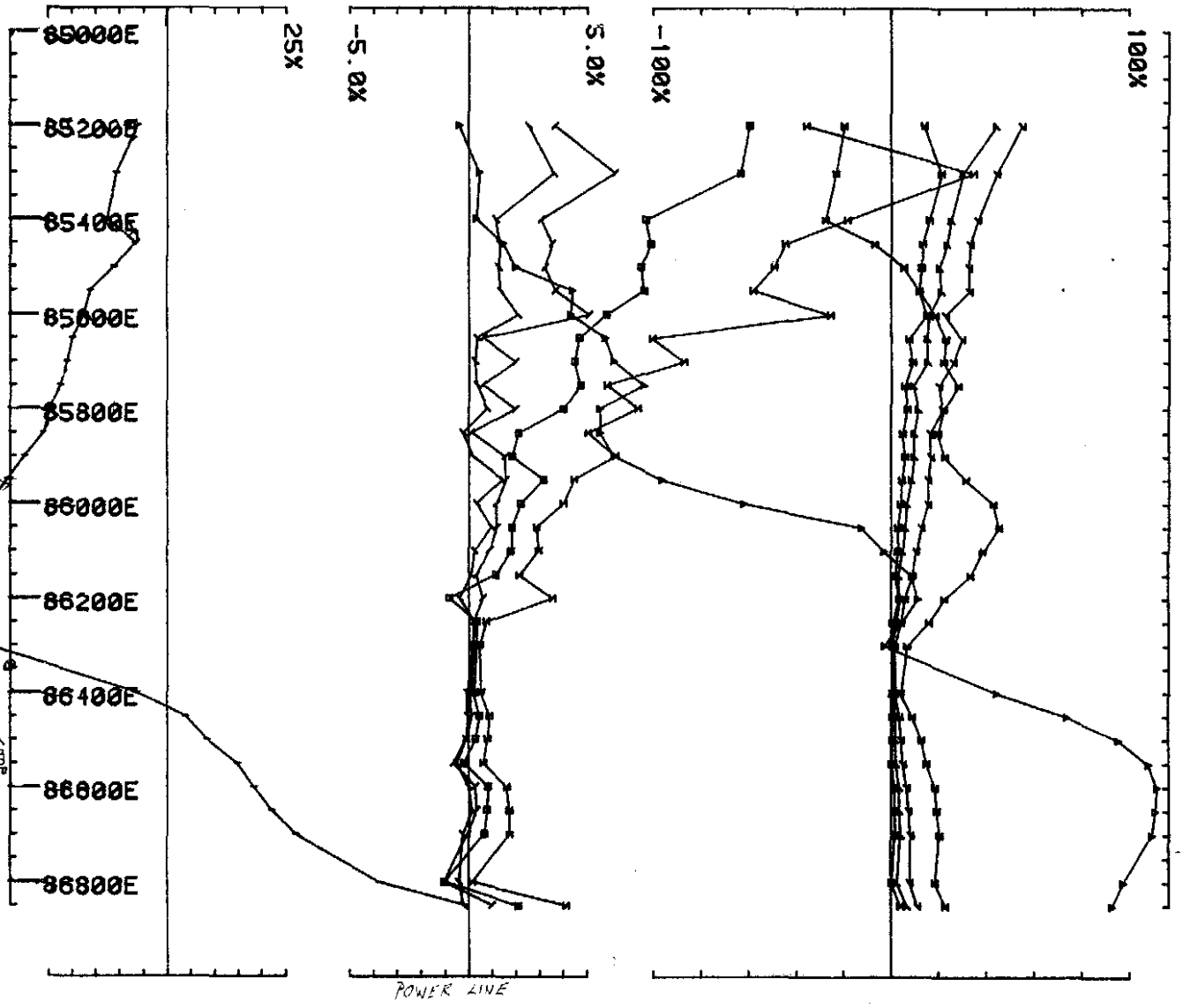
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM JCM ML
L82250N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 8003
LINE 82250N
Hz

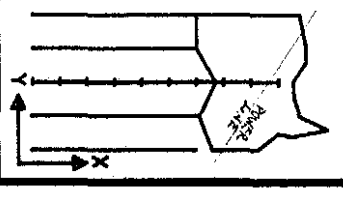
159

960160



5 cm

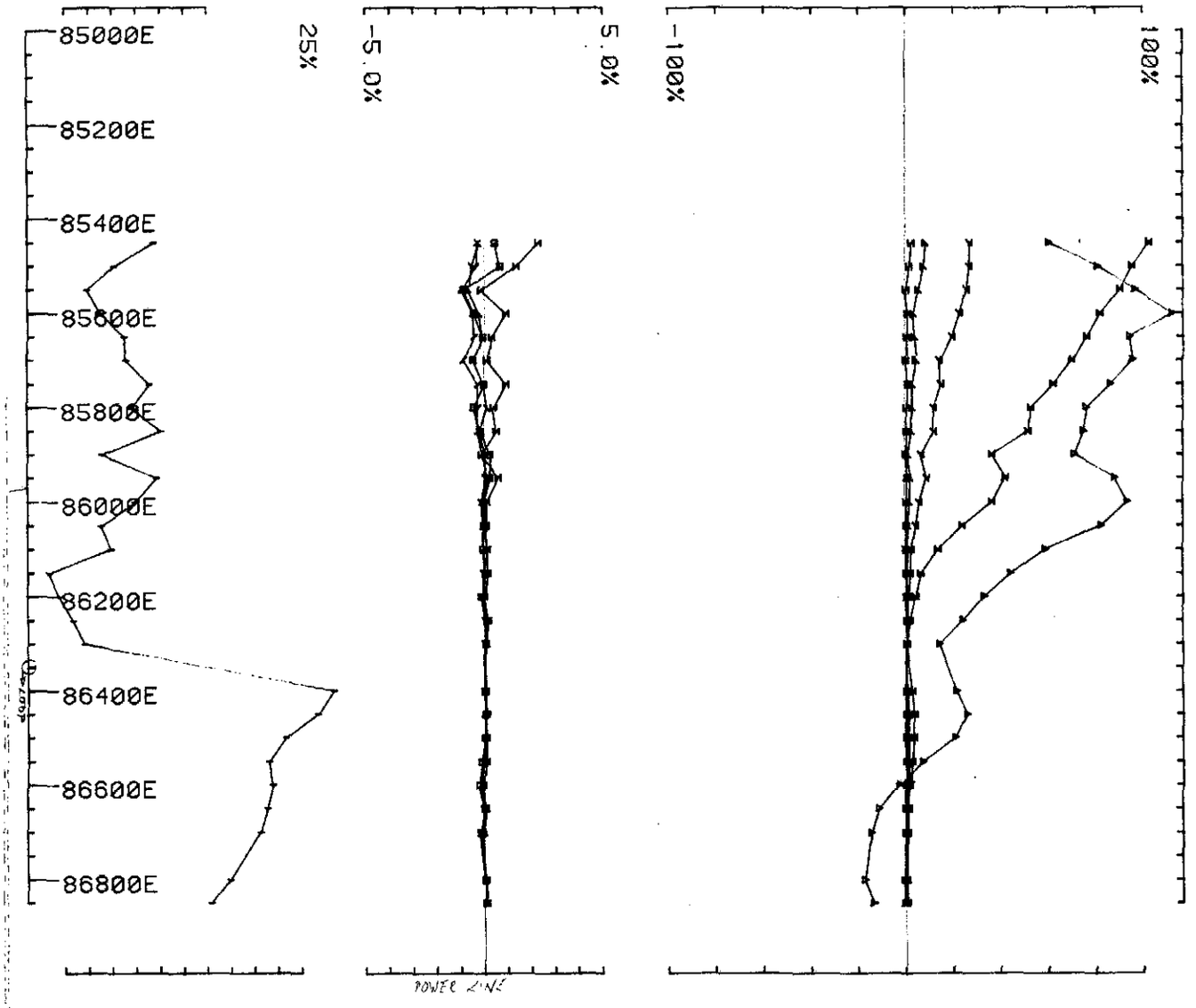
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM JCM ML
L82000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 8003
LINE 82000N
Hz

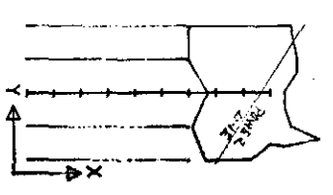
160

960161



5 cm

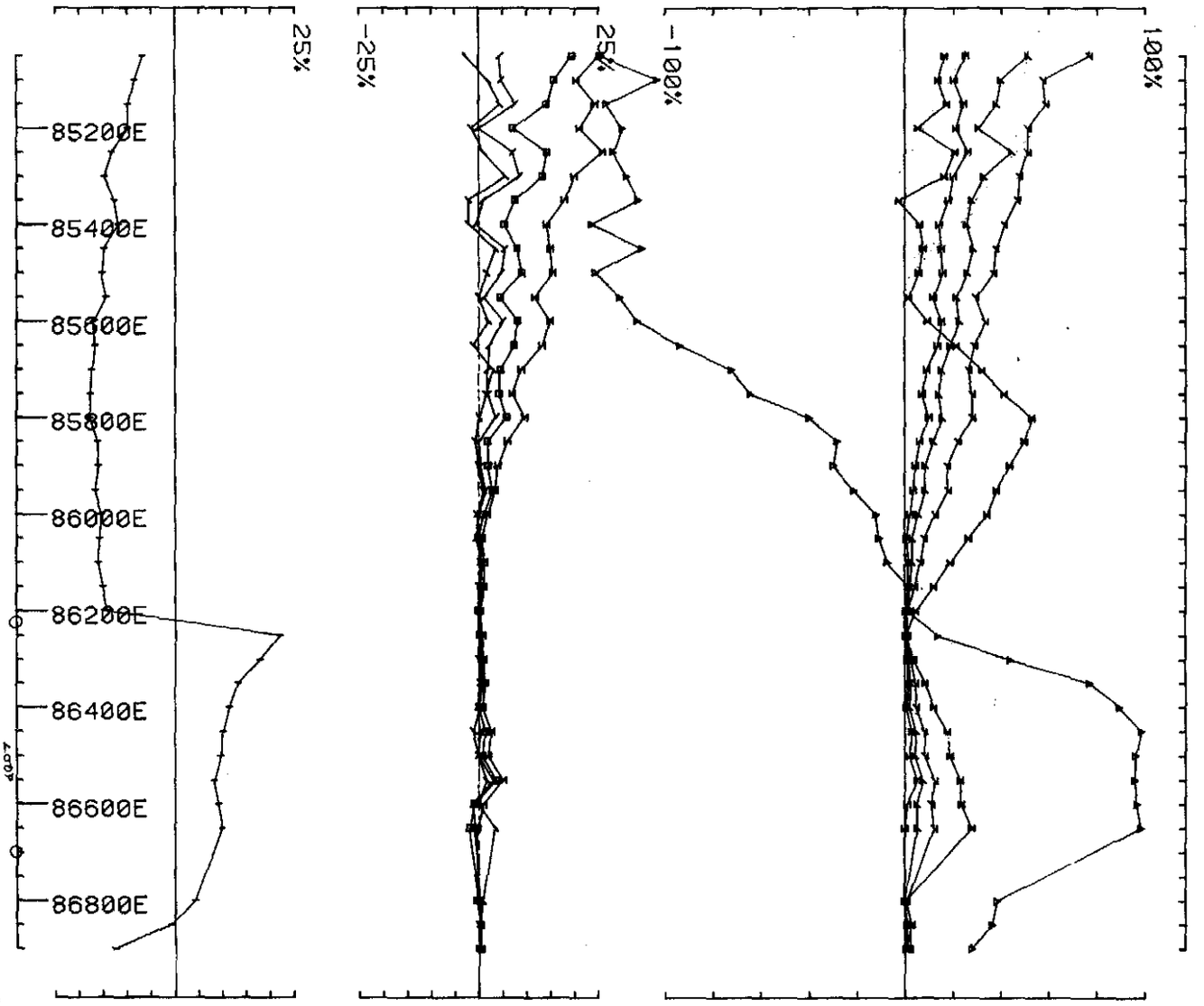
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM JCM ML
L82000N Hx COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 8003
LINE 82000N
Hx

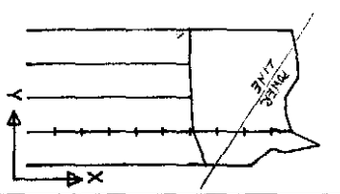
161

960162



5 cm

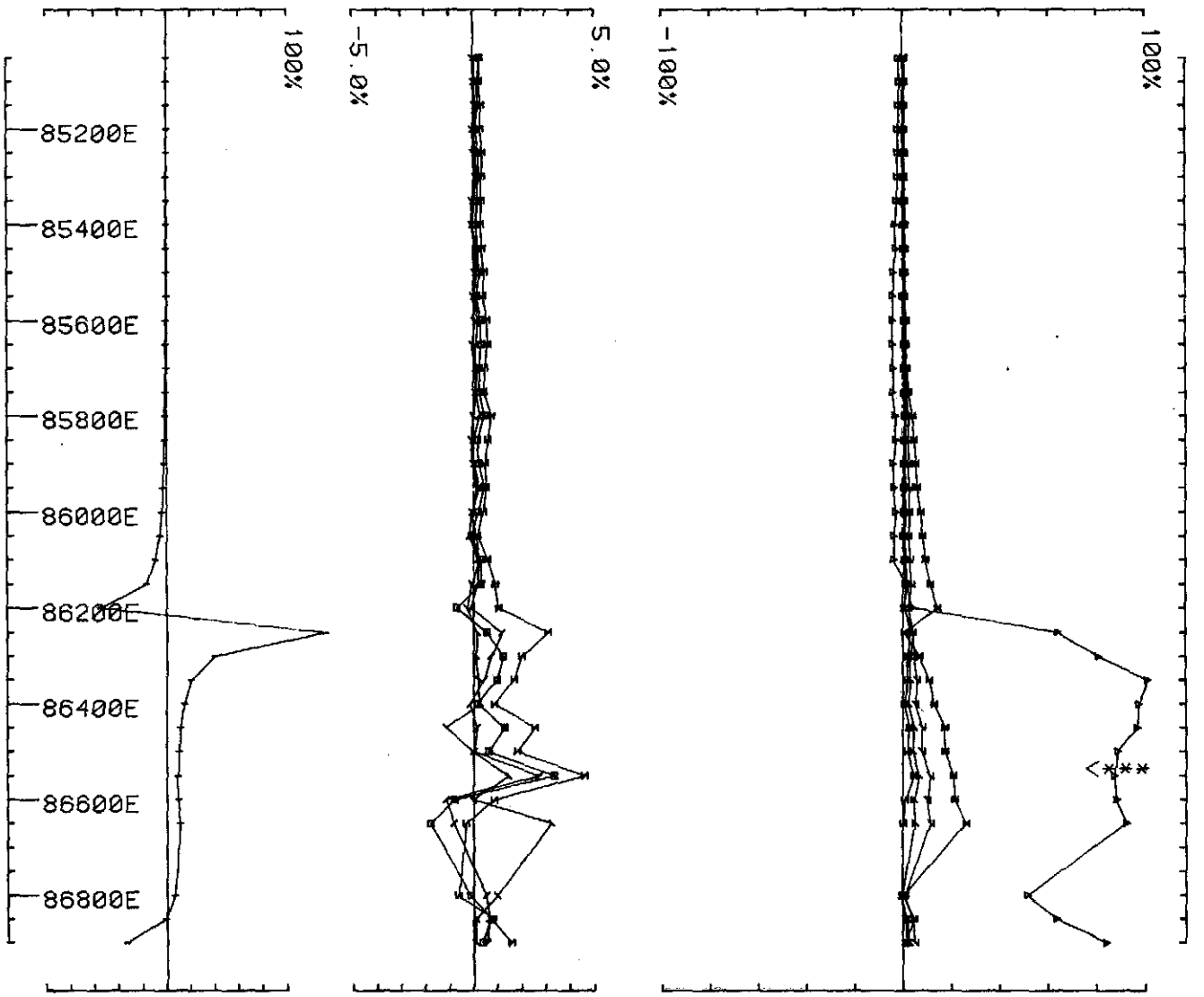
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM JCM ML
L81750N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 8003
LINE 81750N
Hz

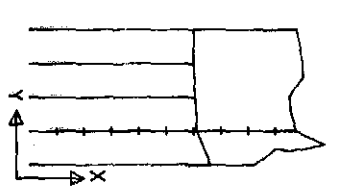
162

960163



5 cm

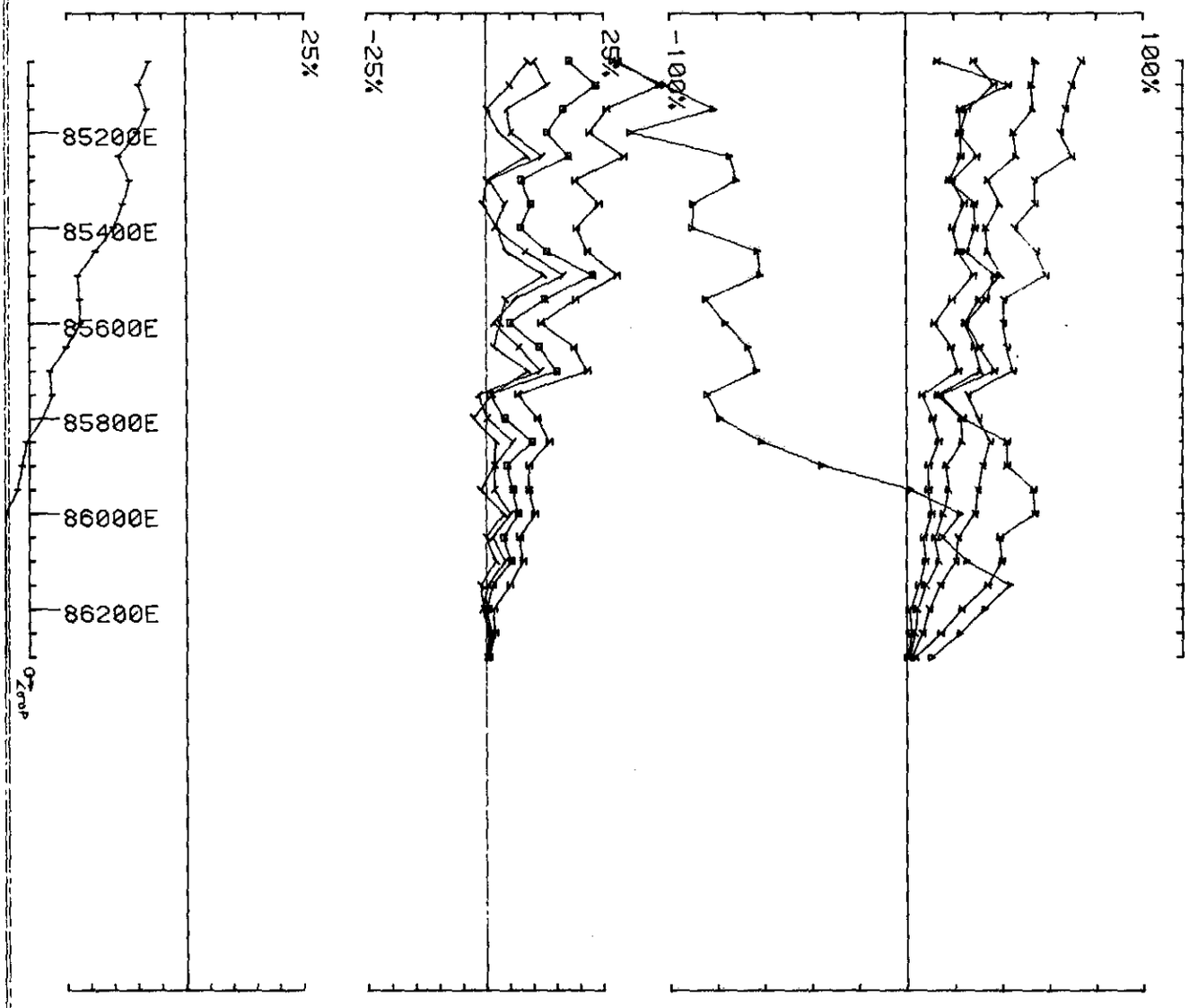
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM JCM ML
L81750N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD POINT Ch 1 NORMALIZATION



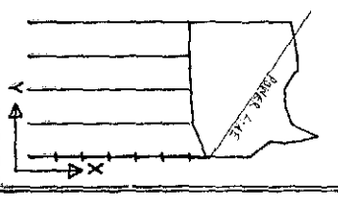
Rosebery East
LOOP 0003
LINE 81750N
Hz

163

960164

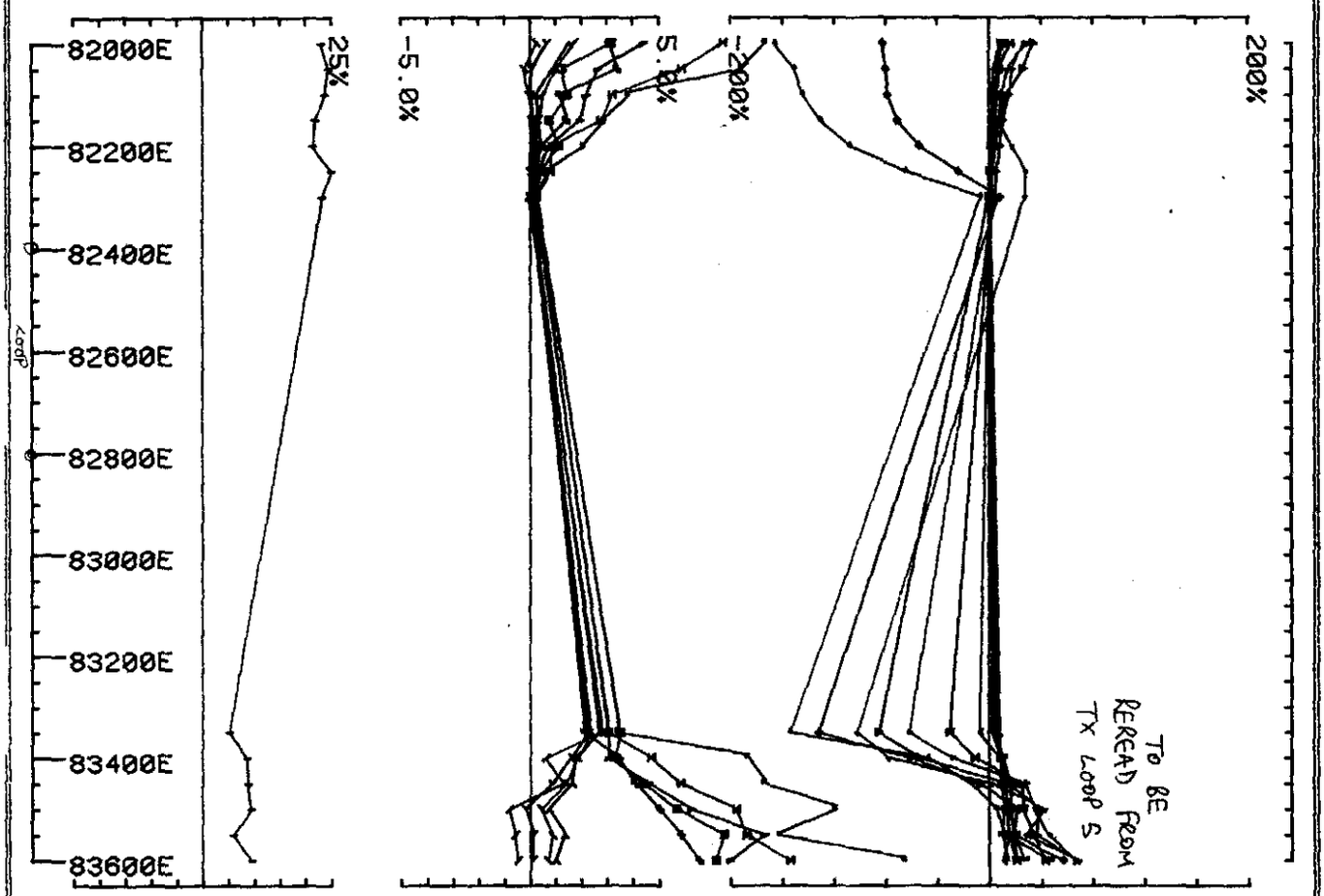


LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM JCM ML
L81500N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



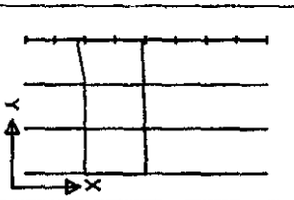
164

960103



5 cm

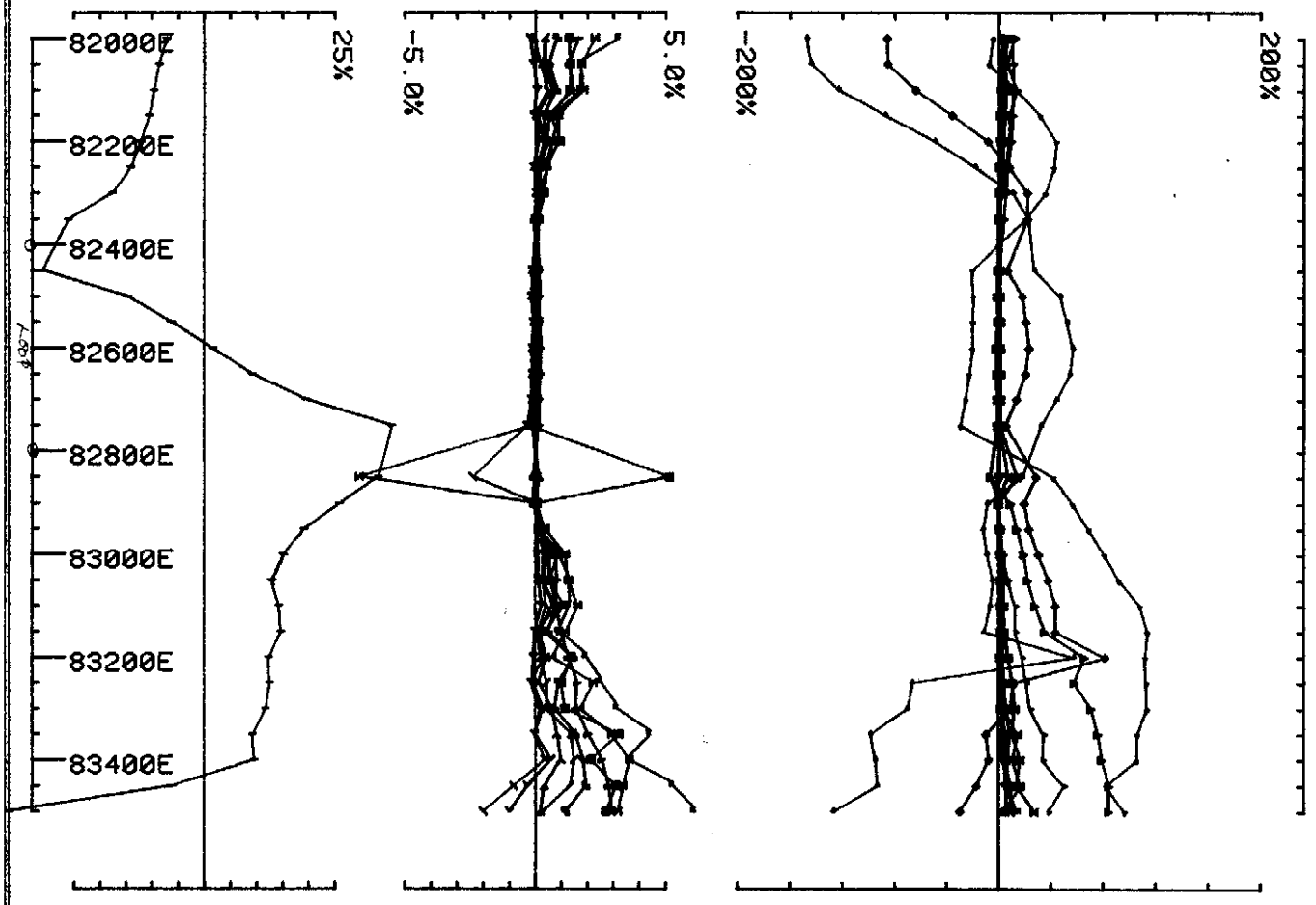
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8506
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM TC
Line 80300N Hz COMPONENT BASE FREQ :- 30.974HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 8004
LINE 80300
Hz

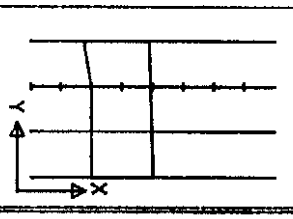
165

960166



5 cm

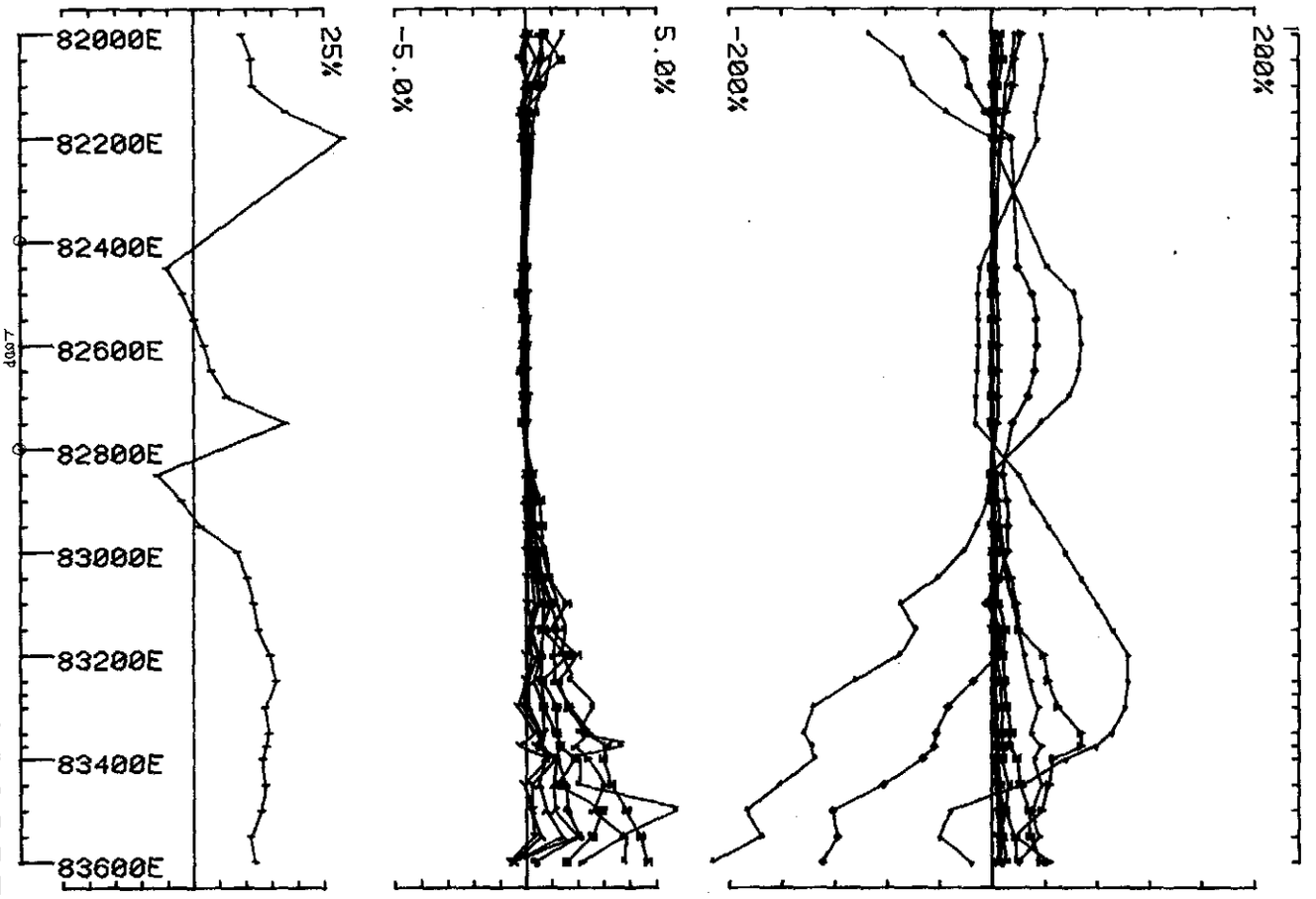
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8506
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM TC
Line 80000N Hz COMPONENT BASE FREQ :- 30.974HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 8004
LINE 80000
Hz

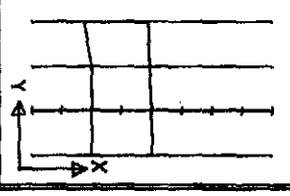
166

960107



5 cm

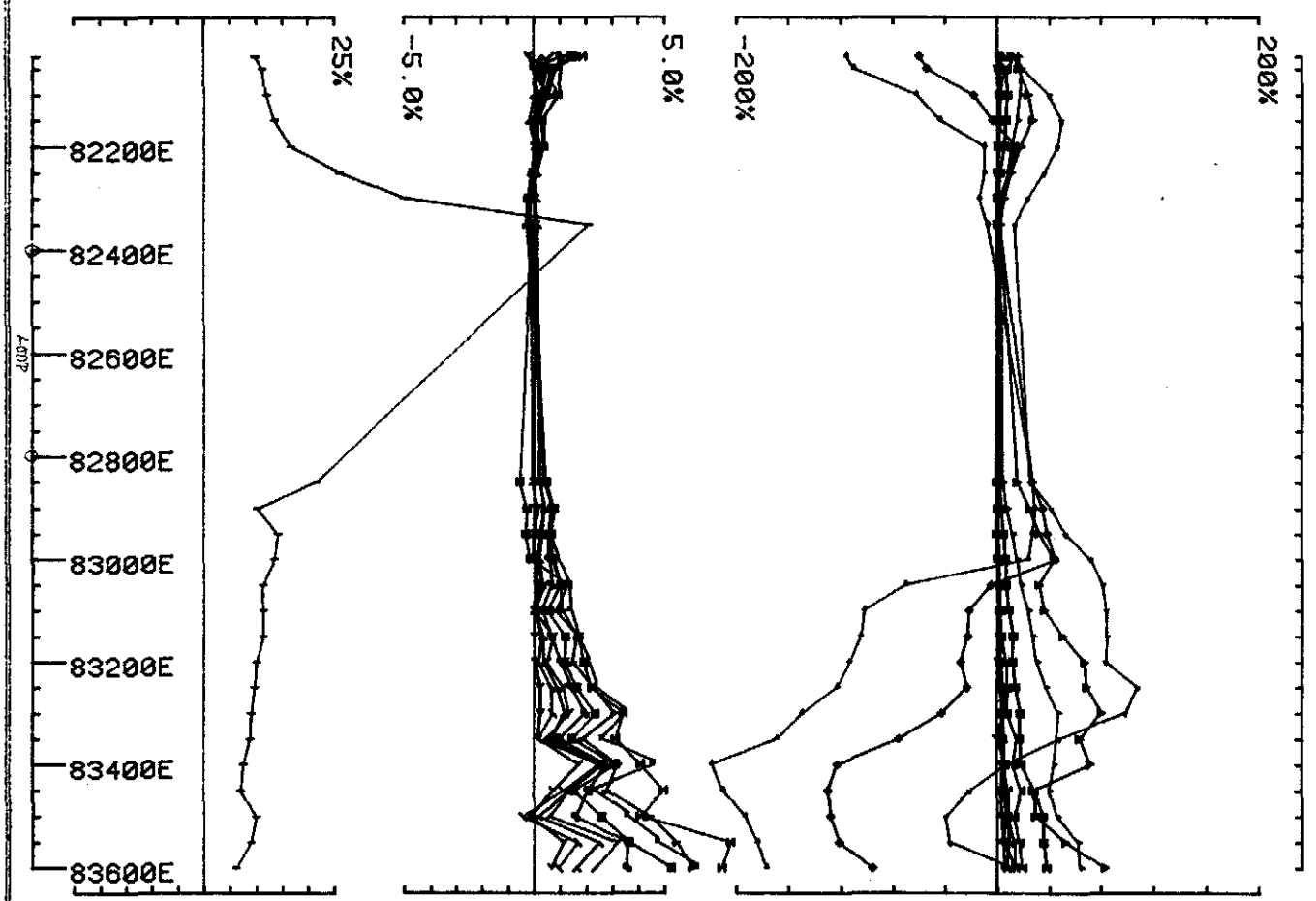
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8506
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM TC
Line 79700N Hz COMPONENT BASE FREQ :- 30.974HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery
LINE 79700
Hz

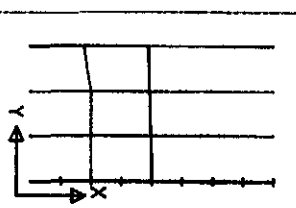
167

S6016S



5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8506
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM TC
Line 79400N Hz COMPONENT BASE FREQ :- 30.974HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 9004
LINE 79400
Hz

SHELL COMPANY OF AUSTRALIA

METALS DIVISION

R.O.C.S. - PROTEM

ROSEBERY EAST
LINE 379400N
UTEM HZ

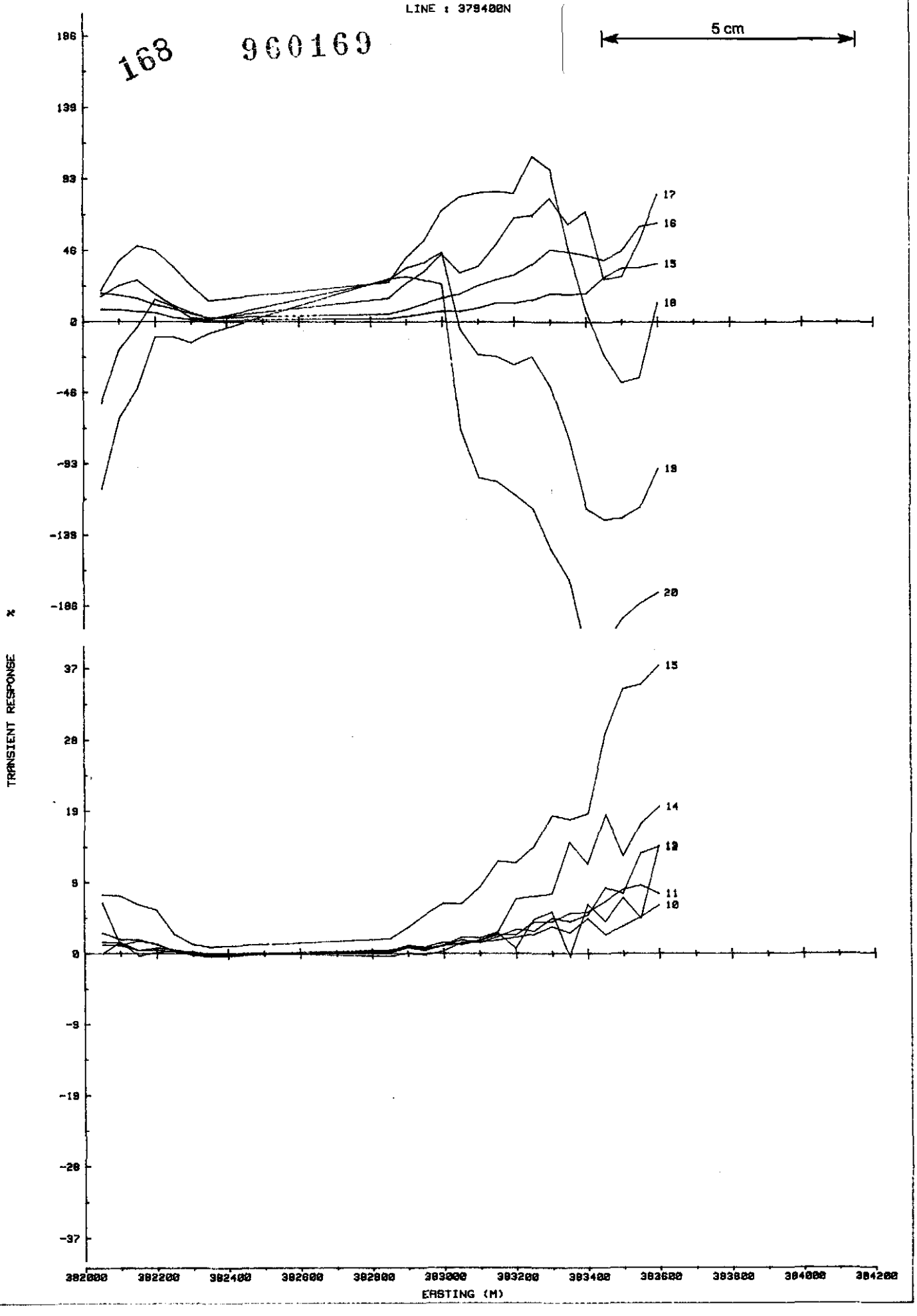
SCALE 1 : 10000

FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	LOOP 4

LINE : 379400N

168 960169

5 cm



SHELL COMPANY OF AUSTRALIA

METALS DIVISION

R.O.C.S. - PROTEM

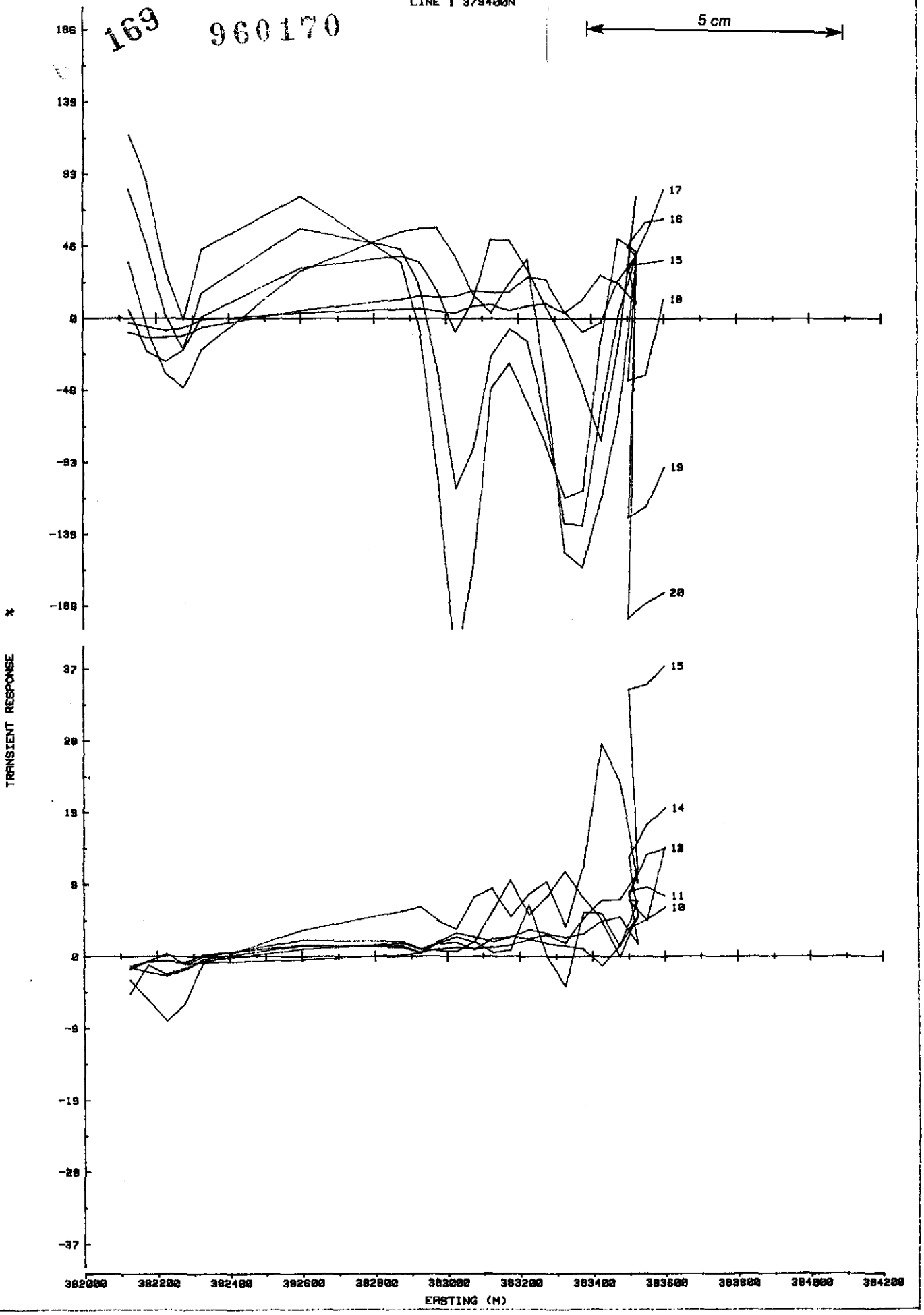
ROSEBERY EAST
LINE 379400N
UTEM HZ
FRASER FILTER
SCALE 1 : 10000

FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	LOOP 4

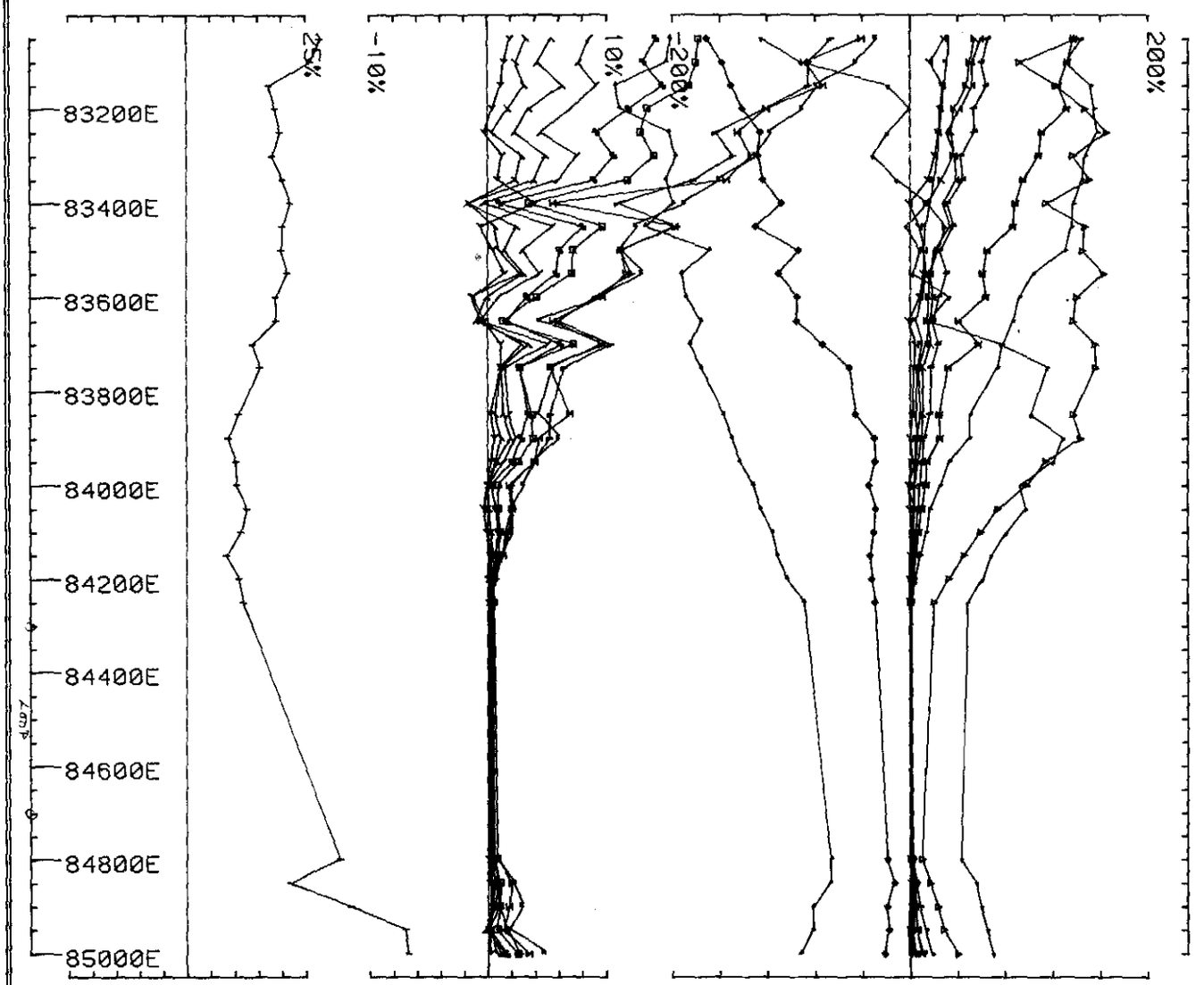
LINE : 379400N

169 960170

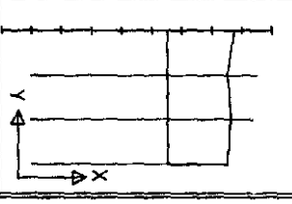
5 cm



170 960171

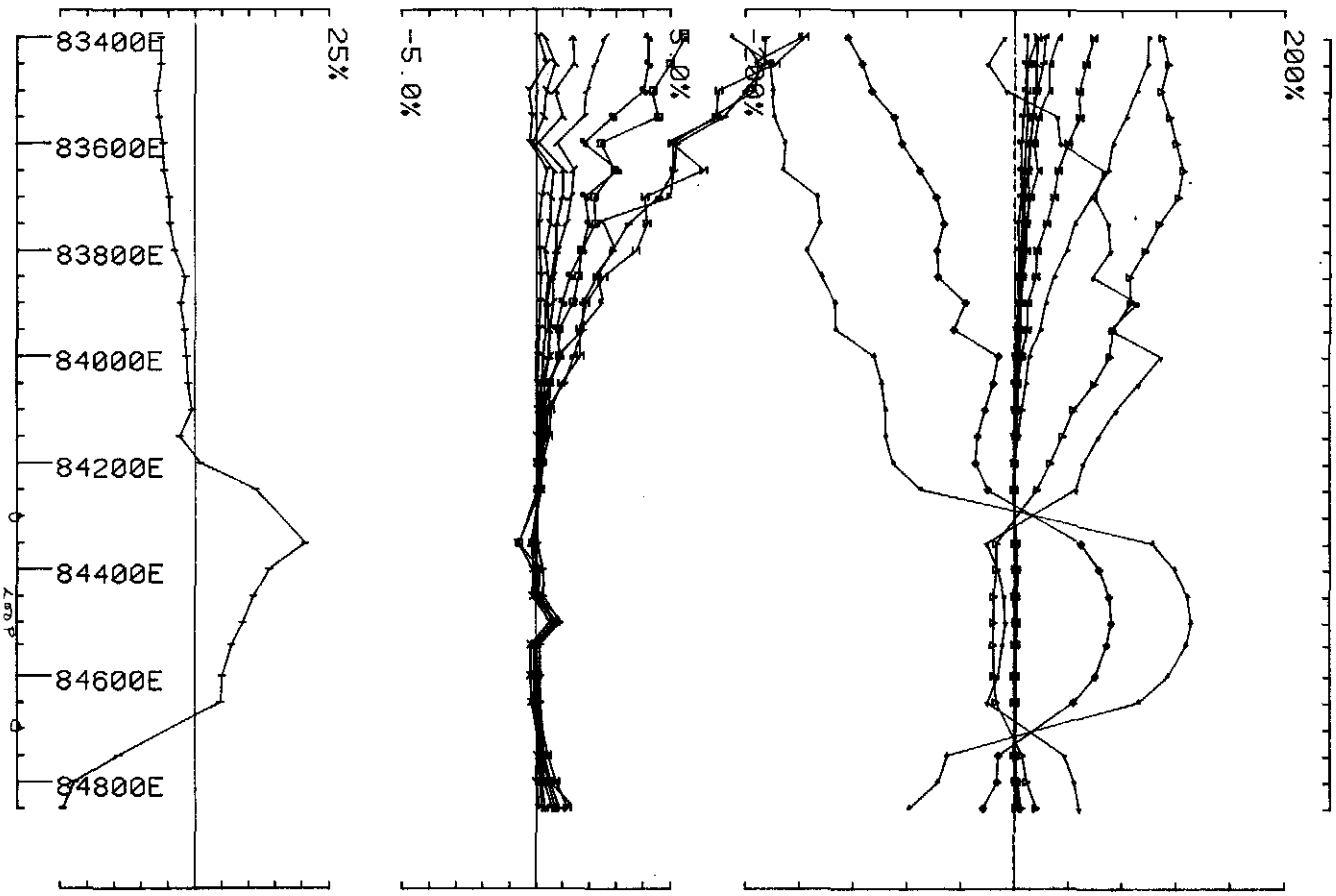


LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8506
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG TC
Line 80300N Hz COMPONENT BASE FREQ :- 30.974HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



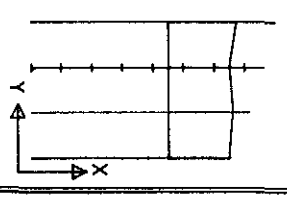
ROSEBERY EAST
LOOP 8005
LINE 80300
Hz

171 960172



5 cm

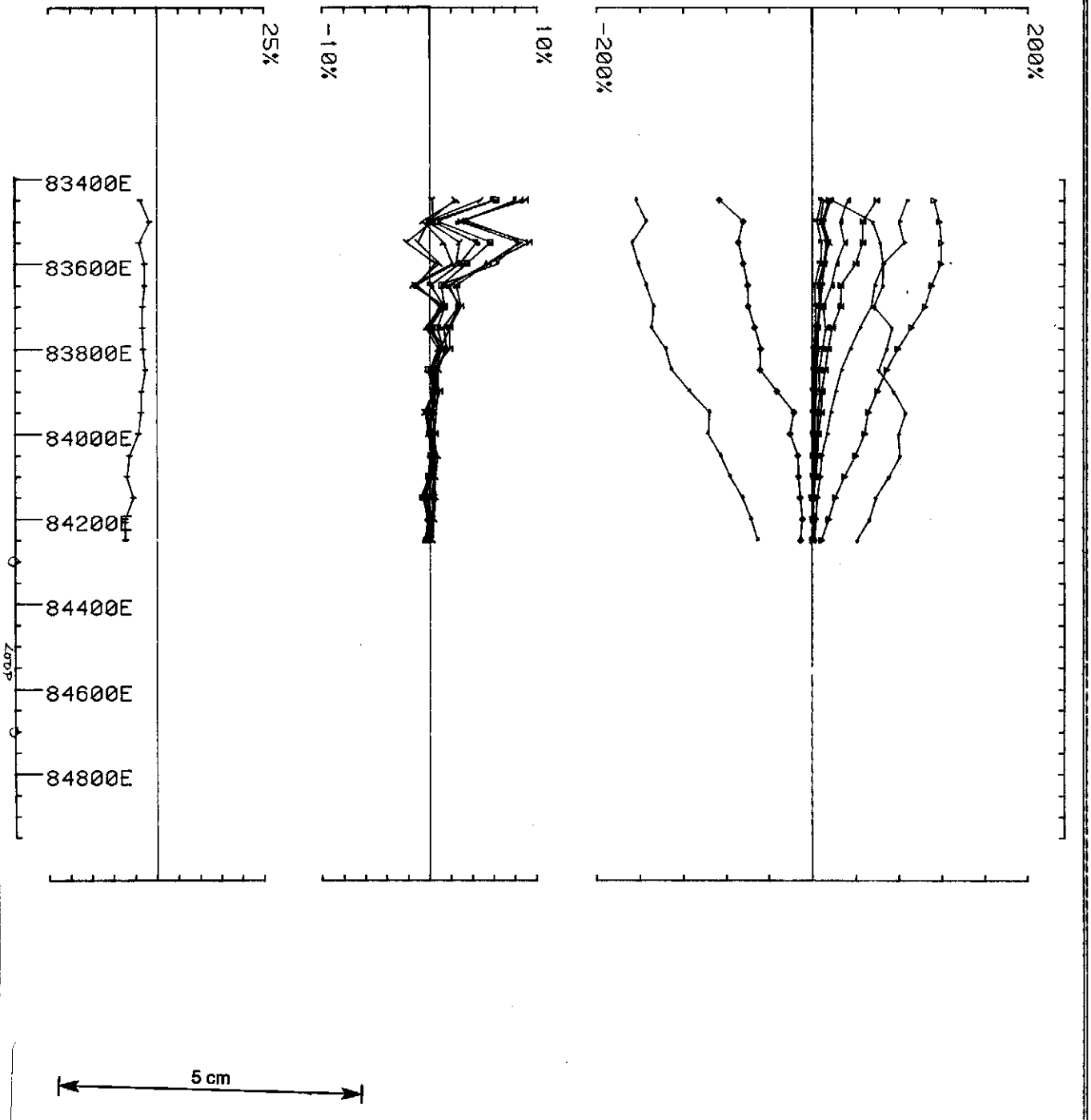
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8506
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG TC
Line 80000N Hz COMPONENT BASE FREQ :- 30.974HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



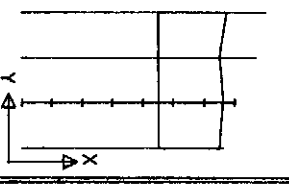
ROSEBERY EAST
Loop 0005
LINE 80000
Hz

960173

172

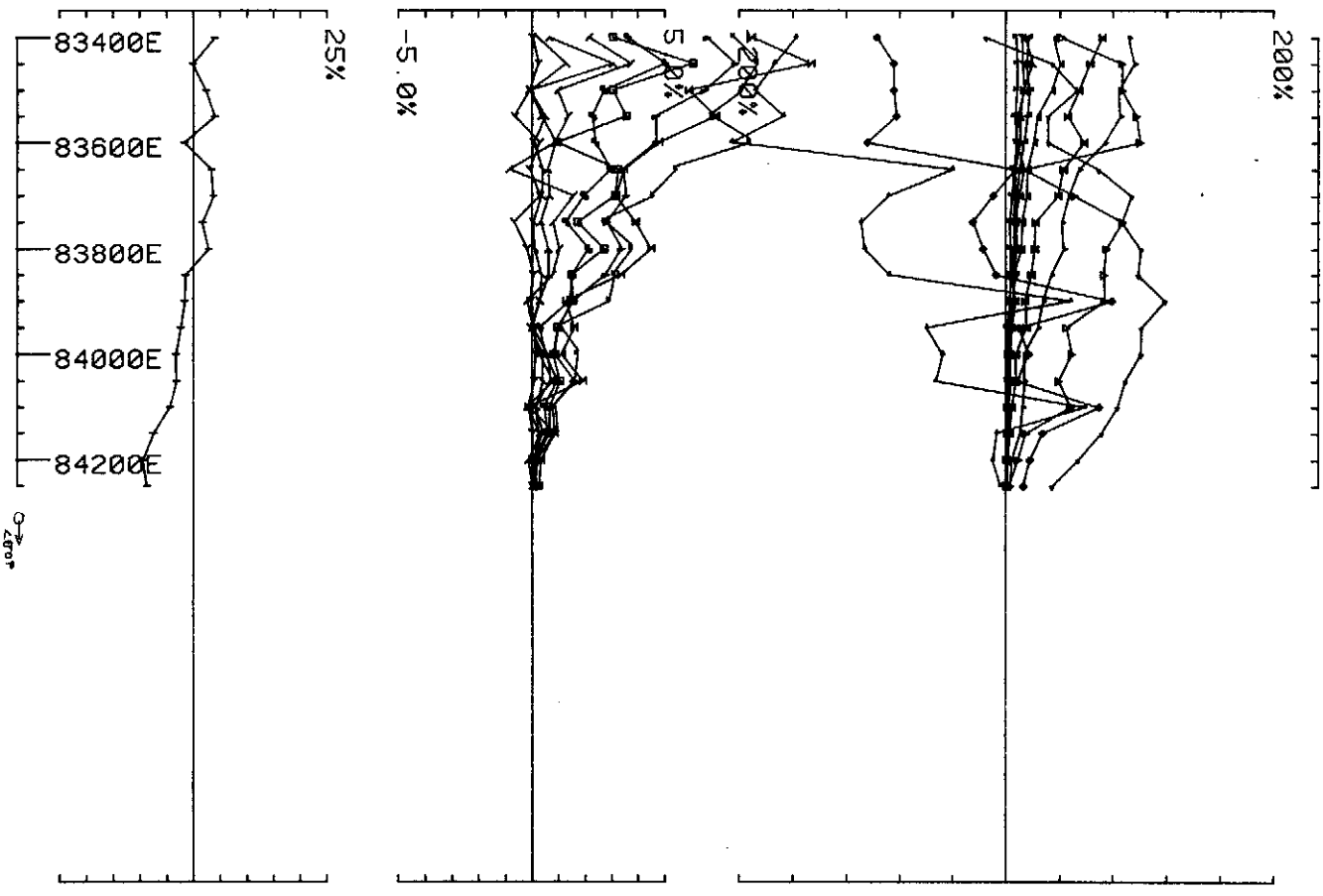


LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8506
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG TC
Line 79700N Hz COMPONENT BASE FREQ :- 30.974HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



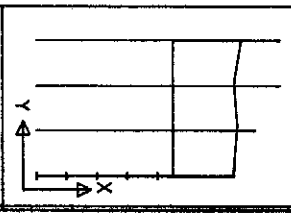
ROSEBERY EAST
LOOP 00PS
LINE 79700
Hz

173 960174



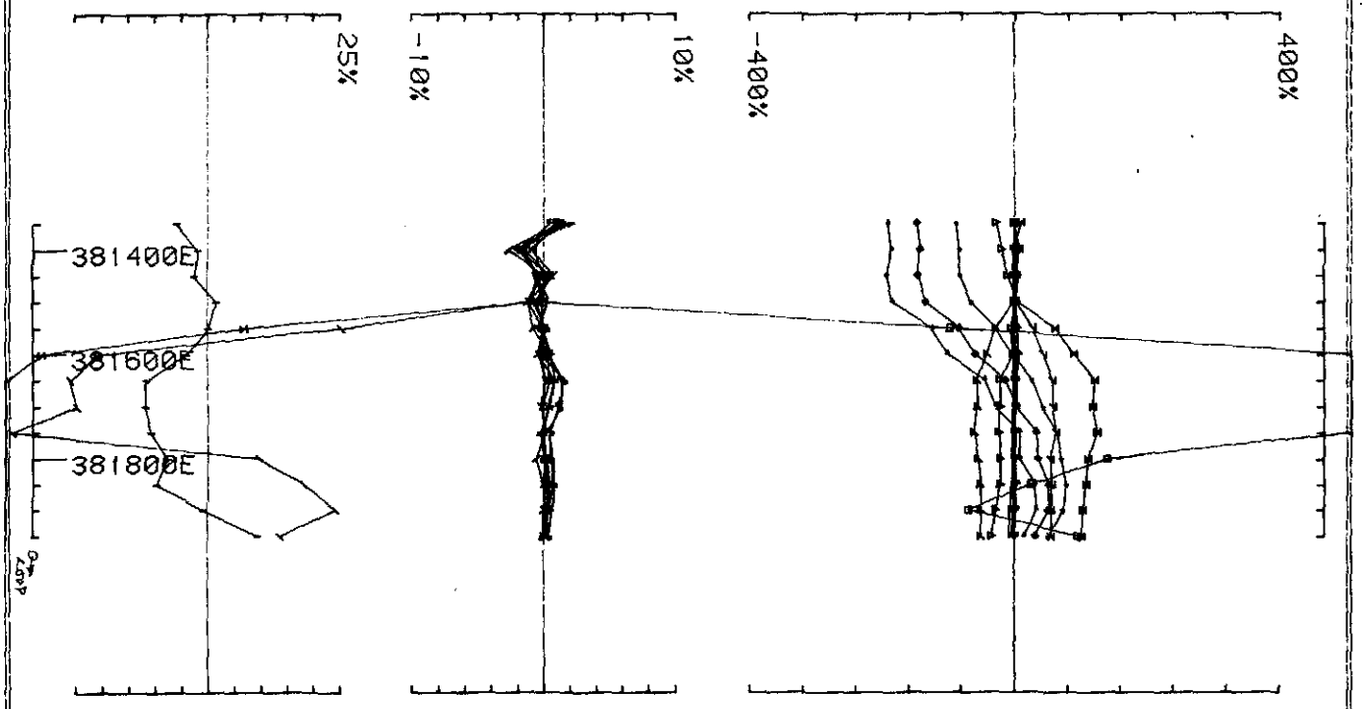
5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8506
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG TC
Line 79400N Hz COMPONENT BASE FREQ :- 30.974HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0005
LINE 79400
Hz

174 960175



5 cm

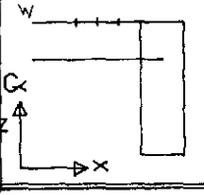
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508

AREA :- Rosebery East

CLIENT :- Billiton Australia CREW :- PMM JRG TC

Line 378750N Hz COMPONENT BASE FREQ :- 30.974HERTZ

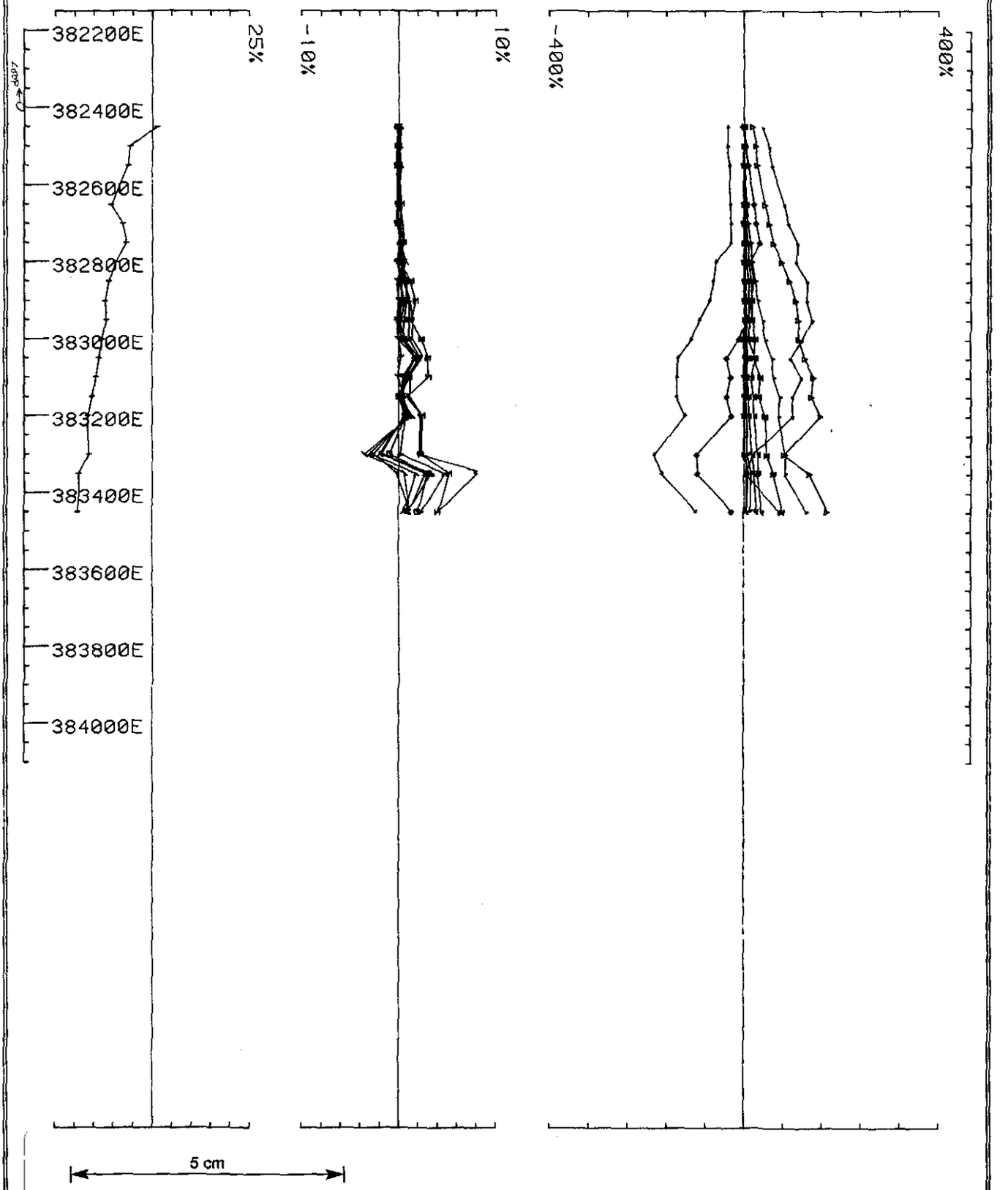
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 0006
LINE 378750
Hz

175

960176



LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508

AREA :- Rosebery East

CLIENT :- Billiton Australia CREW :- PMM JRG TC

Line 378750N Hz COMPONENT BASE FREQ :- 30.974HERTZ

SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

Rosebery East
LOOP 0006
LINE 378750
Hz

960177

176

SHELL COMPANY OF AUSTRALIA

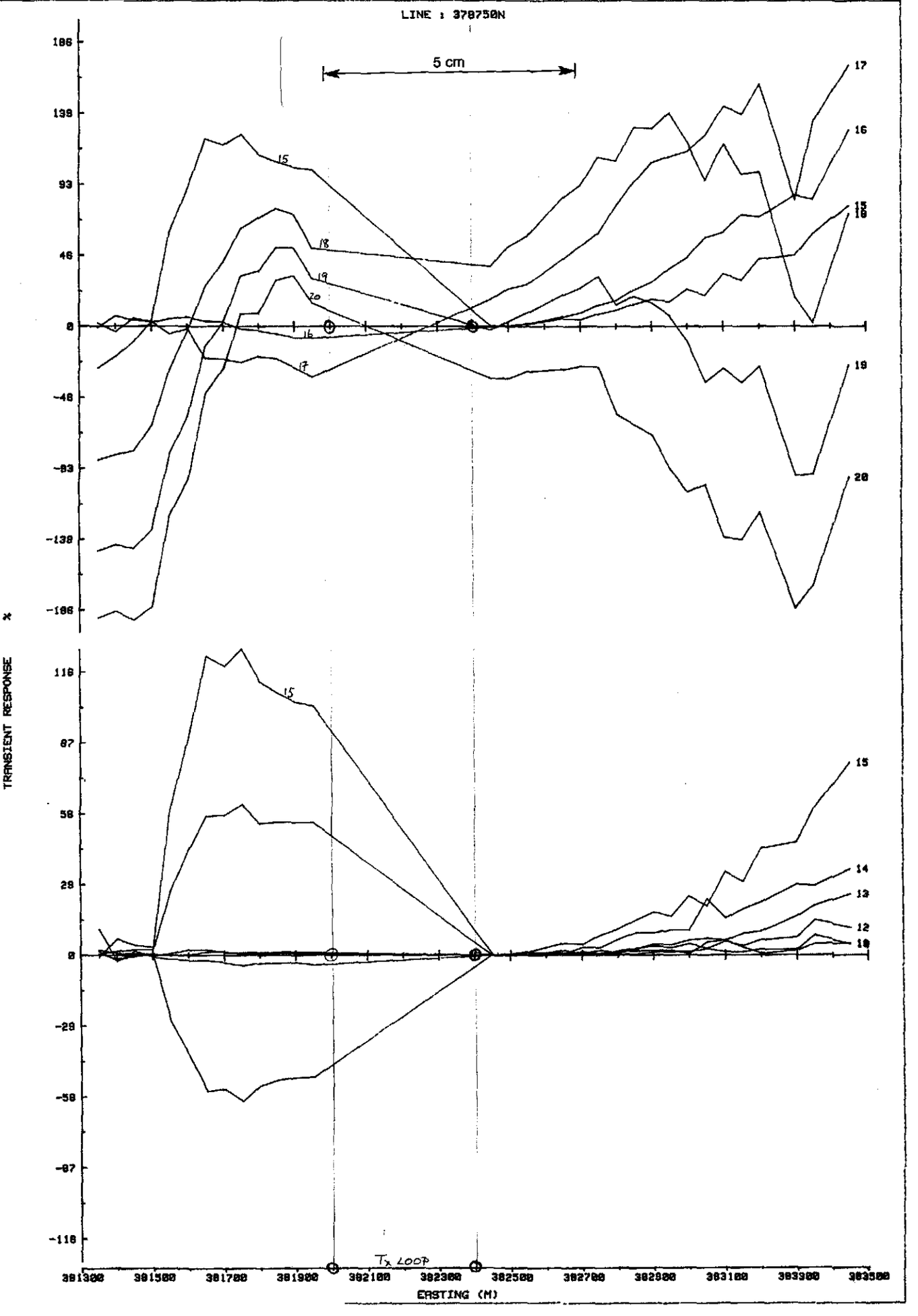
METALS DIVISION

R.O.C.S. - PROTEM

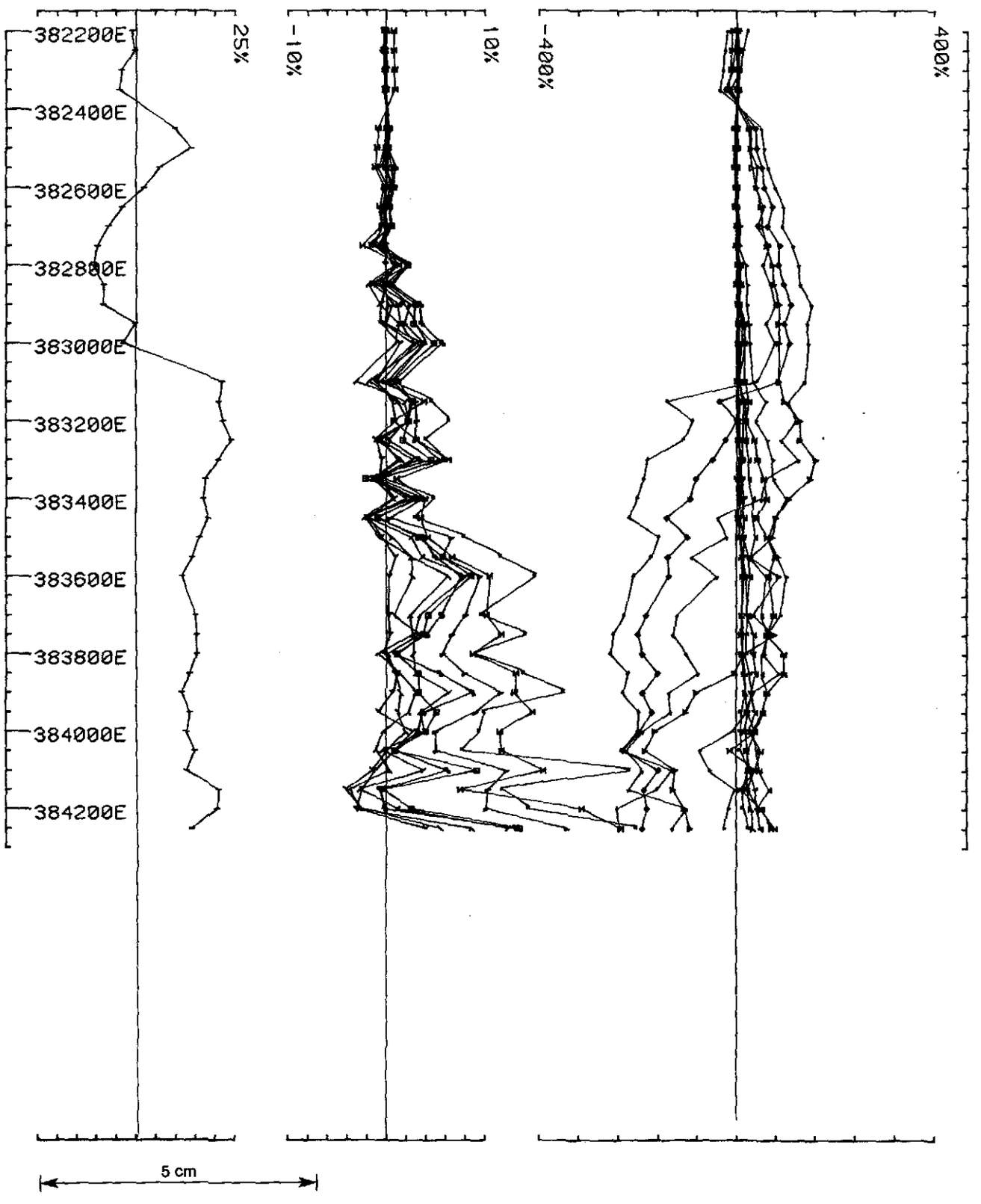
ROSEBERY EAST
LINE 378750N
UTEM HZ

SCALE 1 : 10000

FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	LOOP 6



960178



LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Australia CREW :- PMM JRG TC
Line 378400N Hz COMPONENT BASE FREQ :- 30.974HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

Rosebery East
LOOP 8006
LINE 378400
Hz

960179

178

SHELL COMPANY OF AUSTRALIA

METALS DIVISION

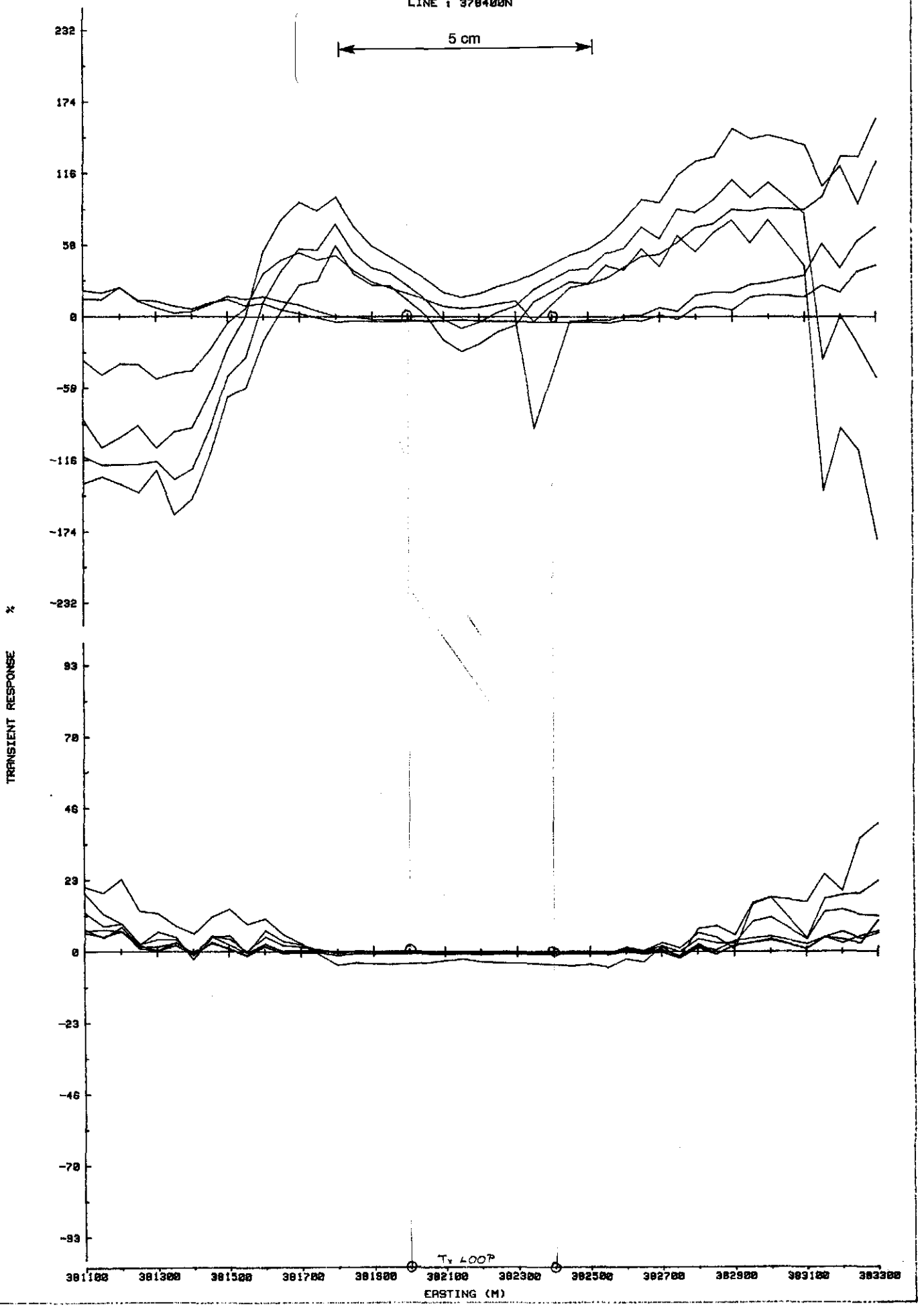
R.O.C.S. - PROTEM

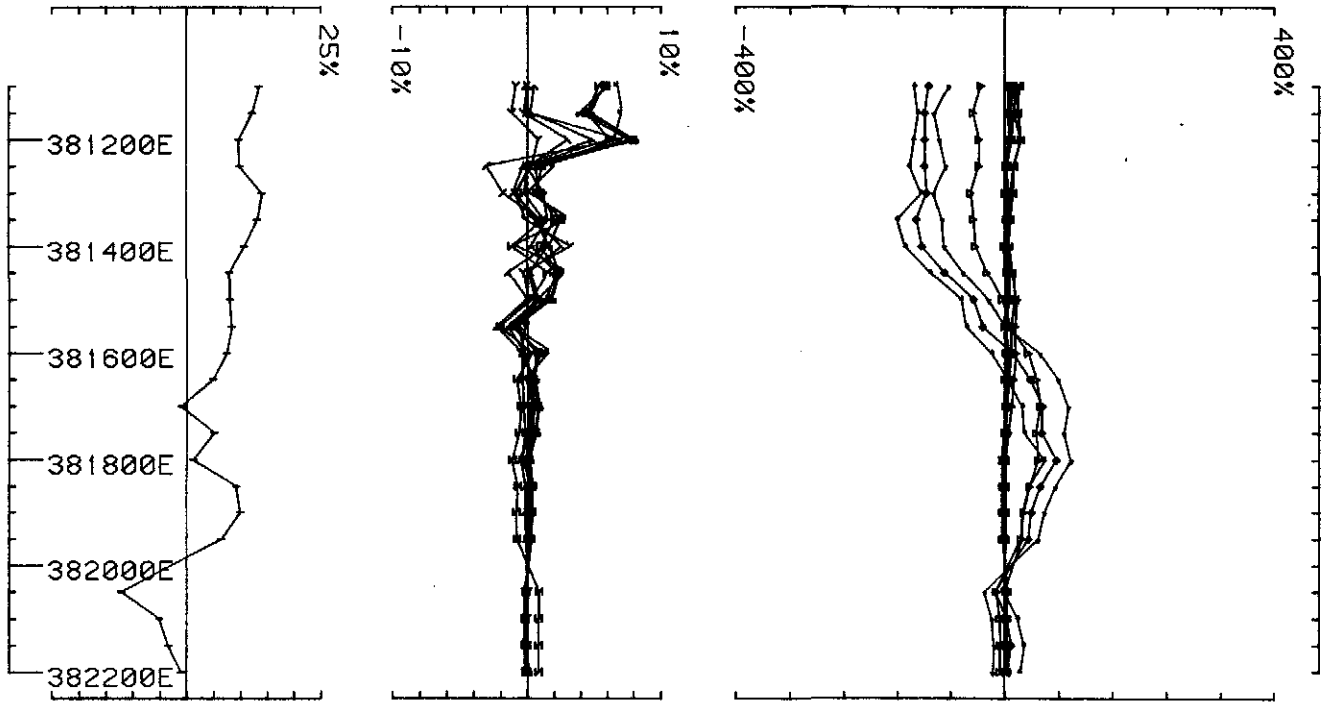
ROSEBERY EAST
LINE 378400N
UTEM HZ

SCALE 1 : 10000

FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	LOOP 6

LINE : 378400N





5 cm

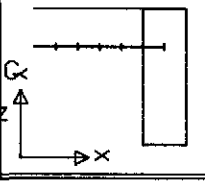
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508

AREA :- Rosebery East

CLIENT :- Billiton Australia CREW :- PMM JRG TG

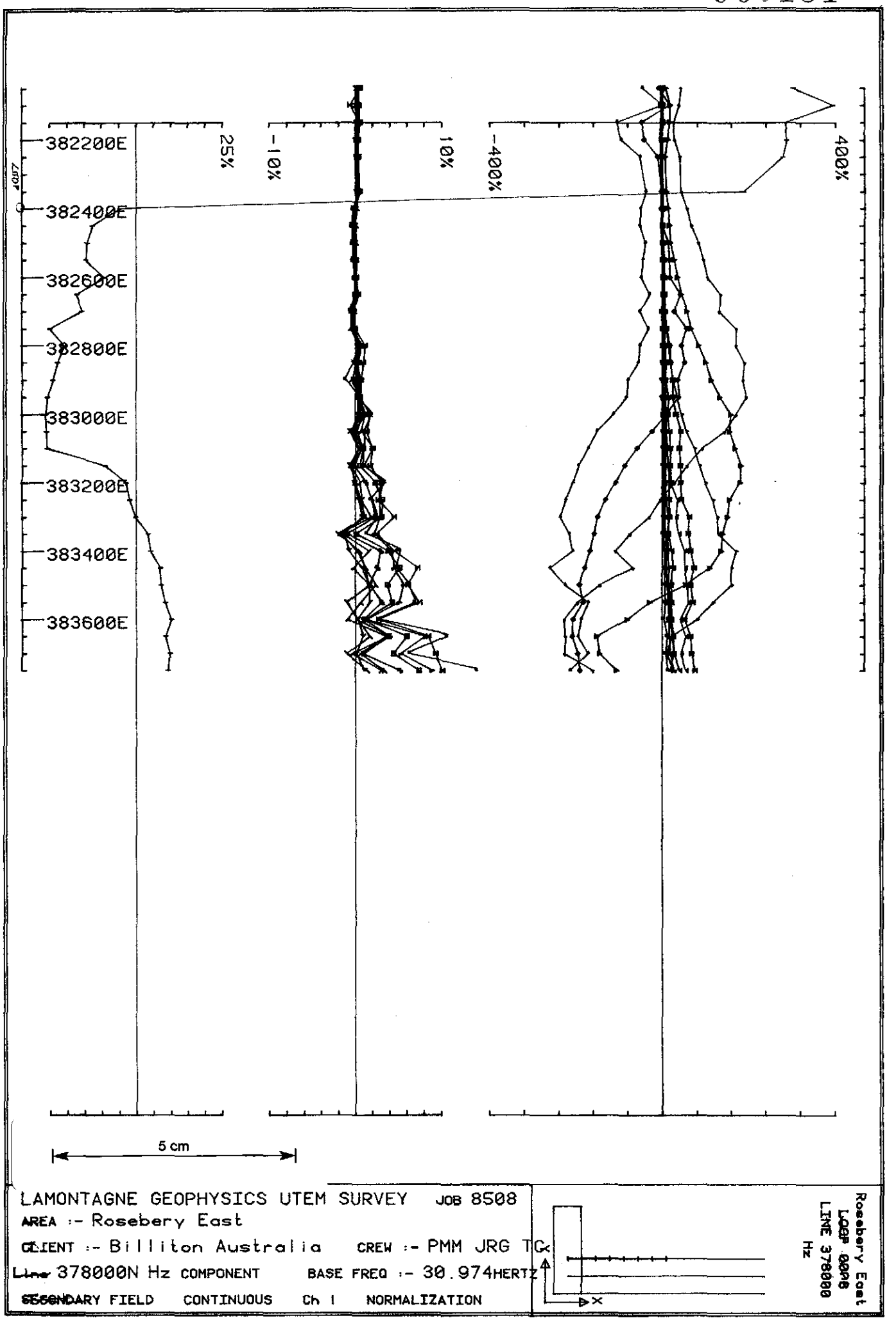
Line 378400N Hz COMPONENT BASE FREQ :- 30.974HERTZ

SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 0006
LINE 378400
Hz

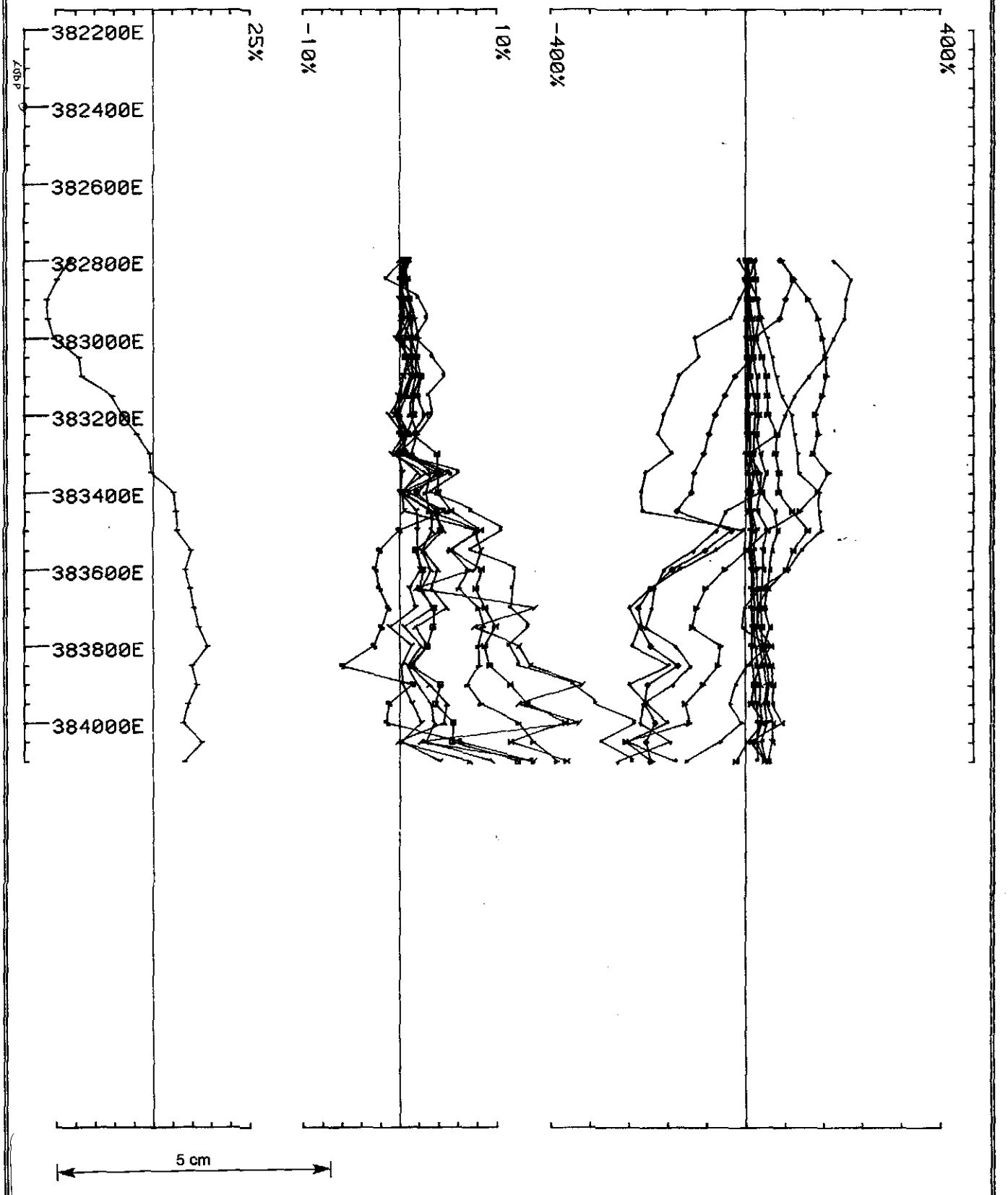
960181



LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Australia CREW :- PMM JRG TC
Line 378000N Hz COMPONENT BASE FREQ :- 30.974HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

Rosebery East
LOOP 0006
LINE 378000
Hz

960182



LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508

AREA :- Rosebery East

CLIENT :- Billiton Australia CREW :- PMM JRG TC

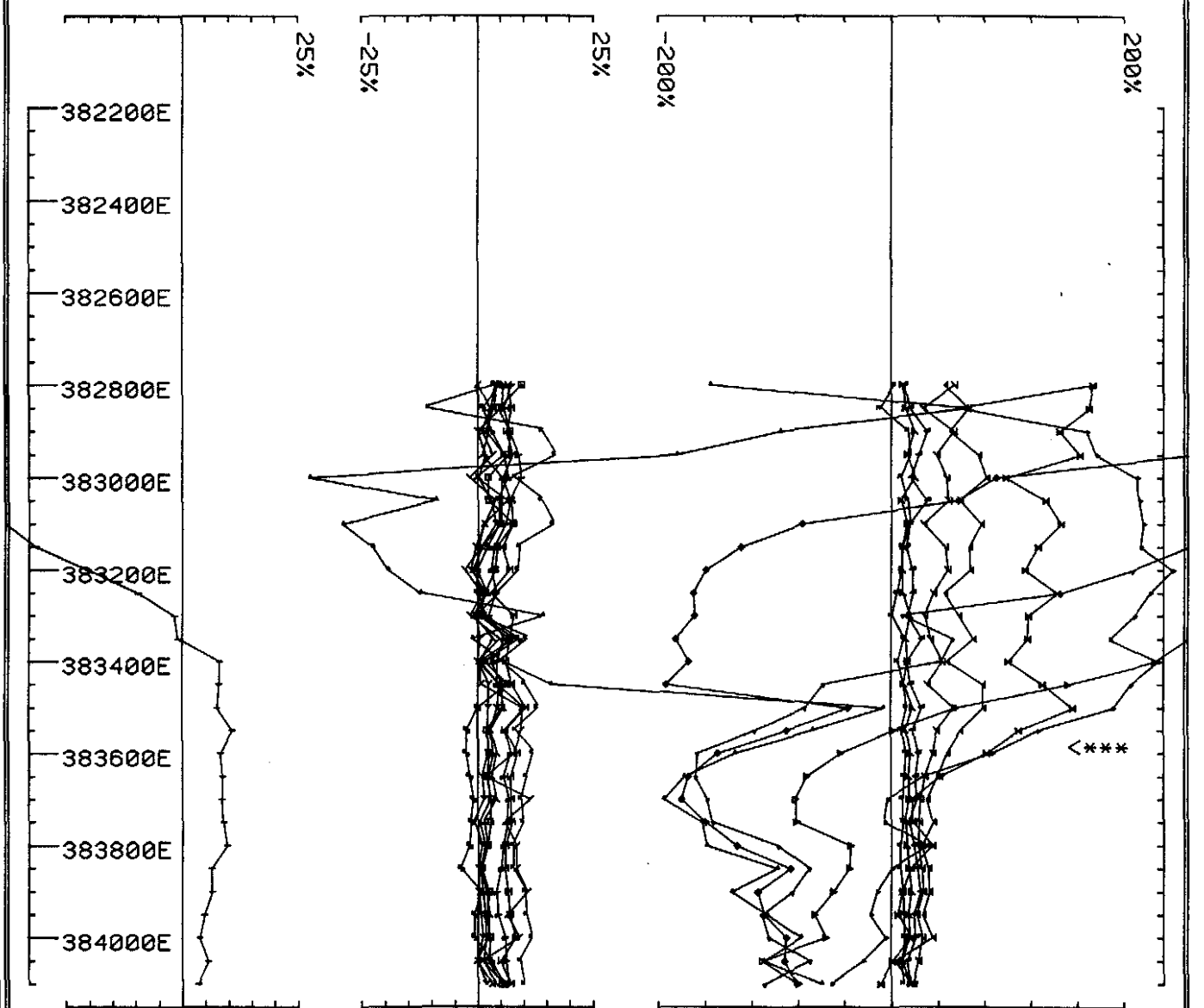
Line 377750N Hz COMPONENT BASE FREQ :- 30.974HERTZ

SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

Rosebery East
LOOP 00NG
LINE 377750
Hz

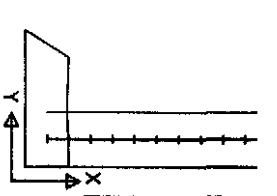
182

960183



5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG
Line 377750N Hz COMPONENT BASE FREQ :- 30.974HERTZ
SECONDARY FIELD POINT Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0000
LINE 377750
Hz

960184

183

SHELL COMPANY OF AUSTRALIA

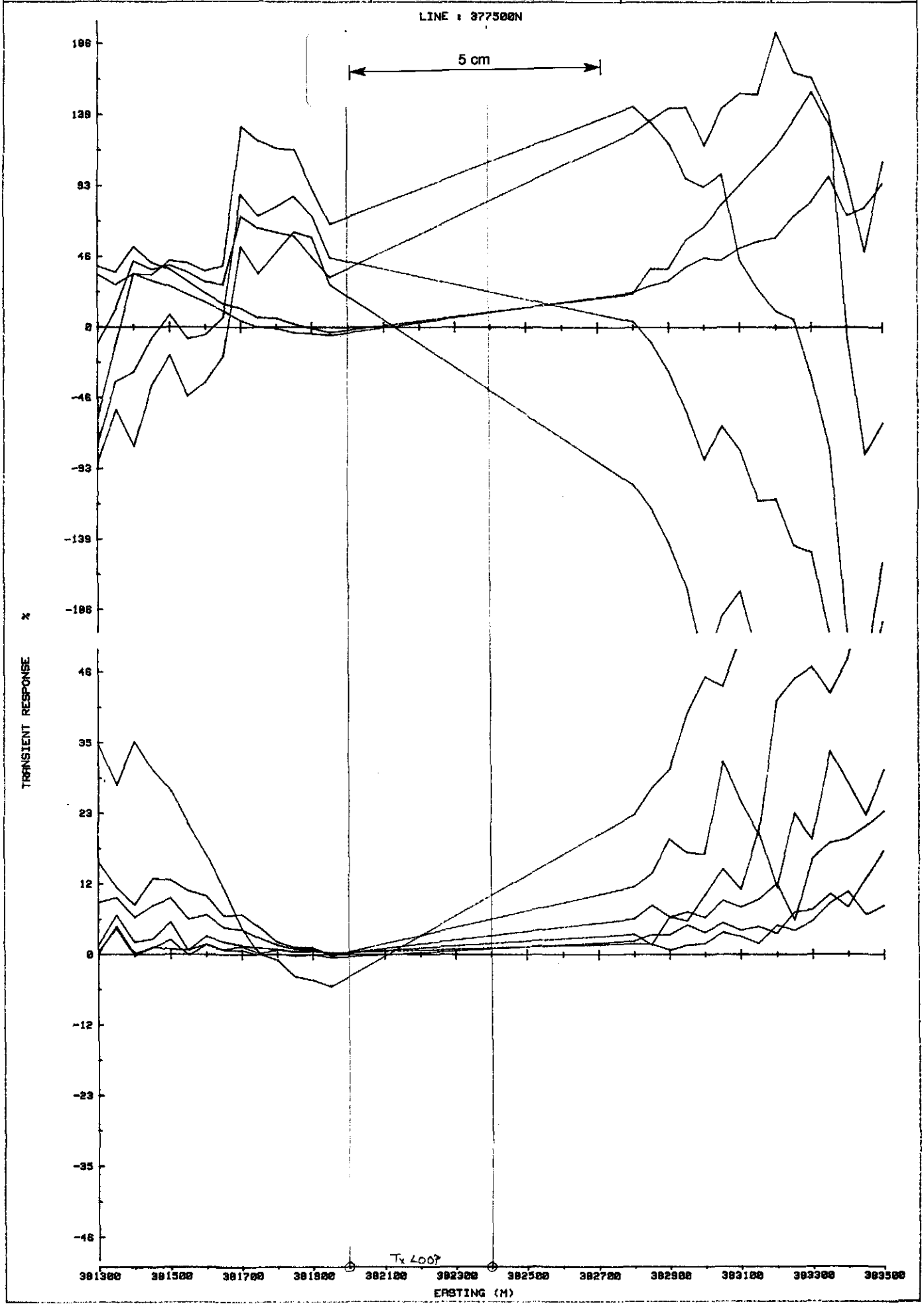
METALS DIVISION

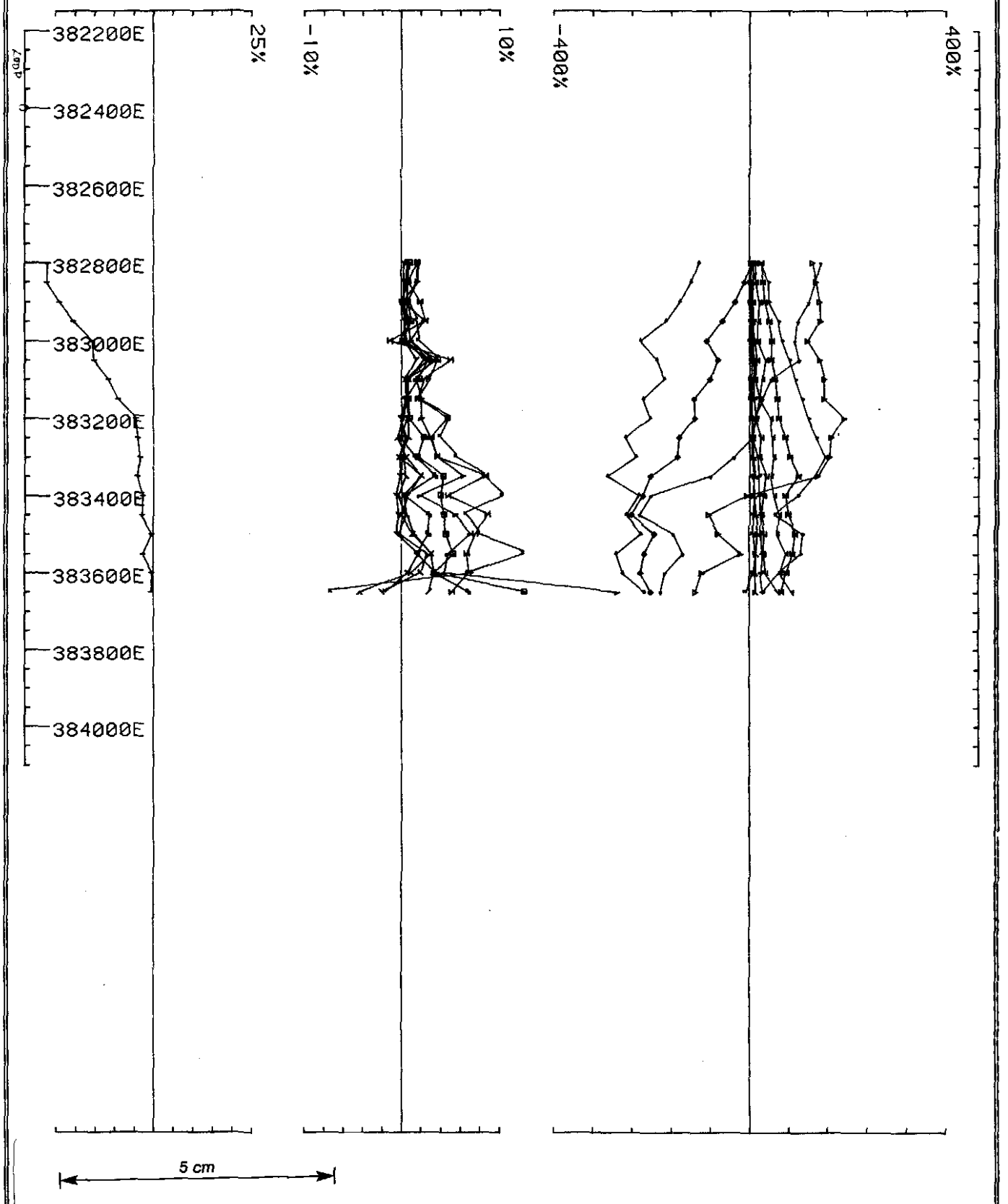
R.O.C.S. - PROTEM

ROSEBERY EAST
LINE 377750N
UTEN HZ

SCALE 1 : 10000

FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	Loop 6





LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508

AREA :- Rosebery East

CLIENT :- Billiton Australia CREW :- PMM JRG TG

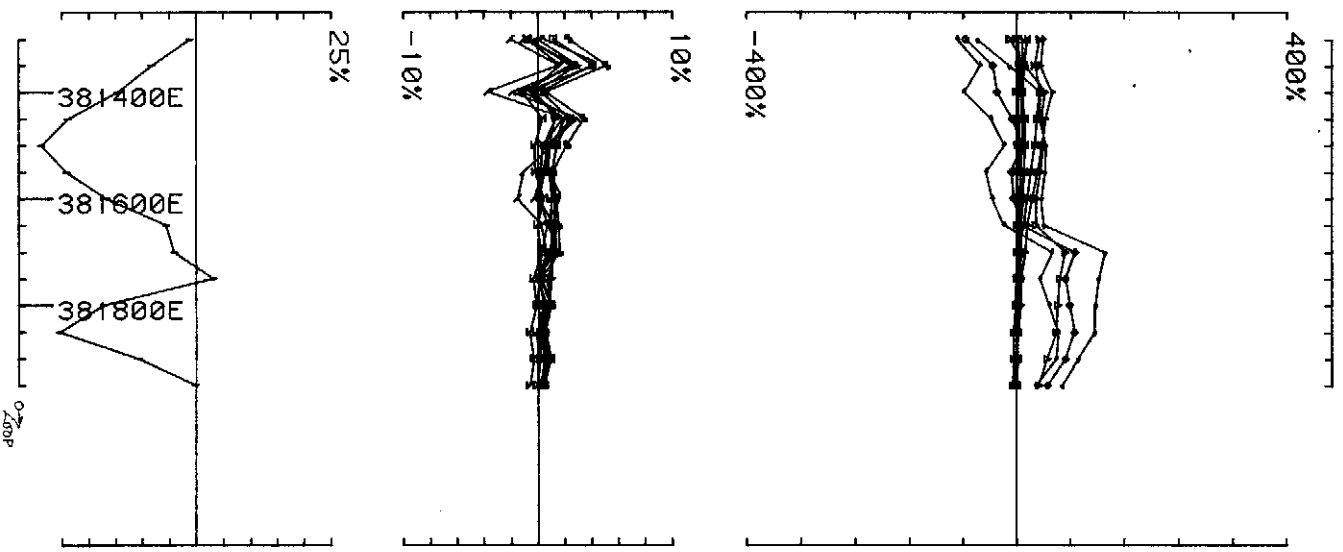
Line 377500N Hz COMPONENT BASE FREQ :- 30.974HERTZ

SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

Rosebery East
LOOP 0006
LINE 377500
Hz

185

960186



5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508

AREA :- Rosebery East

CLIENT :- Billiton Australia CREW :- PMM JRG TC

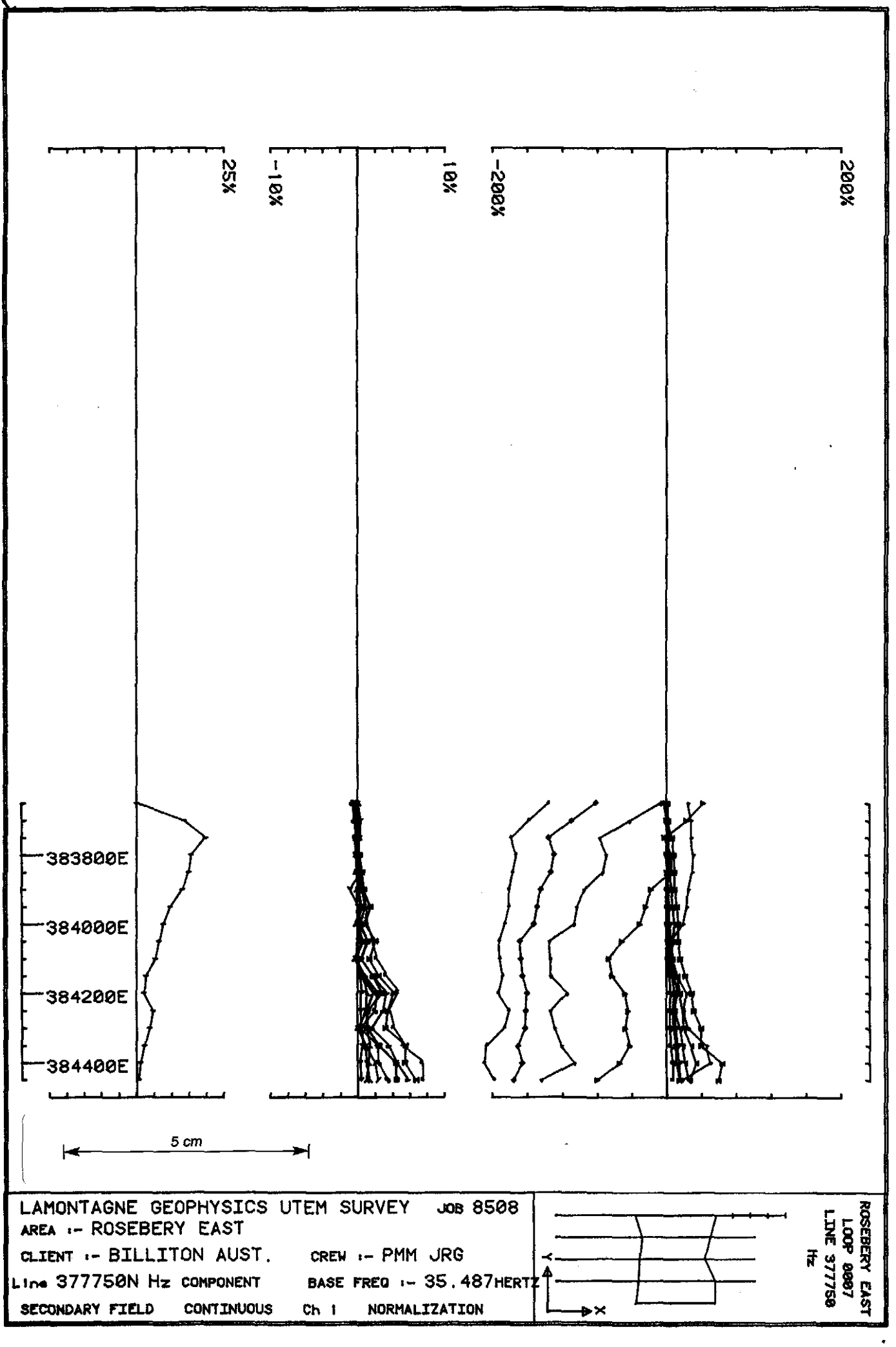
Line 377500N Hz COMPONENT BASE FREQ :- 30.974HERTZ

SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

Rosebery East
LOOP 0006
LINE 377750
Hz

186

960187


25%
-10%
10%
-200%
200%
383800E
384000E
384200E
384400E
5 cm
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG
Line 377750N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION
Y
X
ROSEBERY EAST
LOOP 0007
LINE 377750
Hz

960188

187

SHELL COMPANY OF AUSTRALIA

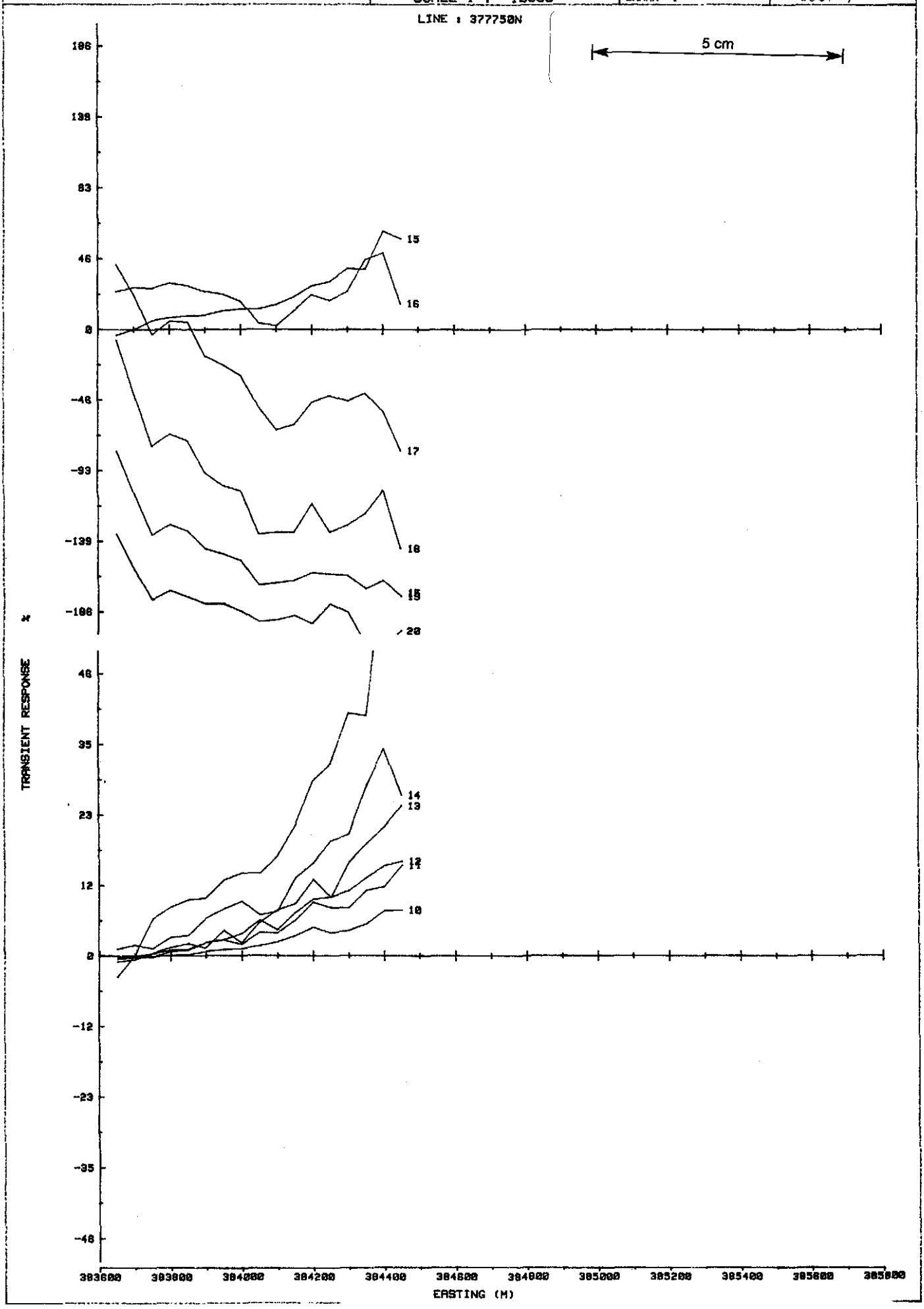
METALS DIVISION

R.O.C.S. - PROTEM

ROSEBERY EAST
LINE 377750N
UTEM HZ

SCALE 1 : 10000

FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	LOOP 7



960189

183

SHELL COMPANY OF AUSTRALIA

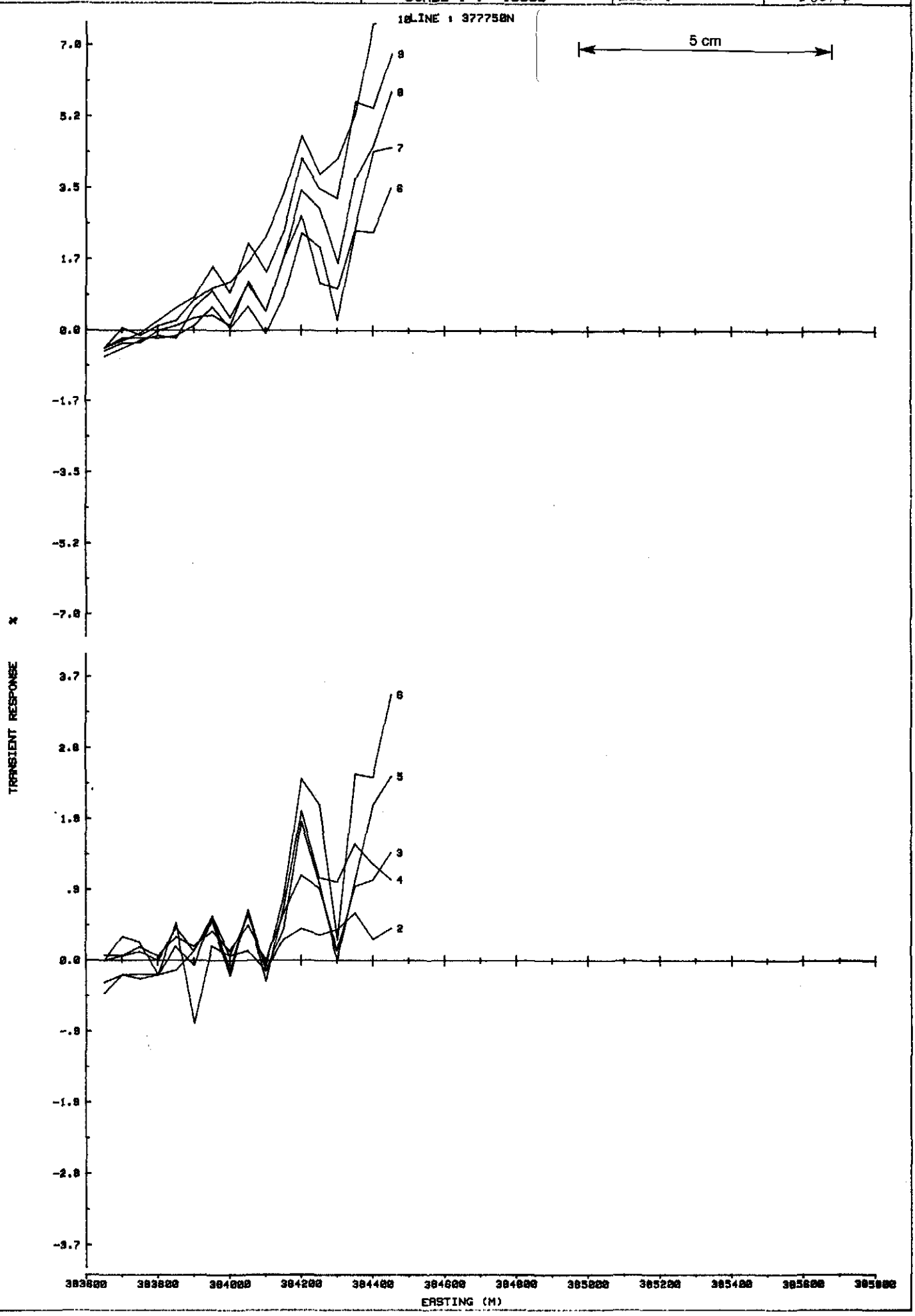
METALS DIVISION

R.O.C.S. - PROTEM

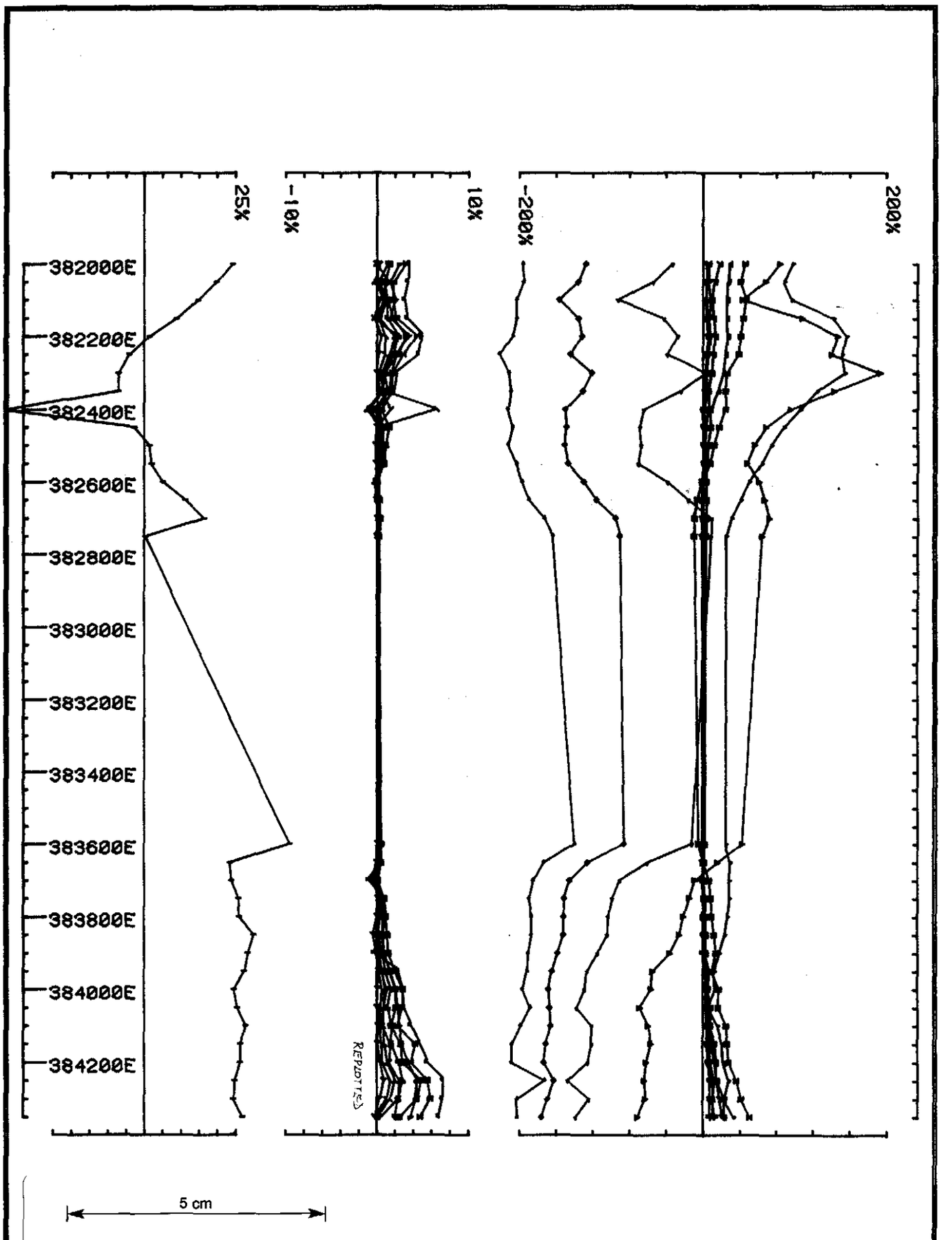
ROSEBERY EAST
LINE 377750N
UTEM HZ

SCALE 1 : 10000

FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	LOOP 7



960190



LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG
Line 377500N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

ROSEBERY EAST
LOOP 9007
LINE 377500
Hz

960191

190

SHELL COMPANY OF AUSTRALIA

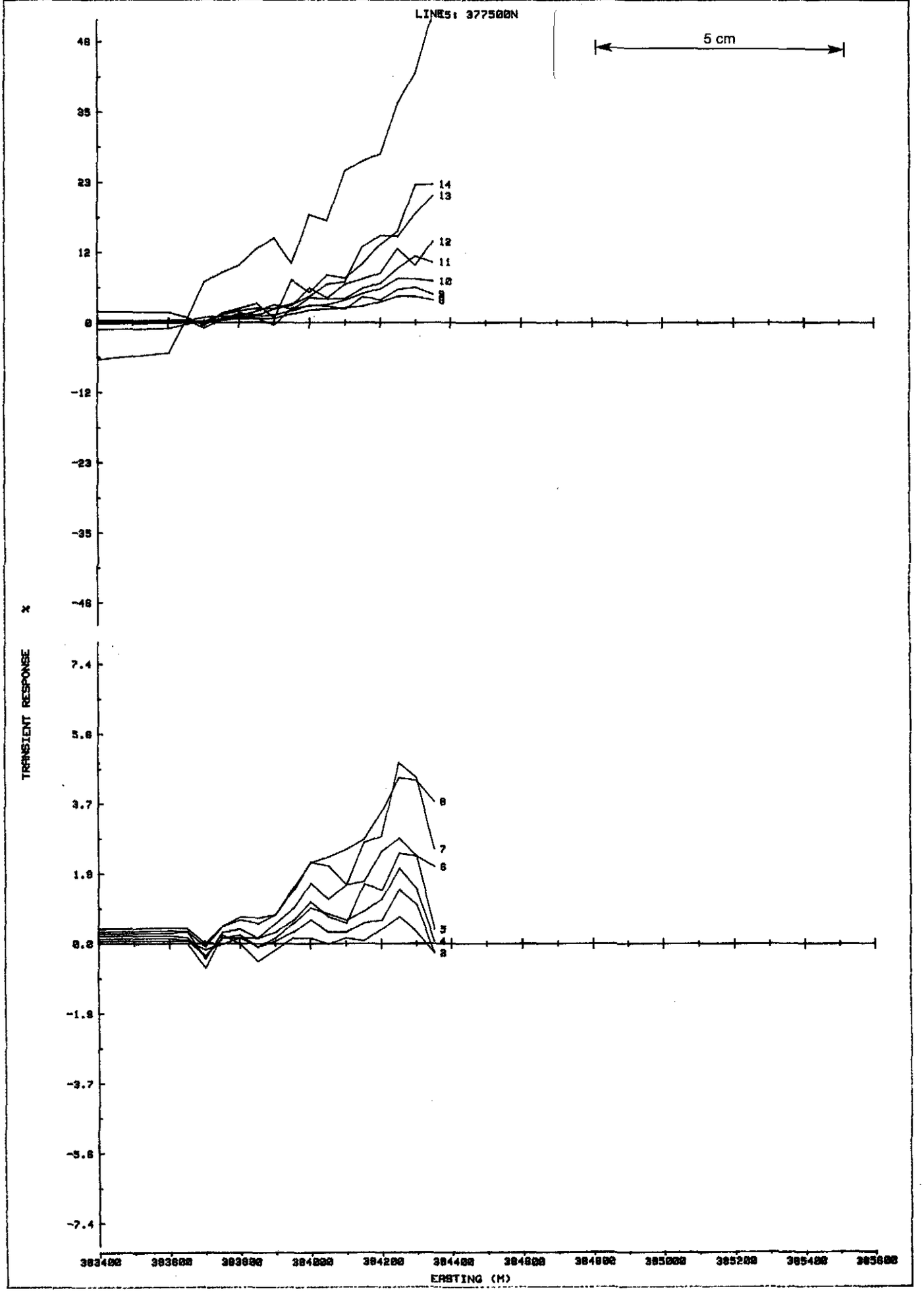
METALS DIVISION

R.O.C.S. - PROTEM

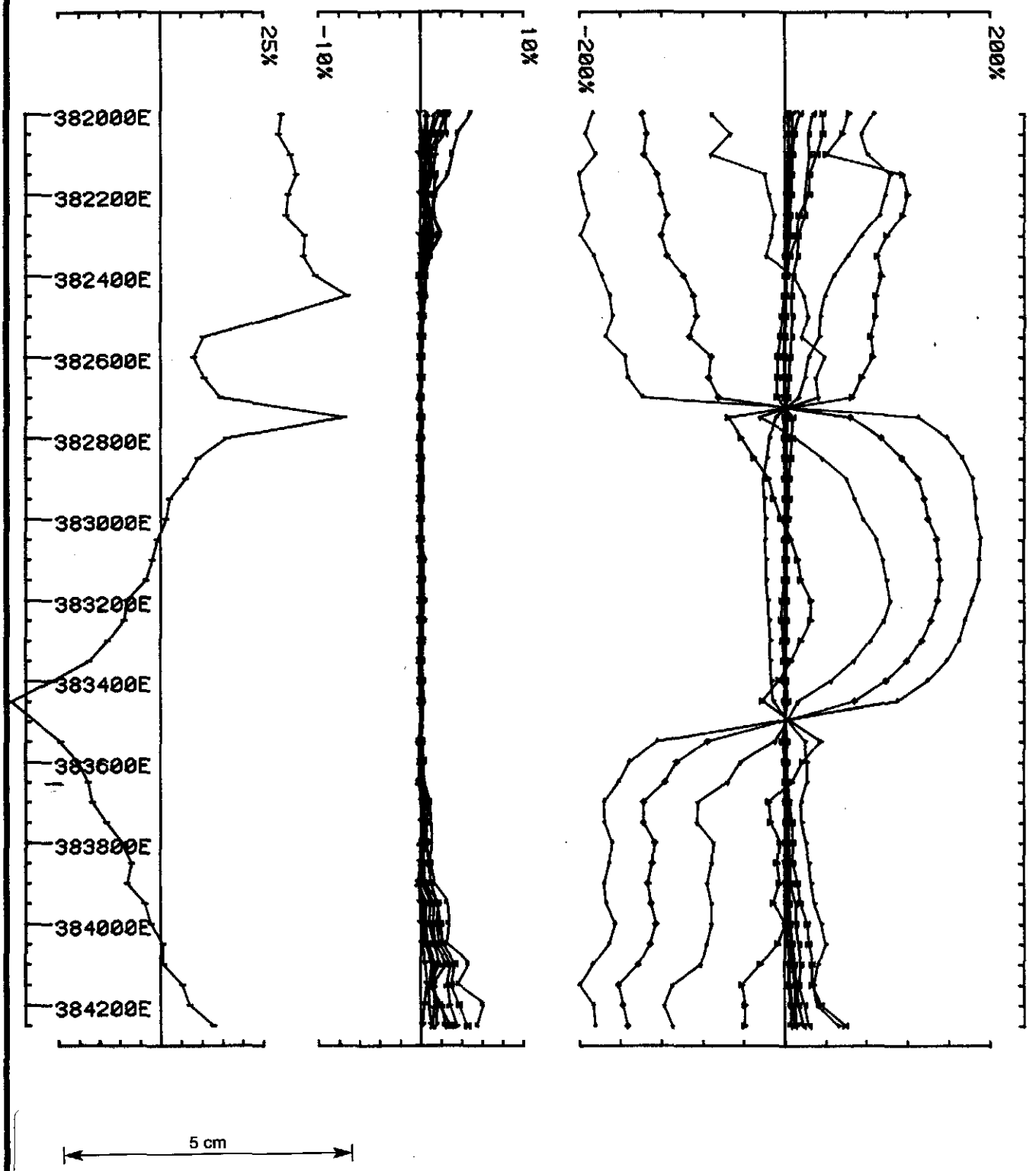
ROSEBERY EAST
LINE 377500N
UTEM HZ

SCALE 1 : 10000

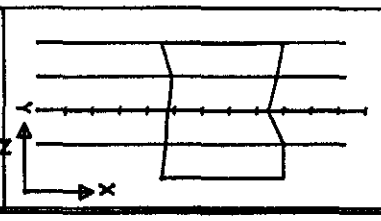
FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	Loop 7



960192



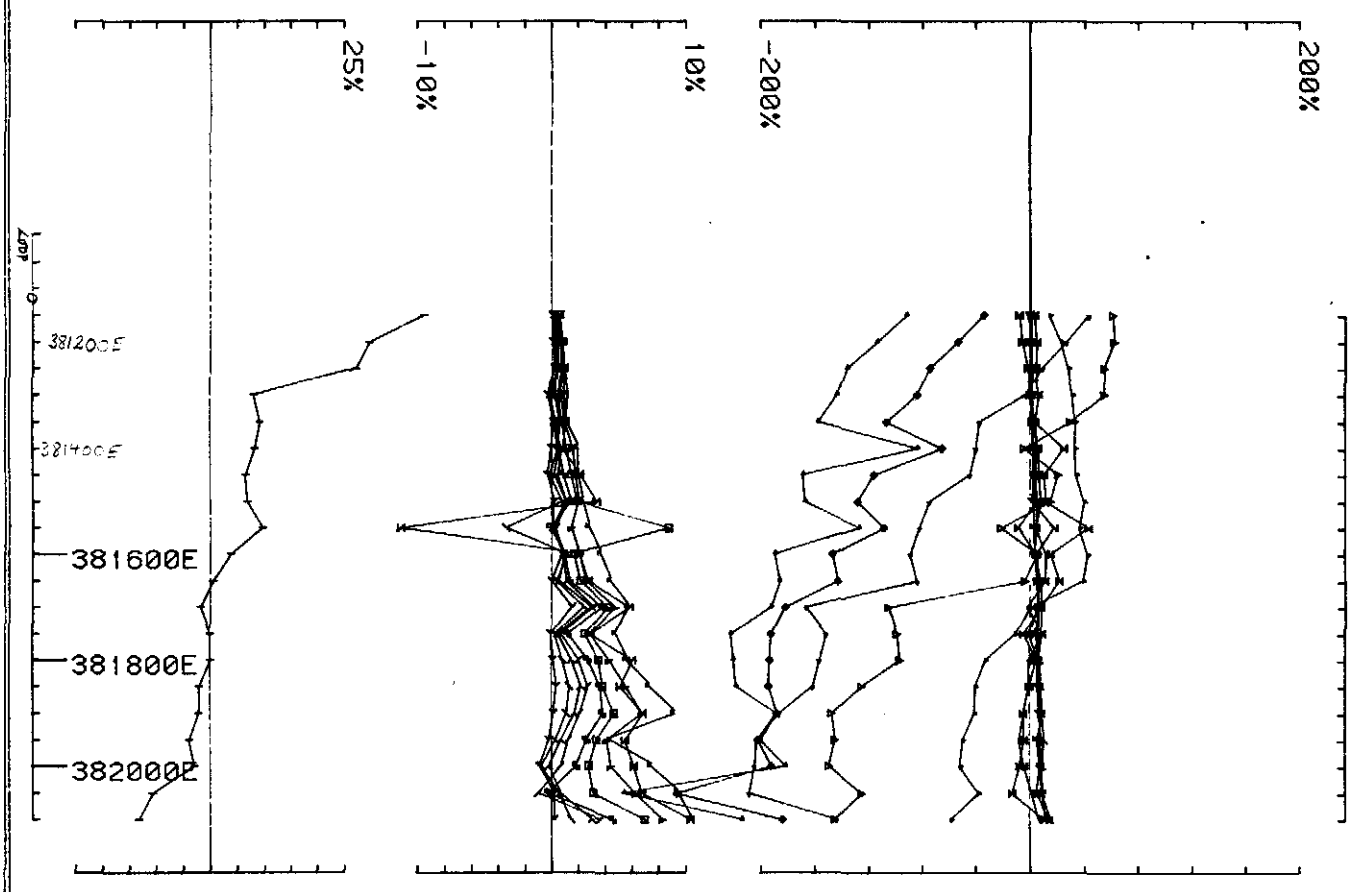
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG
Line 377250N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

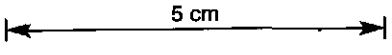


ROSEBERY EAST
LOOP 8007
LINE 377250
Hz

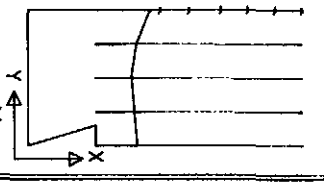
960193

192





LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- JRG PMM
Line 377500N Hz COMPONENT BASE FREQ :- 35.521 HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 0008
LINE 377500
Hz

960194

SHELL COMPANY OF AUSTRALIA

METALS DIVISION

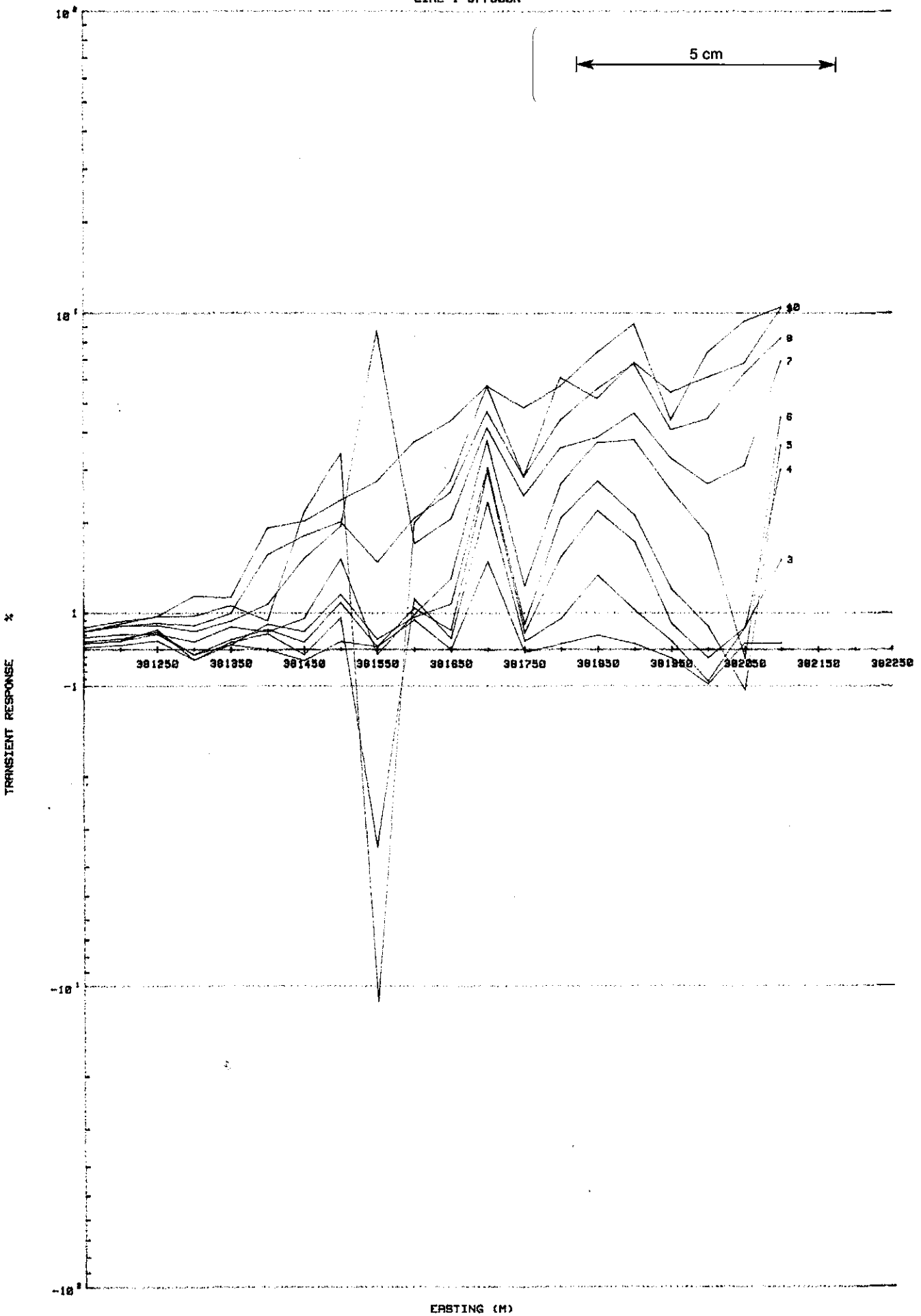
R.O.C.S. - PROTEM

ROSEBERY EAST, TAS
LINE 377500N
CONTINUOUS NORM
CHAN 2-10

SCALE 1 : 5000

FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	

LINE : 377500N



960195

194

SHELL COMPANY OF AUSTRALIA

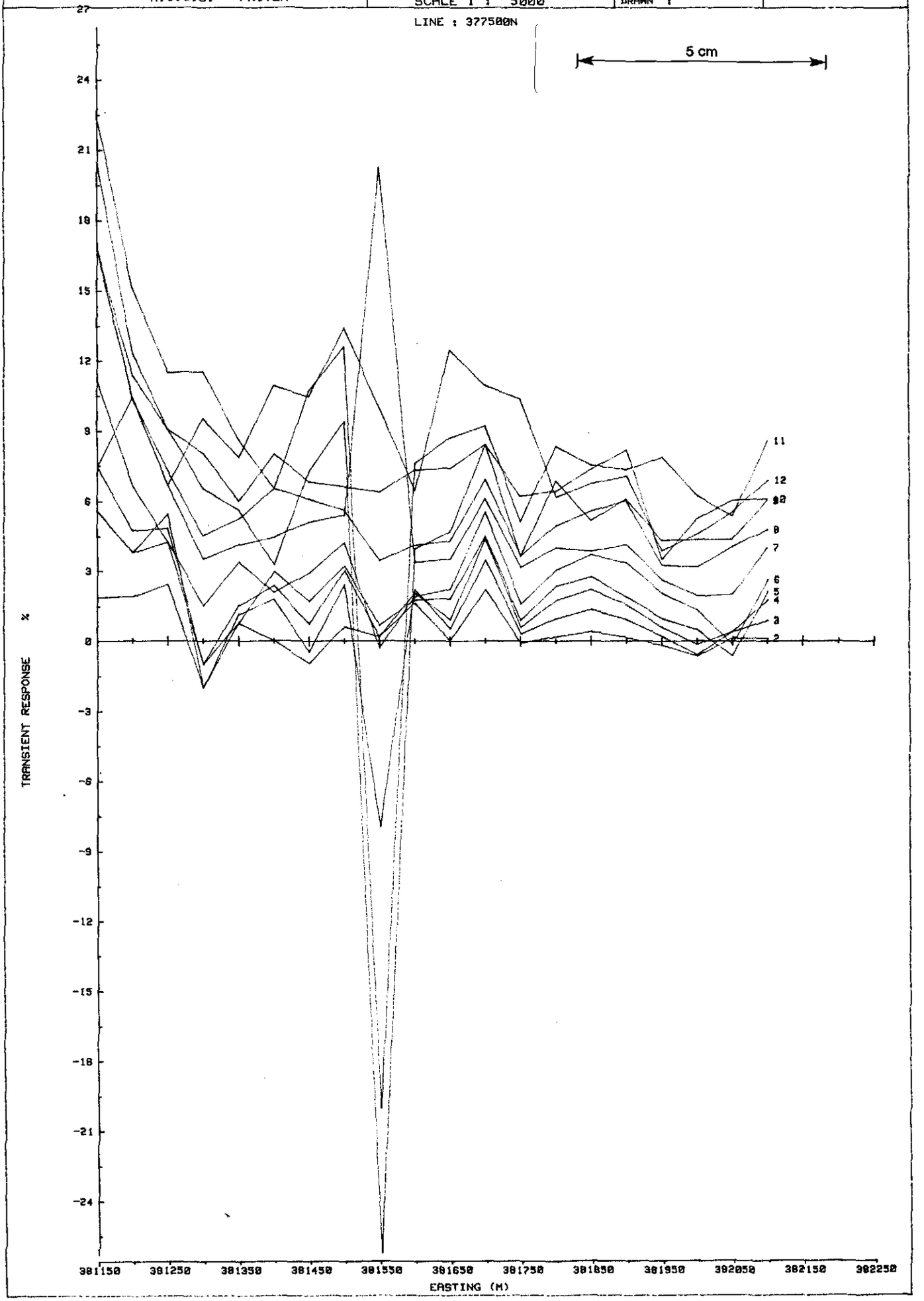
METALS DIVISION

R.O.C.S. - PROTEM

ROSEBERY EAST, TAS
LINE 377500N
POINT NORMALISED
TO STN 381850E

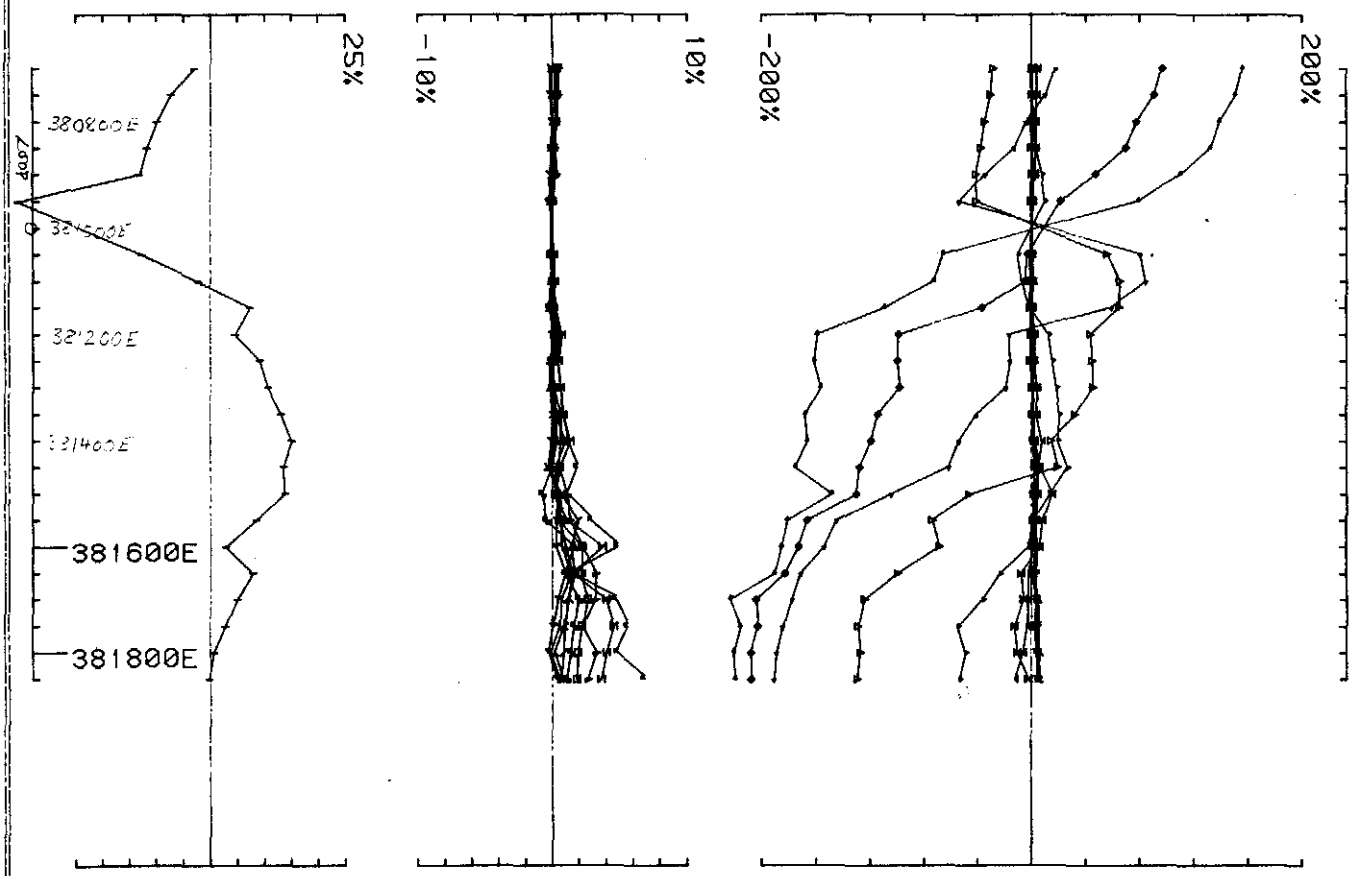
SCALE 1 : 5000

FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	



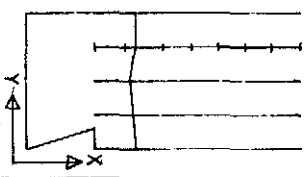
960196

195



5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- JRG PMM
Line 377250N Hz COMPONENT BASE FREQ :- 35.521 HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 8008
LINE 377250
Hz

196

960197

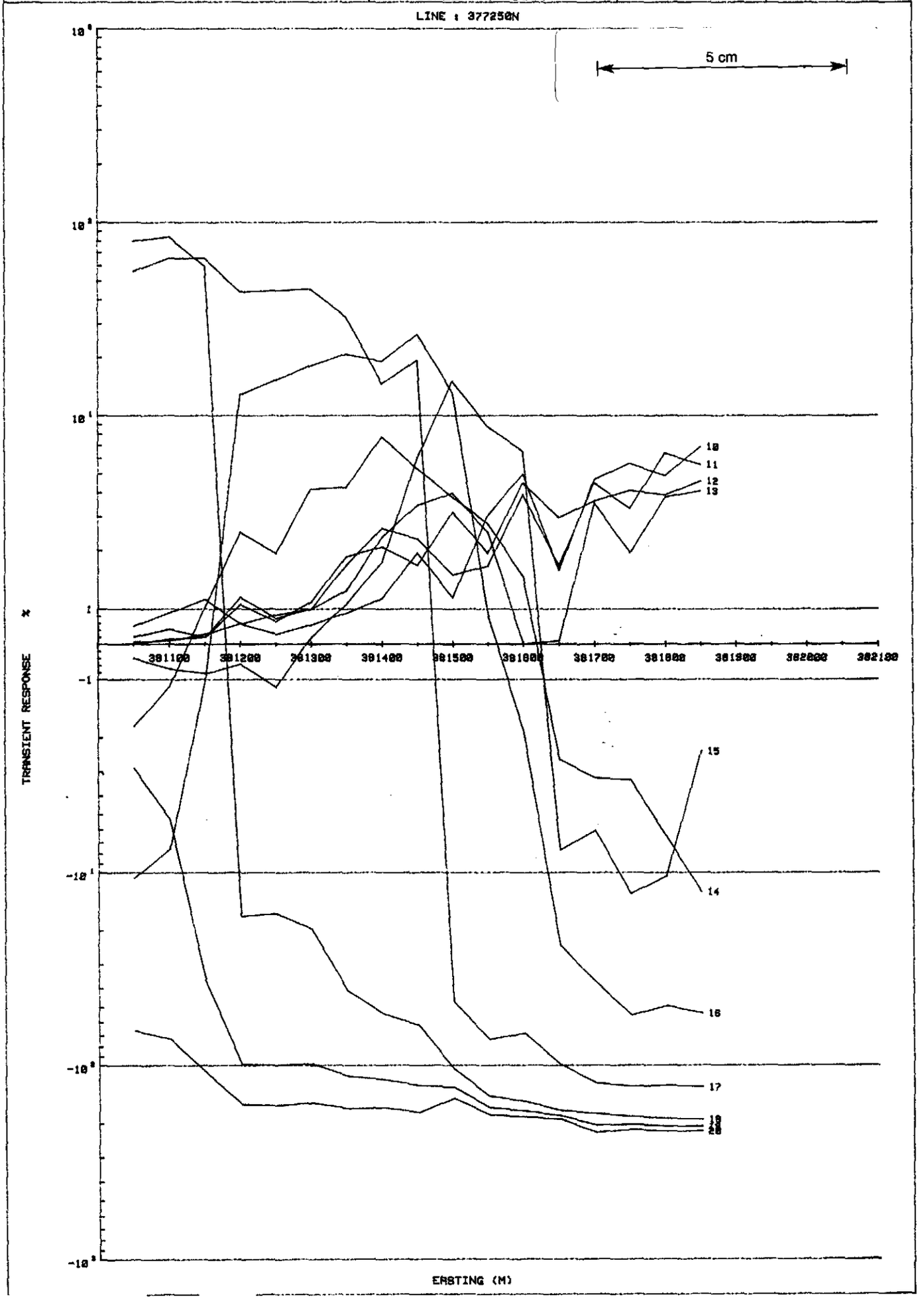
SHELL COMPANY OF AUSTRALIA

METALS DIVISION

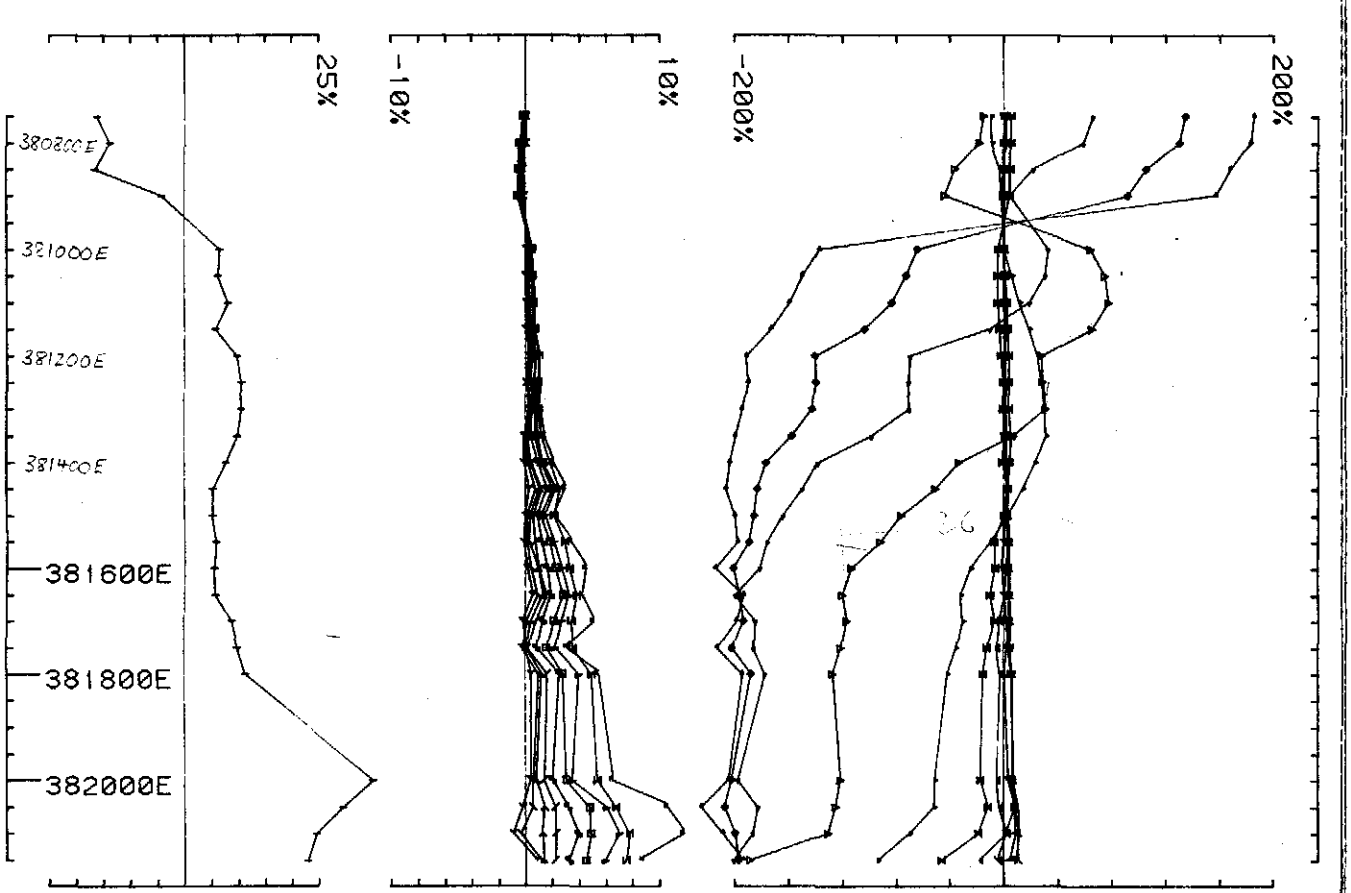
R.O.C.S. - PROTEM

ROSEBERY EAST
LINE 377250N
UTEM
CONT NORM
SCALE 1 : 5000

FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	

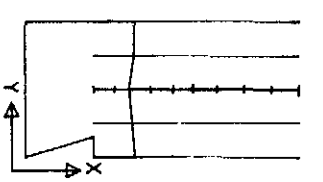


960198



5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- JRG PMM
Line 377000N Hz COMPONENT BASE FREQ :- 35.521 HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 0008
LINE 377000
Hz

960193

198

SHELL COMPANY OF AUSTRALIA

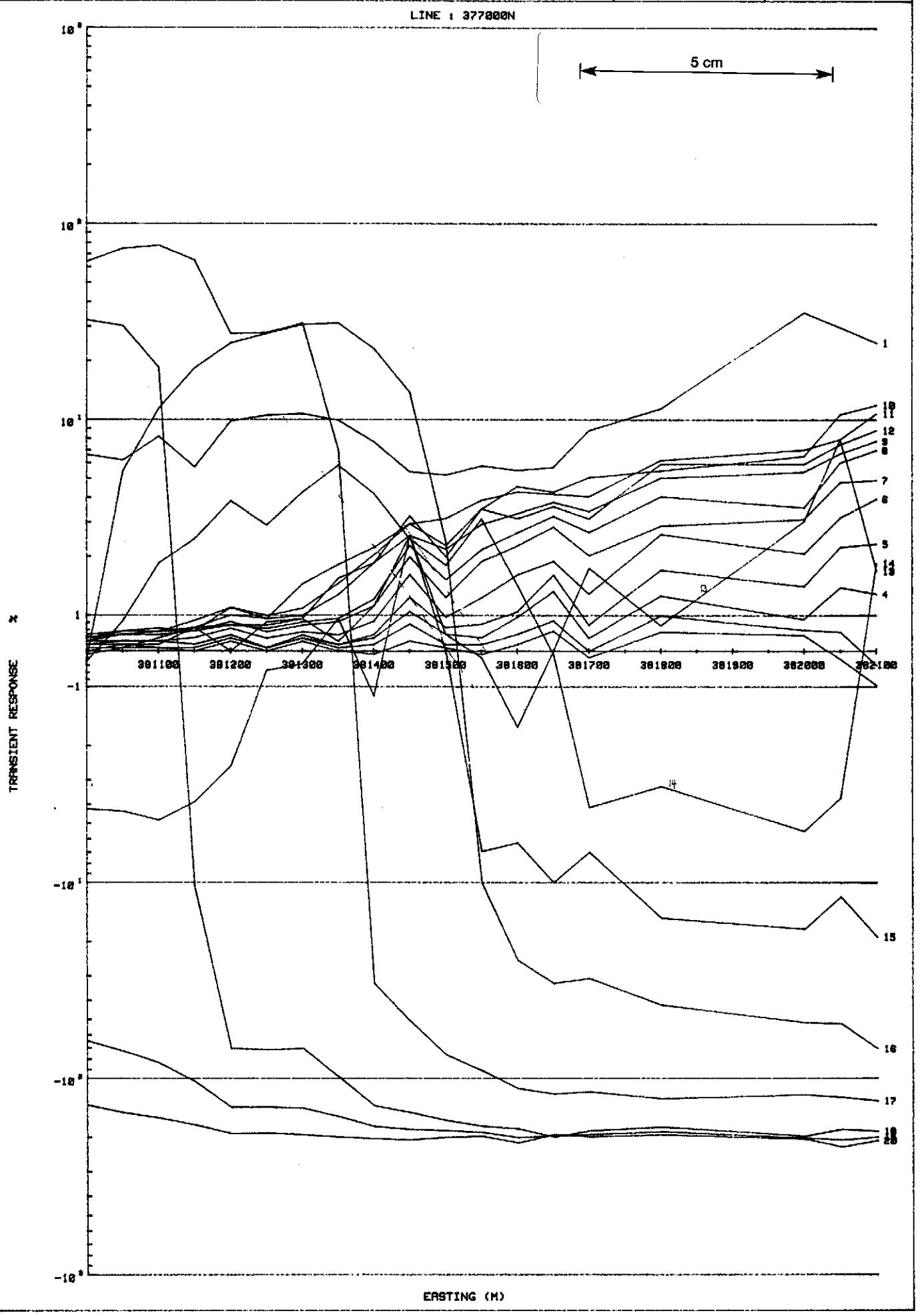
METALS DIVISION

R.O.C.S. - PROTEM

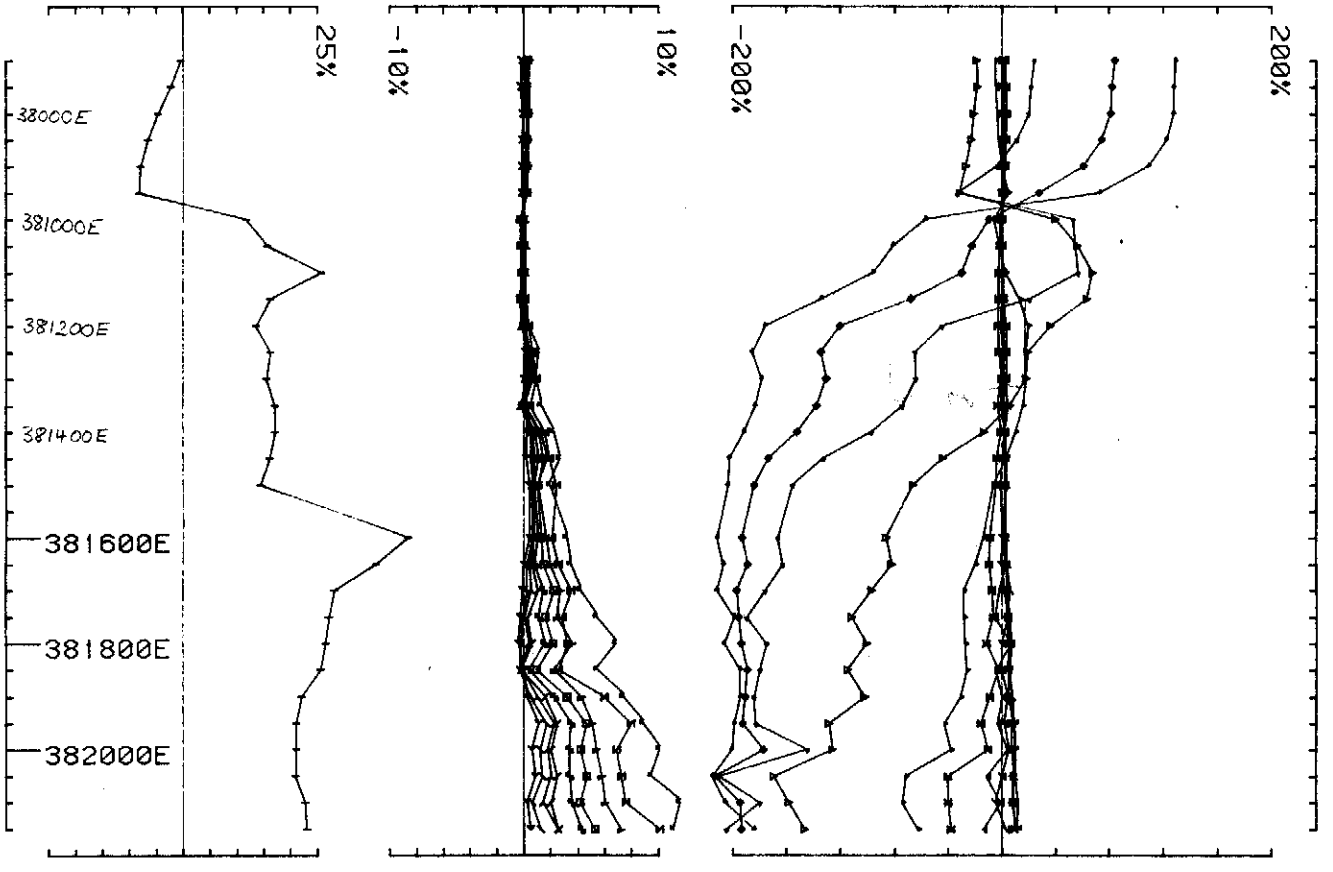
ROSEBERY EAST
LINE 377000N
UTEM
CONT NORM

SCALE 1 : 5000

FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	

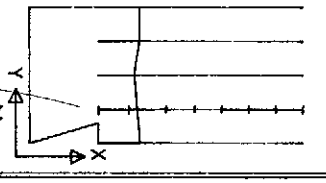


960200



5 cm

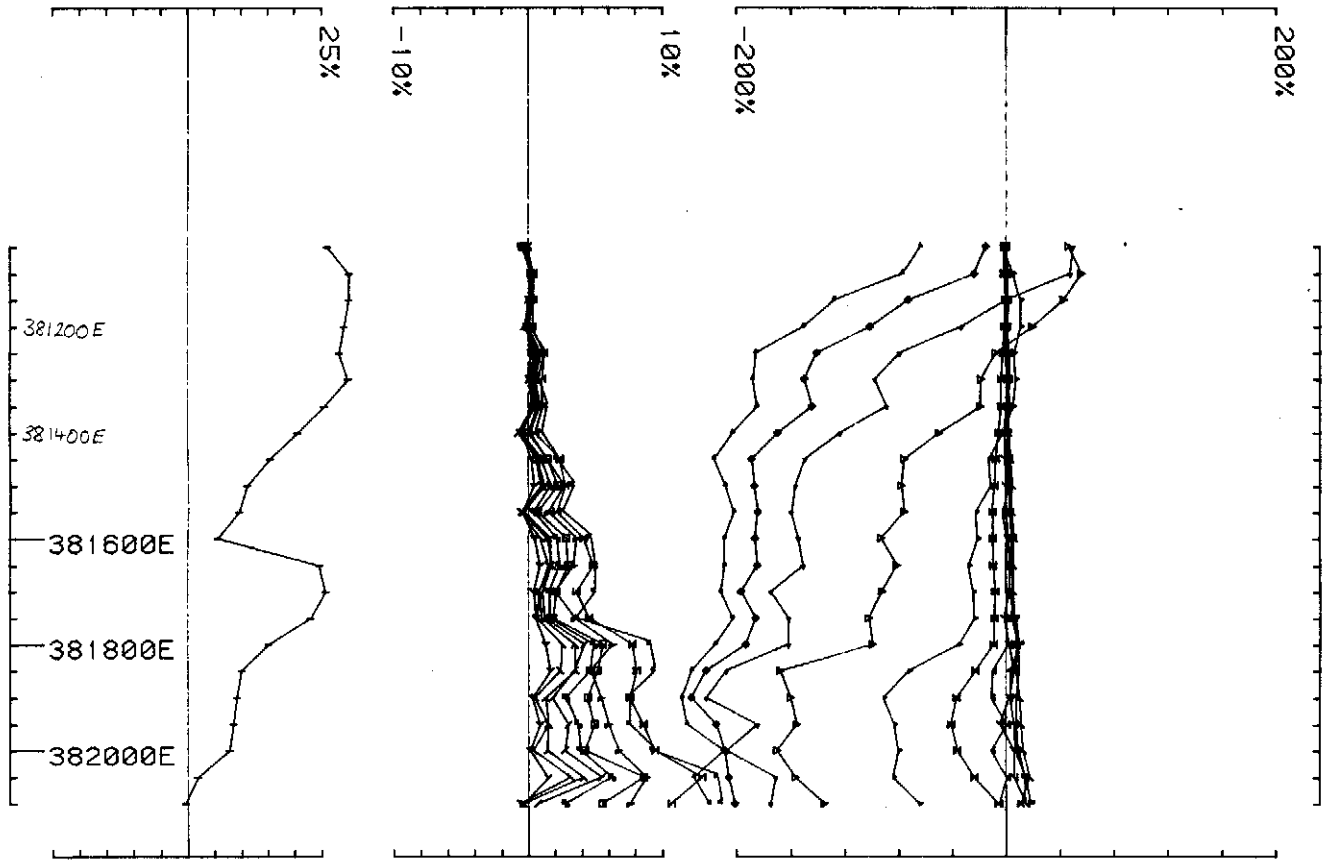
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- JRG PMM
Line 376750N Hz COMPONENT BASE FREQ :- 35.521 HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 0008
LINE 376750
Hz

200

960201



5 cm

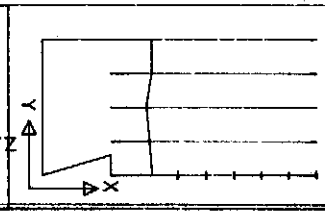
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508

AREA :- Rosebery East

CLIENT :- Billiton Aust. CREW :- JRG PMM

Line 376500N Hz COMPONENT BASE FREQ :- 35.521 HERTZ

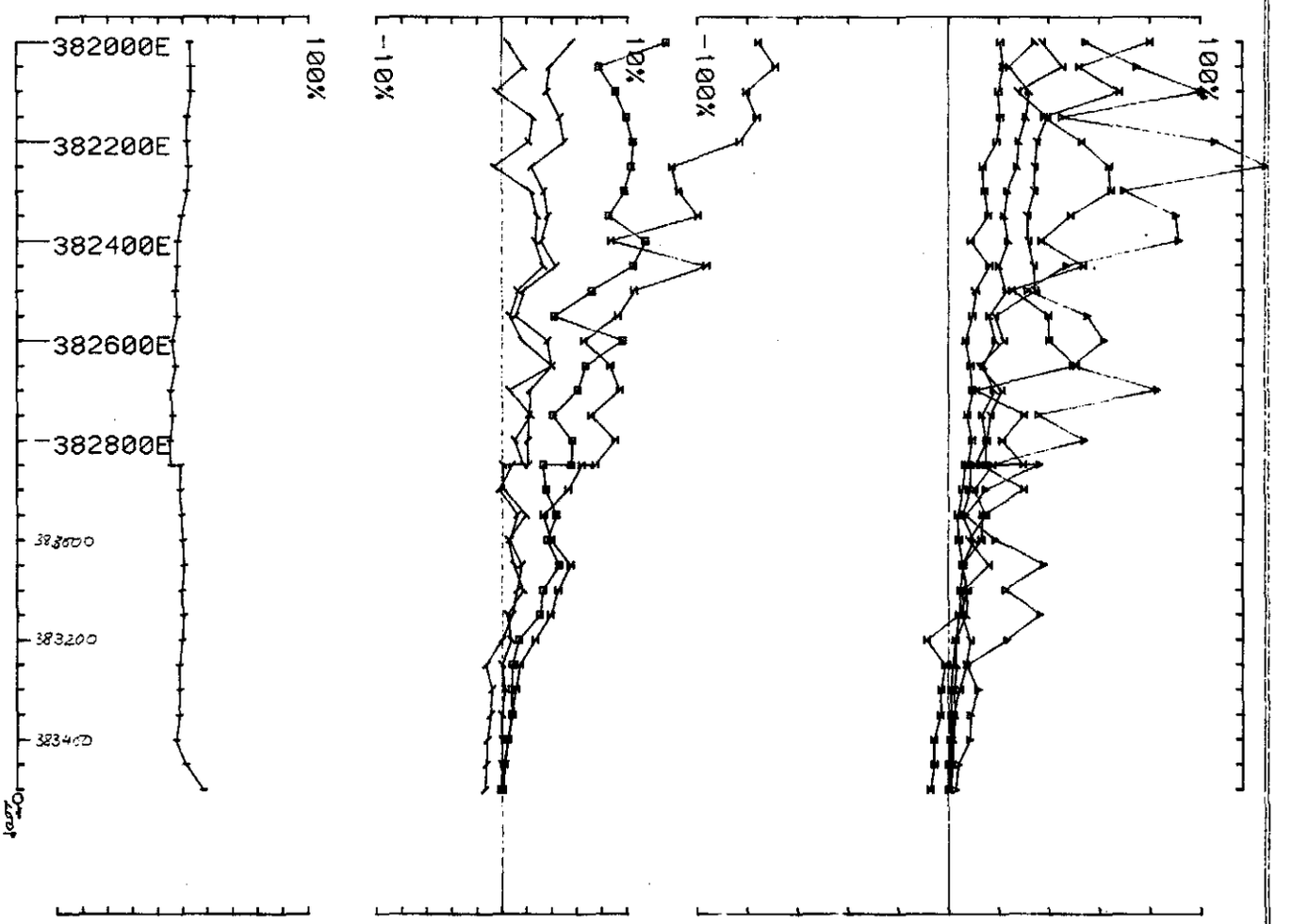
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 0008
LINE 376500
Hz

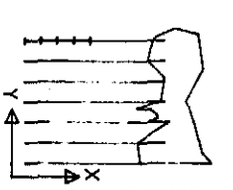
201

960202



5 cm

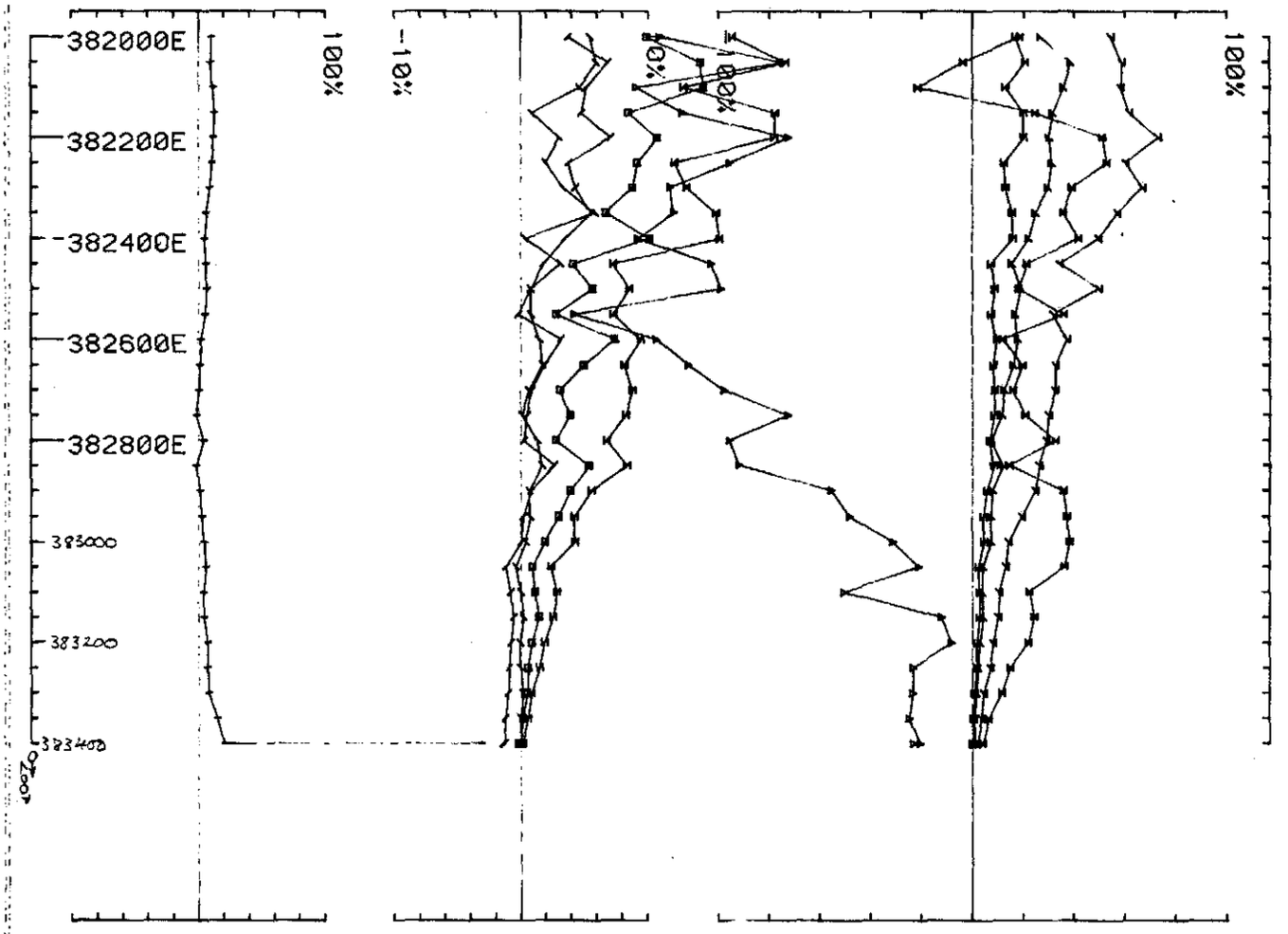
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM JCM ML SR
L376750N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 8009
LINE 376750N
Hz

202

960203

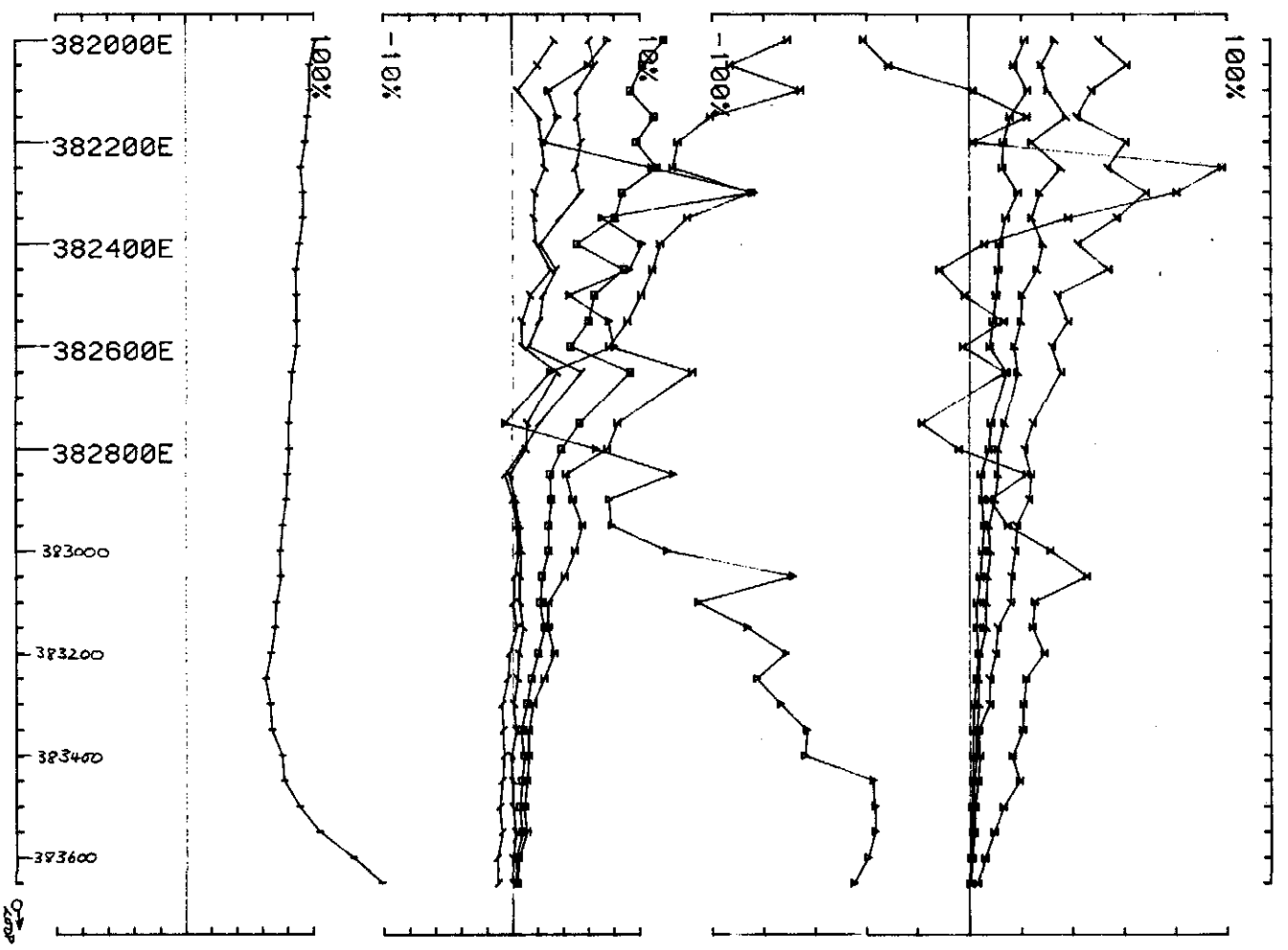


5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM JCM ML SR
L376500N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

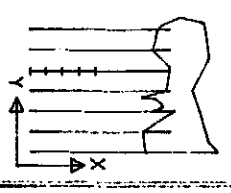
Rosebery East
LOOP 0009
LINE 376500N
Hz

960204



5 cm

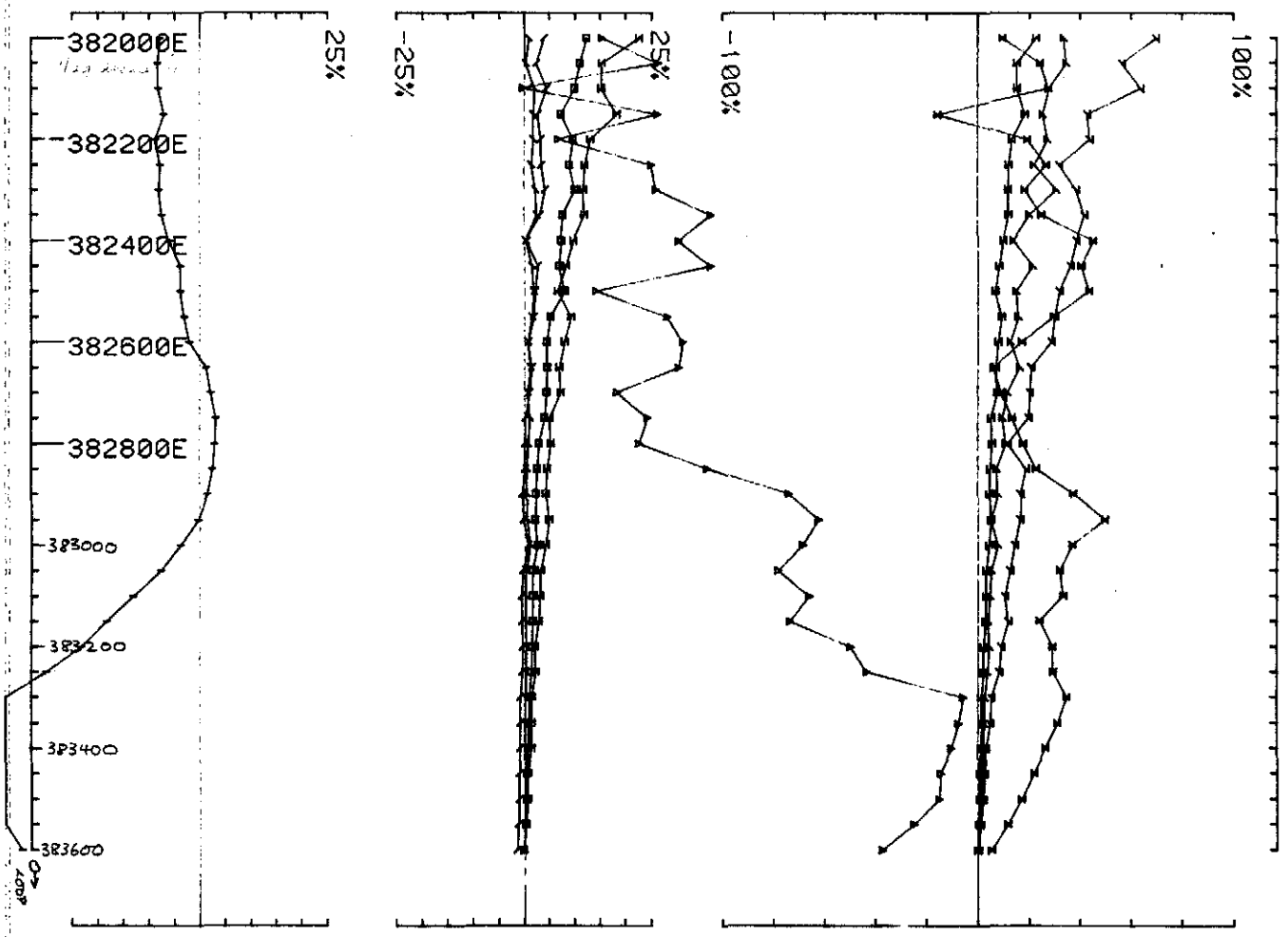
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM JCM ML SR
L376250N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 9009
LINE 376250N
Hz

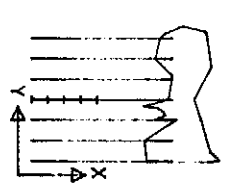
960205

204



5 cm

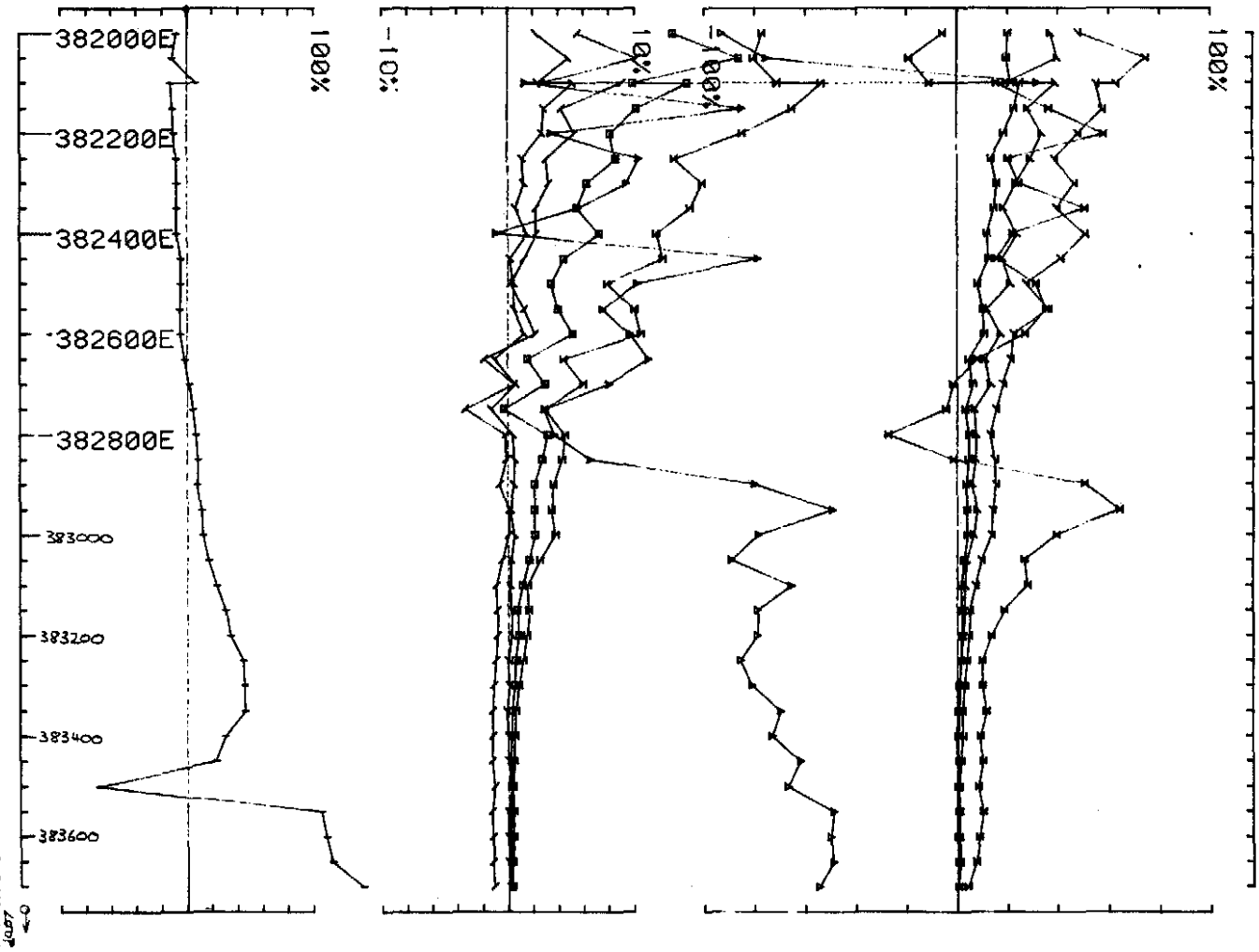
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM JCM ML SR
L376000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 0008
LINE 376000N
Hz

205

960206



5 cm

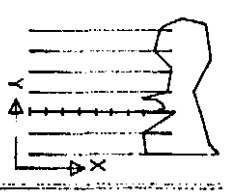
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508

AREA :- Rosebery East

CLIENT :- Billiton Aust. CREW :- PMM JCM ML SR

L375750N Hz COMPONENT BASE FREQ :- 26.230HERTZ

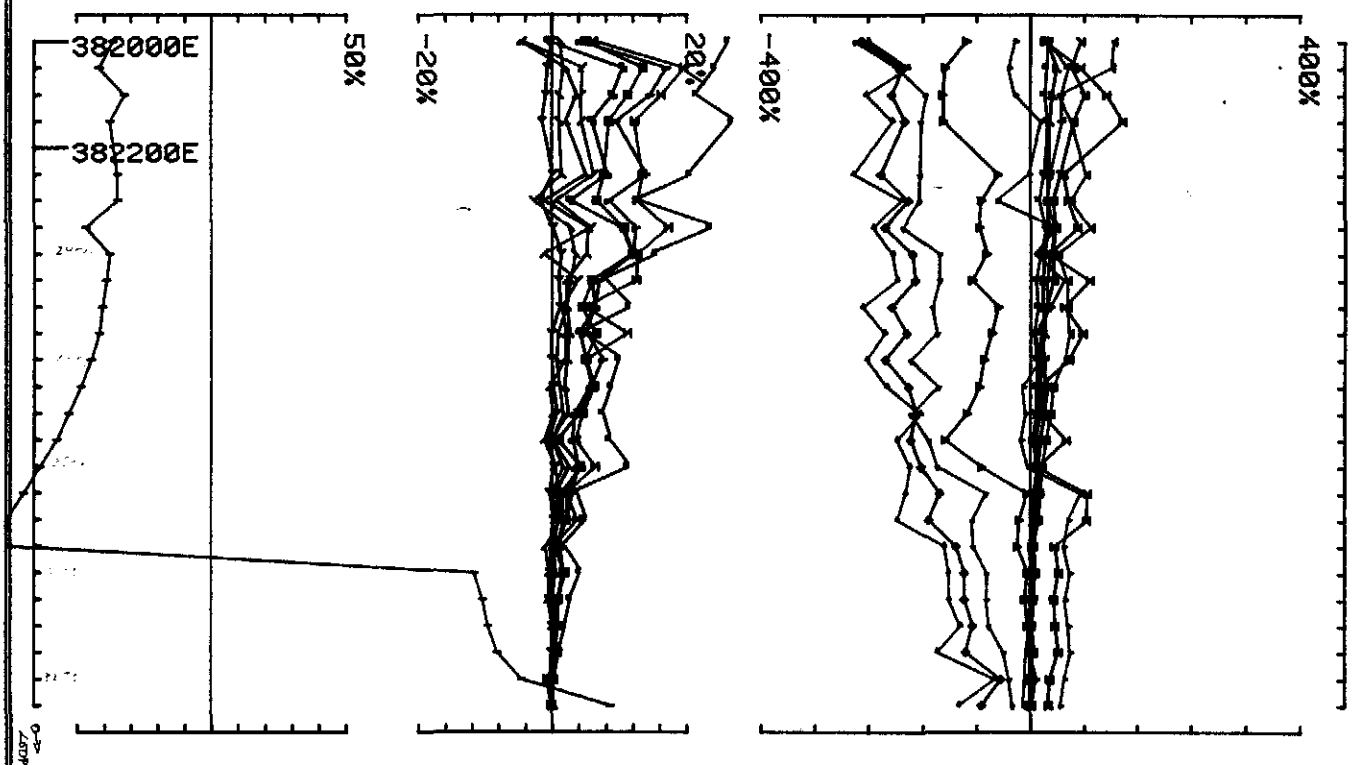
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 0009
LINE 375750N
Hz

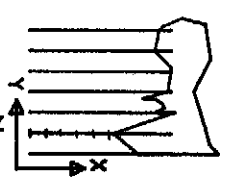
206

960207



5 cm

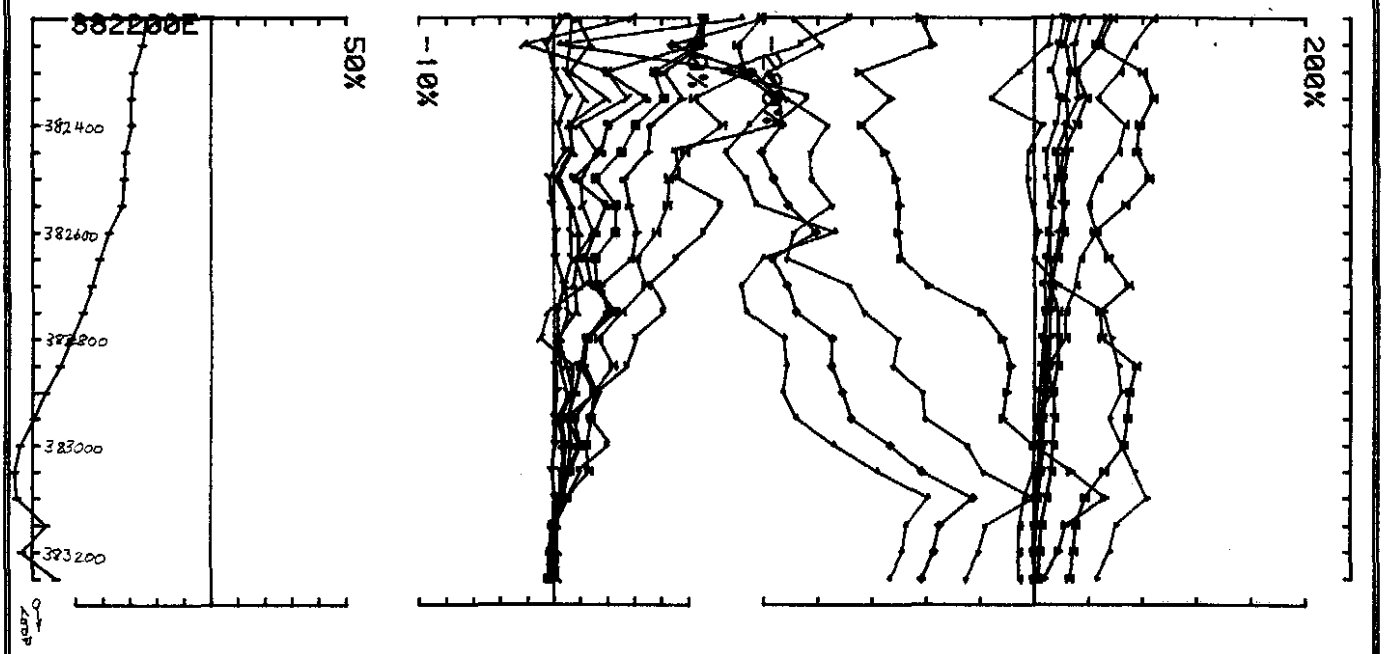
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM
Line 375500N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 8000
LINE 375500
Hz

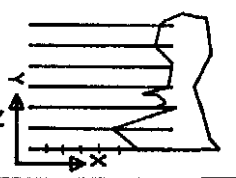
207

960208



5 cm

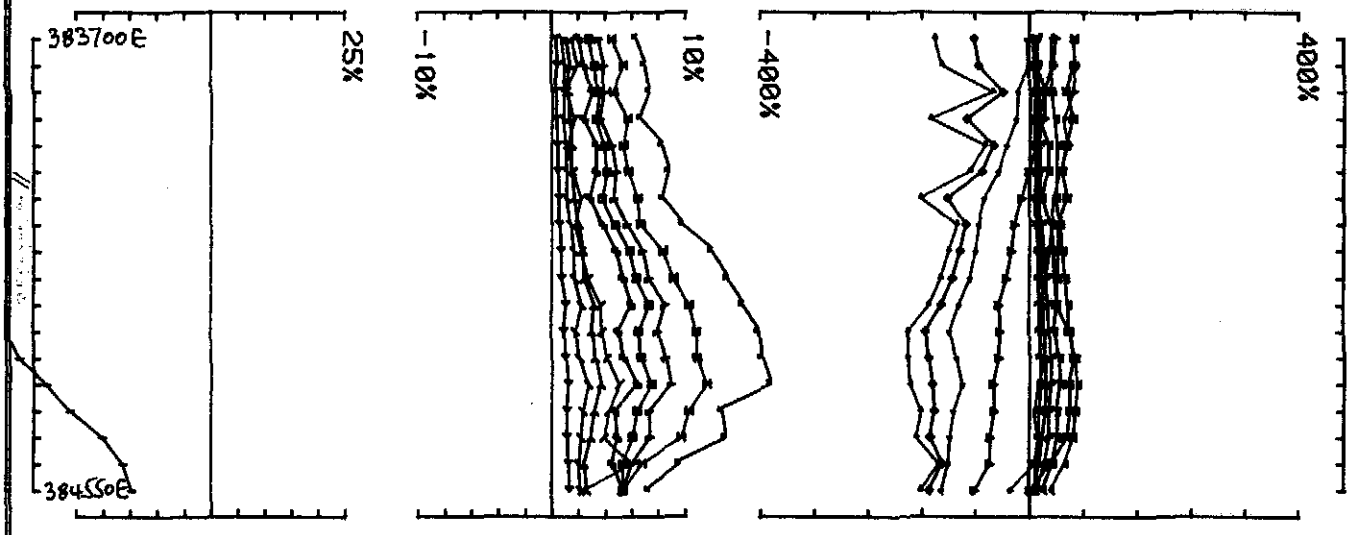
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM
Line 375250N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 8000
LINE 375250
Hz

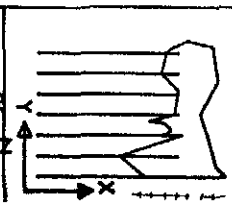
208

960209



5 cm

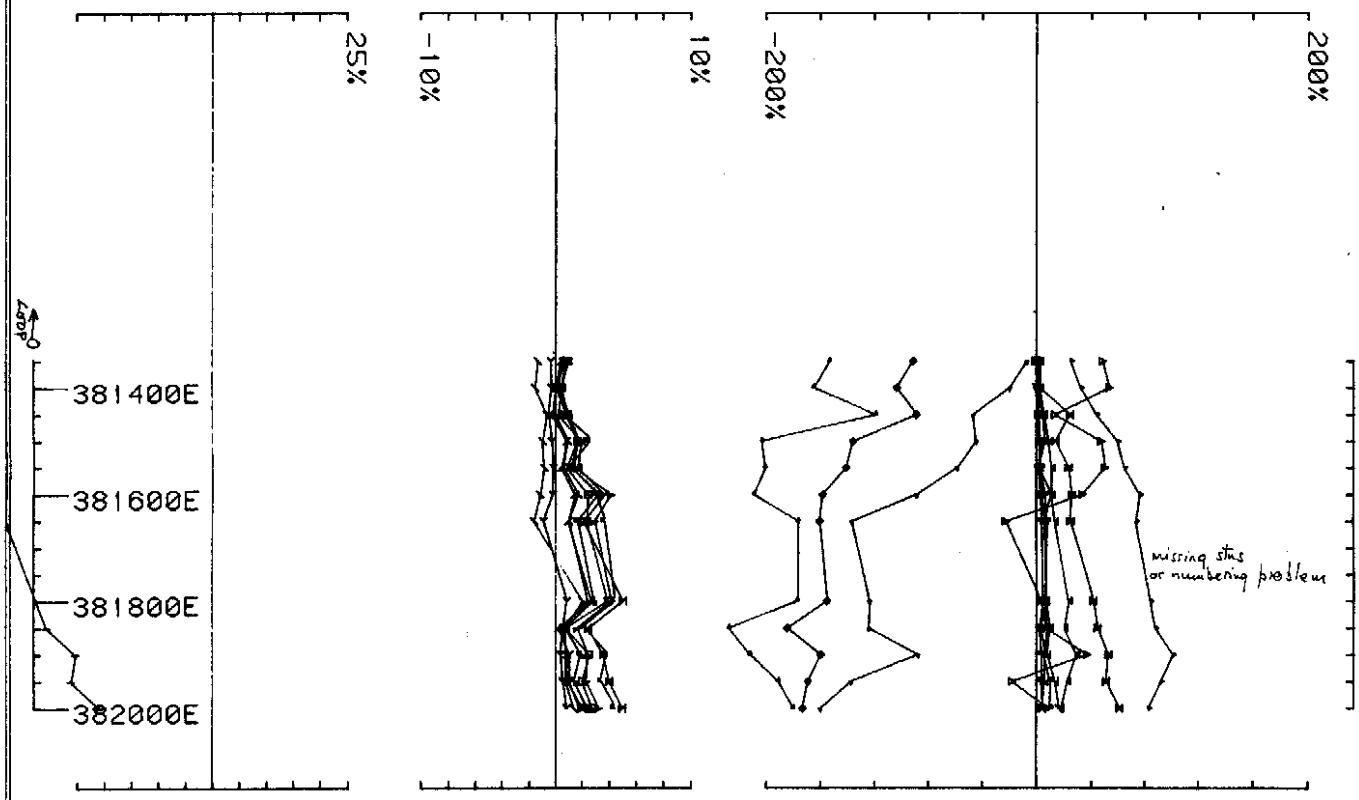
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- Rosebery East
CLIENT :- Billiton Aust. CREW :- PMM JCM ML SR
Line 375125N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Rosebery East
LOOP 8000
LINE 375125
Hz

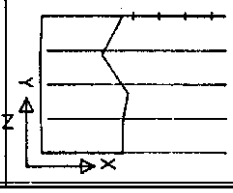
960210

209



5 cm

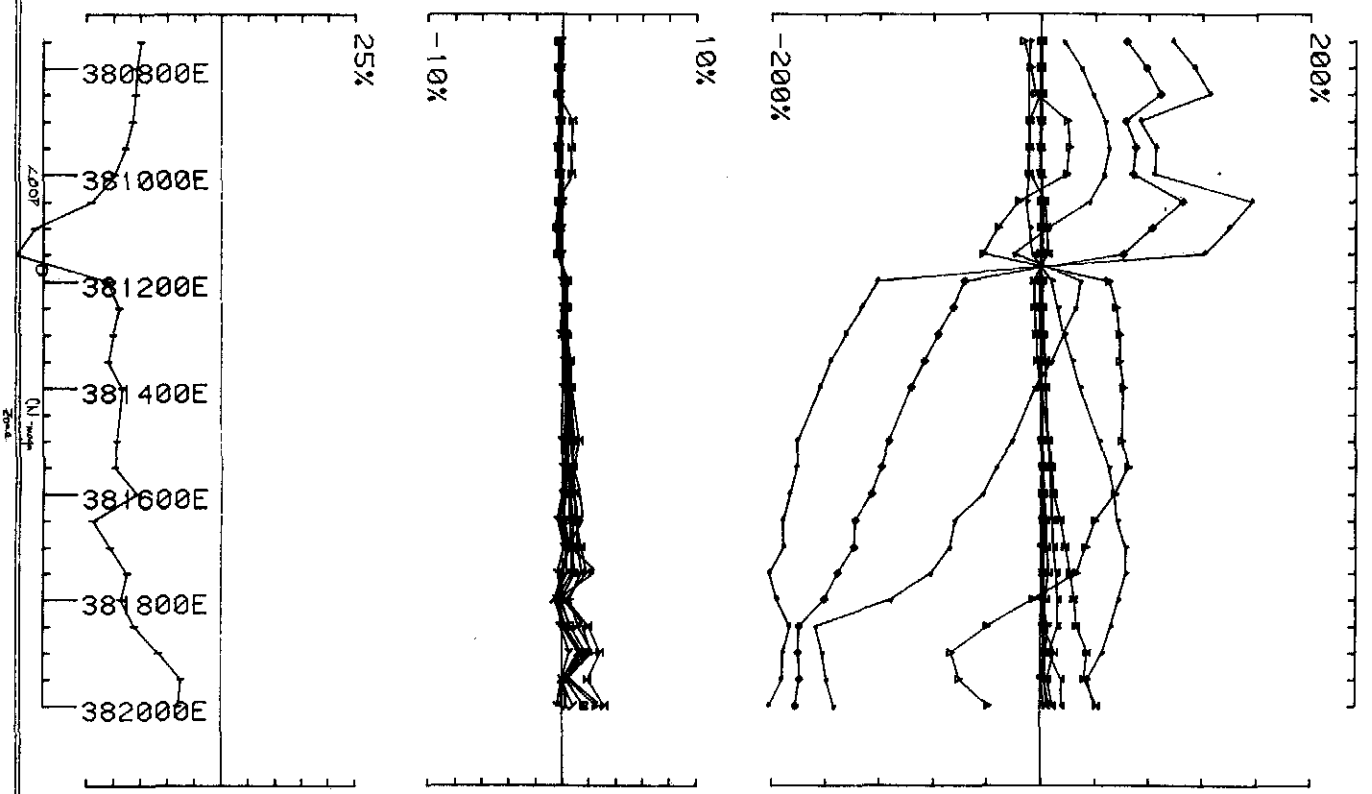
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- JRG BJS
Line 376300N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0010
LINE 376300
Hz

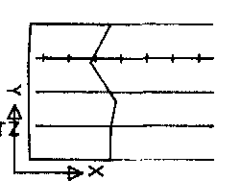
960211

210



5 cm

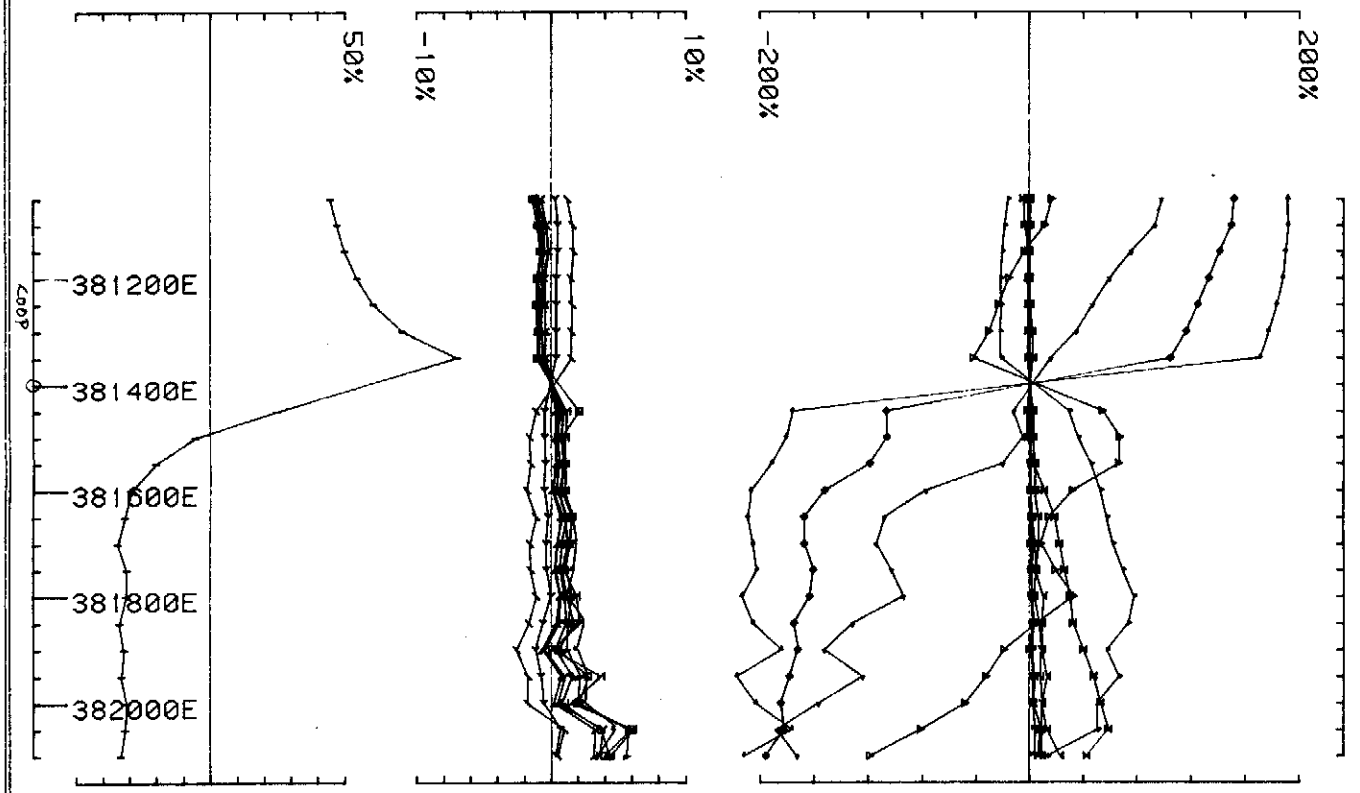
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- JRG BJS
Line 376000N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0010
LINE 376000N
Hz

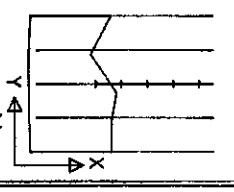
960212

211



5 cm

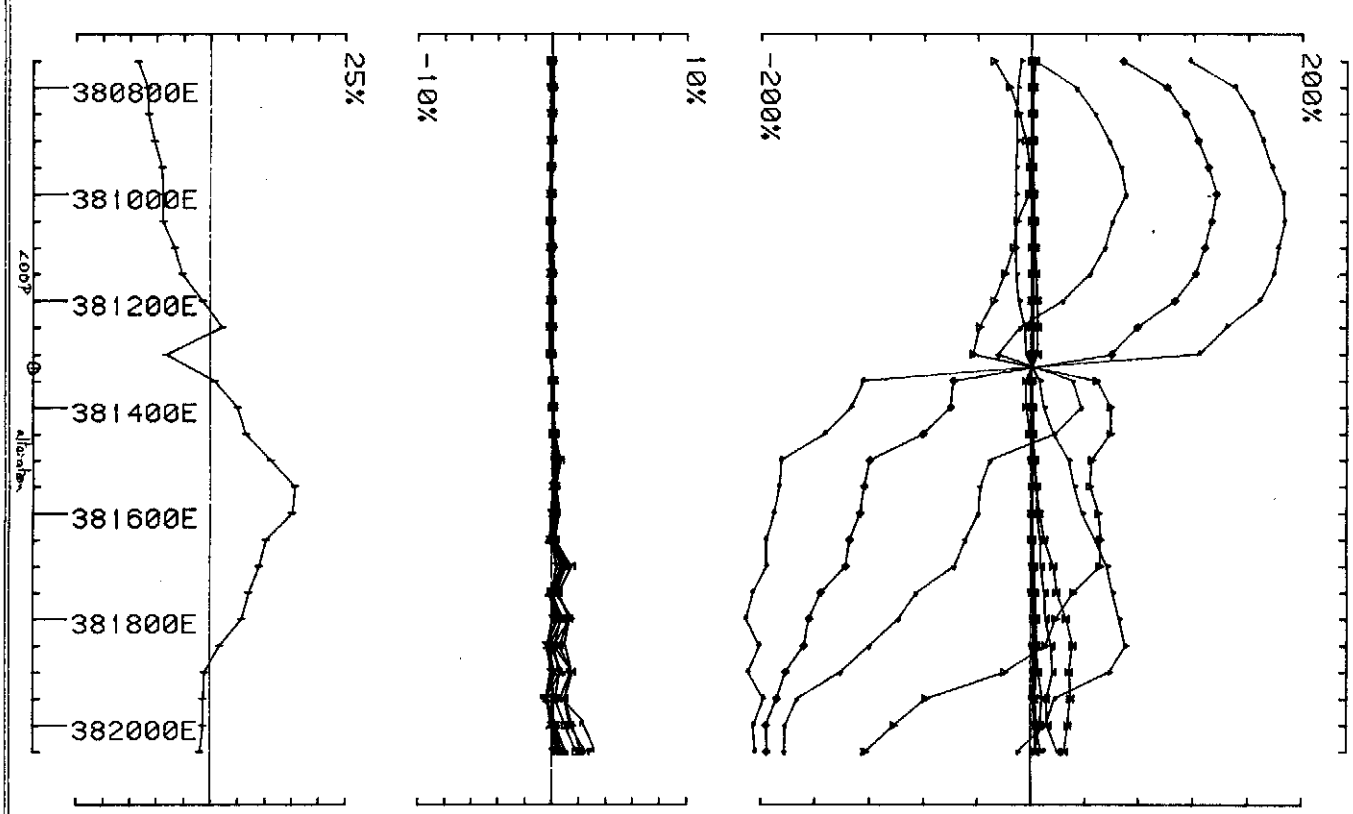
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- JRG BJS
Line 375700 N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 8010
LINE 375700
Hz

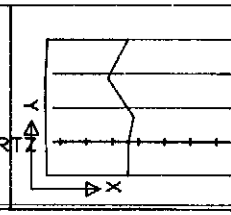
960213

212



5 cm

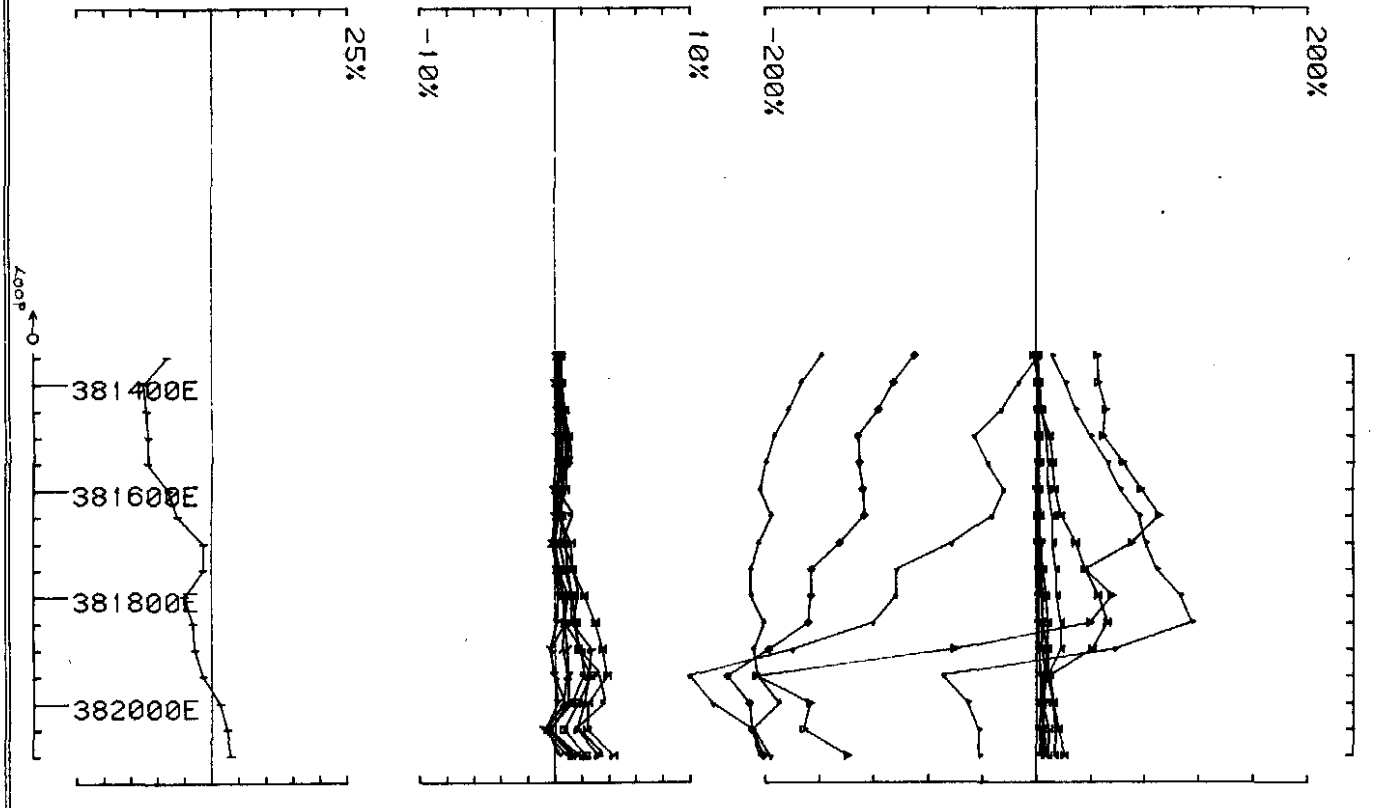
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- JRG BJS
Line 375500N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0010
LINE 375500N
Hz

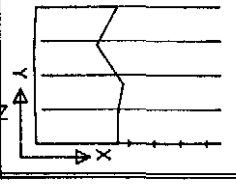
960214

213



5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- JRG BJS
Line 375250N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0010
LINE 375250
Hz

214

960215

SHELL COMPANY OF AUSTRALIA

METALS DIVISION

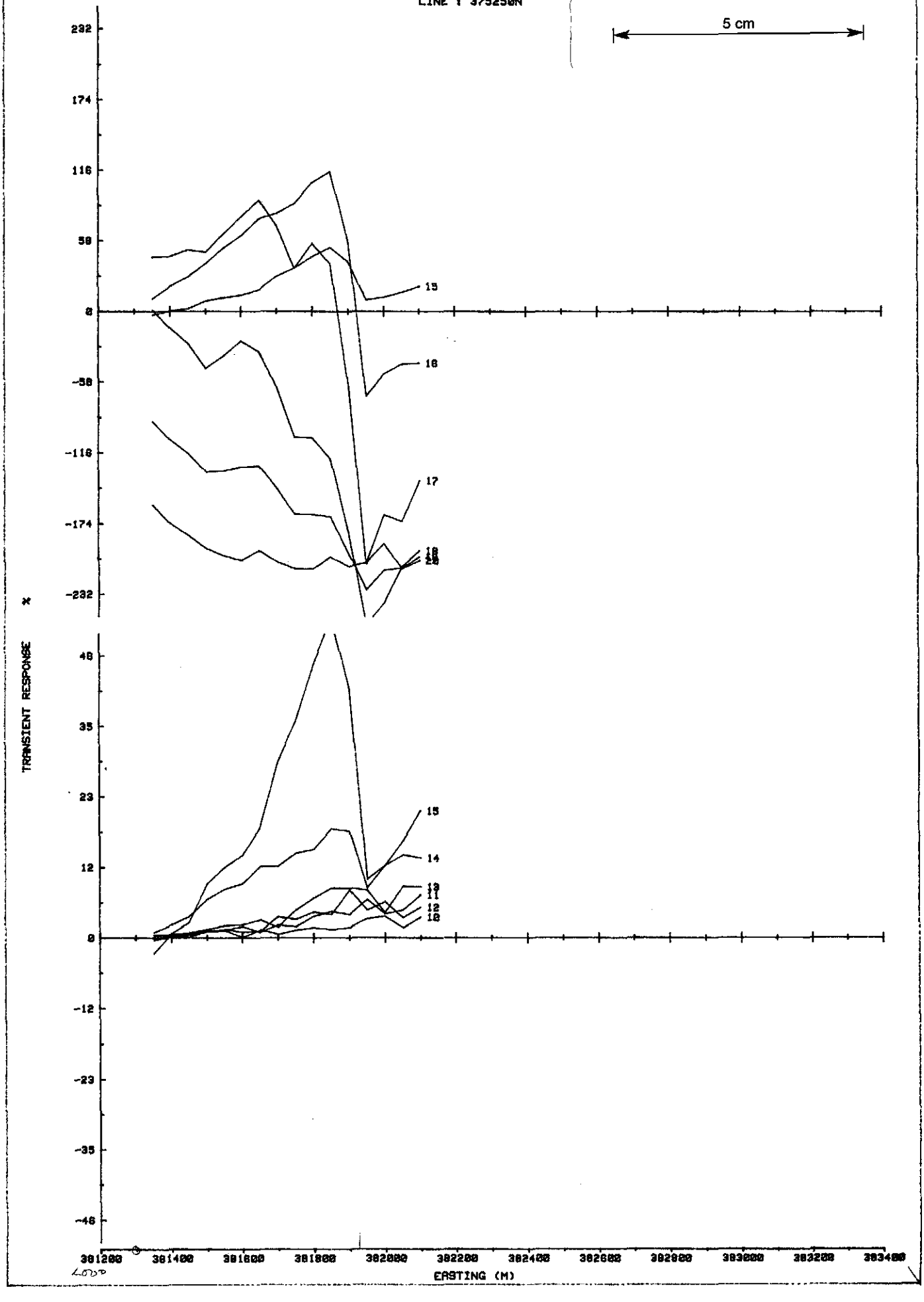
R.O.C.S. - PROTEM

ROSEBERY EAST
LINE 375250N
UTEM HZ

SCALE 1 : 10000

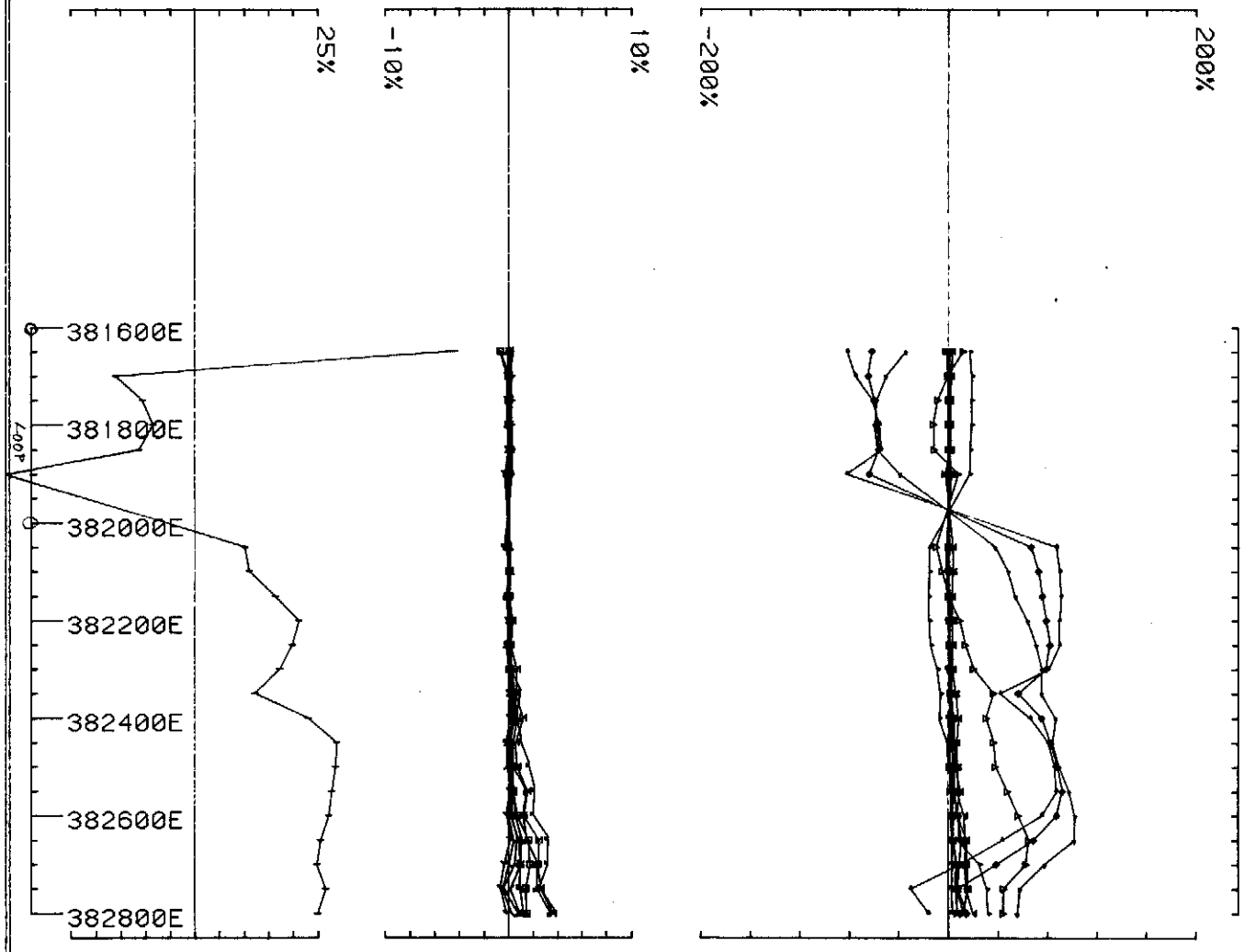
FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	Loop 10

LINE : 375250N



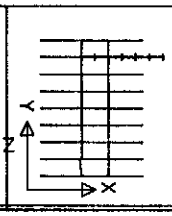
Loop

960216

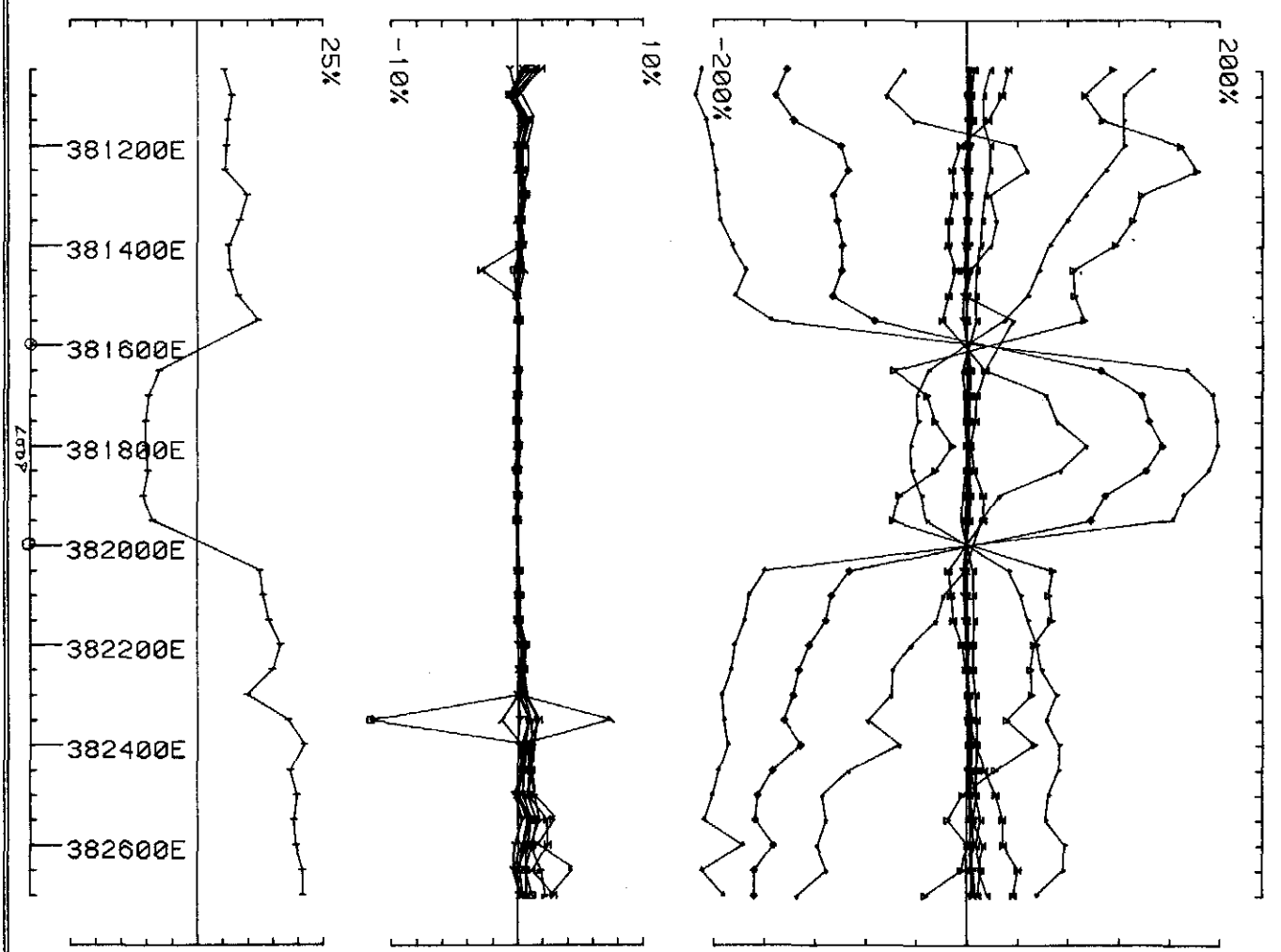


5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JM BHR
Line 375000N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0011
LINE 375000
Hz



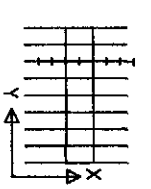
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508

AREA :- ROSEBERY EAST

CLIENT :- BILLITON AUST. CREW :- PMM JM BHR

Line 374750N Hz COMPONENT BASE FREQ :- 35.487HERTZ

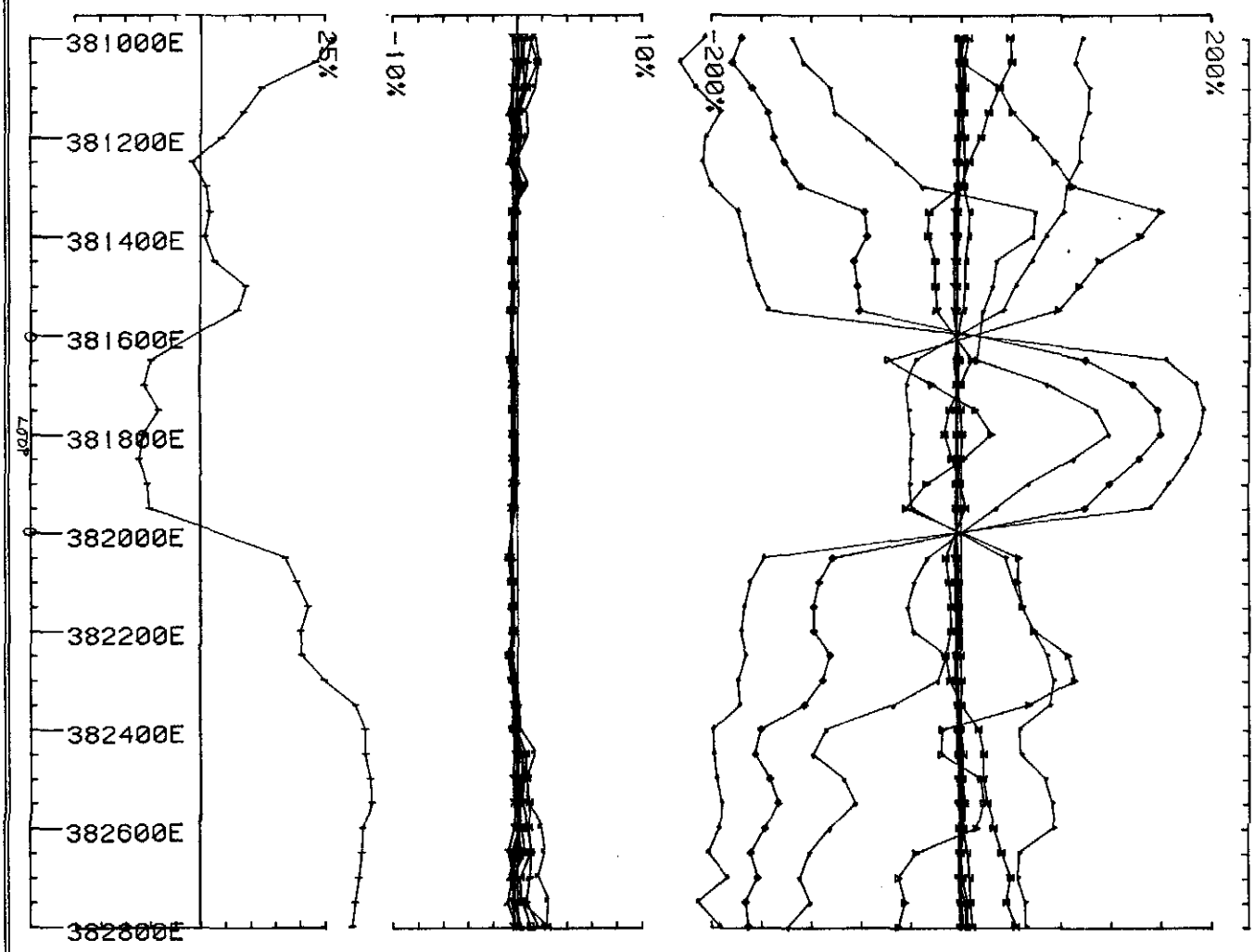
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0011
LINE 374750
Hz

217

960218



5 cm

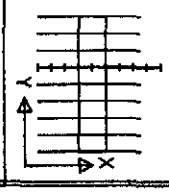
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508

AREA :- ROSEBERY EAST

CLIENT :- BILLITON AUST. CREW :- PMM JM BHR

Line 3745mN Hz COMPONENT BASE FREQ :- 35.487 HERTZ

SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 8011
LINE 3745mN
Hz

218

960219

SHELL COMPANY OF AUSTRALIA

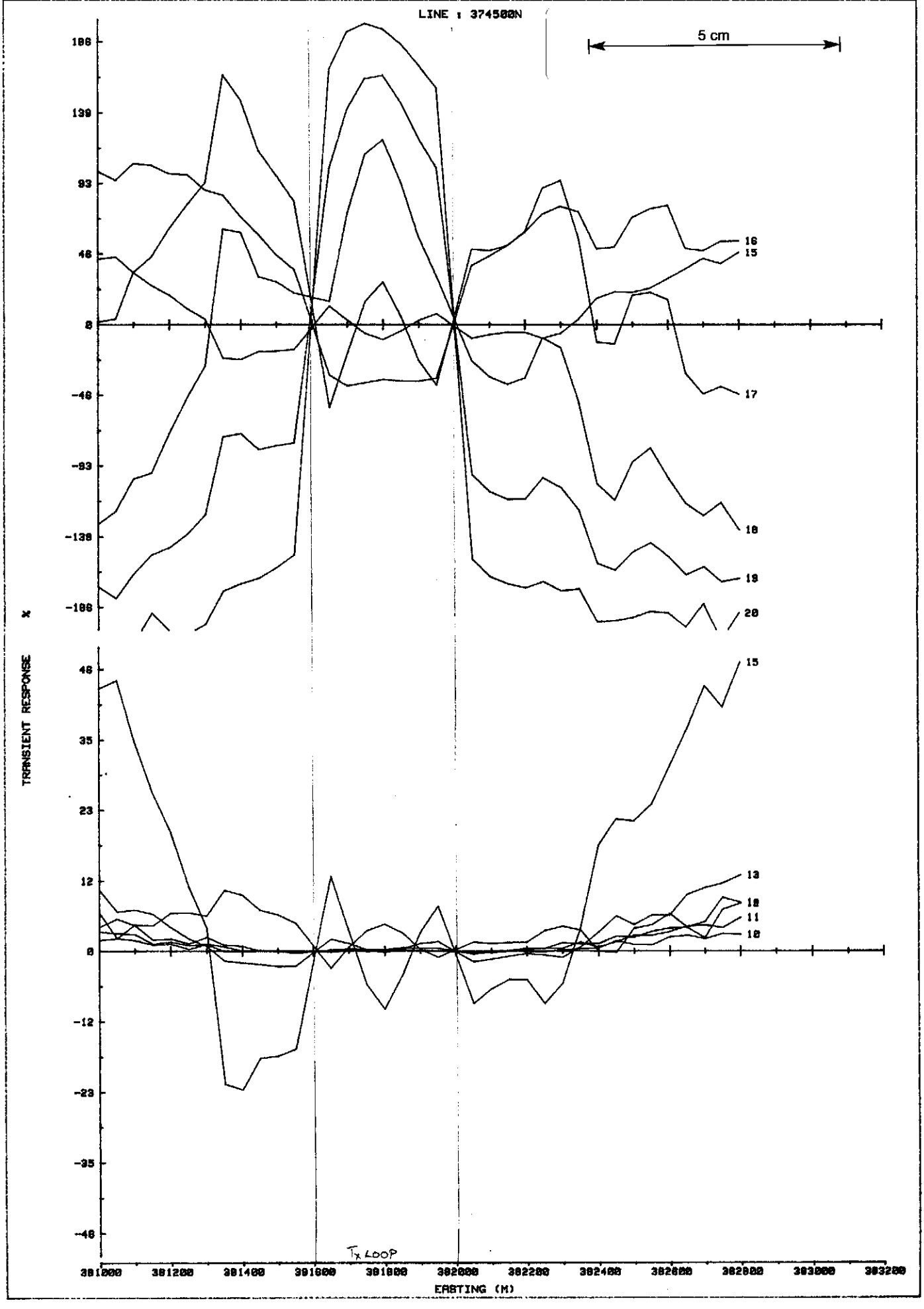
METALS DIVISION

R.O.C.S. - PROTEM

ROSEBERY EAST
UTEM HZ

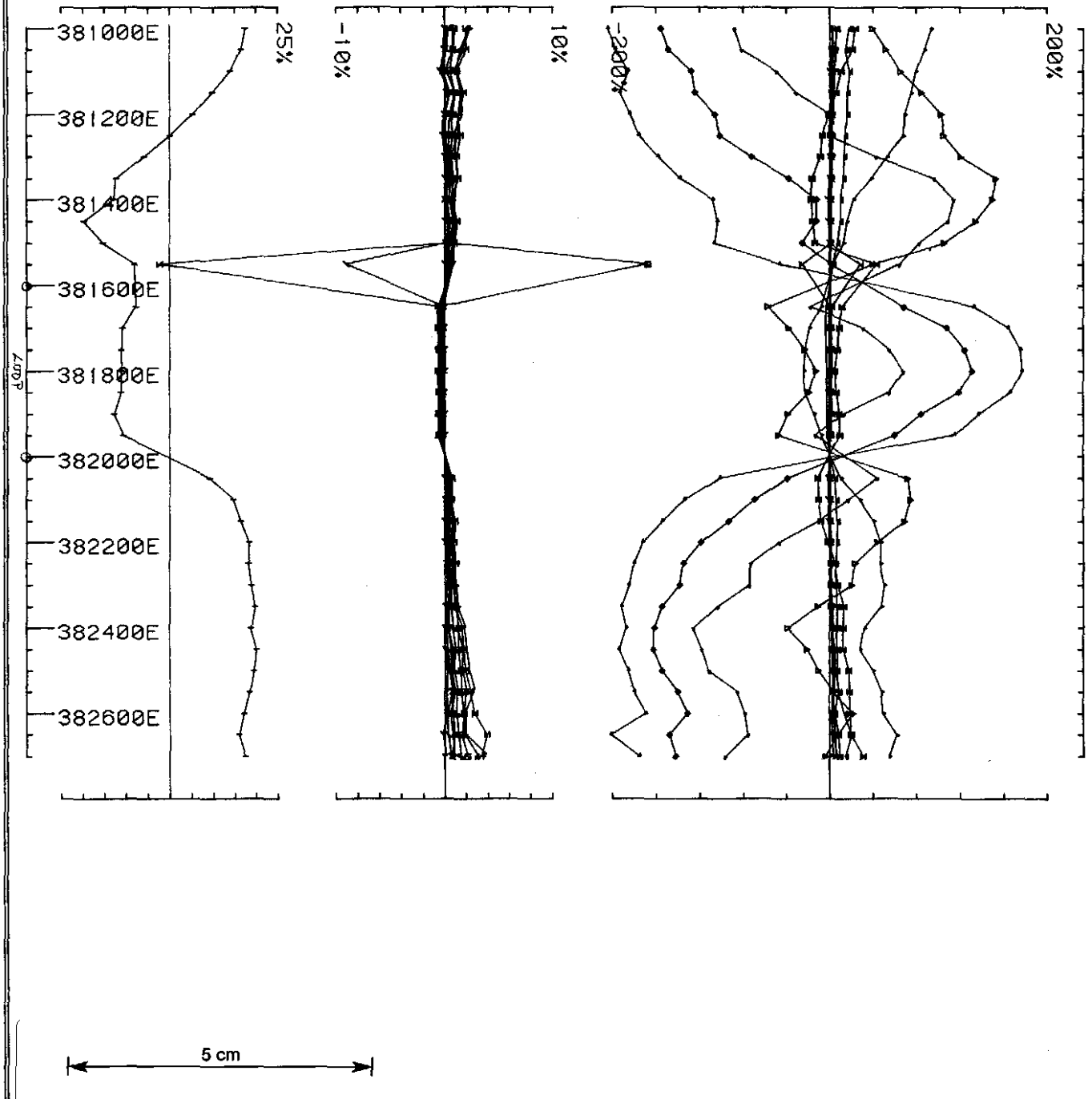
SCALE 1 : 10000

FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	LOOP 11



219

960220



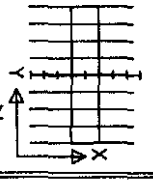
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508

AREA :- ROSEBERY EAST

CLIENT :- BILLITON AUST. CREW :- PMM JM BHR

Line 374250N Hz COMPONENT BASE FREQ :- 35.487HERTZ

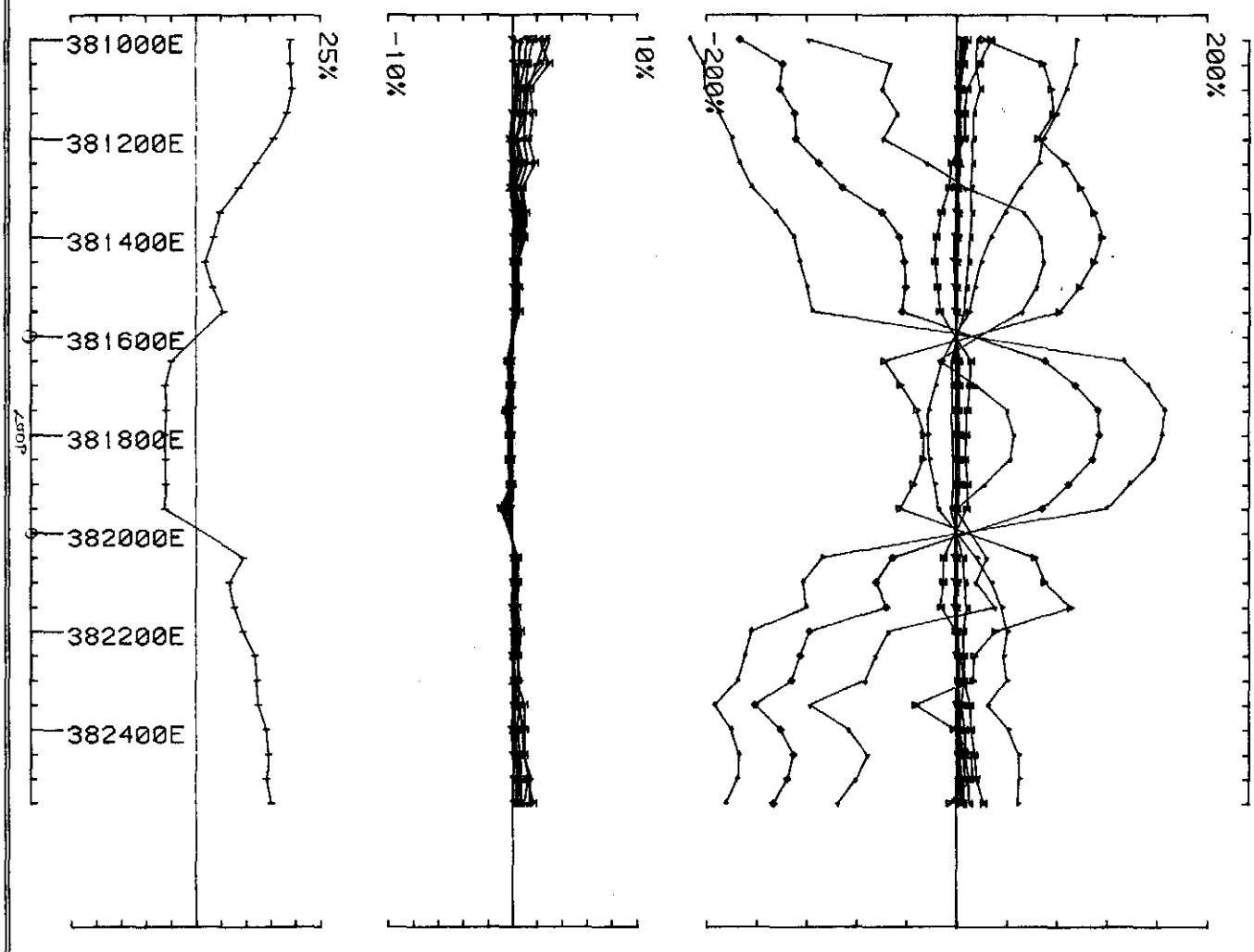
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0011
LINE 374250
Hz

220

960221



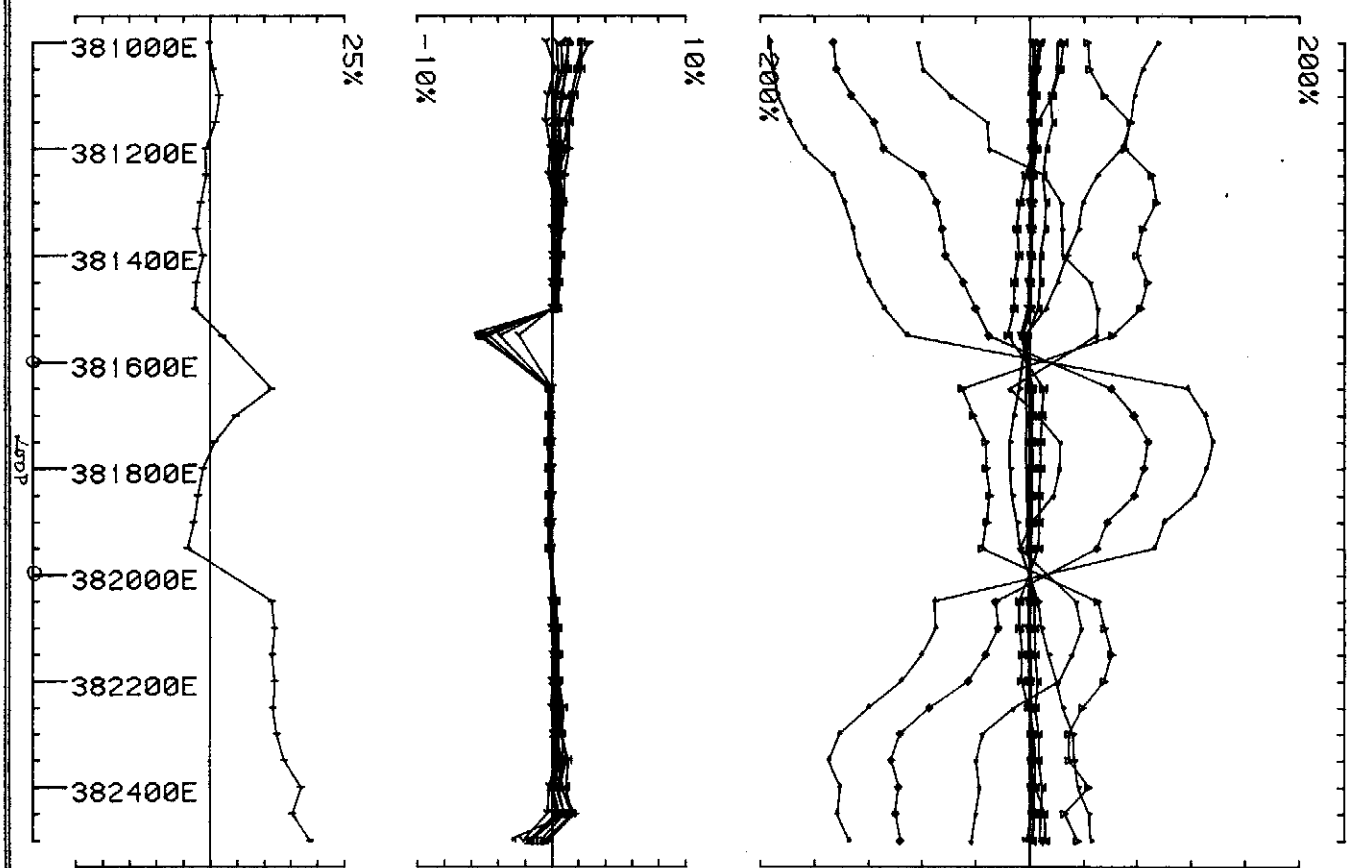
5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JM BHR
Line 374000N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

ROSEBERY EAST
LOOP 001
LINE 374000
Hz

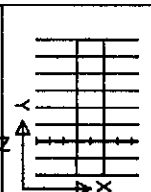
221

960222



5 cm

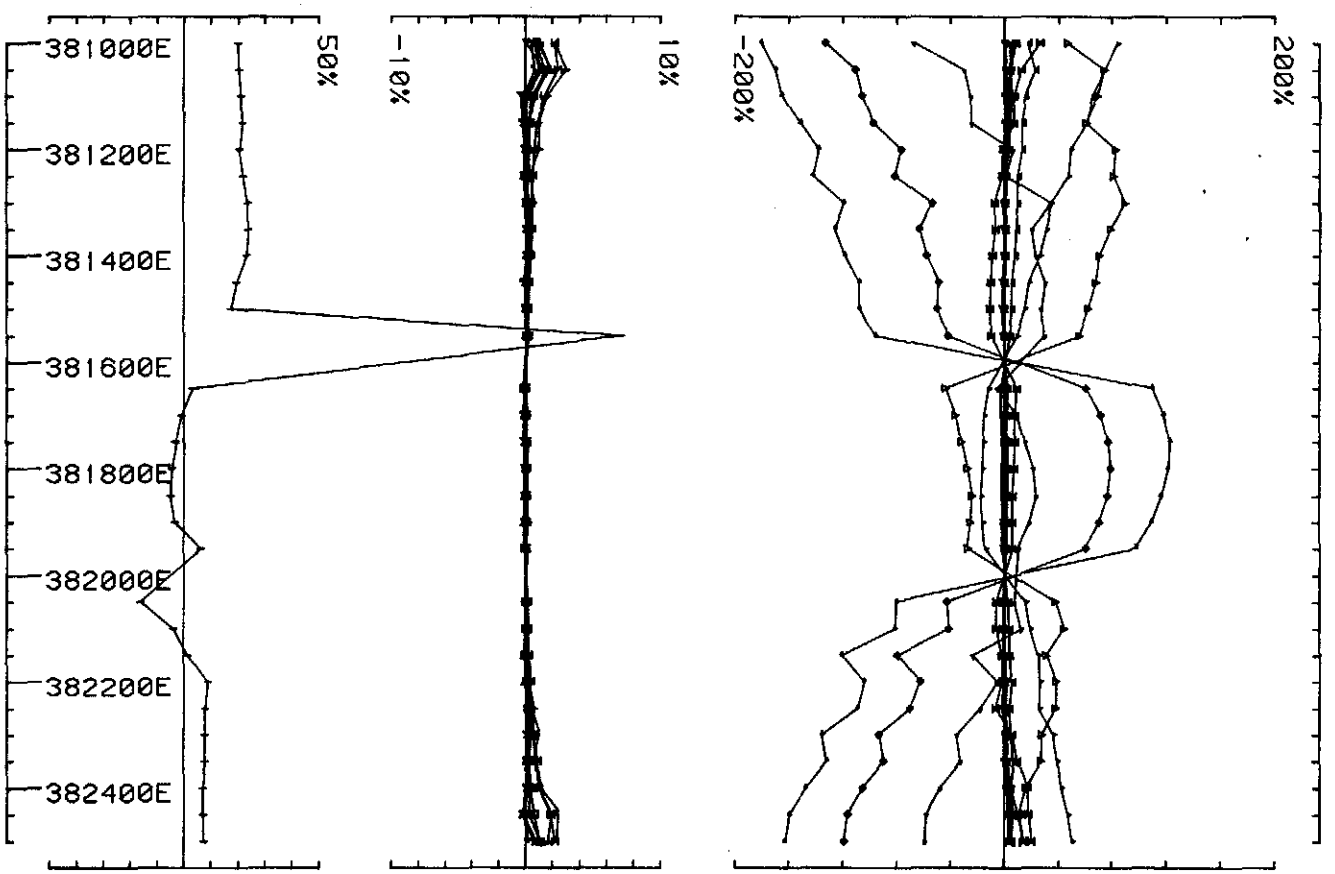
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JM BHR
Line 373750N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0011
LINE 373750
Hz

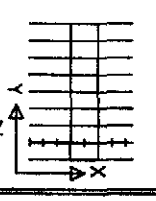
222

960223



5 cm

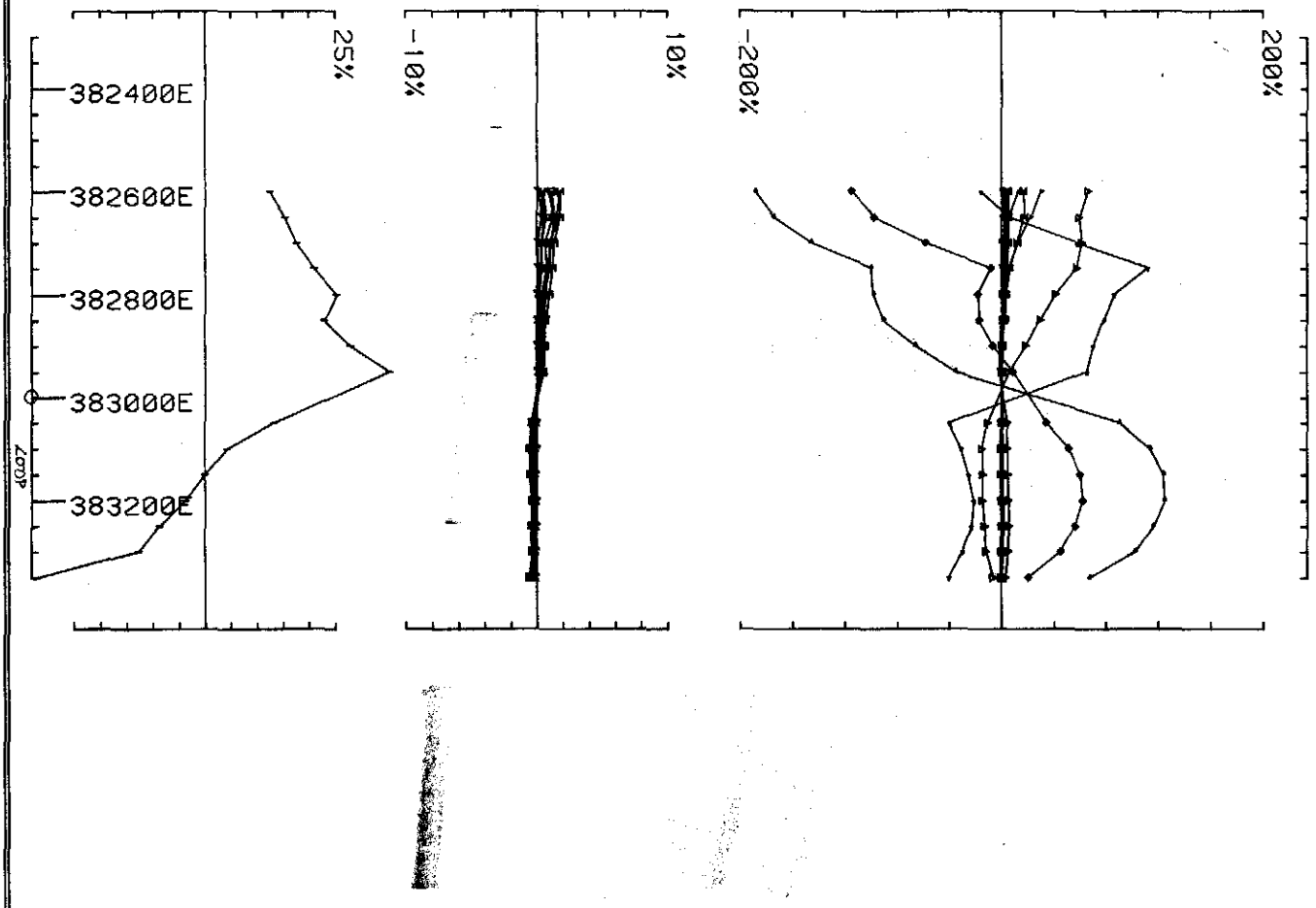
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JM BHR
Line 373500N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 8011
LINE 373500
Hz

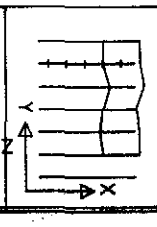
223

960224



5 cm

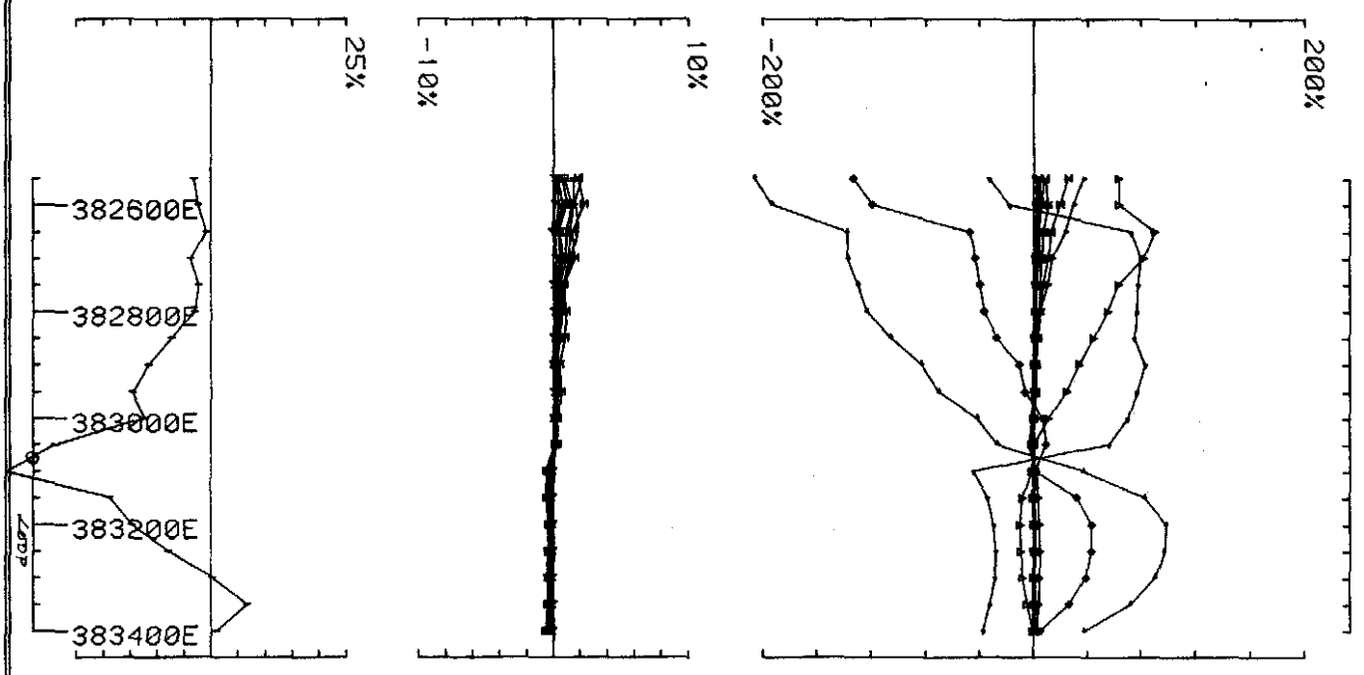
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM BHR
Line 374750N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch NORMALIZATION



ROSEBERY EAST
LOOP-0012
LINE 374750
Hz

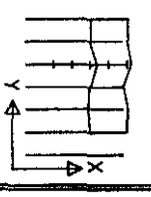
224

960225



5 cm

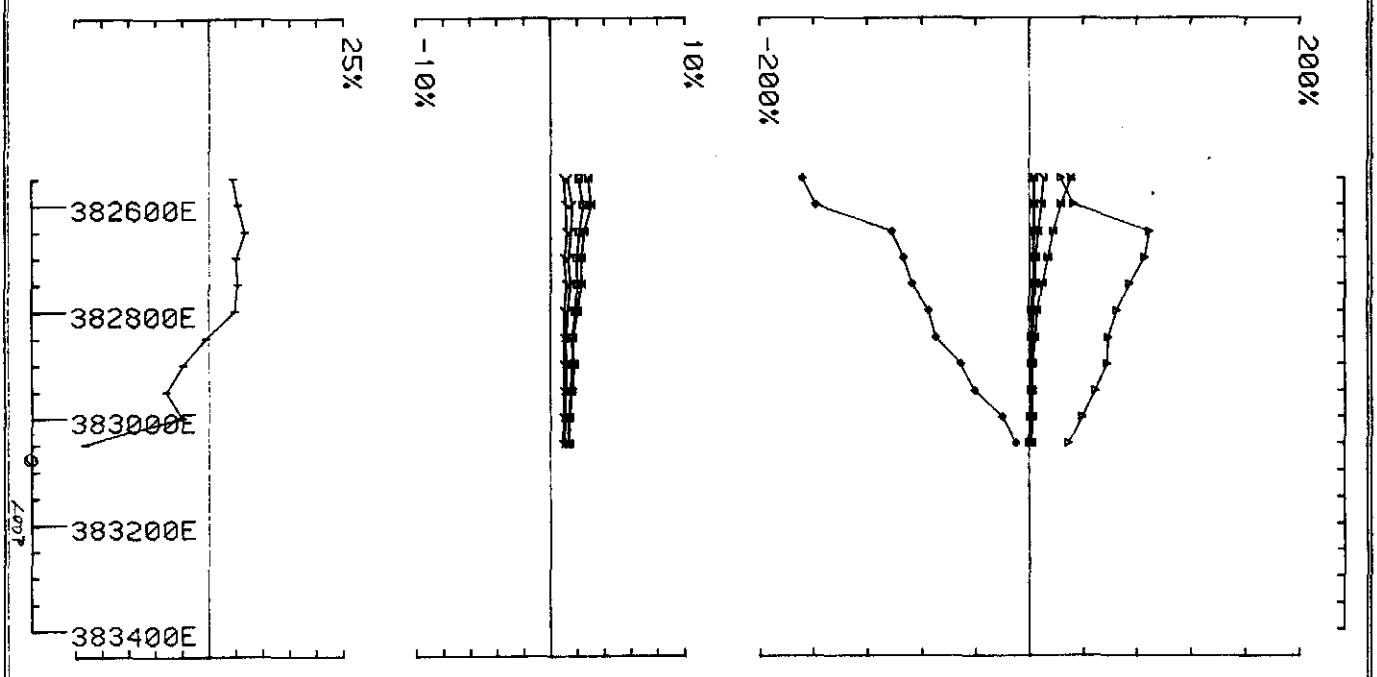
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM BHR
Line 374500N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0012
LINE 374500
Hz

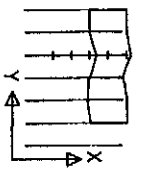
225

960226



5 cm

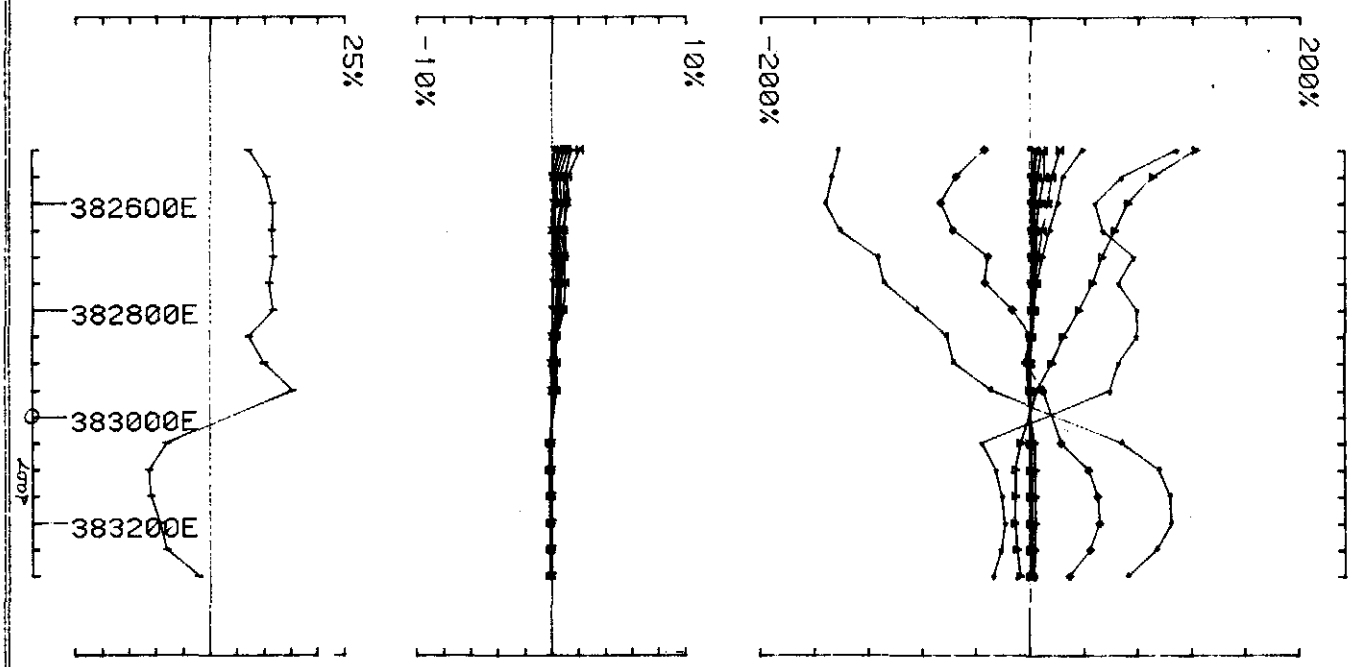
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM BHR
L374500N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 12
LINE 374500N
Hz
(10 channel)

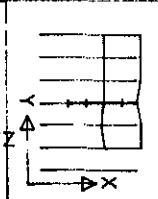
226

960227



5 cm

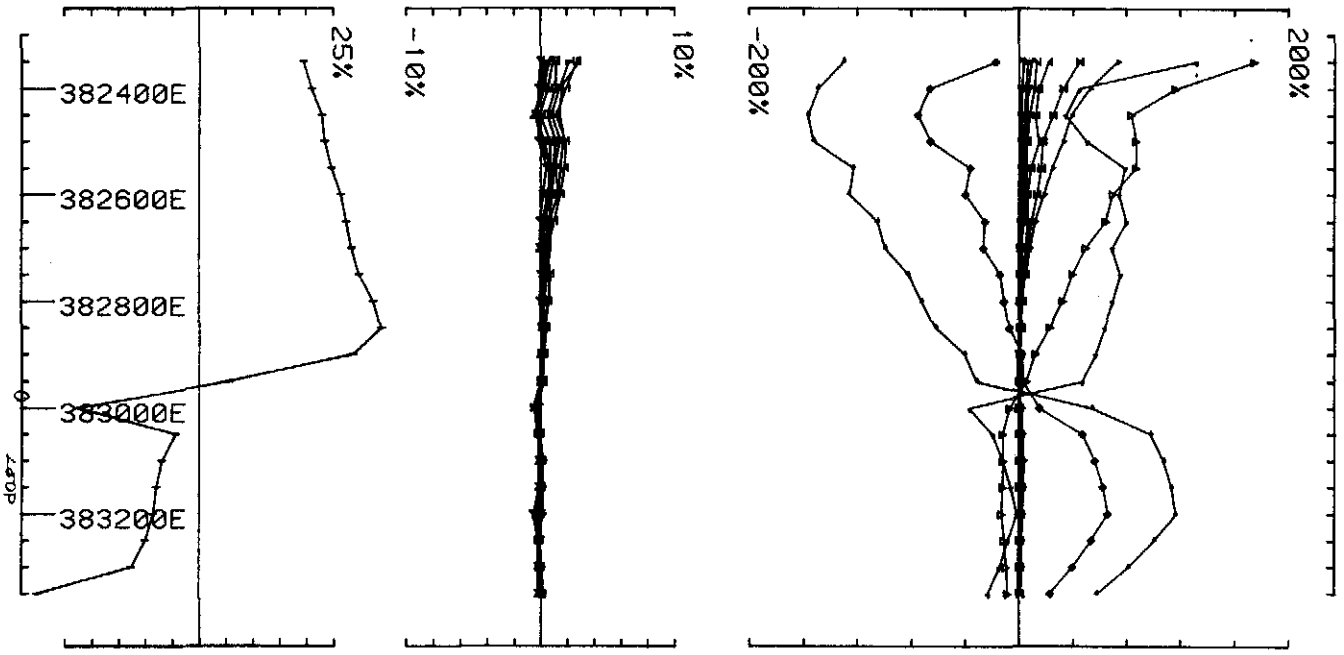
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM BHR
Line 374250N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0012
LINE 374250
Hz

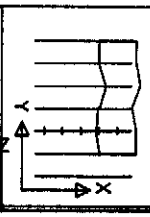
227

960228



5 cm

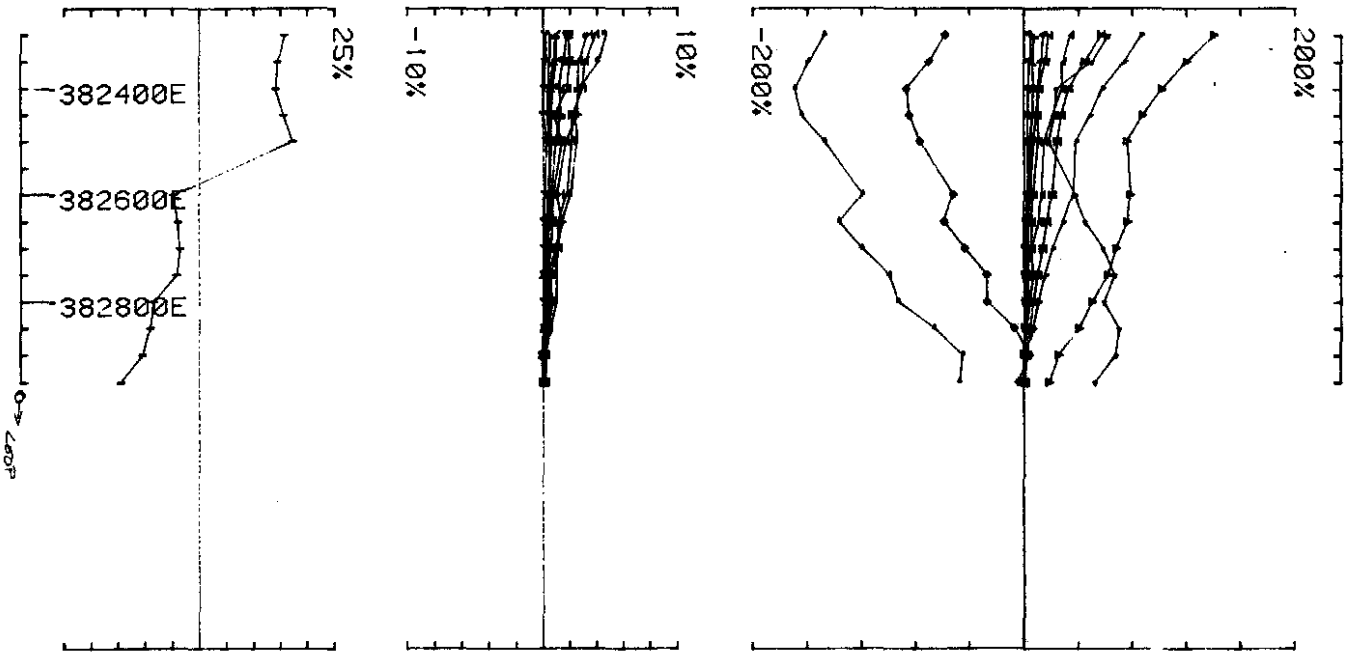
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM BHR
Line 374000N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0012
LINE 374000
Hz

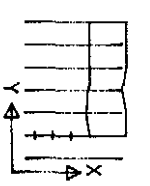
228

960229



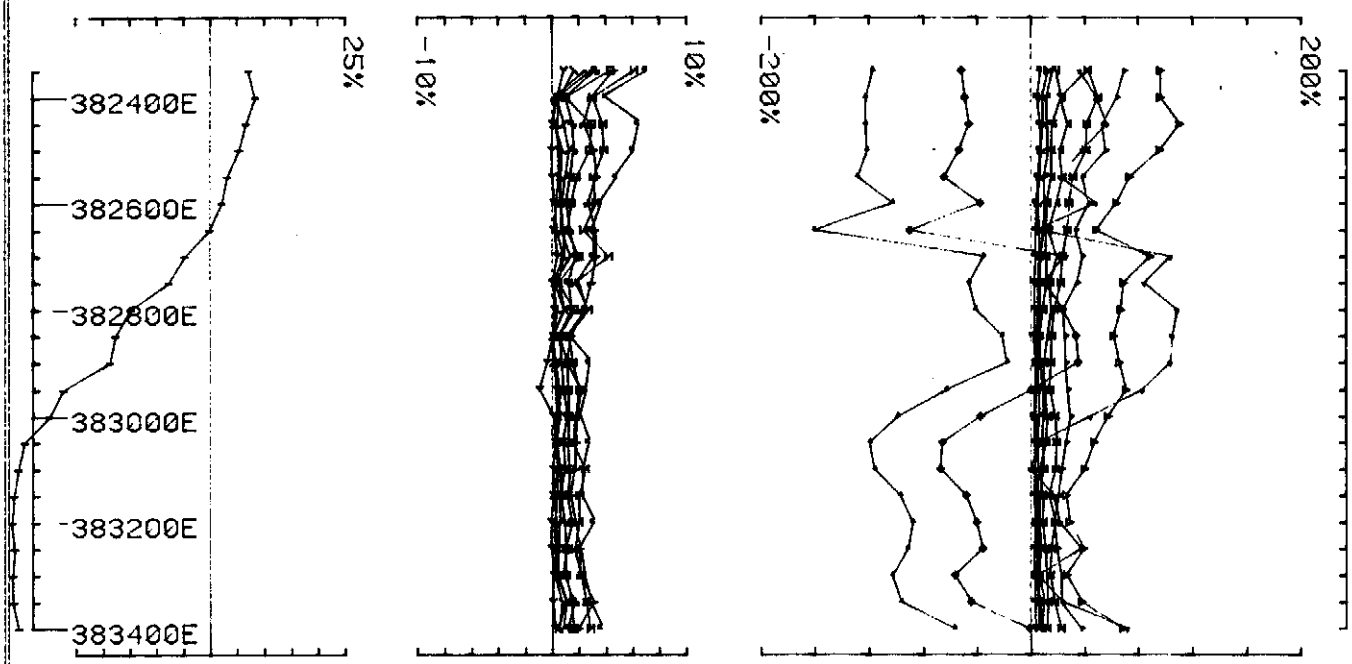
5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM BHR
Line 373750N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



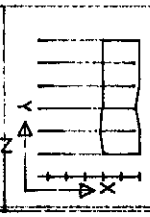
ROSEBERY EAST
LOOP 0012
LINE 373750
Hz

960230



5 cm

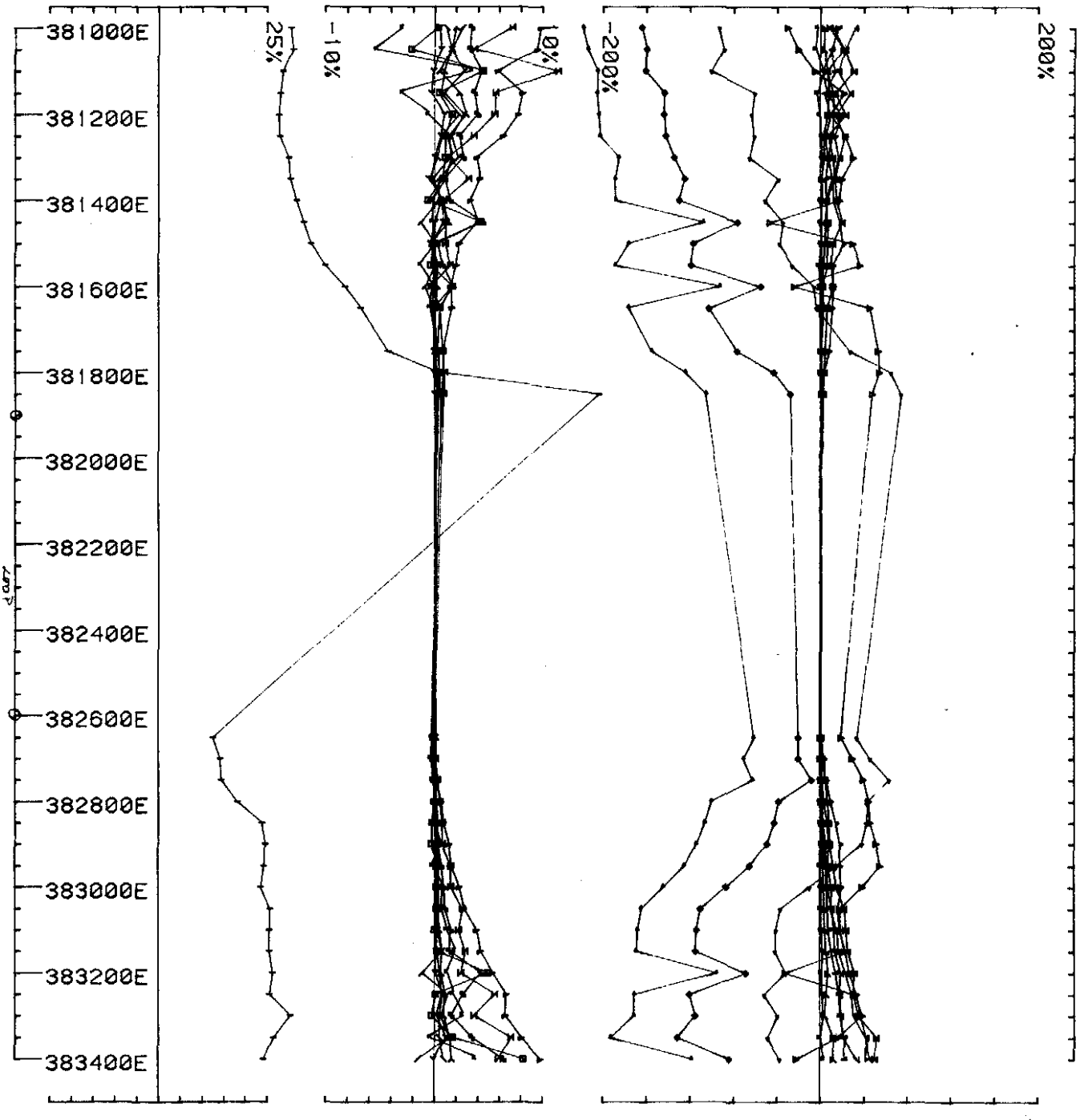
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM BHR
Line 373500N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



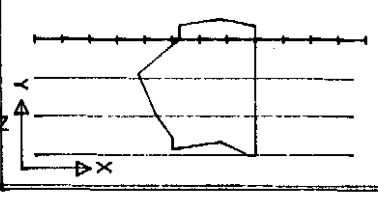
ROSEBERY EAST
LOOP 0012
LINE 373500
Hz

230

960231



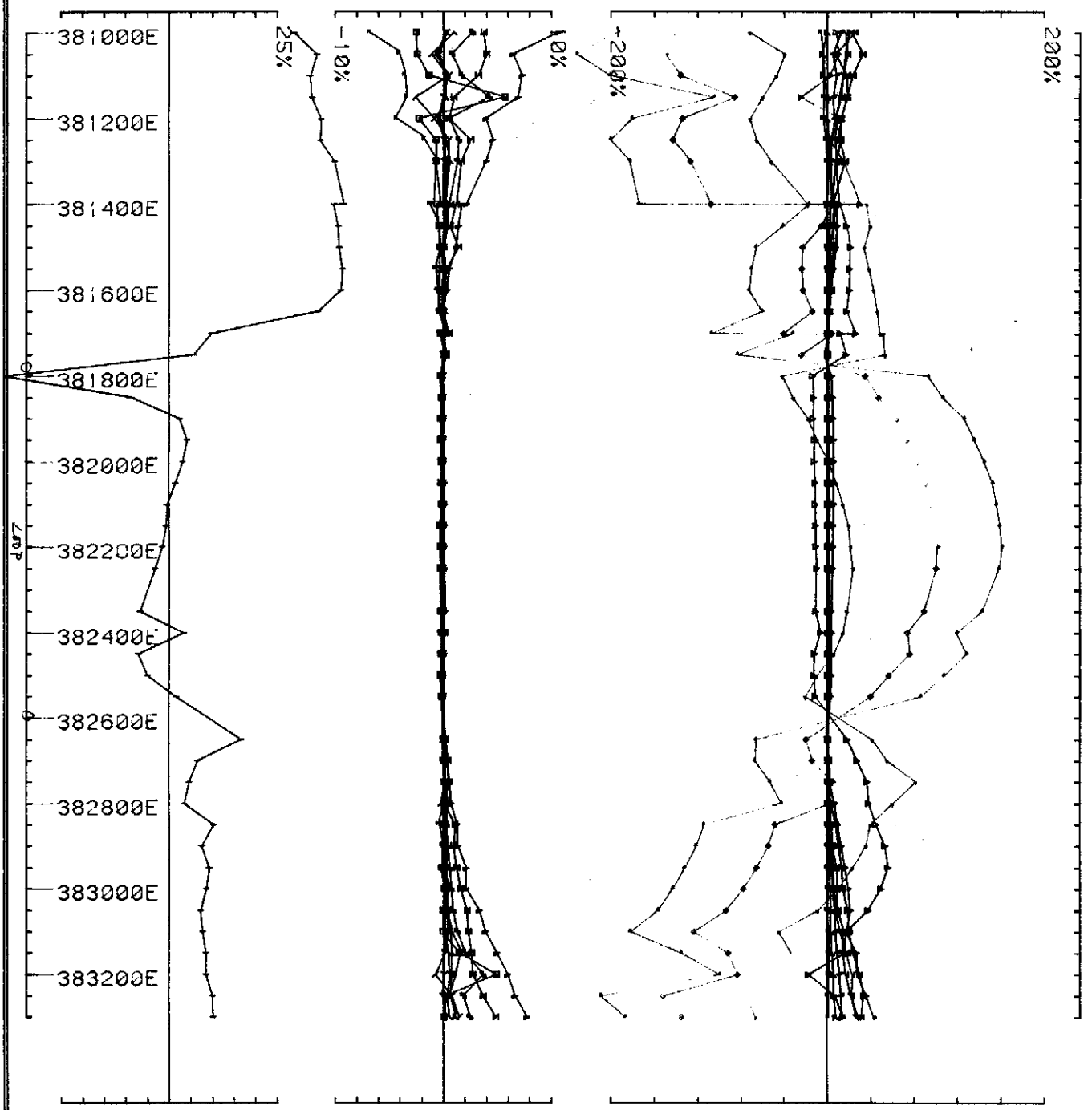
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG
Line 373250N Hz COMPONENT BASE FREQ :- 35.521 HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



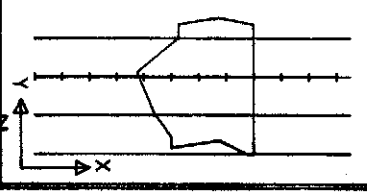
ROSEBERY EAST
LOOP 001,3
LINE 373250
Hz

231

960232



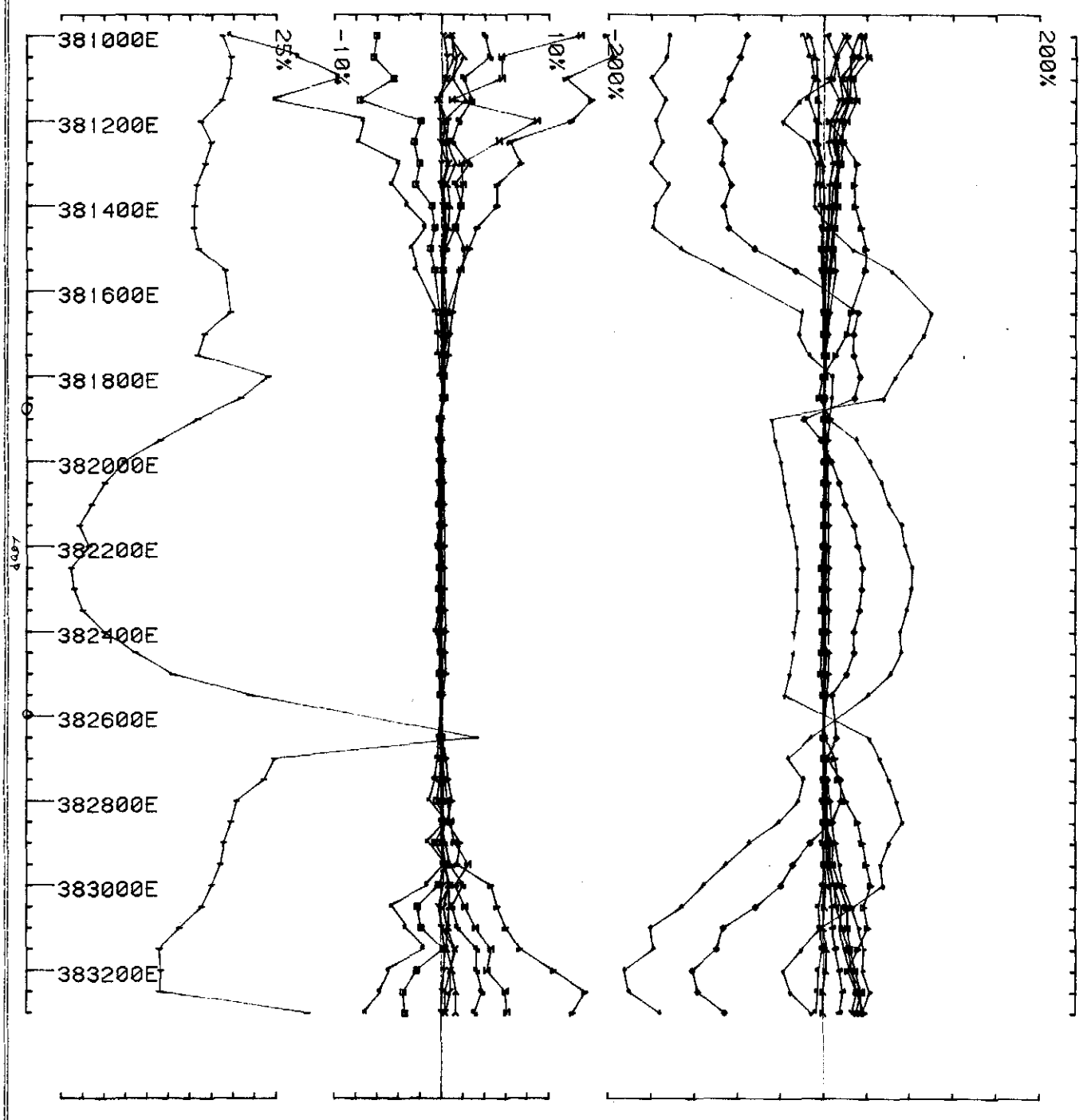
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG
Line 373000 N Hz COMPONENT BASE FREQ :- 35.521 HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



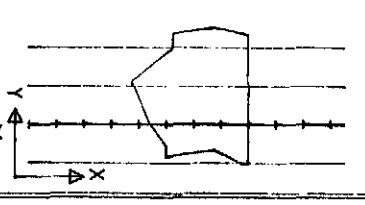
ROSEBERY EAST
LOOP 0013
LINE 373000N
Hz

232

960233



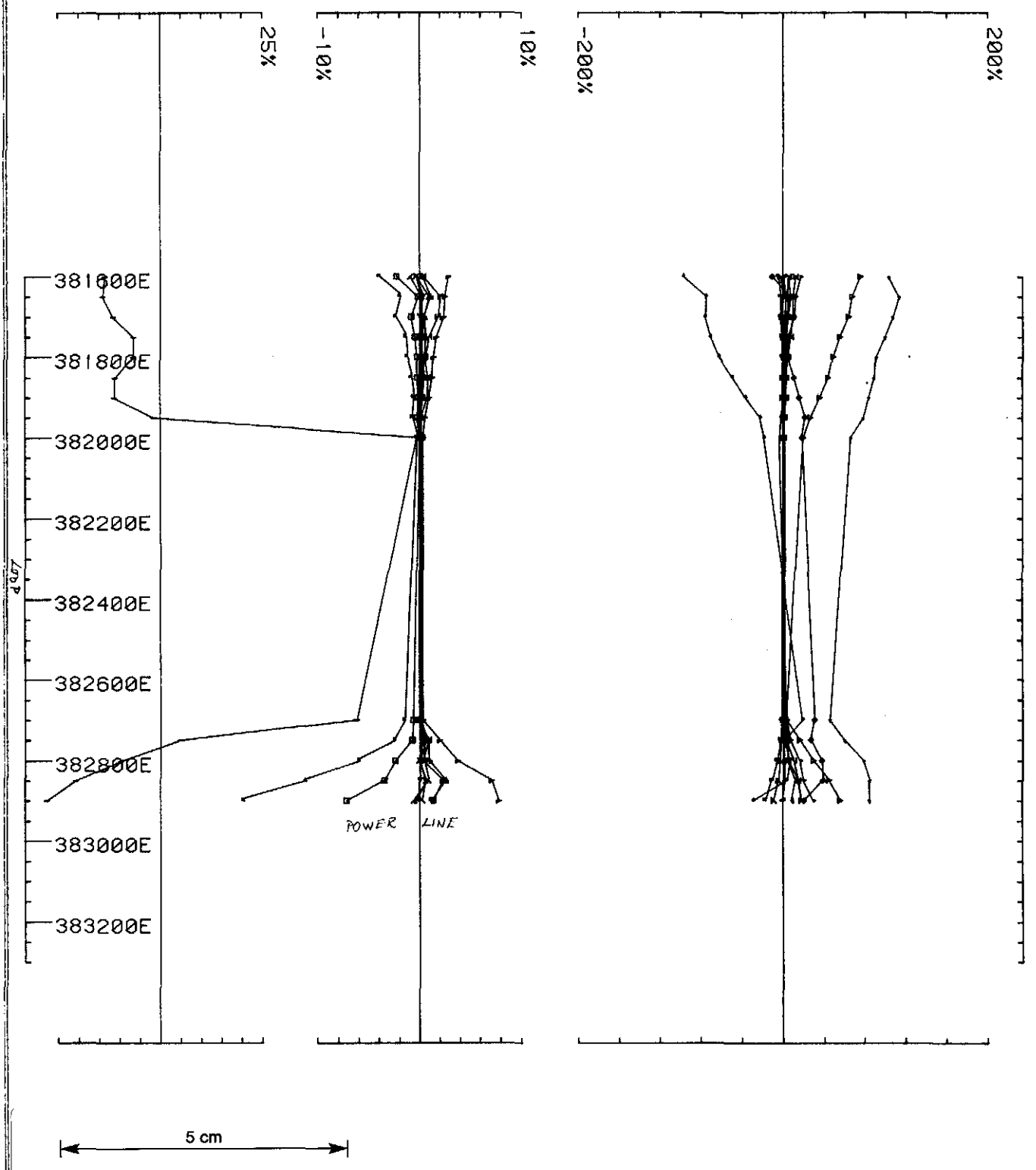
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG
Line 372700N Hz COMPONENT BASE FREQ :- 35.521 HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



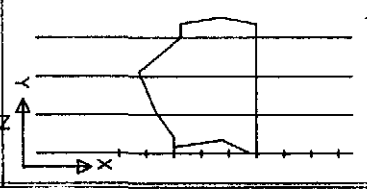
ROSEBERY EAST
LOOP 0013
LINE 372700
Hz

233

960234



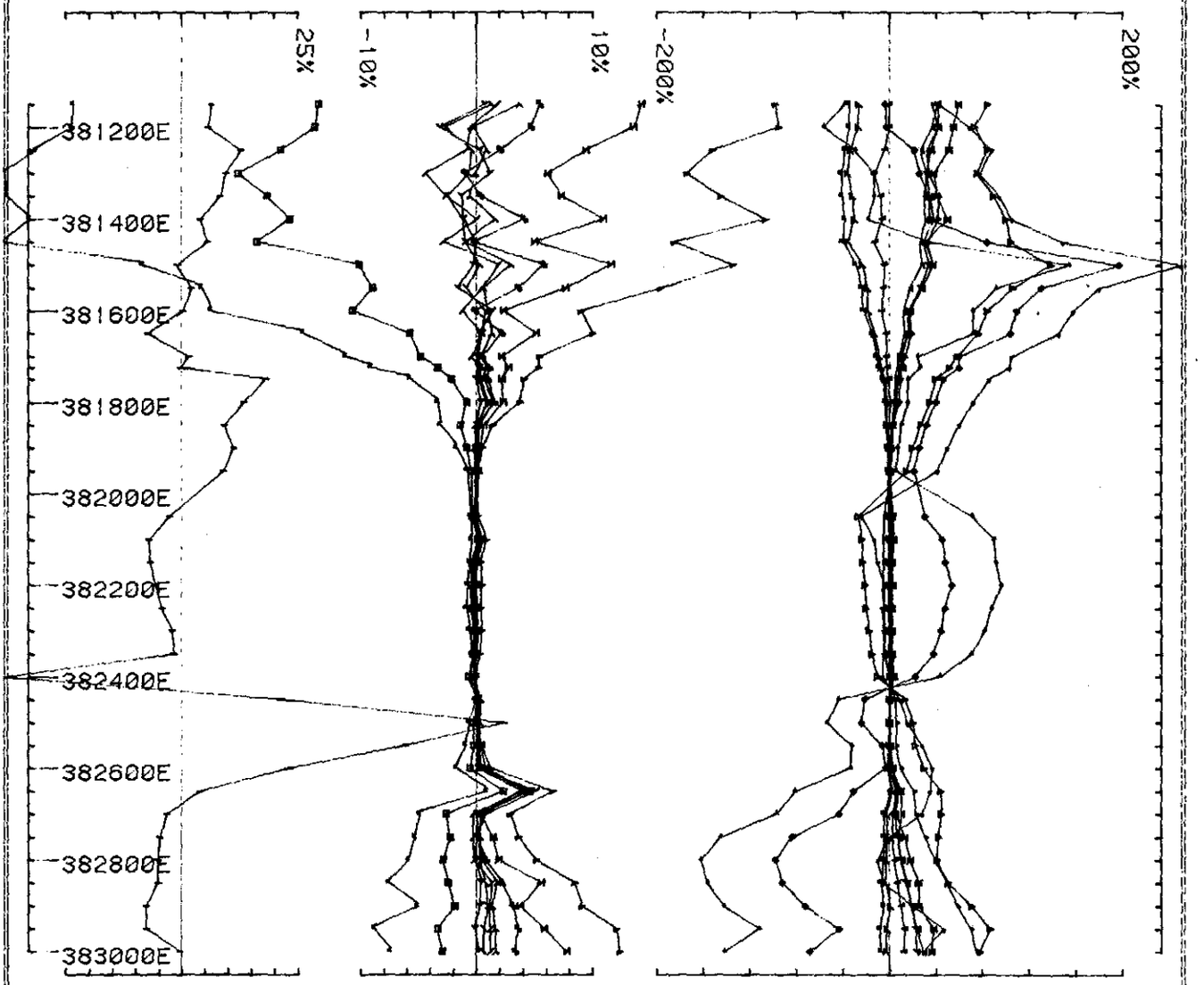
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG
Line 372400N Hz COMPONENT BASE FREQ :- 35.521 HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



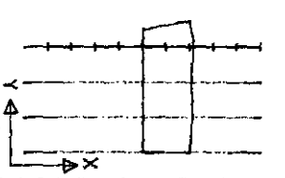
ROSEBERY EAST
LOOP 0013
LINE 372400
Hz

234

960235



LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM BHR
Line 372000N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP-0014
LINE 372000
Hz

960236

235

SHELL COMPANY OF AUSTRALIA

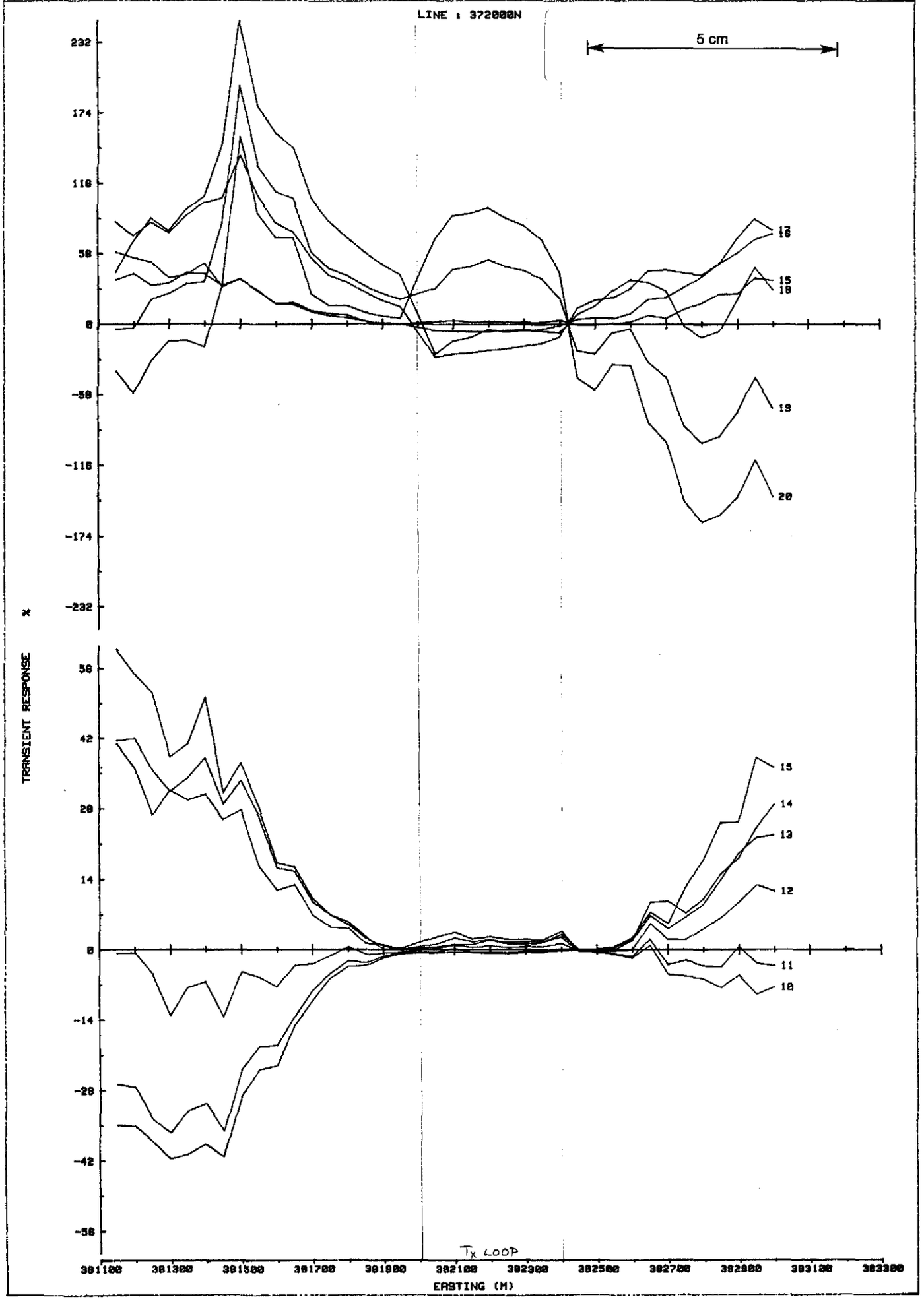
METALS DIVISION

R.O.C.S. - PROTEM

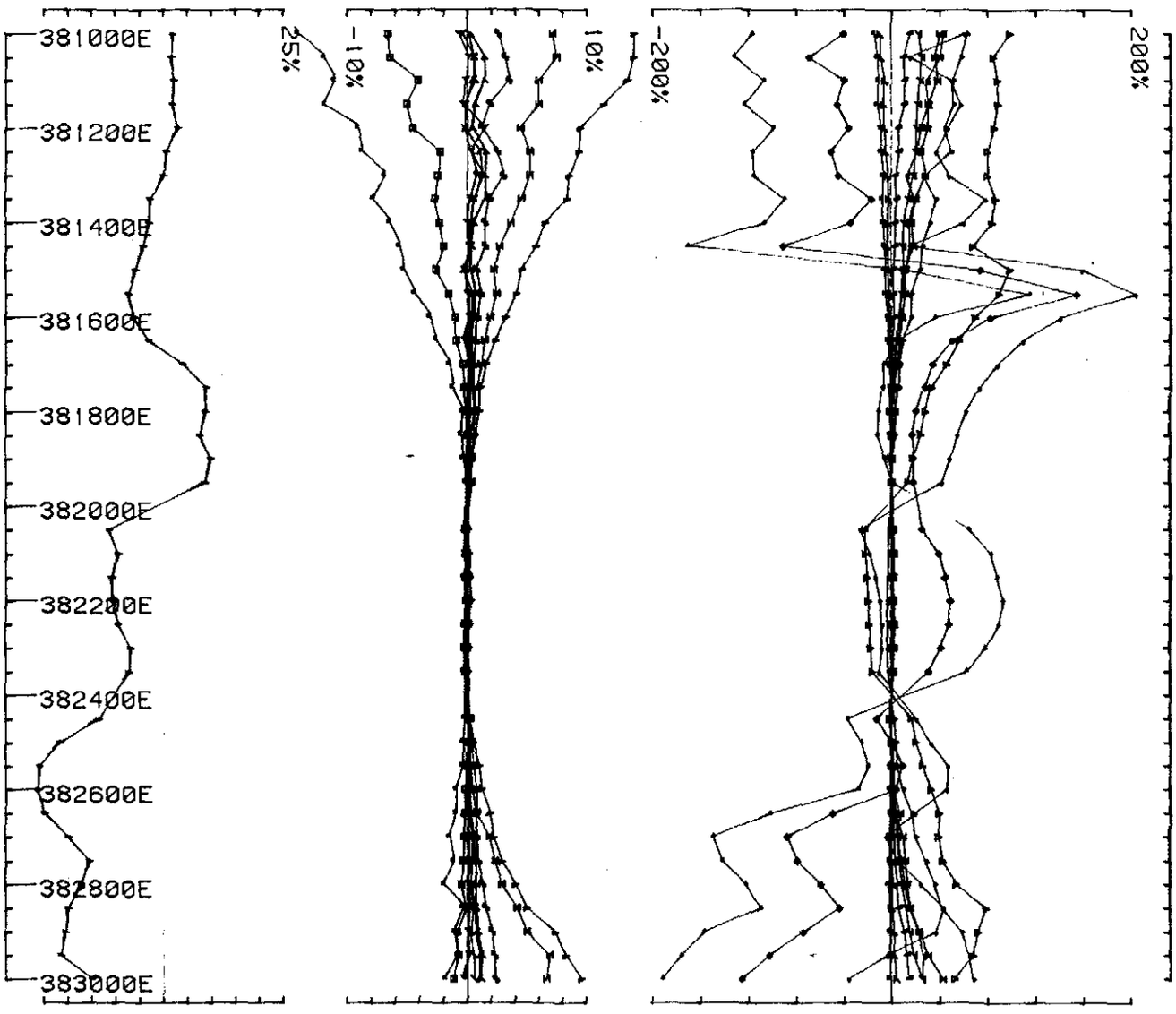
ROSEBERY EAST
UTEM HZ

SCALE 1 : 10000

FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	LOOP 14

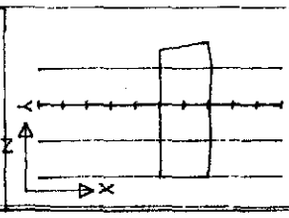


960237



5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM BHR
Line 371700N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 8014
LINE 371700
Hz

23'

960238

SHELL COMPANY OF AUSTRALIA

METALS DIVISION

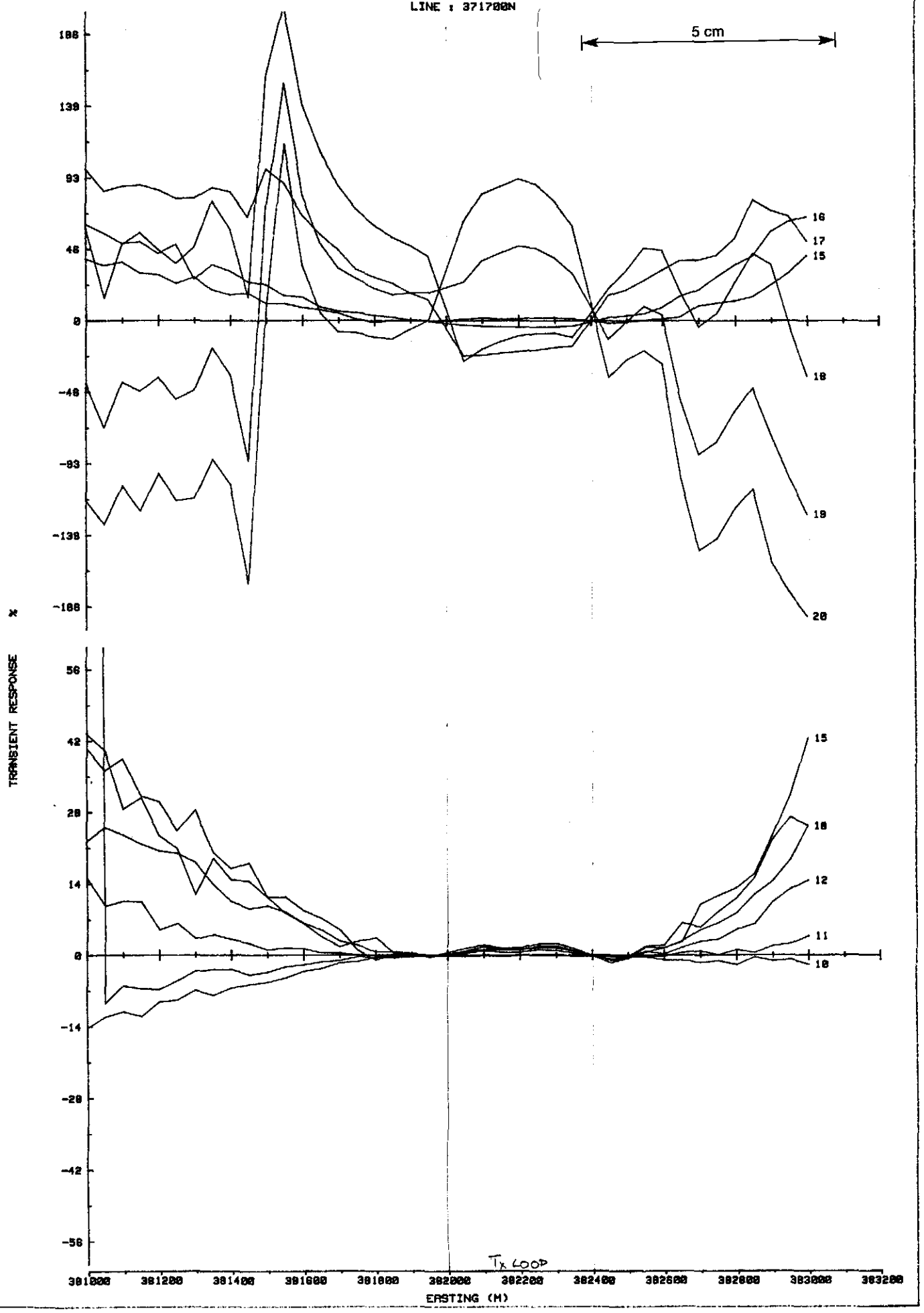
R.O.C.S. - PROTEM

ROSEBERY EAST
UTEM HZ

SCALE 1 : 10000

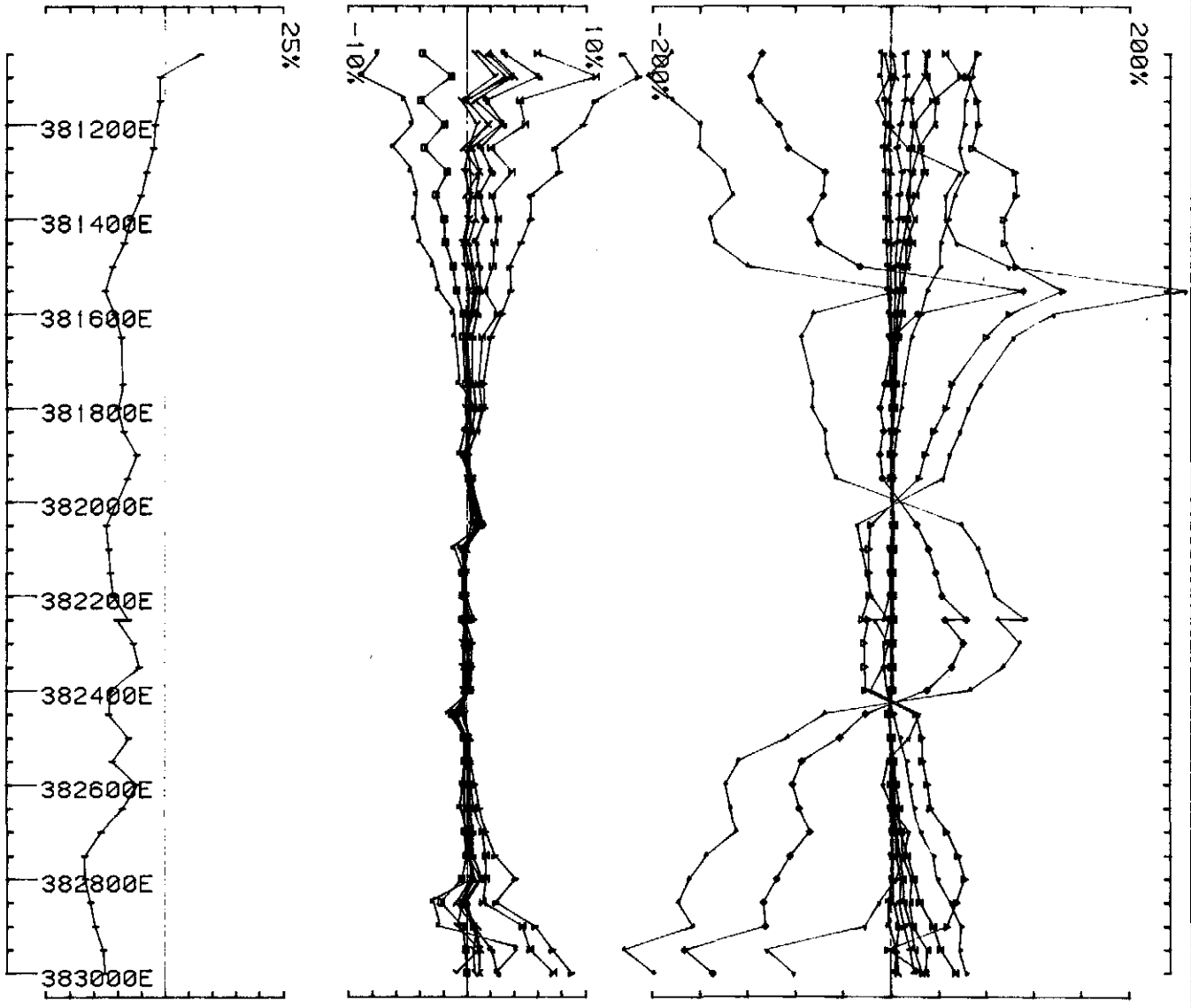
FIG No :	LEGEND
DATE :	
AUTHOR :	
OFFICE :	
DRAWN :	LOOP 11

LINE : 371700N



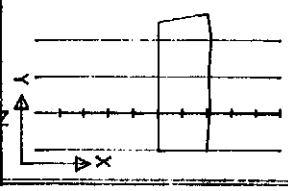
238

960239



5 cm

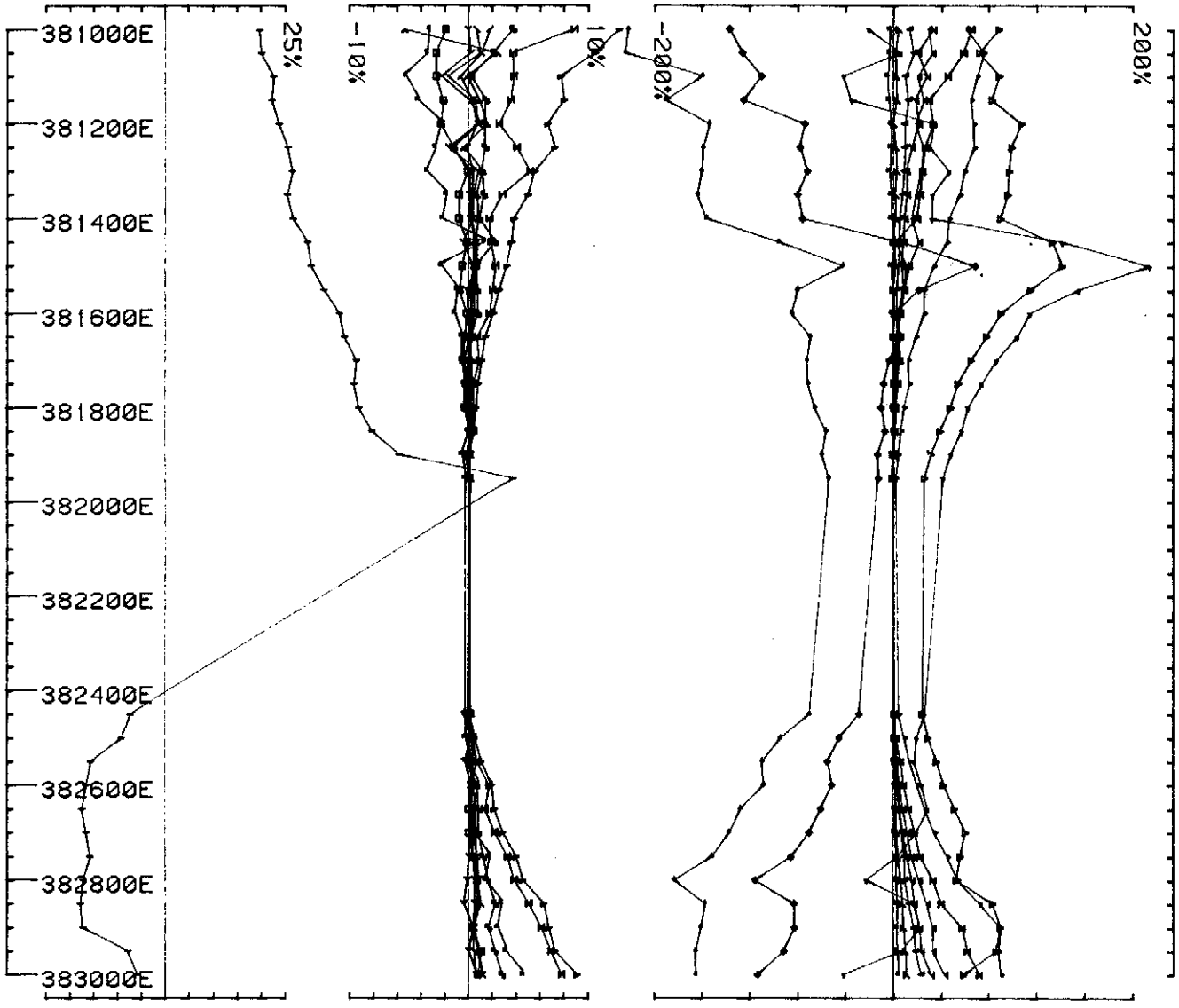
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM BHR
Line 371400N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0014
LINE 371400
Hz

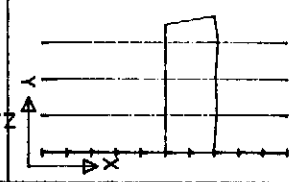
960240

239



5 cm

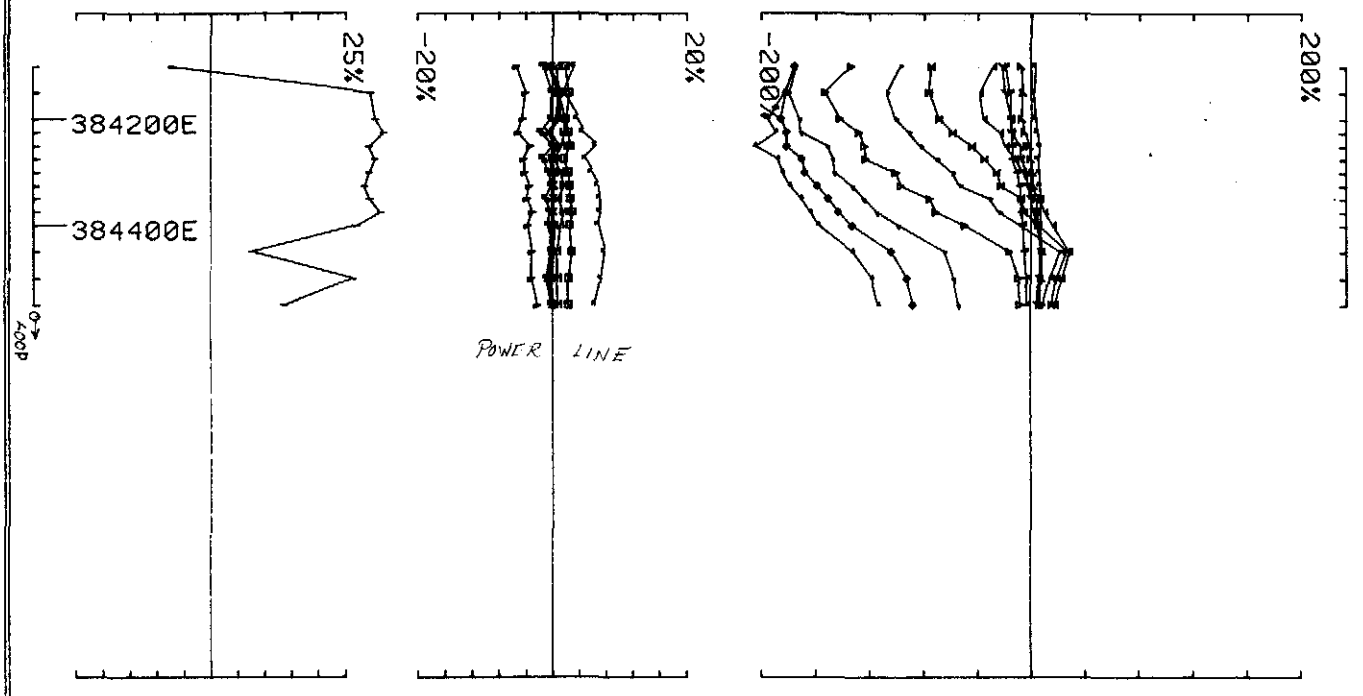
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM BHR
Line 371100N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 001.4
LINE 371100
Hz

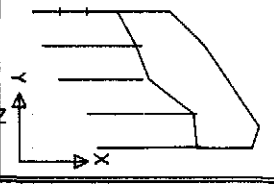
960241

240



5 cm

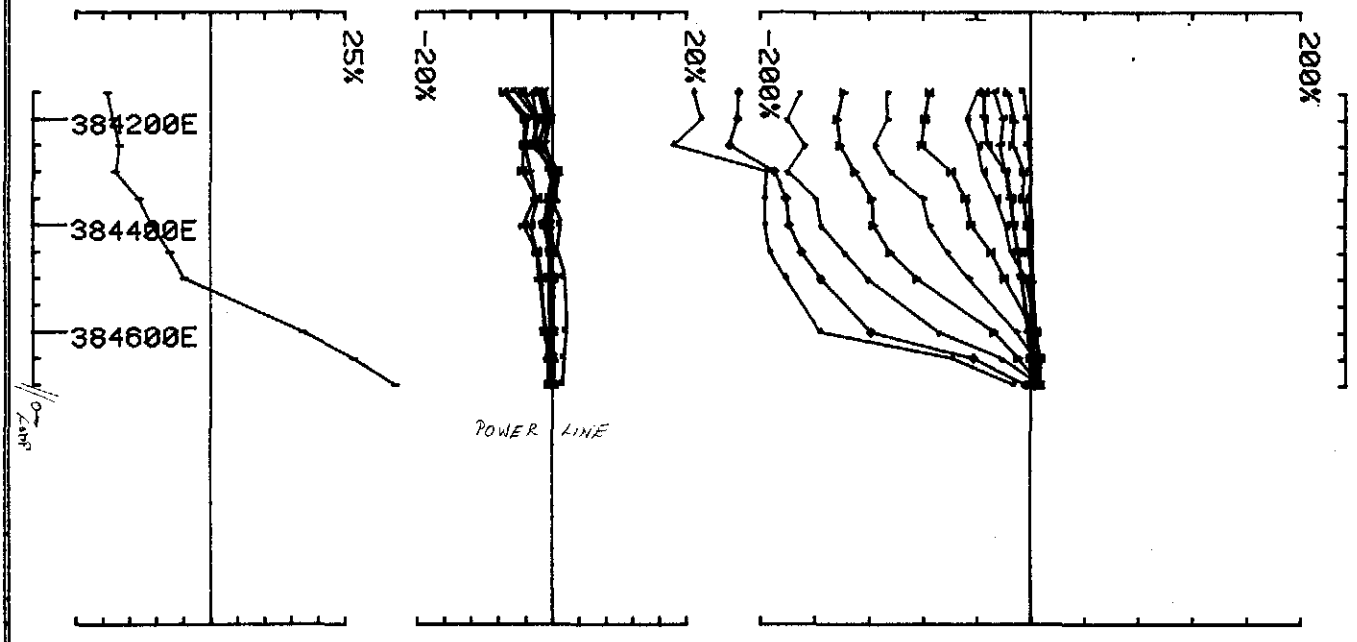
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG
Line 377500N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0015
LINE 377500
Hz

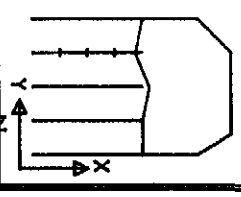
241

960242



5 cm

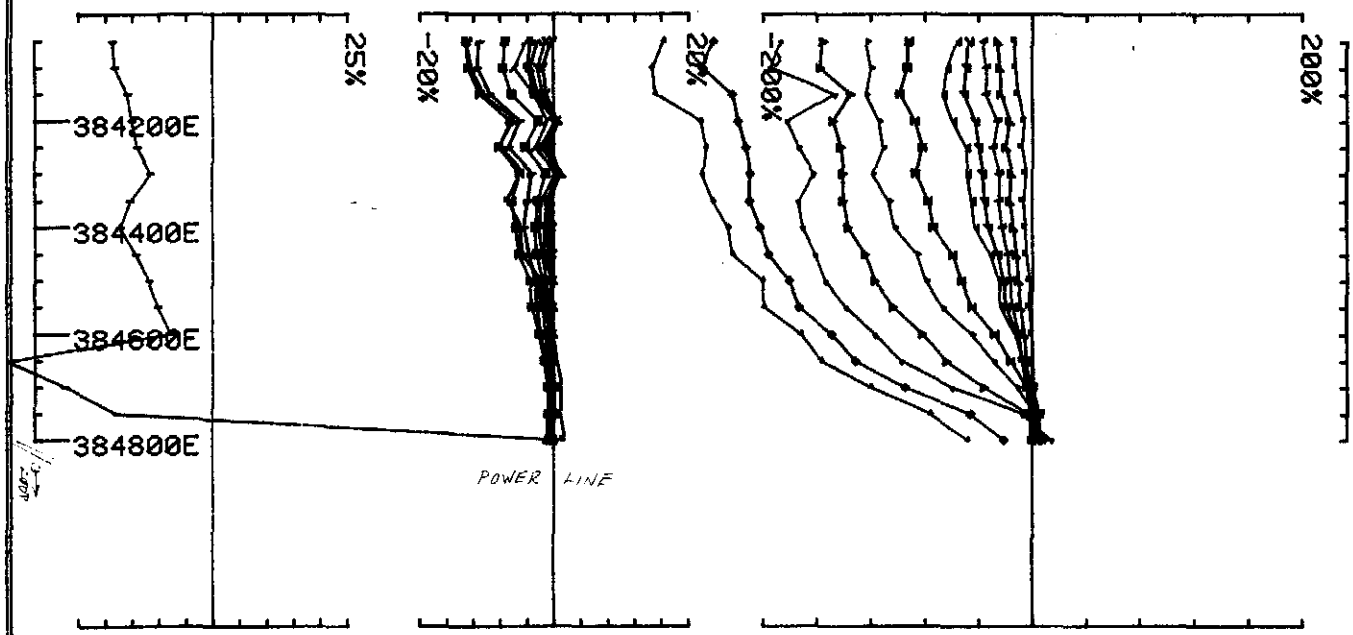
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG
Line 377250N Hz COMPONENT BASE FREQ :- 30.974HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 8015
LINE 377250
Hz

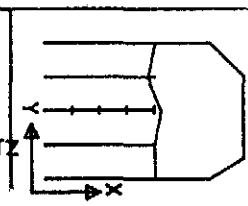
242

960243



5 cm

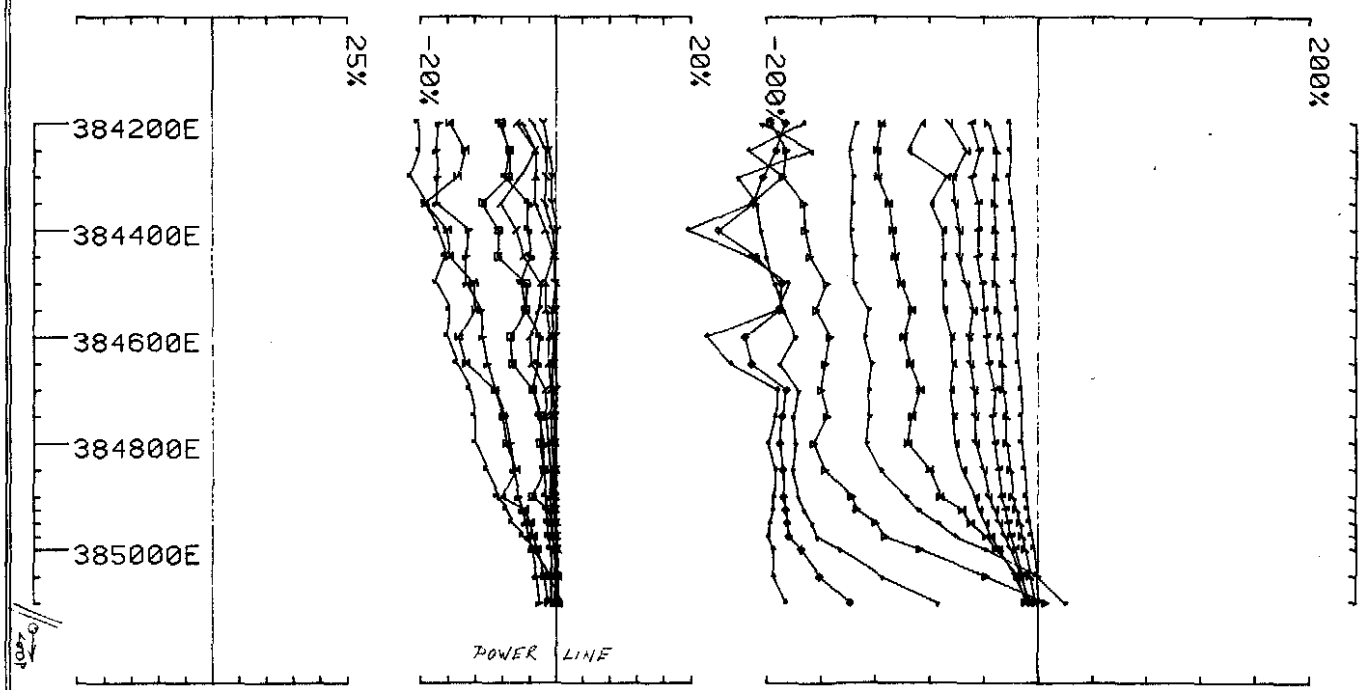
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG
Line 377000N Hz COMPONENT BASE FREQ :- 30.974HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0015
LINE 377000
Hz

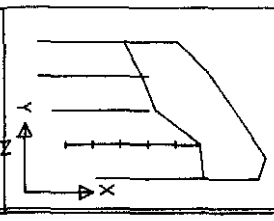
243

960244



5 cm

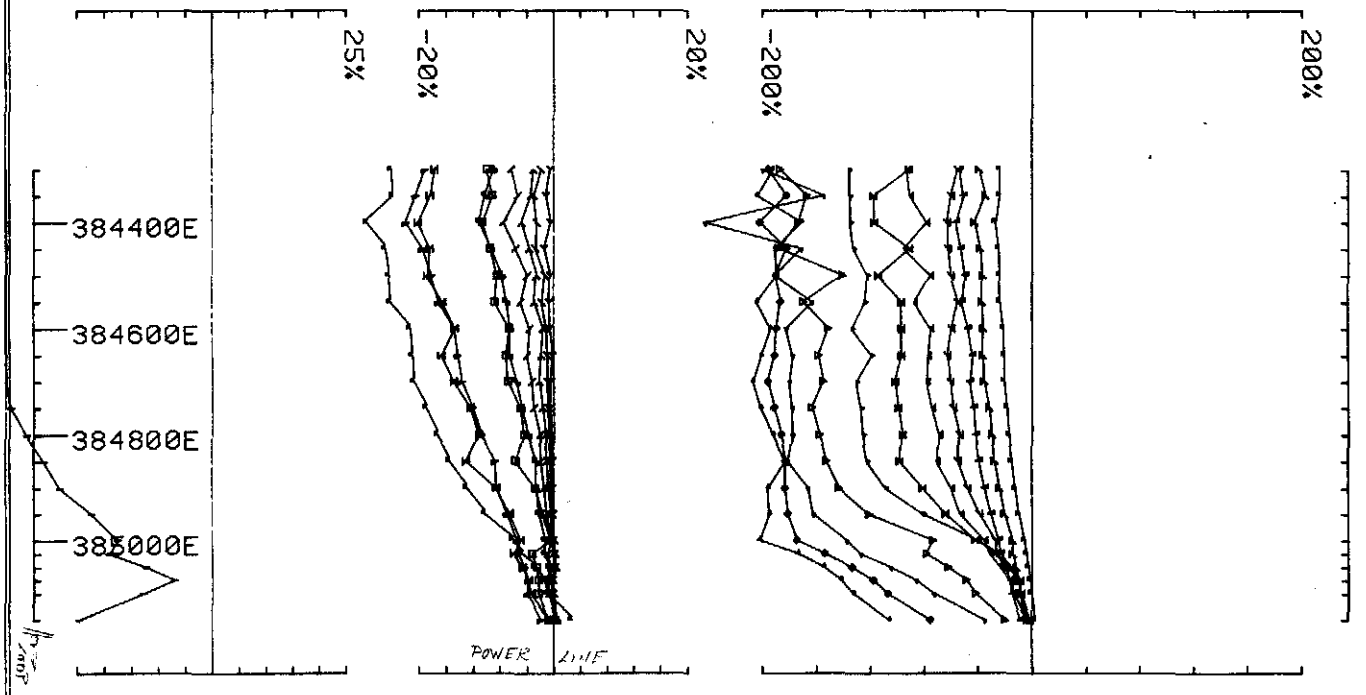
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG
Line 376750N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0015
LINE 376750
Hz

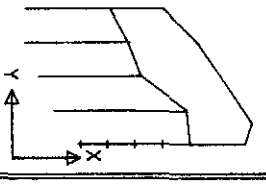
244

960245



5 cm

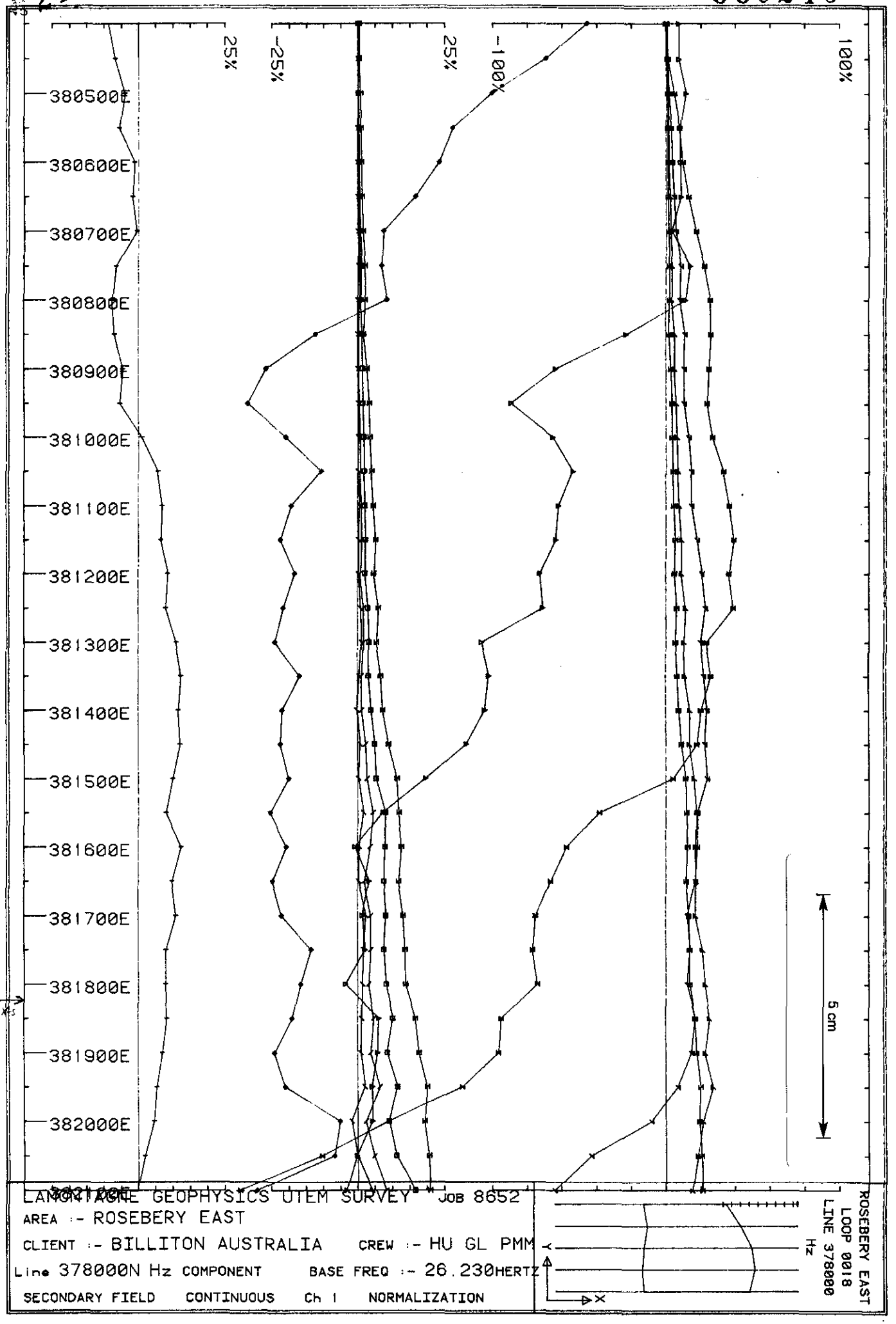
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8508
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUST. CREW :- PMM JRG
Line 376500N Hz COMPONENT BASE FREQ :- 35.487HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0015
LINE 376500
Hz

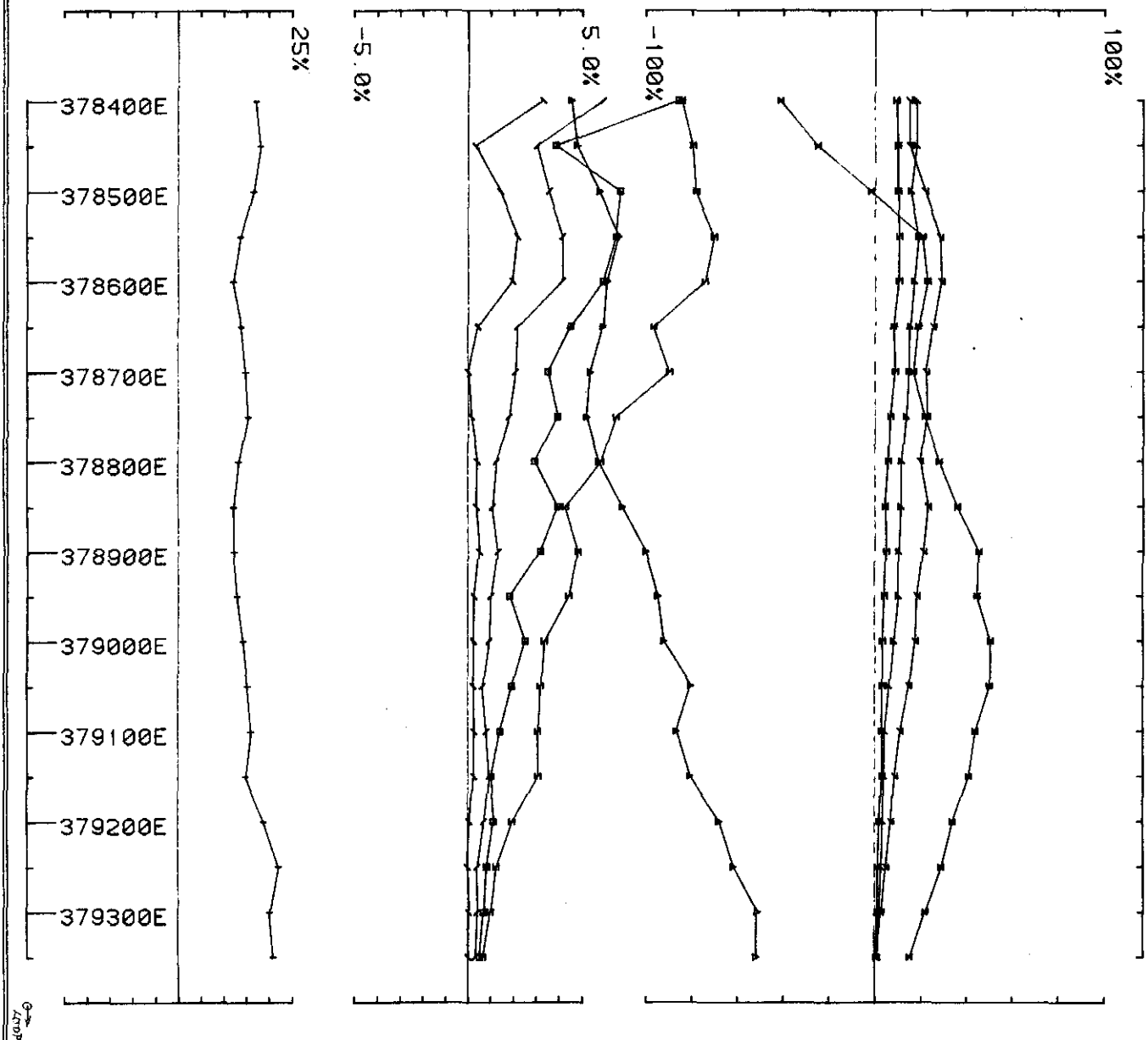
245

960246


25%
-25%
25%
-100%
100%
380500E
380600E
380700E
380800E
380900E
381000E
381100E
381200E
381300E
381400E
381500E
381600E
381700E
381800E
381900E
382000E
382100E
5 cm
LANGTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- HU GL PMM
Line 378000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION
Hz
ROSEBERY EAST
LOOP 0018
LINE 378000

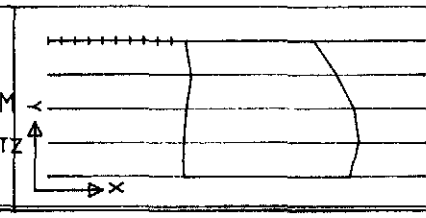
960247

246



5 cm

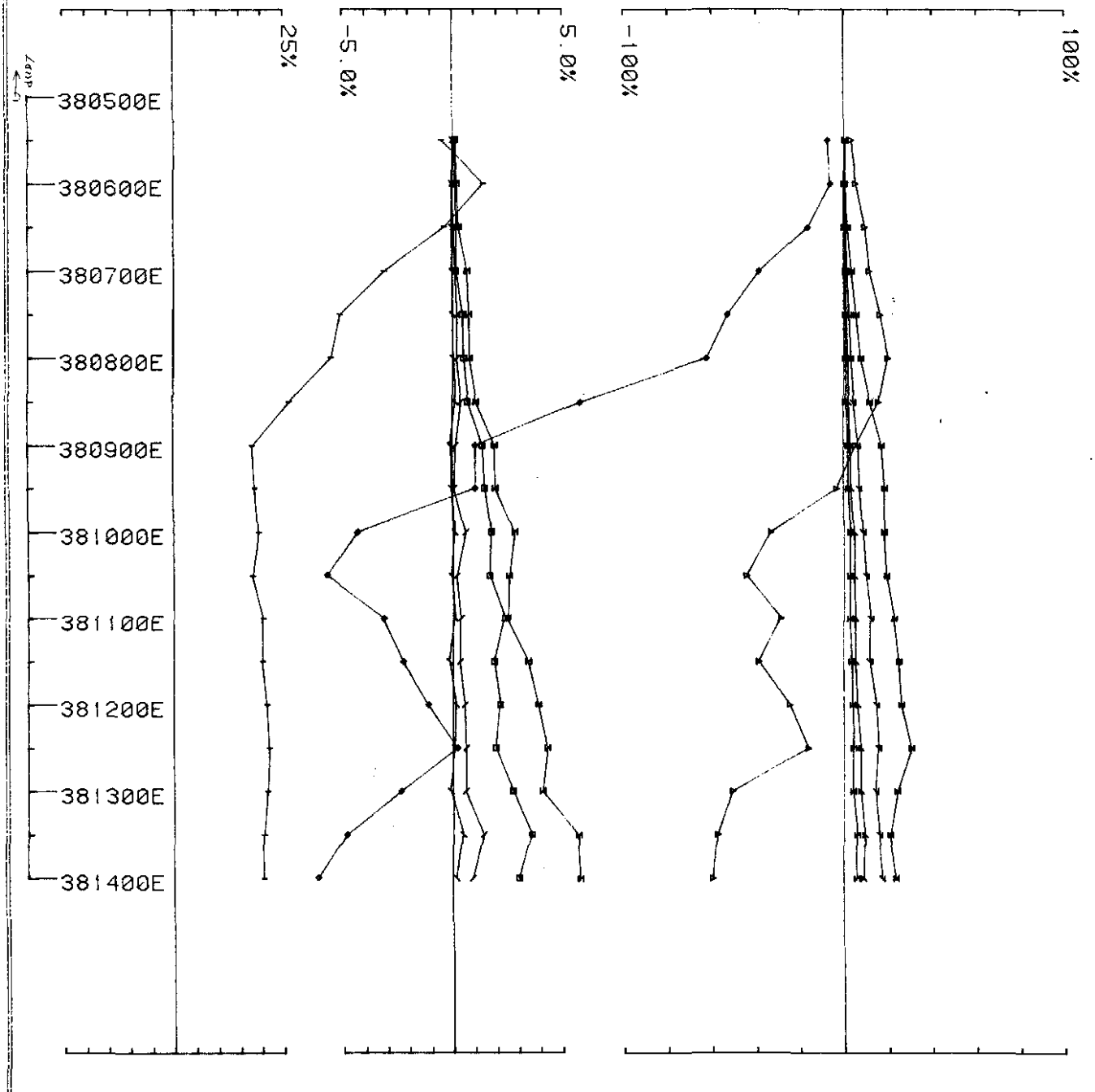
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- HU GL PMM
Line 378000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



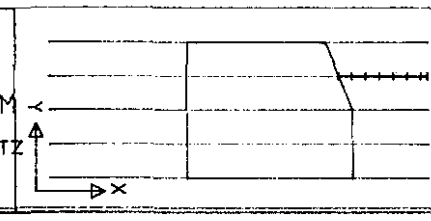
ROSEBERY EAST
LOOP 0018
LINE 378000

247

960248



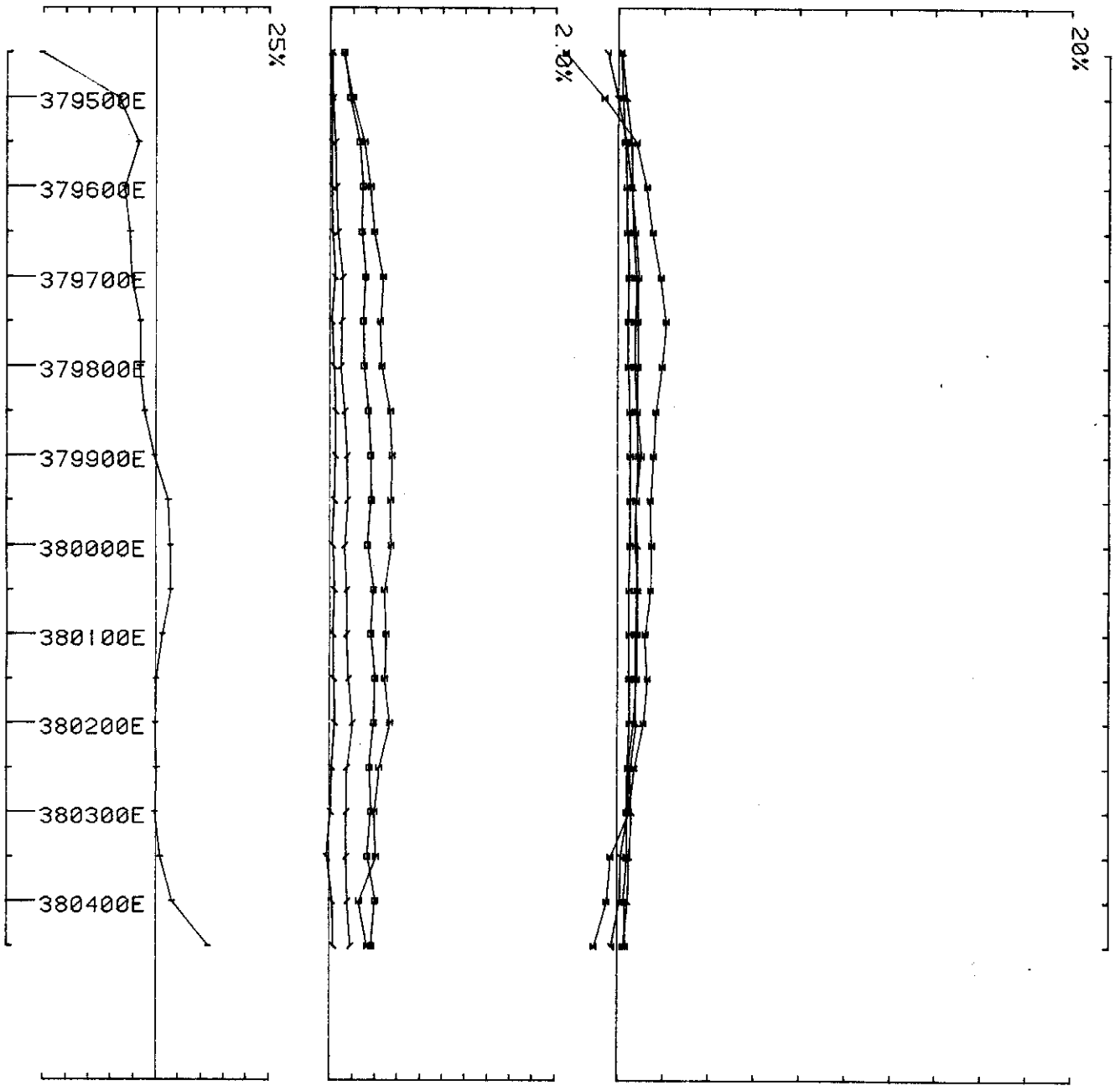
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- HU GL PMM
Line 377750N Hz COMPONENT BASE FREQ :- 26.230HERTZ
~~SECONDARY~~ FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0018
LINE 377750

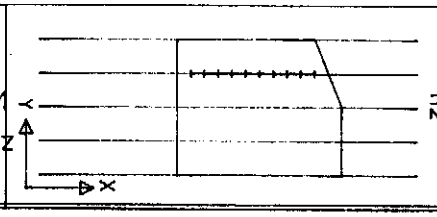
960249

248



5 cm

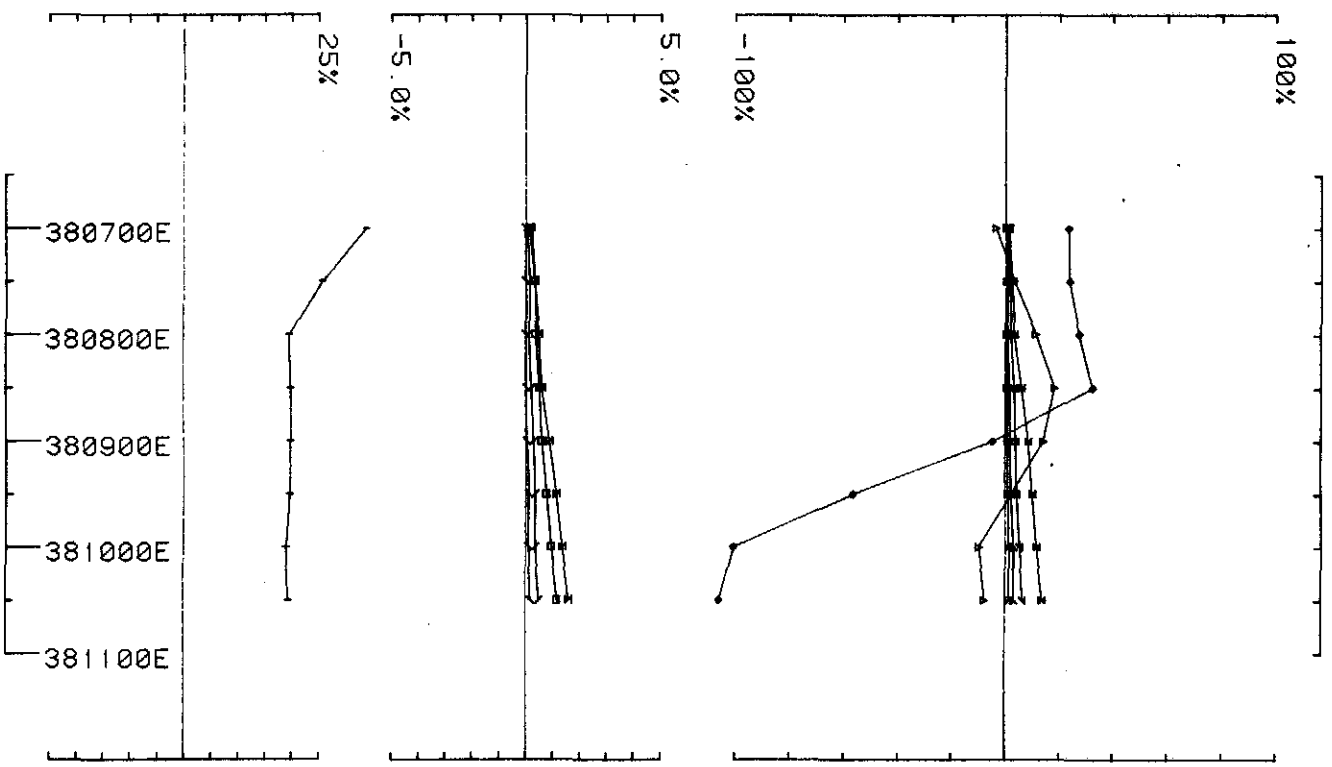
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- HU GL PMM
Line 377750N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0018
LINE 377750

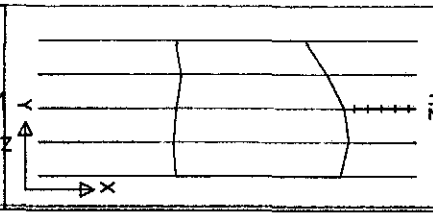
960250

249



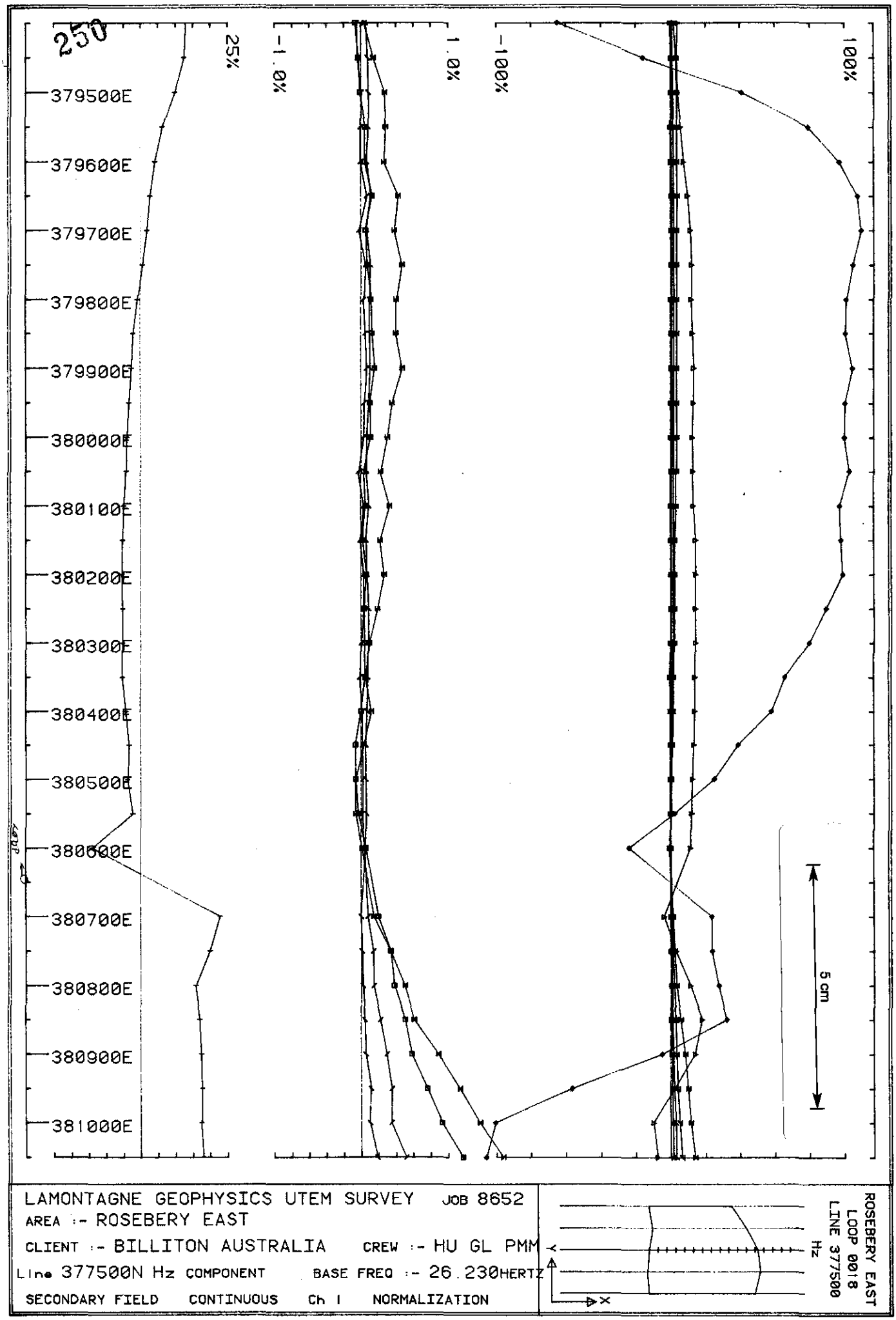
5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- HU GL PMM
Line 377500N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



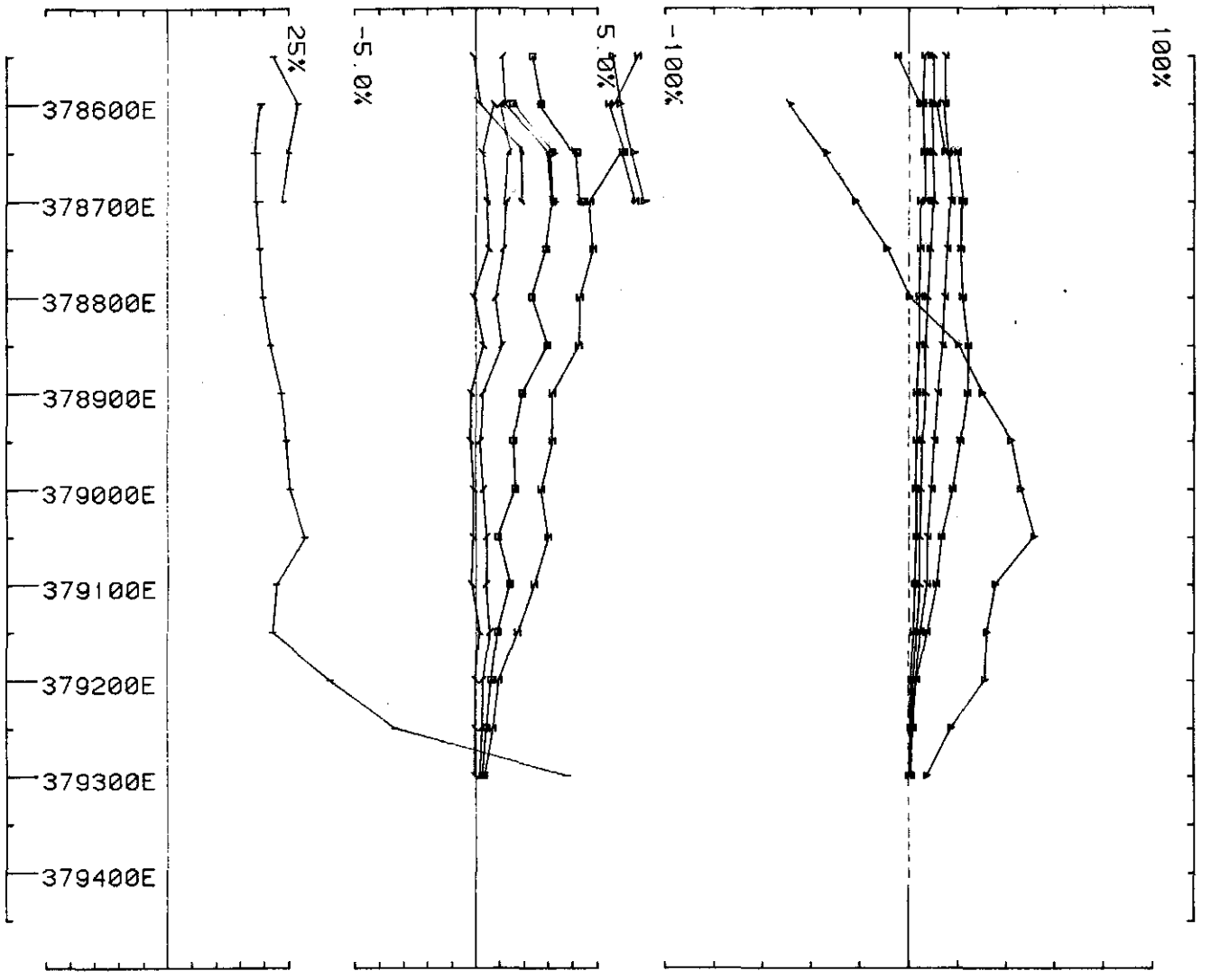
ROSEBERY EAST
LOOP 0018
LINE 377500

960251


250
25%
-1.0%
1.0%
-100%
100%
379500E
379600E
379700E
379800E
379900E
380000E
380100E
380200E
380300E
380400E
380500E
380600E
380700E
380800E
380900E
381000E
5 cm
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- HU GL PMM
Line 377500N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION
Y
X
Hz
ROSEBERY EAST
LOOP 0018
LINE 377500

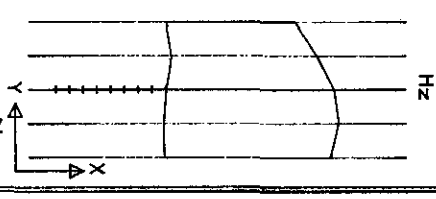
960252

251



5 cm

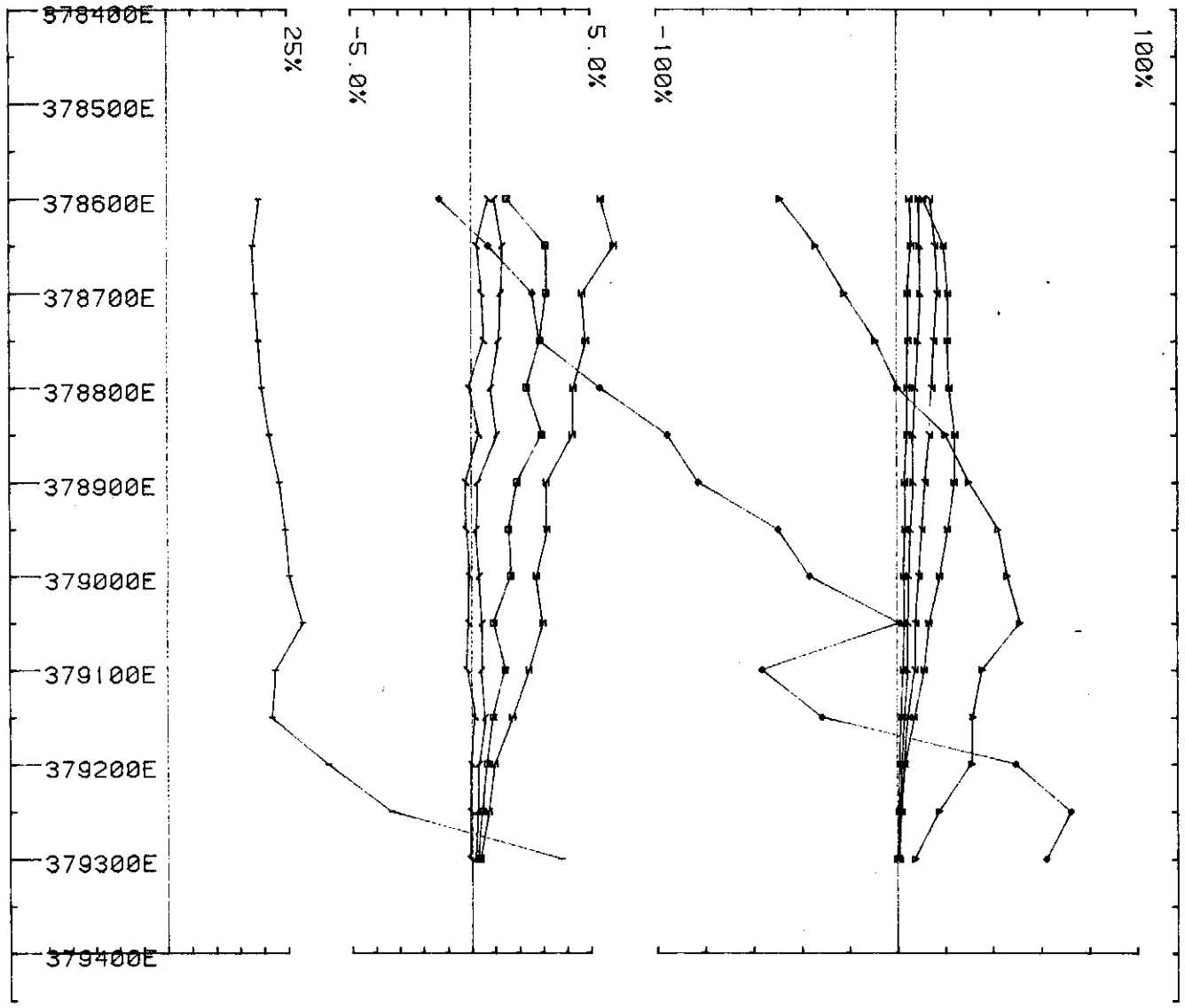
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- HU GL PMM
Line 377500N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0018
LINE 377500

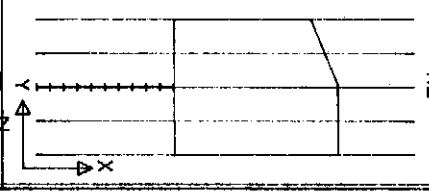
960253

252



5 cm

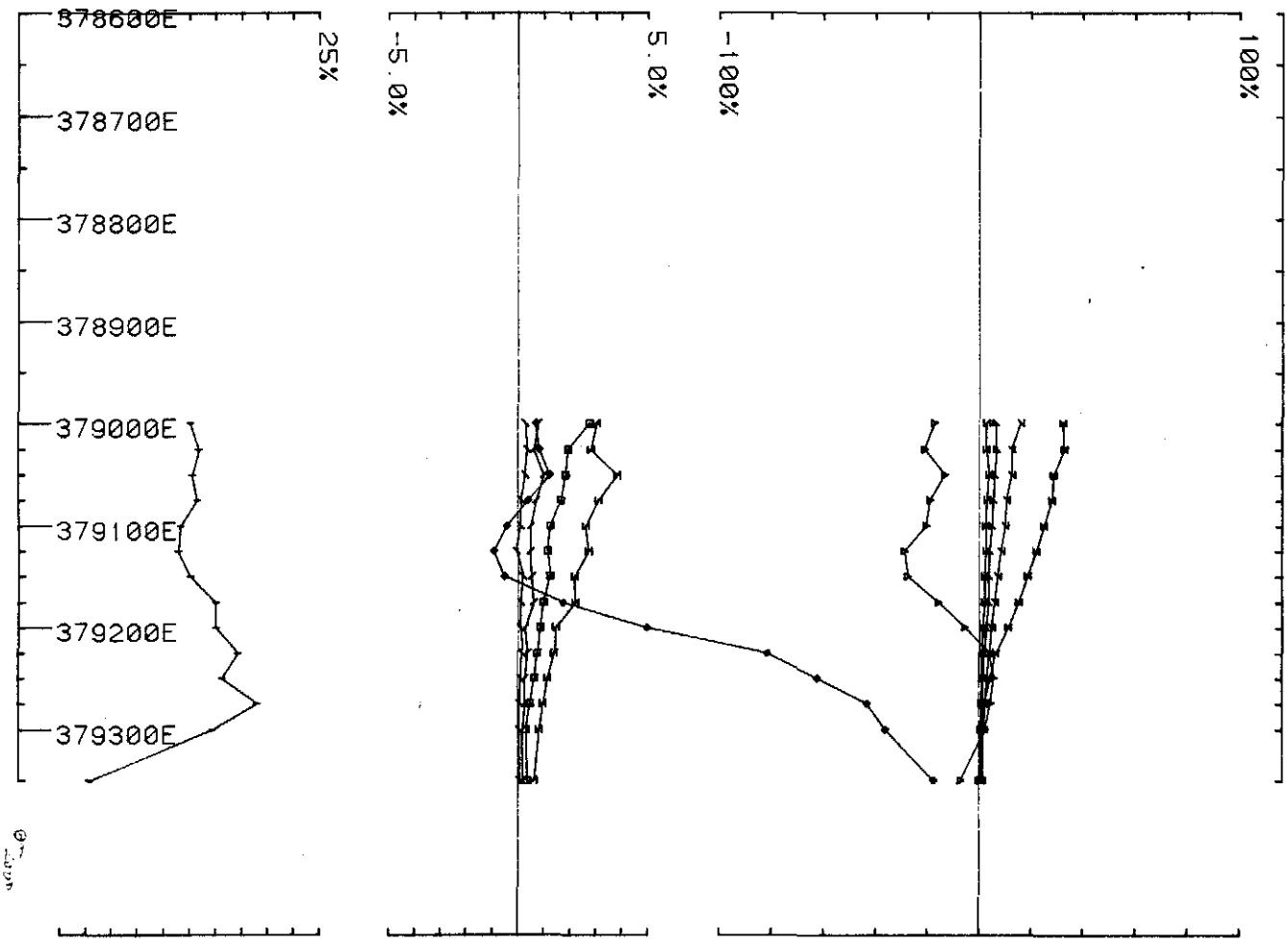
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- HU GL PMM
Line 377500N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0018
LINE 377500
Hz

960254

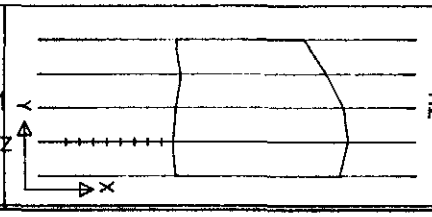
253



DETAILED 25m STN. SPACING

5 cm

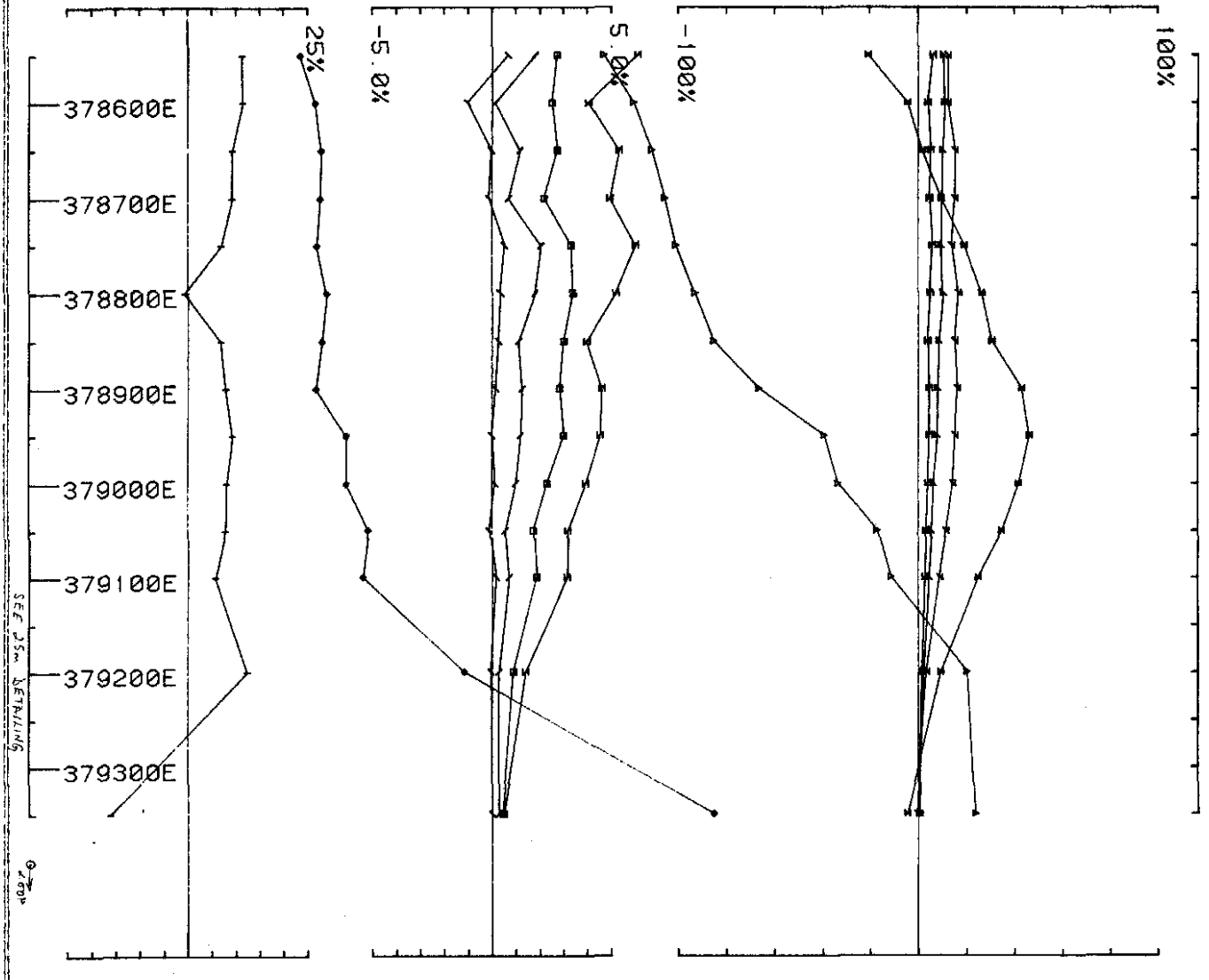
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- HU GL PMM
Line 377250N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



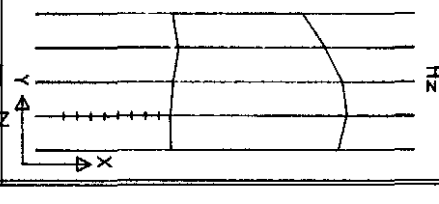
ROSEBERY EAST
LOOP 0018
LINE 377250
Hz

254

960255



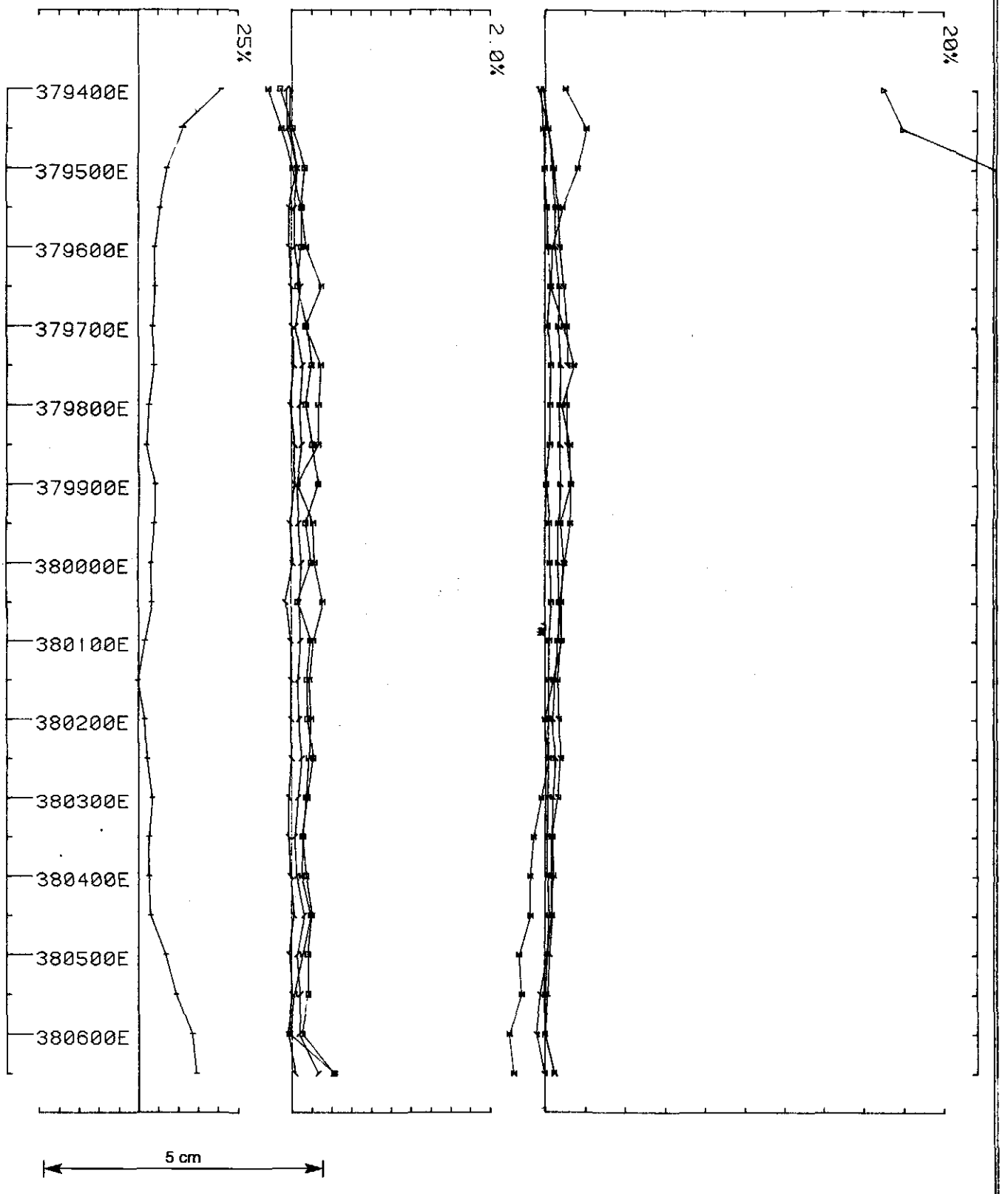
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- HU GL PMM
Line 377250N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



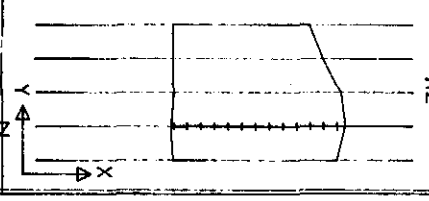
ROSEBERY EAST
LOOP 0018
LINE 377250

255

960256



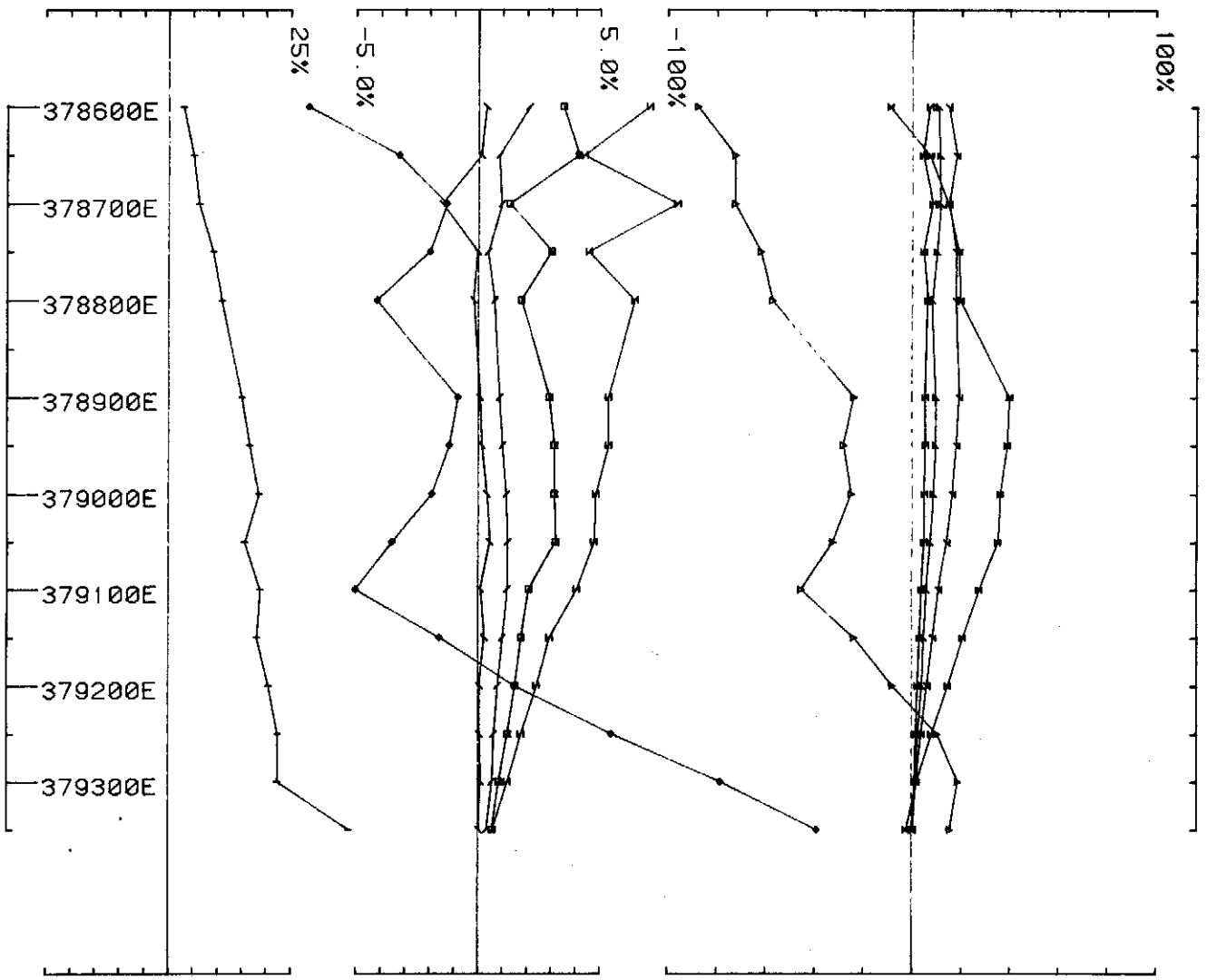
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- HU GL PMM
Line 377250N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0018
LINE 377250

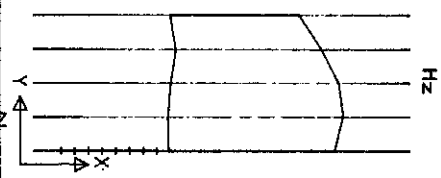
256

960257



5 cm

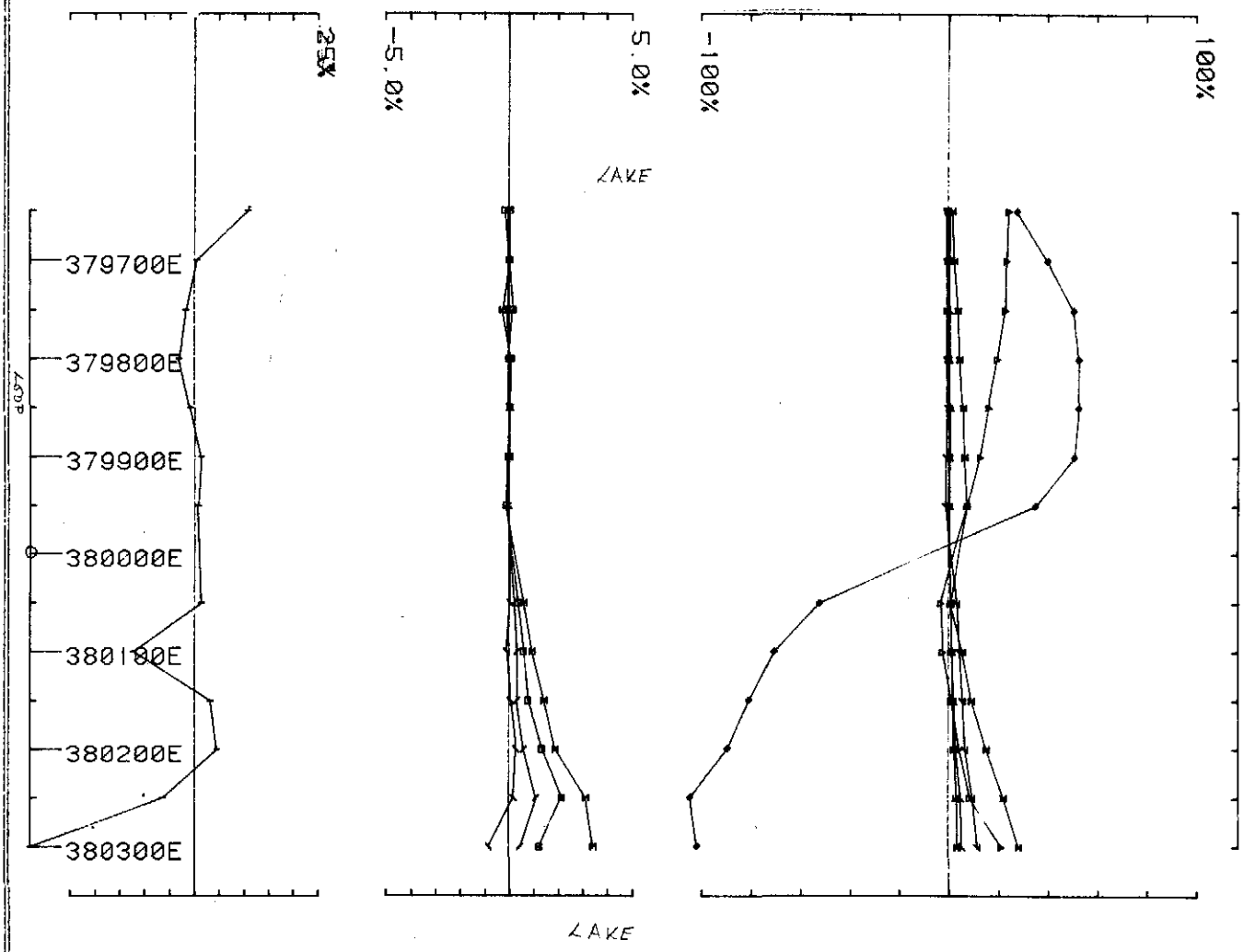
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- HU GL PMM
Line 377000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0018
LINE 377000

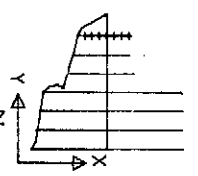
257

960258



5 cm

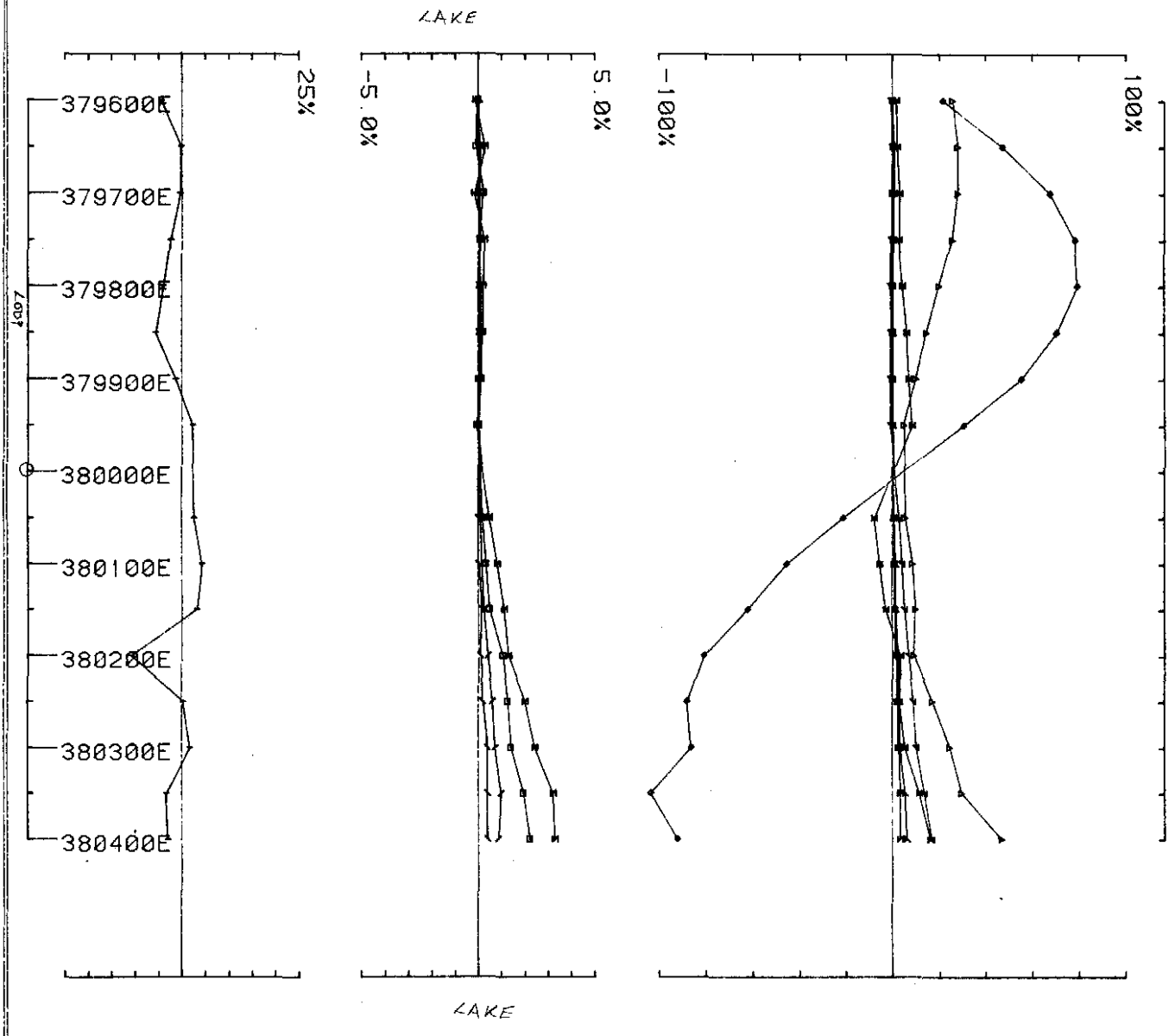
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- PMM HU GL
Line 379500N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0019
LINE 379500
Hz

258

960259



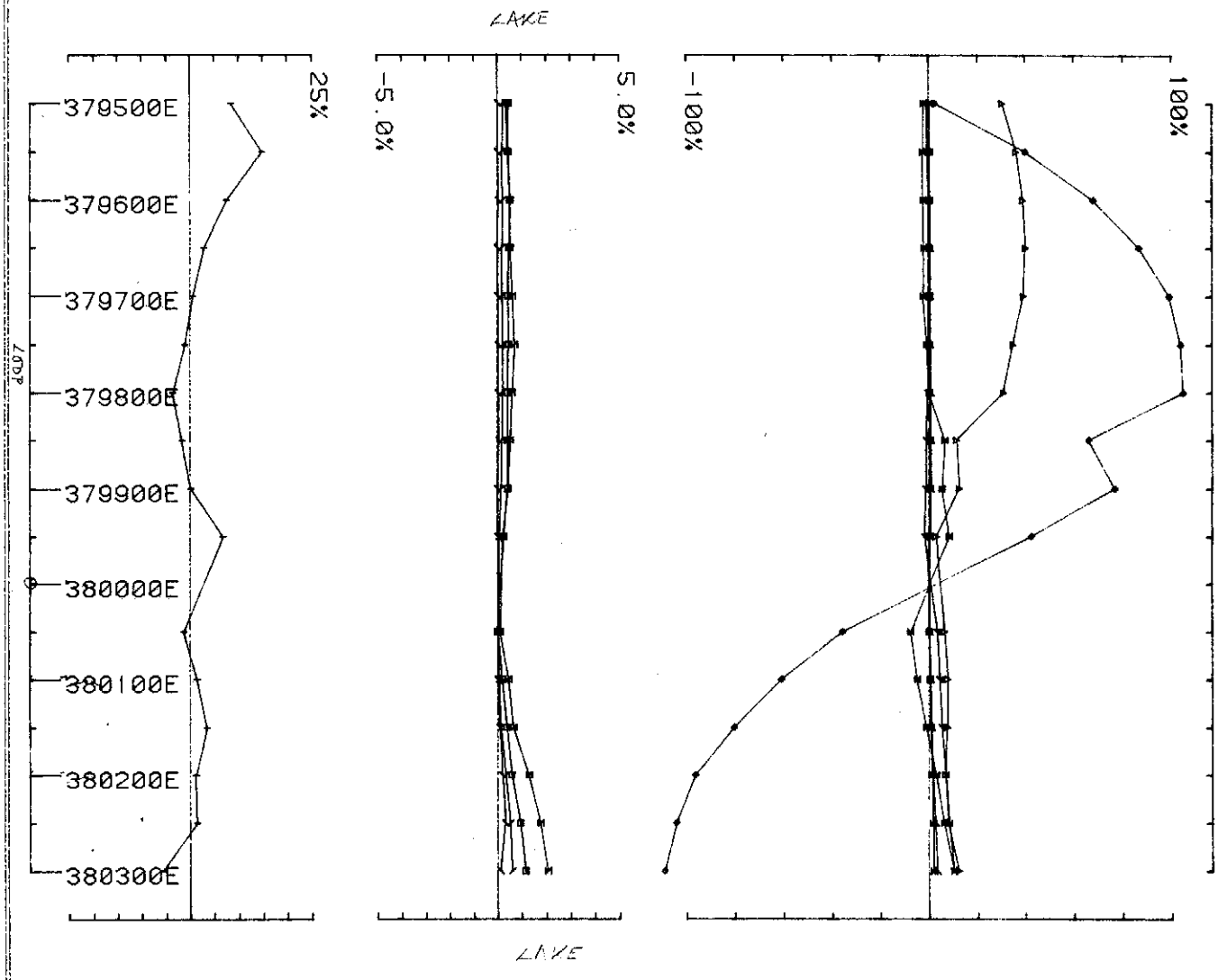
5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- PMM HU GL
Line 379250N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

ROSEBERY EAST
LOOP 0019
LINE 379300N
Hz

259

960260



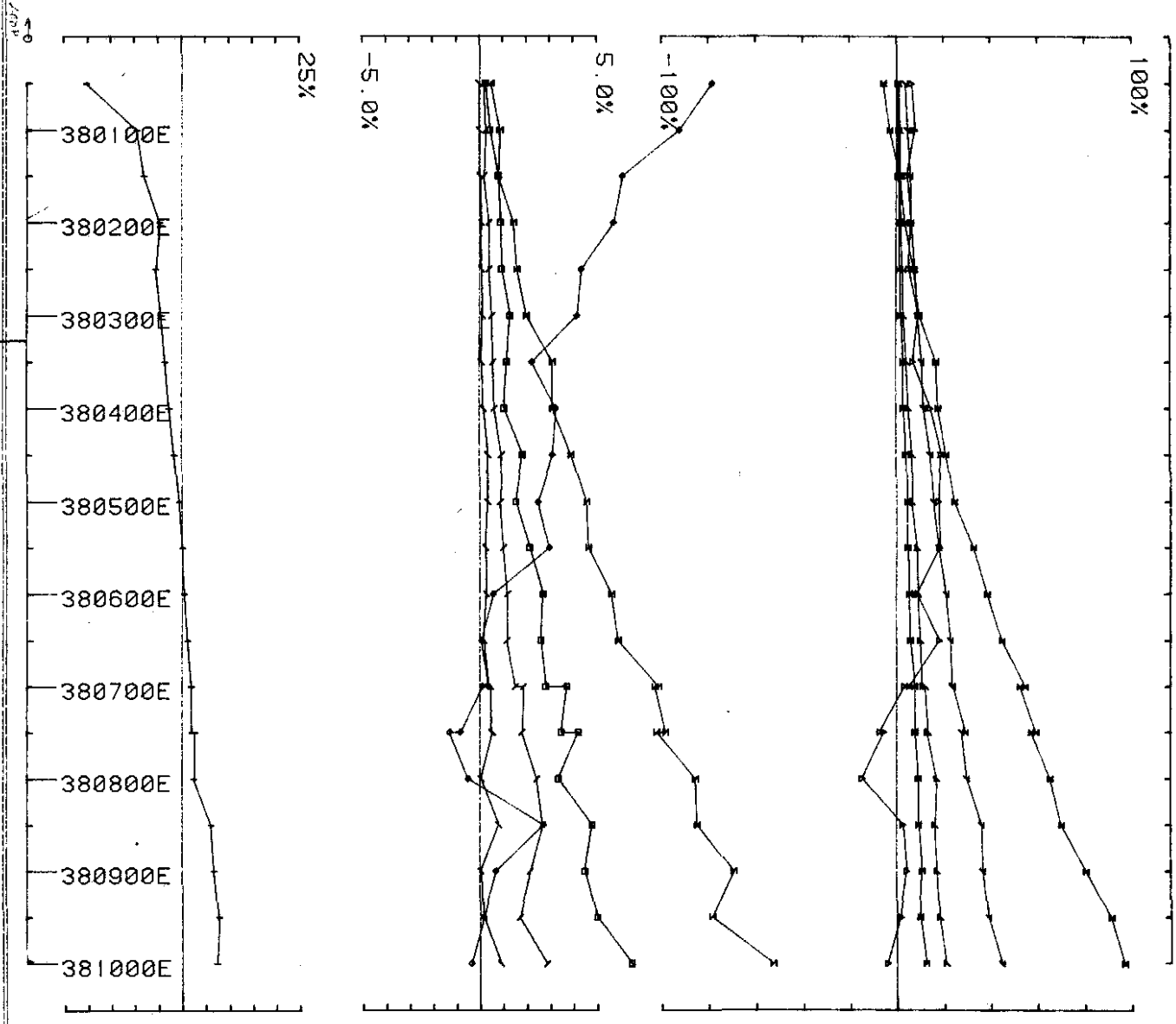
5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- PMM HU GL
Line 379000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

ROSEBERY EAST
LOOP 0019
LINE 379100N
Hz

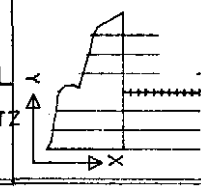
960261

260



5 cm

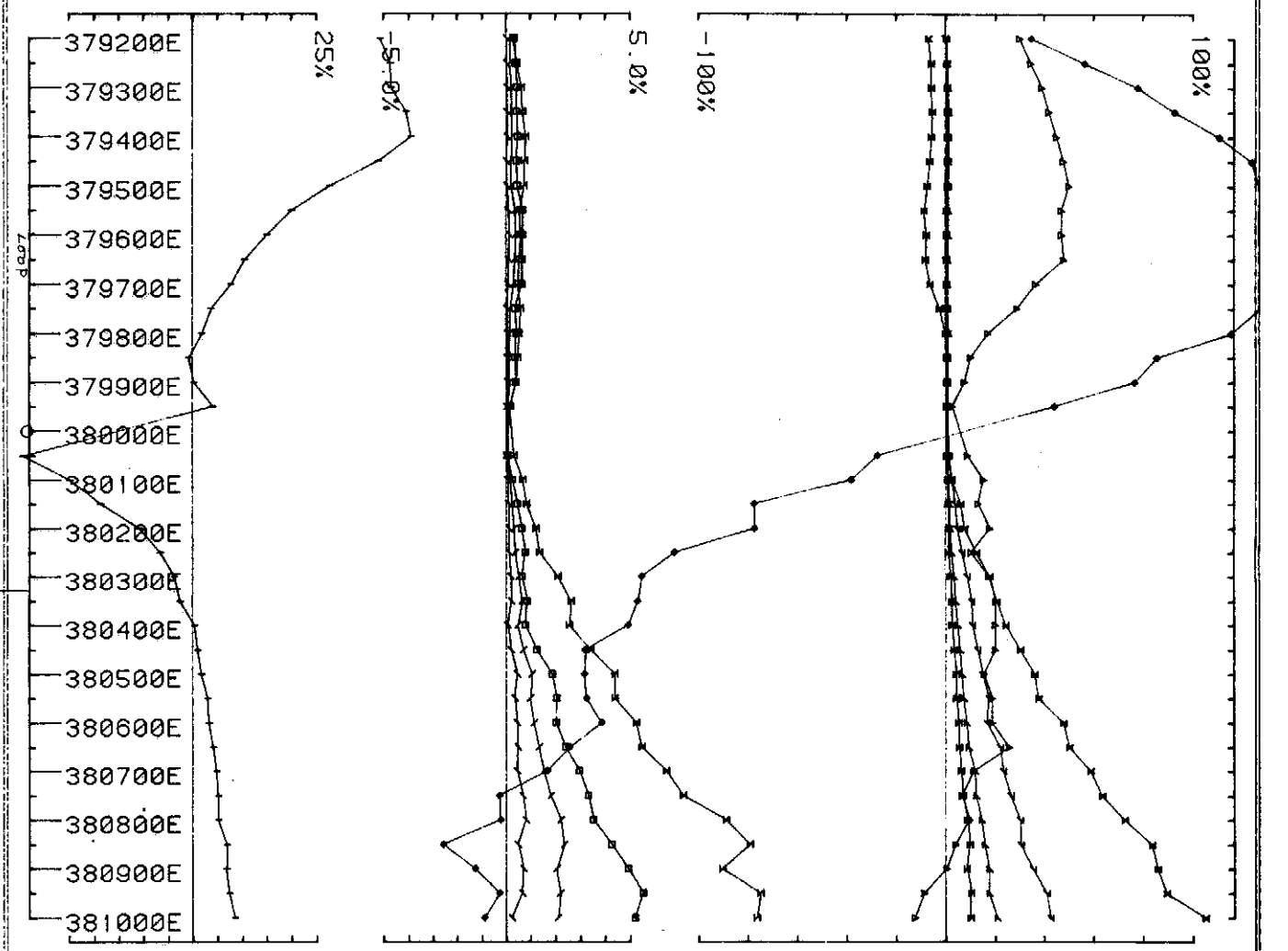
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- PMM HU GL
Line 378750N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0019
LINE 378750N
Hz

261

960262

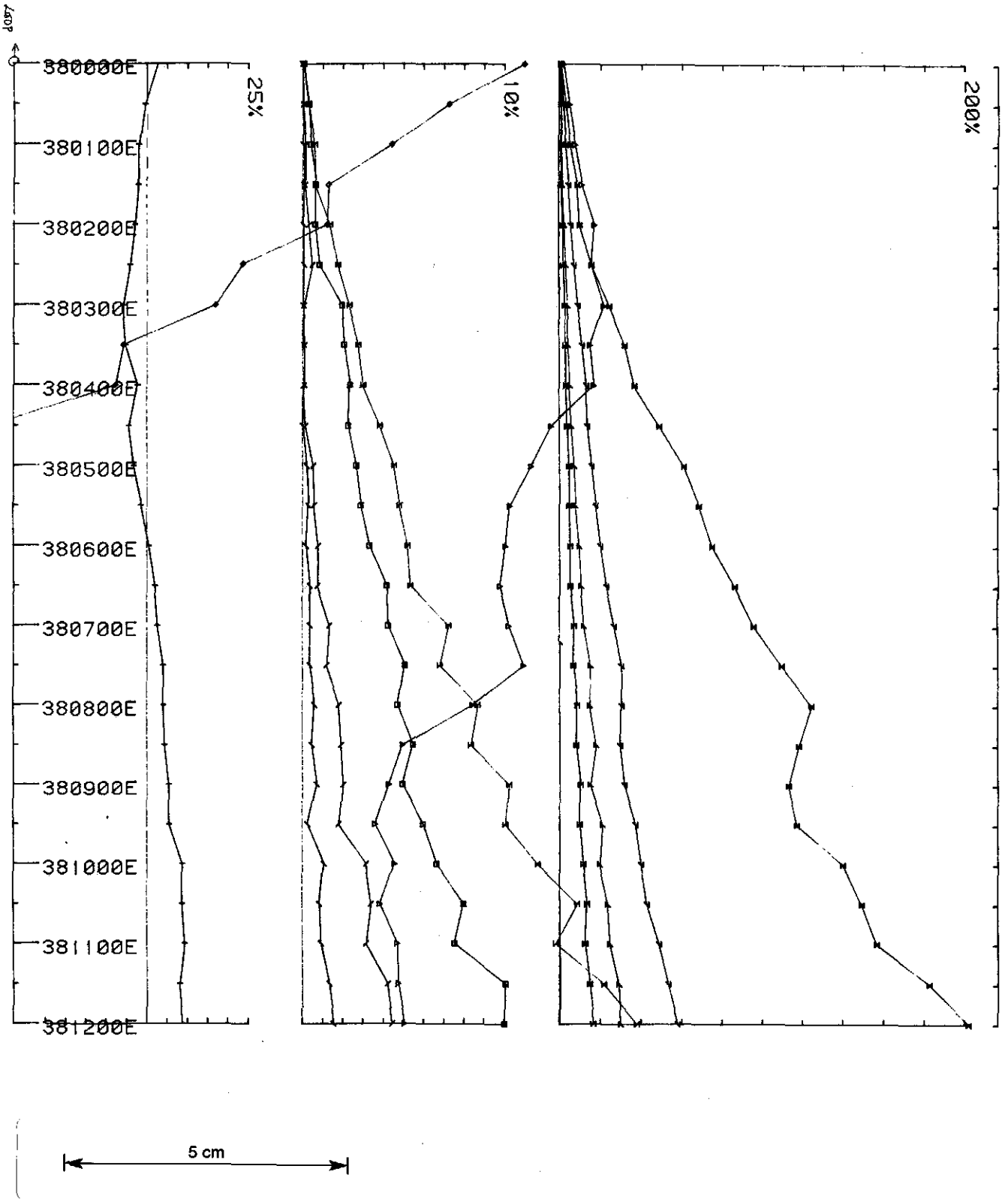


LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- PMM HU GL
Line 378500N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

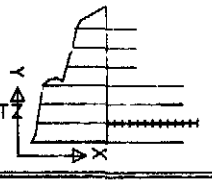
ROSEBERY EAST
LOOP 0019
LINE 378750N
Hz

262

960263



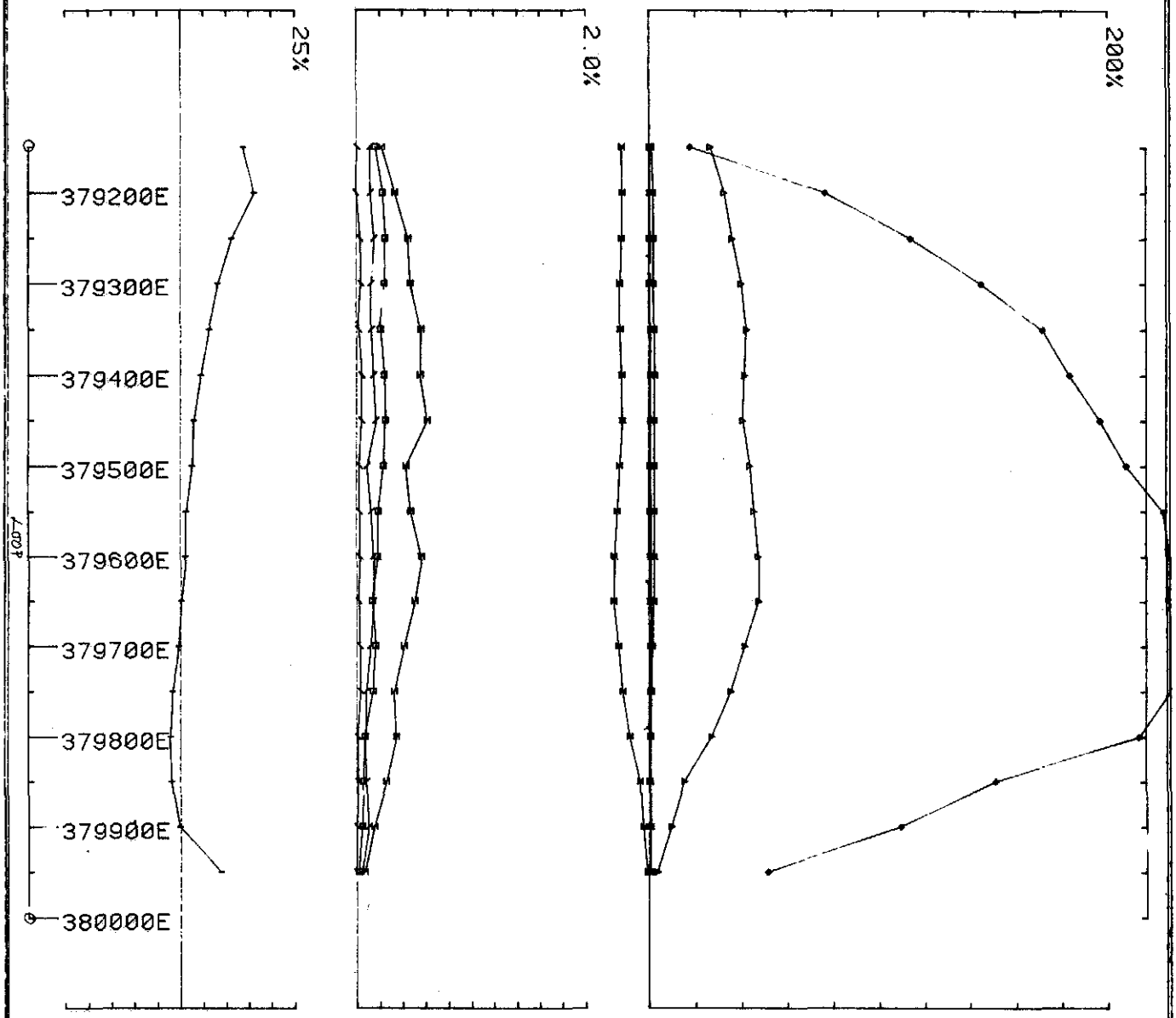
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- PMM HU GL
Line 378400N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0019
LINE 378400N
Hz

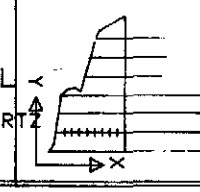
960264

263



5 cm

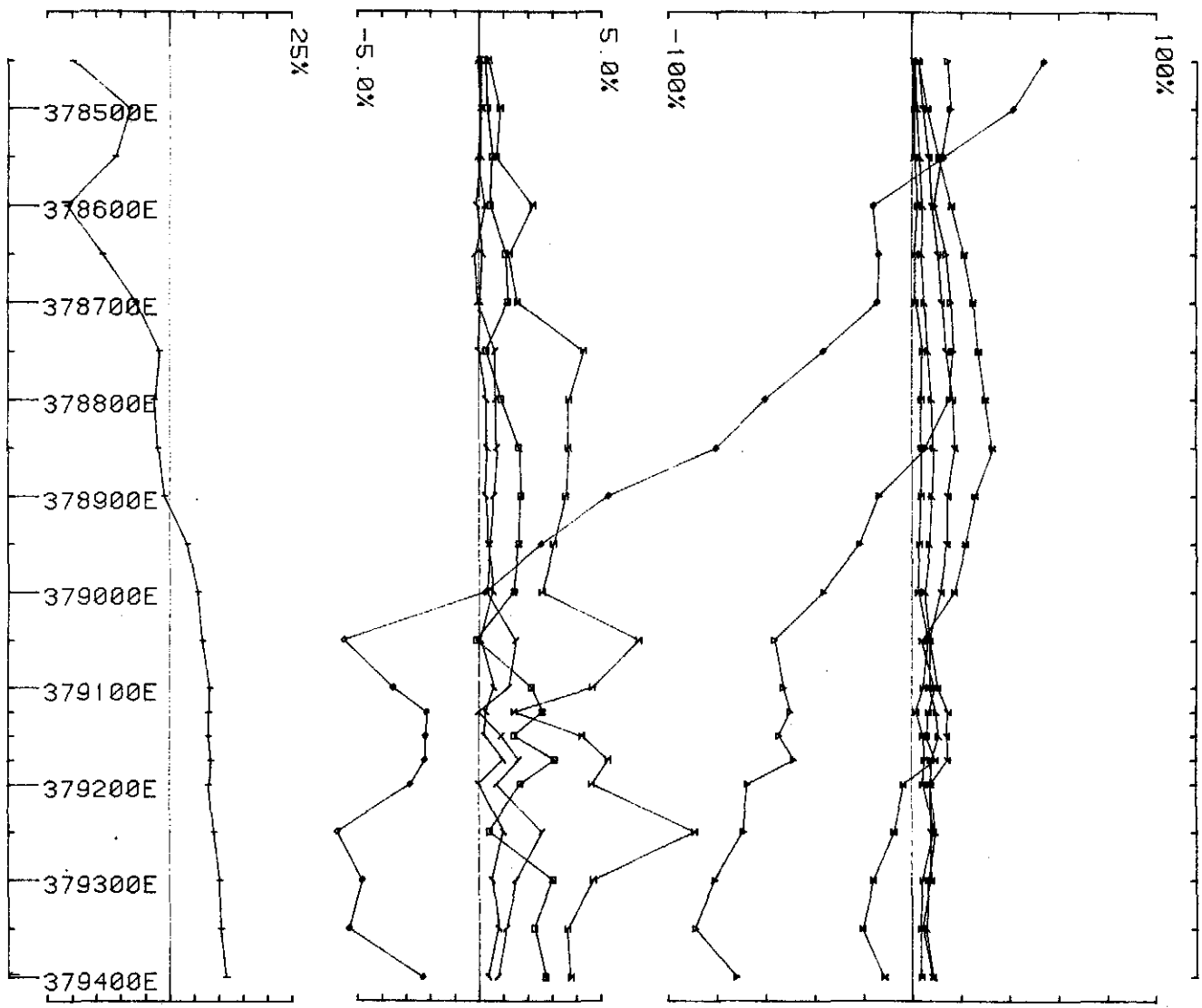
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON AUSTRALIA CREW :- PMM HU GL
Line 378400N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0019
LINE 378400N
Hz

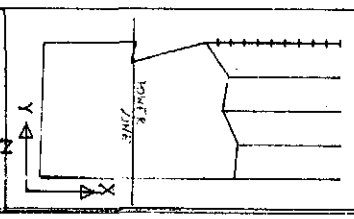
960265

264



5 cm

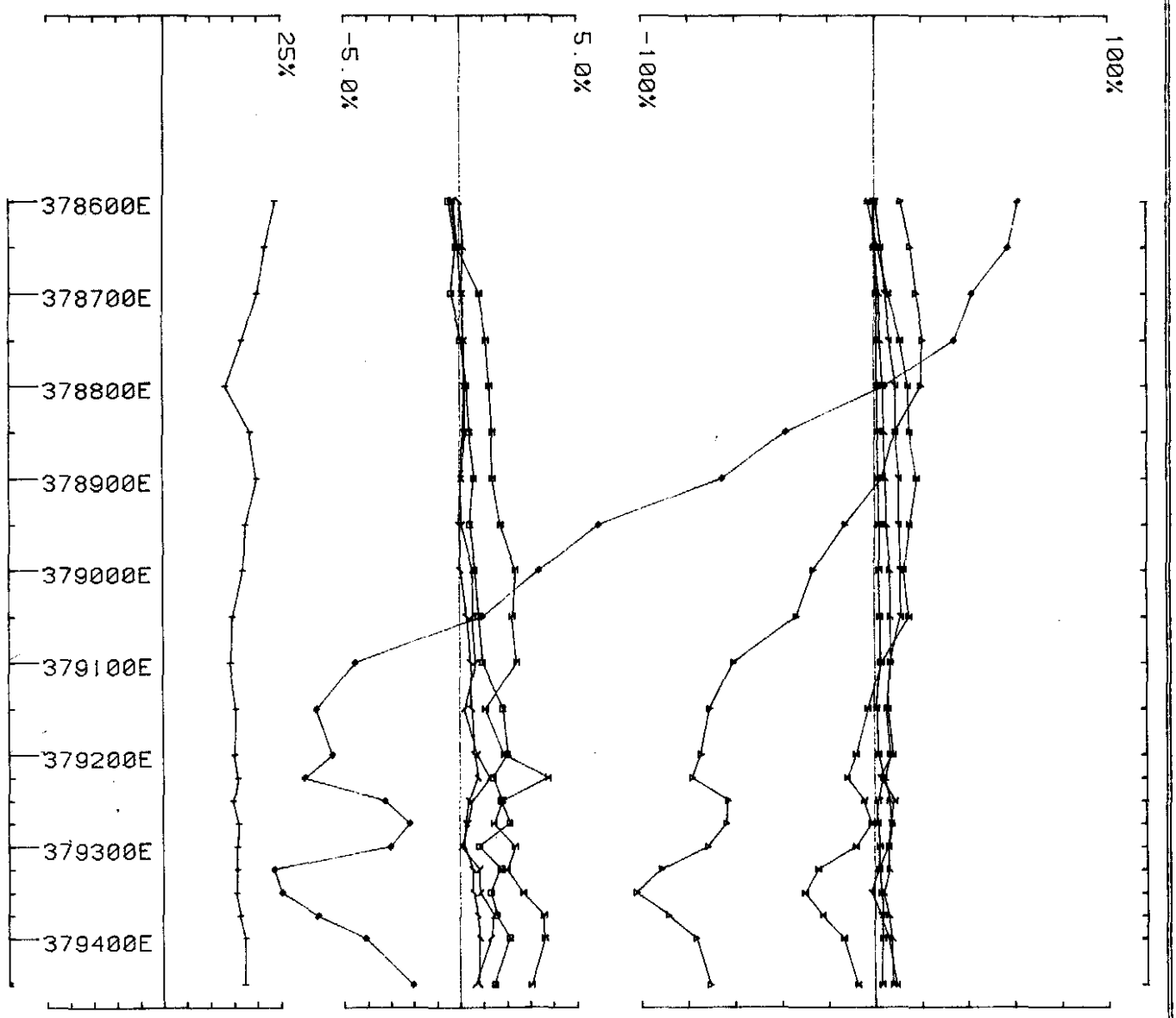
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM HU GL
Line 378000N Hz COMPONENT BASE FREQ :- 26 230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 8020
LINE 378000
Hz

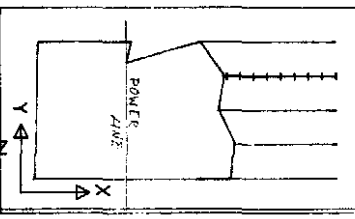
960266

265



5 cm

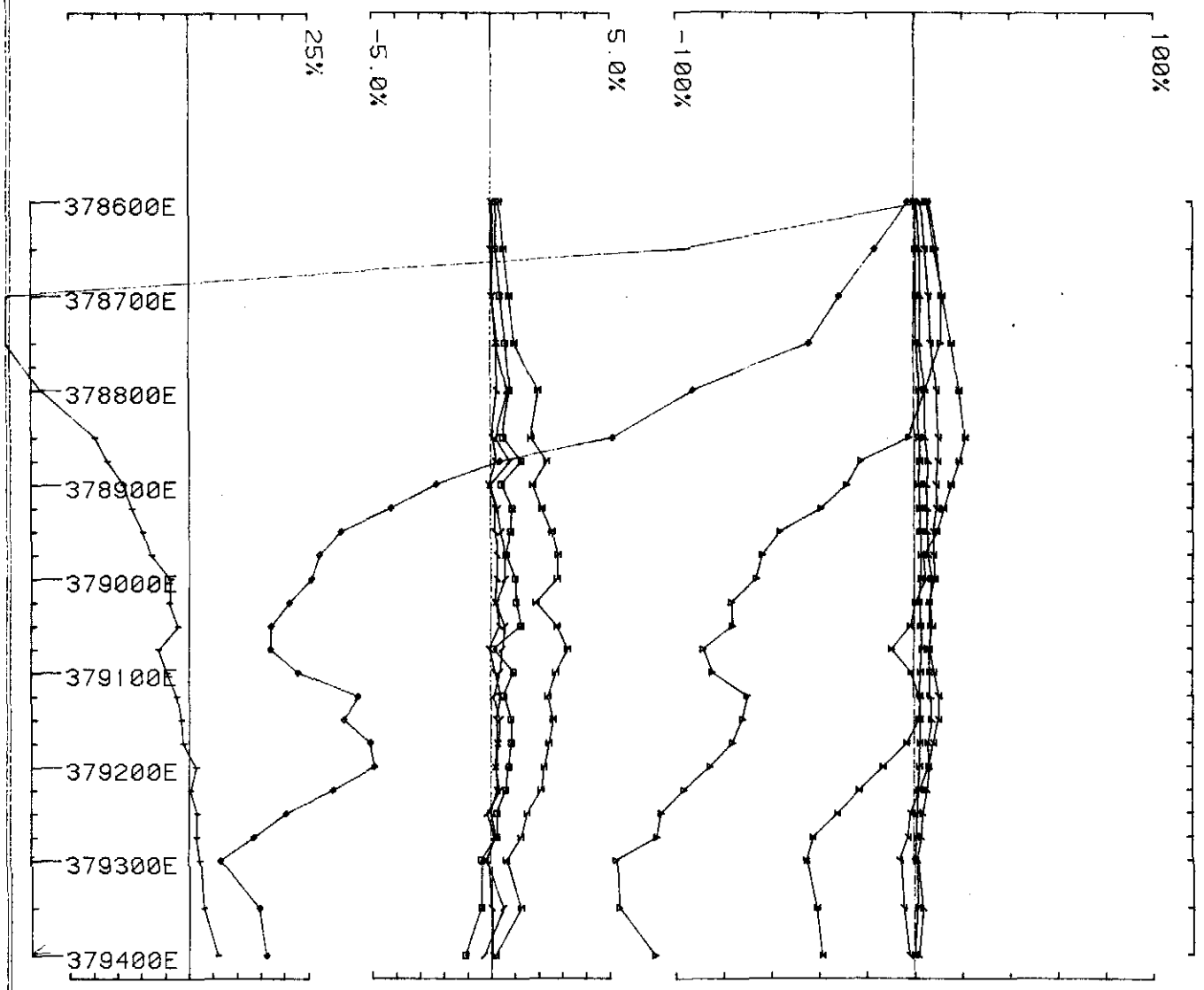
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM HU GL
Line 377750N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0020
LINE 377750
Hz

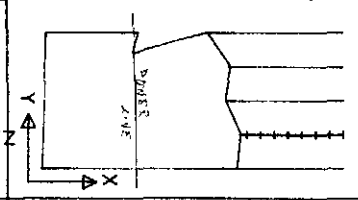
960267

266



5 cm

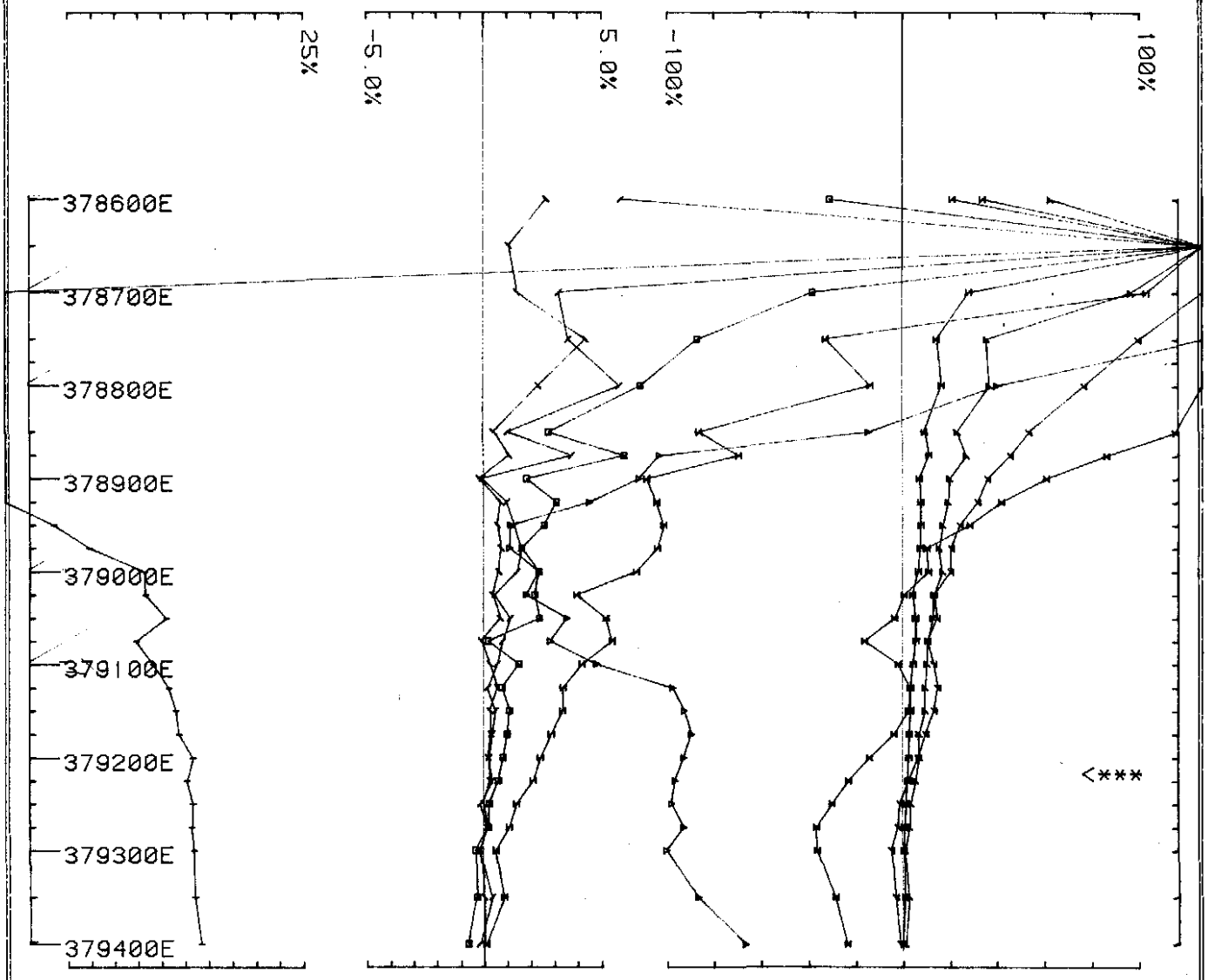
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM HU GL
Line 377250N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0020
LINE 377250
Hz

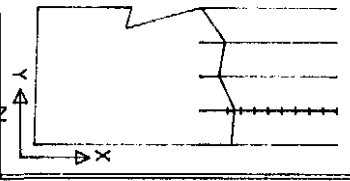
267

960268



5 cm

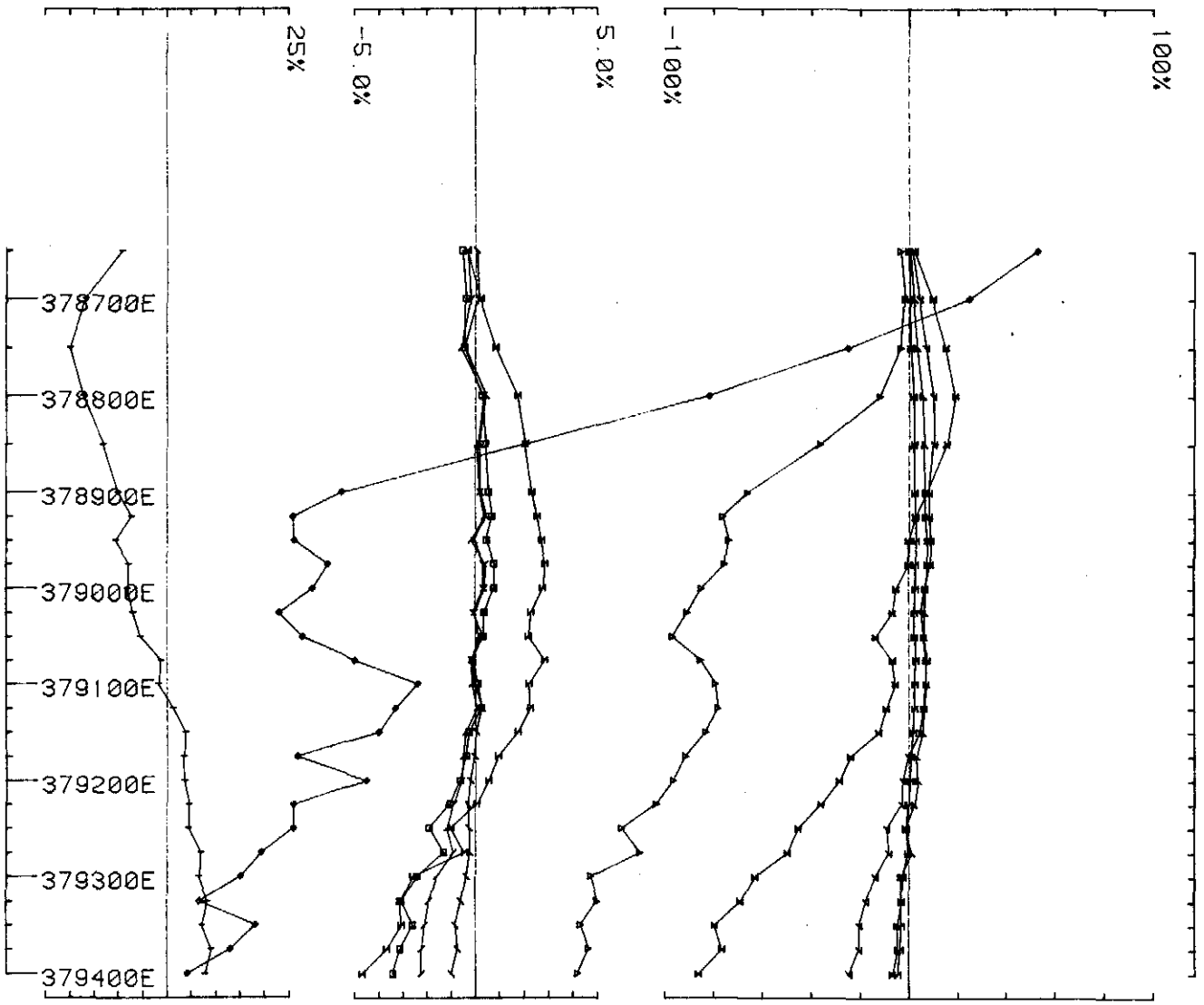
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM HU GL
Line 377250N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD POINT Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0020
LINE 377250
Hz

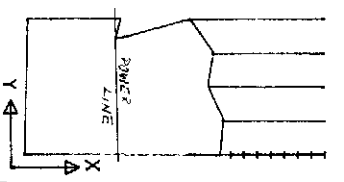
960269

268



5 cm

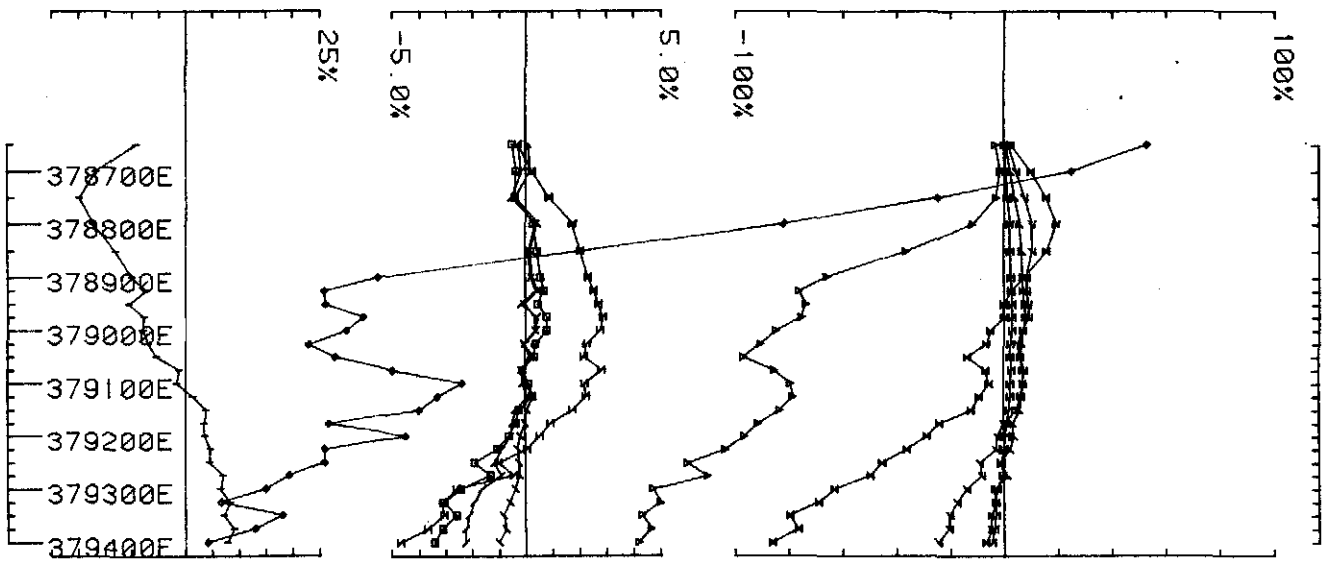
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM HU GL
Line 377000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0020
LINE 377000
Hz

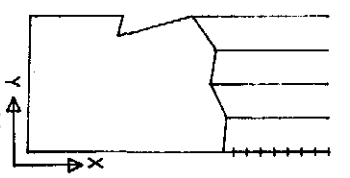
269

960270



5 cm

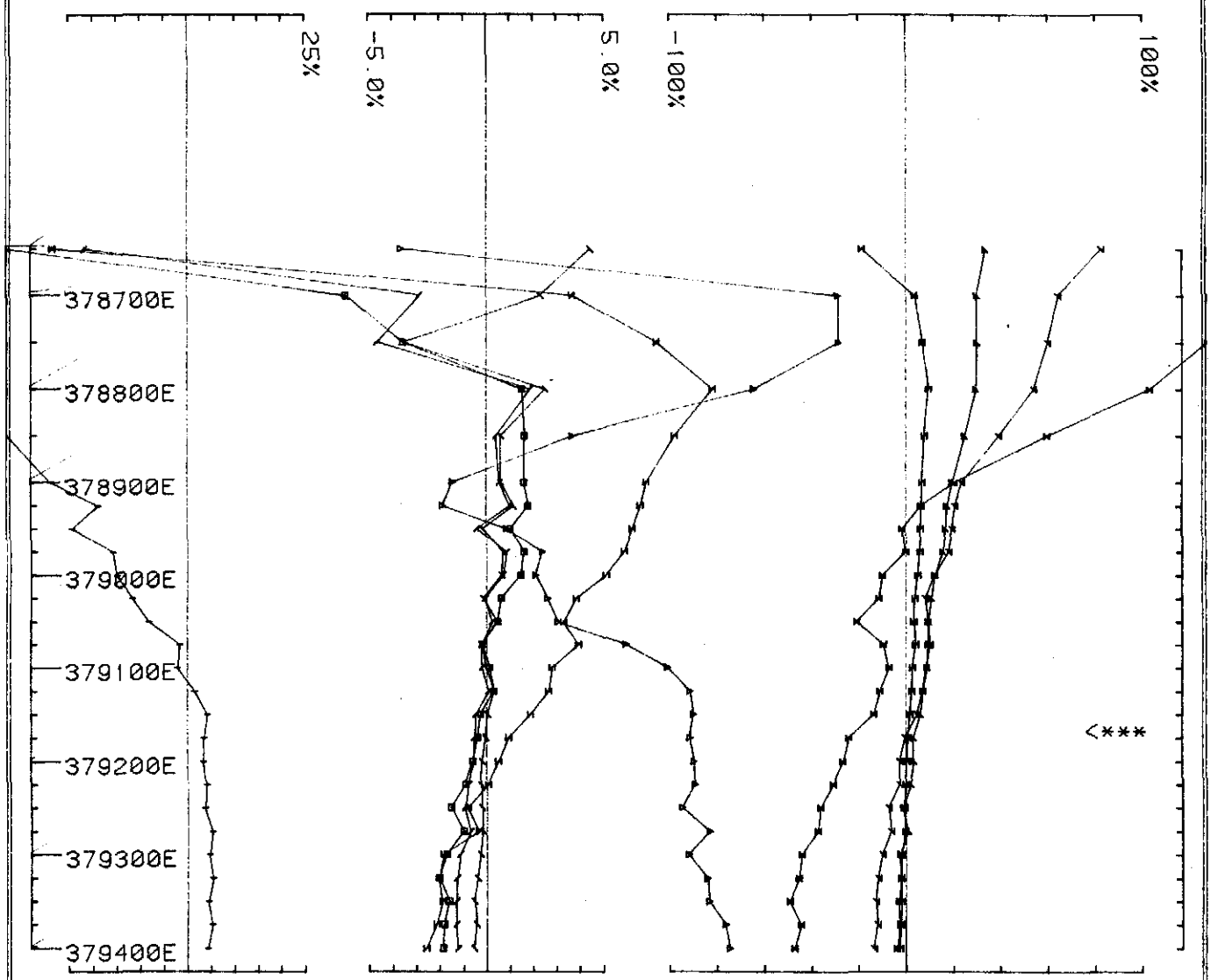
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM HU GL
Line 377000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0020
LINE 377000
Hz

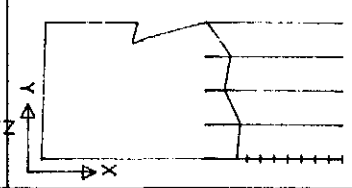
270

960271



5 cm

LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- ROSEBERY EAST
CLIENT :- BILLITON CREW :- PMM HU GL
Line 377000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD POINT Ch 1 NORMALIZATION



ROSEBERY EAST
LOOP 0020
LINE 377000
Hz

272

960272

APPENDIX II

CSAMT Survey, Interpretation Report

273

960273

CSAMT SURVEY, FINAL REPORT

ROSEBERY EAST, CUTTY SARK PROSPECT

near ROSEBERY, TASMANIA

for BILLITON AUSTRALIA PTY. LTD.

FEBRUARY, 1986

by

ZONGE ENGINEERING AND RESEARCH ORGANISATION

(AUSTRALIA) PTY. LTD.

JOB 578/584

Billiton Job 578/584

Introduction:

At the request of Billiton Australia, Zonge Engineering mobilized a crew to Rosebery, Tasmania, on the 22nd of February, 1986. Surveys were conducted in two areas within the Cutty Sark prospect and Rosebery mine lease. Work on the second site was completed on the 23rd of March, 1986.

Three traverses were completed in this lease area using two separate transmitter sites. The initial traverse followed lines 9900N, 7300N and 7000N which provided more-or-less continuous East-West data coverage. Two shorter traverses were completed several kilometres south; see lines 3900N and 4700N. On all lines, data for each station was collected from 16 Hz to 4096 Hz. The purpose of this survey was to identify and locate possible conductive structure on the 9900N/7000N series traverse. Data along the 3900N and 4700N traverse was collected as part of a test to identify and locate electrically known dipping conductive structure.

Conclusion:

Test lines 3900N and 4700N show the easterly dipping trend of the target conductor. Electrically this conductor outcrops/subcrops on or about station -1 (100W) on both lines.

On the single traverse line to the north (see line 9900N, 7300N and 7000N), results similar to the test line results were not observed. A weakly defined electrical contact is identified between lines 9900N and 7300N; also contacts are identified on the west end of 9900N and the far east of line 7000N. The only anomalous feature on this extended traverse is the conductor identified at station 793E/line 7300N.

This conductor appears to be primarily a vertically defined feature. However, it is possible that easterly dipping structure could produce similar results. The situation is complicated by rather severe topographic relief which can physically mask small features which may indeed outcrop/subcrop only a short distance away. No other significant anomalous features are identified.

General Discussion

All survey lines are strongly influenced by the near-field/far-field transition notch and near-field effects. The transition notch frequency occurs about 512/1024 Hz; near-field effects are observed below the transition notch frequency.

Resistive structure is observed at depth on all lines. As a result of the combination of resistive structure at depth and the geometric effects of near-field resistive doubling, it is sometimes extremely difficult to define the on-set frequency for the observed near-field resistivities when structural resistives are increasing with depth as well.

Lines 3900N and 4700N clearly define easterly dipping conductive structure already located by drilling. Both these lines were completed as test lines. It is difficult to assign depths to resistivity/phase data because of strong near-field geometric effects. It should be noted that while the transition notch (not readily observed on some data) and associated near-field data will combine in most cases to provide useful input for interpretation, this data is strongly controlled by geometric considerations (such as the relative placement of the transmitter dipole and receiver dipole) and the geology in the vicinity of the transmitter site. There is no simple geometric adjustment which will allow near-field data to be interpreted as far-field data. Quantitive interpretation of near-field data remains a fairly sophisticated computer based modelling exercise.

On all lines, data was collected at nine discrete frequencies: from 16Hz to 4096 Hz. Data obtained at 16 Hz represents the greatest depth of investigation for this survey. A single transmitter site is used to acquire data on lines 9900N, 7300N and 7000N. A second site is used for lines 3900N and 4700N.

Line 9900N

This CSAMT survey line is positioned on the Imperial Grid. The traverse extends from station -33 (3300W) to station 15 (1500E). The traverse is generally characterized by increased resistive layering at depth. The transition notch frequency appears to occur at 1024 Hz; data acquired below this frequency is strongly dominated by near-field geometric effects.

A major cross country power line crosses the survey line at -18 (1800W). The unfiltered log apparent resistivity/log frequency sounding plots show the effect of the power line 50/150/250 Hz noise (see stations 1800W and 2100W). A digital power line filter has been applied to the data and eliminates most of the power line ringing. See the filtered series of plots which have been used to generate the CSAMT profile plots. Near-surface static offset effects are seen on line 9900N. This appears to be confined to data collected northeast of station -3(300W). A comparison between the Resistivity from Phase and Cagniard Resistivity data indicates which data is influenced by static offset effects.

Interpretation of the Resistivity from Phase data and Phase Difference data suggest the following:

- Laterally defined electrical contact observed on or about station -33 (3300W).
- Possible geologic fault near station -18 (1800W) or off-line feature observed between stations -18 (1800W) and -9 (900W).
- Resistive structure near-surface between stations 3 (300E) and 12 (1200E).
- Laterally defined electrical contact observed on or about station 15 (1500E), possibly an off-line effect.

Along this line, surface weathering appears to be confined to the upper 30 metres.

Line 7300N

Line 7300N extends CSAMT survey coverage further east along the original traverse line 9900N. However, a different grid base is used for line 7300N which explains the difference in easting coordinates between the two lines. There is approximately a 30 metre offset between the two lines. Station 15 (1500E)/line 9900N is approximately on the same easterly alignment as station 788E/line 7300N.

As observed on line 9900N, resistivities generally increase with depth. However, the transition frequency appears at 512 Hz (rather than 1024 Hz as observed on line 9900N). This suggests that a change in geology has occurred moving east with an overall general decrease in resistives most probably associated with depth. Only a major change in resistivities can really effect the transition frequency in this manner.

On line 7300N, the log apparent resistivity/log frequency curves suggest that strong static offset effects occur: compare the resistivity sounding plots for stations 788E, 789E and 790E. The shape of each individual curve is similar, but the curves are offset on the plots.

A comparison between the Resistivity from Phase data and the Cagniard Resistivity data identify static offset features. Note that on the Cagniard Resistivity section, a conductive feature centered on stations 791E and 792E does not appear on the Resistivity from Phase section. This appears to be a good candidate for static offset which diminishes the importance of this feature. However, the Resistivity from Phase data indicates a very strong conductive feature centered at station 793E. The feature is identified in the Cagniard Resistivity data once it is realized resistive surface structure masks the conductor. Otherwise one might be tempted to dismiss this feature as a one-station anomaly which may be bo gus. The Resistivity from Phase technique allows investigation of static offset effects that result from thin layered conductive/resistive structure (usually surface or near-surface) or from off-line structure (topography can produce such an off-line effect).

Interpretation of the Resistivity from Phase and Phase Difference data suggest the following:

- A laterally defined electrical contact is identified at station 788E (see also station 1500E/9900N) in the Cagniard Resistivity section which is not observed on any phase derived data. As resistive layering appears similar on both sides of this contact, it is possible that some feature (shear zone or electically equivalent) exists between lines 9900N and 7300N.

- A conductive feature is identified at station 793E. While this feature could be a topographic artifact, station 793E is not coincident with topographic low which occurs just west. Likewise a second topographic low mapped between stations 790E and 791E is not observed in this electrical data at all.

  The intensity of this one-station anomaly may be enhanced by the static offset removal technique and/or current channelling which can be related to anisotropic effects. Note that the Cagniard Resistivity data suggests this feature is buried. This appears to be a bonafide feature. While the Resistivity from Phase data suggests this feature is a near-vertical conductor, an argument could be made for thinly bedded conductive layers with a moderate easterly dip as a possible explanation.

  This conductor appears to subcrop, possibly within 25 metres of the surface. This feature would not necessarily have to be very wide and depending on conductivity/thickness may be less than 20 metres in width.

  It is natural to try to compare this anomaly with known conductive structure on lines 3900N and 4700N, but there is no direct basis for this comparison. The conductor on lines 3900N and 4700N is obvious on the profile sections. The anomalous feature at 793E is basically confined to the vicinity of one station and really appears near-vertical. However, similar results as seen at station 793E have been observed with shallow dipping thinly bedded conductive structure in resistive host rock. Such conductive structure may have several narrow highly conductive bands each only several metres wide.

The Phase Difference data suggests the possibility of different resistivity layering characteristics to the west and east of station 793E. Resistivities appear somewhat lower at depth east of station 793E, higher west of station 793E. The west half of line 7300N more closely relates to the layering characteristics of line 9900N; the east half of line 7300N, to line 7000N. This observed difference is probably related to subtle changes in resistive layering at depths greater than 200/300 metres.

Line 7000N

Line 7000N is a continuation east of the coverage provided by line 7300N. The same grid system is used for control on both lines. While the easting stations are continuous across the two lines, there is a 300 metre offset between the two lines. Generally a rather uniform electrical section is observed on line 7000N with resistivities increasing with depth. Minor static offset conditions are recognized most easily by comparing the Cagniard Resistivity and Resistivity from Phase data.

The transition notch frequency changes going from west to east; essentially it is observed at 1024 Hz at the west end of line 7000N shifting to 512 Hz at the east end. This appears to be caused by changes in resistivities at depth as surface/near surface resistivities appear unchanged between stations 797E and 807E. However, a major resistive contact appears to be identified at station 810E and a laterally defined near-surface conductive change is suggested at station 808E. This is observed in both the Cagniard Resistivity and Resistivity from Phase sections. Resistivity changes mentioned at depth are probably occurring below 300 metres and are not considered anomalous - most likely this is an overall geologic trend. Insufficient data exists to analyse the contact (?) at station 810E.

Lines 3900N and 4700N

On both lines the transition notch frequency occurs at 512 Hz. Note that station 0 for these lines is coincident with EZ grid station 00. As units of "feet" are used for the EZ grid, CSAMT stations are identified on "feet" based coordinates (61m equals 200 ft).

Both lines share similar characteristics and as a result this discussion will be directed to both lines. In general the electric sections indicate increasing resistivities with depth. Both lines identify an easterly dipping horizon which outcrops west of station 0. This is the target feature. On line 3900E a conductive outcrop is identified between sections -5 (500W) and 1 (100E); on line 4700N, between stations -1 (100W) and 1 (100E). In both cases a smaller E-field dipole would have provided higher resolution capabilities in locating electrical contacts.

279

The near-surface characteristics of the conductor indicate a surface intercept of 400 to 600 feet for line 3900N; 100 to 200 feet for line 4700N . As linear depth plots are used, an easterly dip angle of approximately 45 degrees can be surmised. In addition, second conductive features could be expected at a general depth of 400 metres between stations 5 (500E) and 7 (700E) on line 3900N; a general depth of 300 metres on or about station 3 (300E) on line 4700N.

.....

Emmett Van Reed. Date

960280

CUTTY SARK AREA

POWER LINE

ROSEBERY MINE

MEDIUM

DENSE

CLEAR

CHLORITIC SHEAR

9900N (Imperial Grid ?)

377000N

377300N

377600N

378000E

378300E

379200E

379500E

380000E

380700E

381300E

5 cm

ROSEBERY EAST J.V.

CUTTY SARK AREA

PROPOSED CSAMT LINE(S)

Station Spacing = 100m (300')

1: 10,000

TRACKS
ROADS

NH 24/1/86

Line 4700N
Cutty Sark (MINE LEASE - IMPERIAL GRID)
for
BILLITON AUSTRALIA

CSAMT SURVEY DATA
CAGNIARD RESISTIVITY

values in ohm-meters
<RHO-E

[Plot limited and LOGARITHMIC CO
(Interval, 0.20)

[82.9Ω	3981.
63.1K	2512
39.8K	1585.
25.1K	1000.
15.8K	631.
10.0K	398.
6310.	[345.3

281

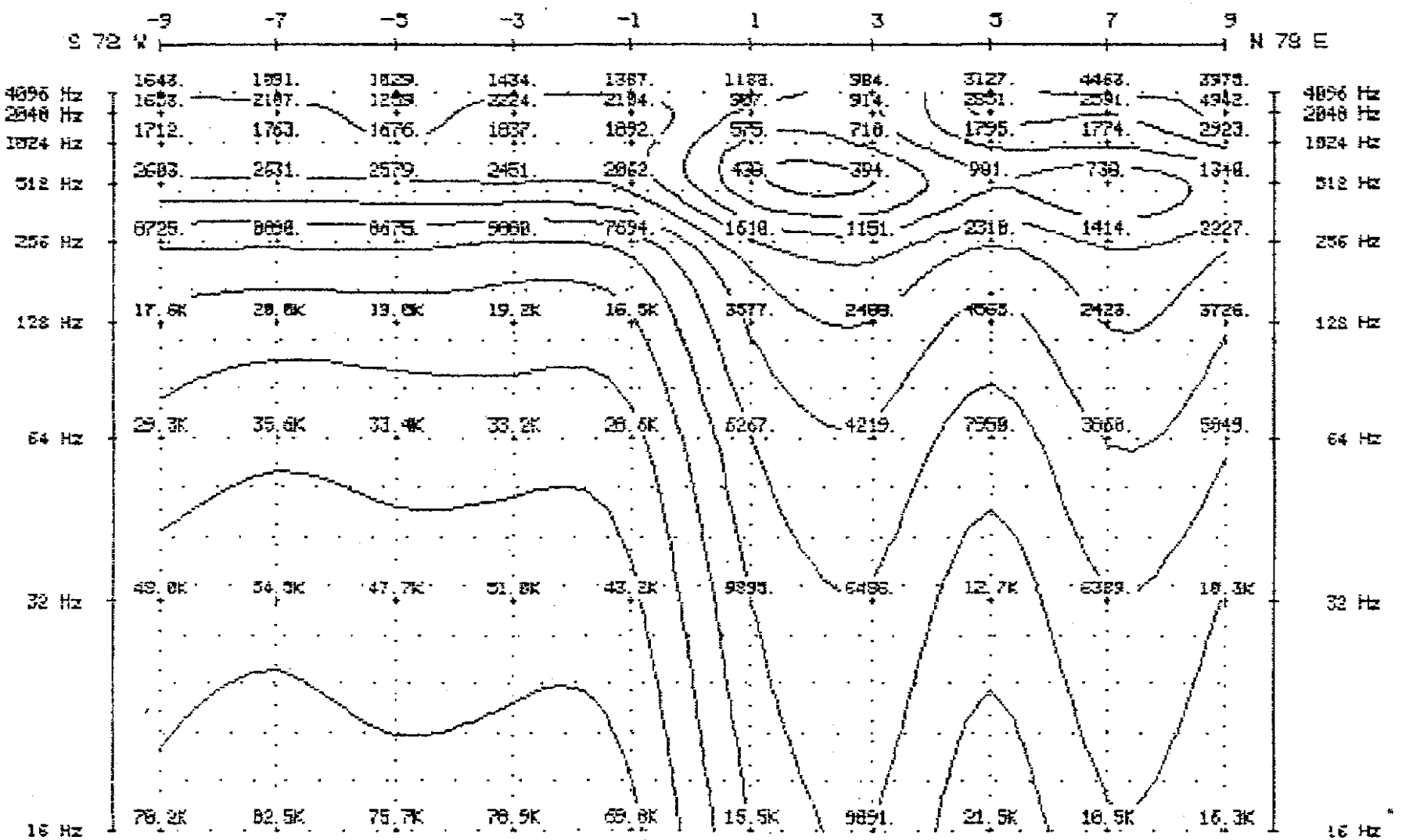
ZONGE # 324
PLOT BY CPLOT 3i
PLOTTED 26 Nov 86

5 cm

RECEIVER DATA
LonGth . 61.m Line . N 78 E
SPacinG. 61.m DiPole. N 78 E

Surveyed Mar 86

TRANSMITTER DATA
LonGth . 1.3 Km
Orient. . N 78 E
Distance 9.2 Km
Rx to Tx. South



9602281

05/21/1986 06:29 E.R.U. USH Howdy Trail 61 BKE 360 1000 r.ew

Line 4700N
Cutty Sark
for
BILLITON AUSTRALIA

CSAMT SURVEY DATA
RESISTIVITY from PHASE

NORMALIZING RHO 1029, REF STA: -5.0
<RHO-C>PHZRHO

(Plot limited and LOGARITHMIC CO
(Interval 0.20)

0196.K	6310.
100.K	3981.
63.1K	2512.
39.8K	1585.
25.1K	1000.
15.8K	631.
10.0K	0398.1

ZONGE # 384
PLOT BY CPLOT 3i
PLOTTED 28 MAY 96

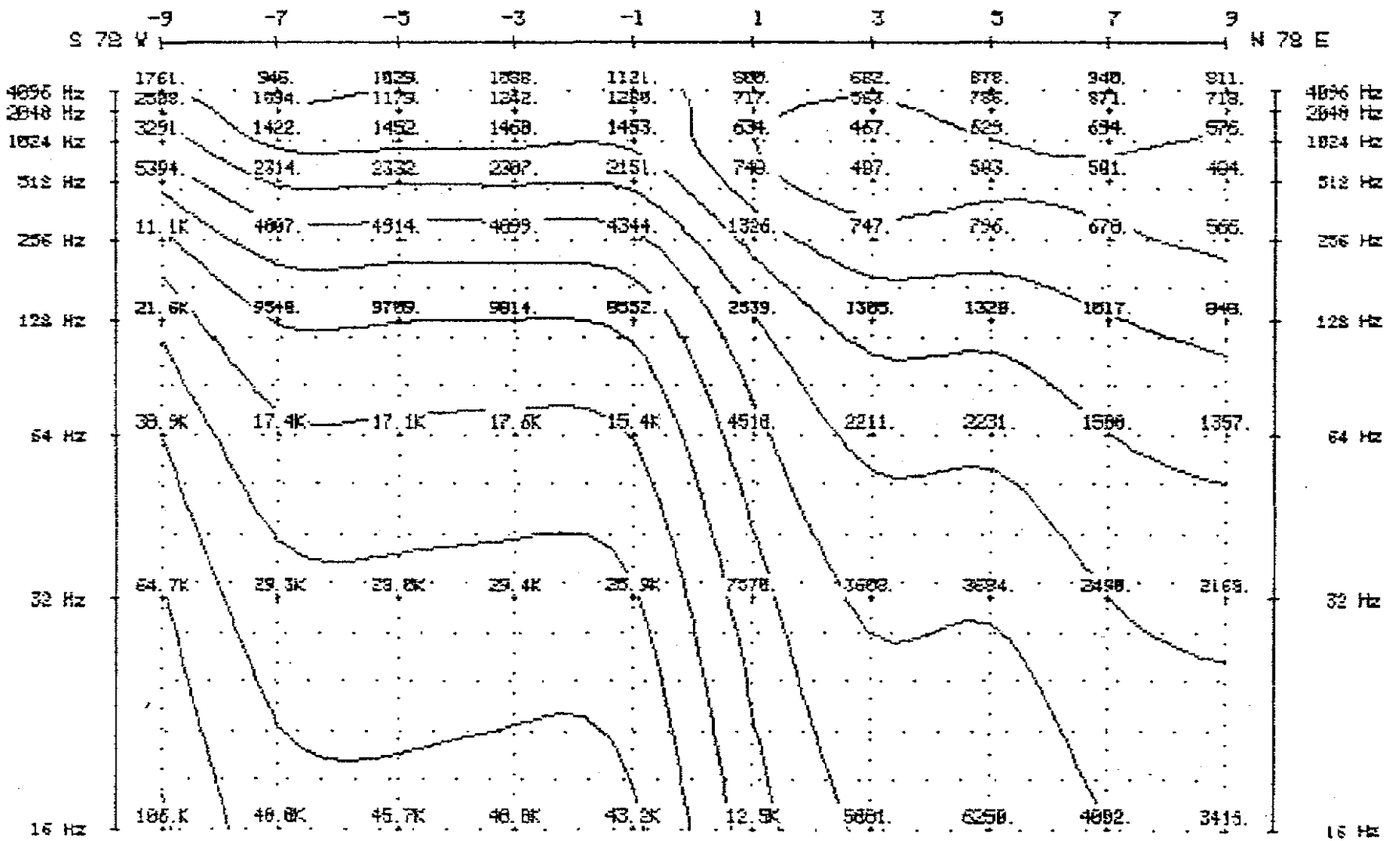
5 cm

RECEIVER DATA
Length . 61.m Line . N 78 E
SPacing 61.m DiPole N 78 E

Surveyed Mar 96

TRANSMITTER DATA
Length . 1.3 Km
Orient. . N 78 E
Distance 9.2 Km
Rx to Tx South

282



9602282

05/21/1986 08:27 Z.E.R.U. USH Howdy Y'all 01 002 320 1000 F.44

Line 4rd0N
Cutty Sark
for
BILLITON AUSTRALIA

CSAM: SURVEY DATA
PHASE DIFFERENCE (E - H)

values in milli-radians
<PDIFF

ZONGE # 584
PLOT BY GPLOT 3i
PLOTTED 30 NOV 96

5 cm

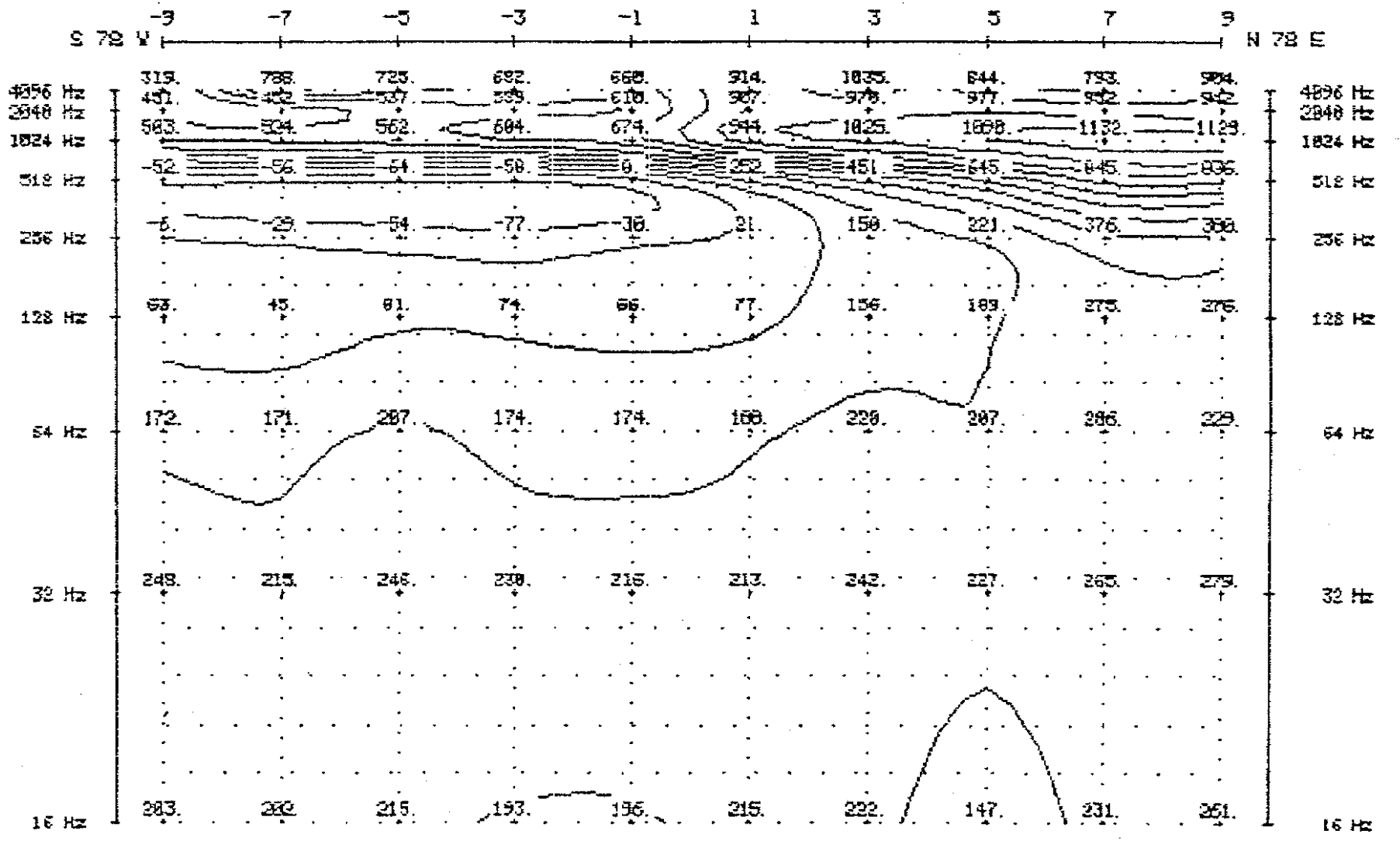
RECEIVER DATA
Length . 61.m Line . N 78 E
Spacing 61.m Dipole N 78 E

Surveyed Mar 96

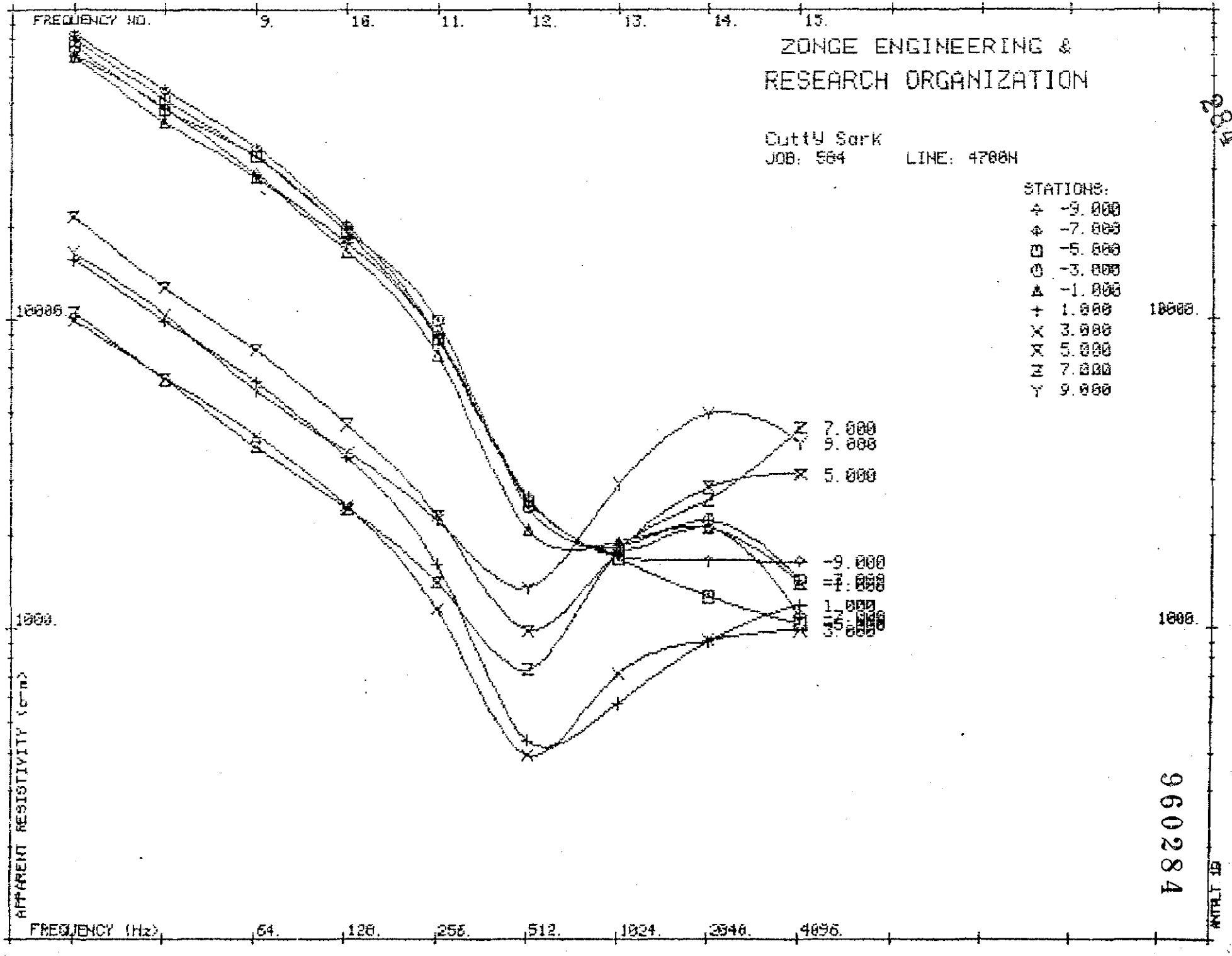
TRANSMITTER DATA
Length . 1.3 Km
Orient. . N 78 E
Distance. 9.2 Km
Rx to Tx. South

Int	Rad	ARI	PFC
(Interval: 100.00)			
12	[1234.]		400.
11	1100.		300.
10	1000.		200.
9	900.		100.
8	800.		0.00
7	700.		-100.
6	600.		[-165.]
5	500.		

283



9602283



05/21/1986 08:26 Z.E.R.O. USA Howdy Y'all 01 602 325 1588 P.23

Line 3900N
Cutty Sark (MINE LEASE - IMPERIAL GRID)
for
BILLITON AUSTRALIA

CSAMT SURVEY DATA
CAGNIARD RESISTIVITY

values in ohm-meters
<RHO-C

[Plot limited and LOGARITHMIC CO
(Interval. 0.20)
[329.K 6310.
251.K 3981.
158.K 2512.
100.K 1585.
63.1K 1000.
39.8K 631.
25.1K 398.
15.8K [365.]
10.0K

RECEIVER DATA
Length . 61.m Line . N 78 E
SPacing. 61.m BiPole. N 78 E

Surveyed. Mar 95

TRANSMITTER DATA
Length . 1.3 Km
Orient. . N 78 E
Distance. 9.0 Km
Rx to Tx. South

ZONGE # 554
PLOT BY CPLOT 3i
PLOTTED 30 Nov 95

5 cm

CONDUCTOR EAST DIP

-9 -7 -5 -3 -1 1 3 5 7 9
S 78 W N 78 E

4096 Hz
2048 Hz
1024 Hz
512 Hz
256 Hz
128 Hz
64 Hz
32 Hz
16 Hz

912 1396. 2179. 4324. 418. 1833. 1159. 2346. 3184. 6133.
1434. 2557. 4683. 5748. 569. 1813. 1229. 2078. 2850. 4474.
1066. 1618. 3235. 3801. 517. 624. 684. 1379. 1296. 2691.
2106. 2897. 6731. 9669. 831. 444. 373. 576. 621. 1368.
5736. 10.3K 24.7K 34.8K 2994. 1401. 886. 1253. 884. 1857.
12.7K 20.9K 51.7K 73.6K 6798. 3113. 1882. 2381. 1682. 2564.
21.0K 32.2K 86.2K 136.K 12.2K 5444. 2975. 3786. 2931. 5219.
31.5K 48.3K 134.K 181.K 18.9K 8583. 4528. 5714. 4586. 8228.
49.1K 73.8K 283.K 282.K 30.0K 13.4K 6530. 6445. 7046. 12.0K

NEAR FIELD

01 602 325 1588 P.21
05/21/1986 08:24 Z.E.R.O. USA Howdy Y'all

285
960285

05/21/1986 08:22 Z.E.R.O. USA Howdy Y'all 01 602 325 1588 P.20

Line 3900N
Cutty Sark
for
BILLITON AUSTRALIA

ZONGE # 584
PLOT BY CPLOT 3i
PLOTTED 28 MAY 86

5 cm

CSAMT SURVEY DATA
RESISTIVITY from PHASE

NORMALIZING RHO 1306. Reference sta: -7.0
<RHO-C>PHZRHO

RECEIVER DATA
Length . 61.m Line . N 78 E
SPacing. 61.m DiPole. N 78 E

Surveyed. Mar 86

TRANSMITTER DATA
Length . 1.3 Km
Orient. . N 78 E
Distance. 9.0 Km
Rx to Tx. South

CPlot lisrtal and LOGARITHMIC CC
(Interval. 0.20)

86.7K	3981.
63.1K	2512.
39.8K	1585.
25.1K	1000.
15.8K	631.
10.0K	398.
6310.	6277.3

286

-9 -7 -5 -3 -1 1 3 5 7 9
S 78 W — N 78 E

4096 Hz
2048 Hz
1024 Hz
512 Hz
256 Hz
128 Hz
64 Hz
32 Hz
16 Hz

1235. 1286. 1240. 971. 633. 597. 686. 537. 643. 679.
1614. 1798. 1716. 1227. 747. 517. 592. 426. 548. 554.
1543. 2231. 2259. 1591. 949. 466. 454. 321. 484. 448.
3181. 3564. 3865. 2795. 1500. 522. 434. 279. 331. 369.
6685. 7467. 6762. 6455. 3348. 876. 599. 342. 375. 363.
13.1K 14.7K 17.9K 13.3K 6888. 1576. 962. 516. 543. 522.
23.4K 26.8K 31.7K 23.9K 12.6K 2724. 1552. 808. 851. 769.
39.3K 42.4K 52.5K 40.8K 22.8K 4537. 2416. 1223. 1368. 1219.
62.9K 72.3K 86.7K 66.4K 35.7K 7524. 3771. 1923. 2231. 1918.

9602886

05/21/1986 08:25 Z.E.R.O. USA Howdy Y'all 01 602 325 1588 P.22

Line 3900N
Cutty Sark
for
BILLITON AUSTRALIA

ZONGE W 584
PLOT BY CPLOT 3i
PLOTTED 28 Nov 86

5 cm

CSAMT SURVEY DATA
PHASE DIFFERENCE (E - H)

values in milli-radians
<PDIFF

RECEIVER DATA
Length . 61.m Line . N 78 E
Spacing 61.m Dipole N 78 E

Surveyed Mar 86

TRANSMITTER DATA
Length . 1.3 Km
Orient. . N 78 E
Distance 3.6 Km
Rx to Tx South

[Plot limited and ARITHMETIC CO
(Interval, 100.00)
[165.] 300.
100. 200.
0. 100.
-100. 0.00
-200. -100.
-300. -200.
-400. -300.
-500. [-338.]

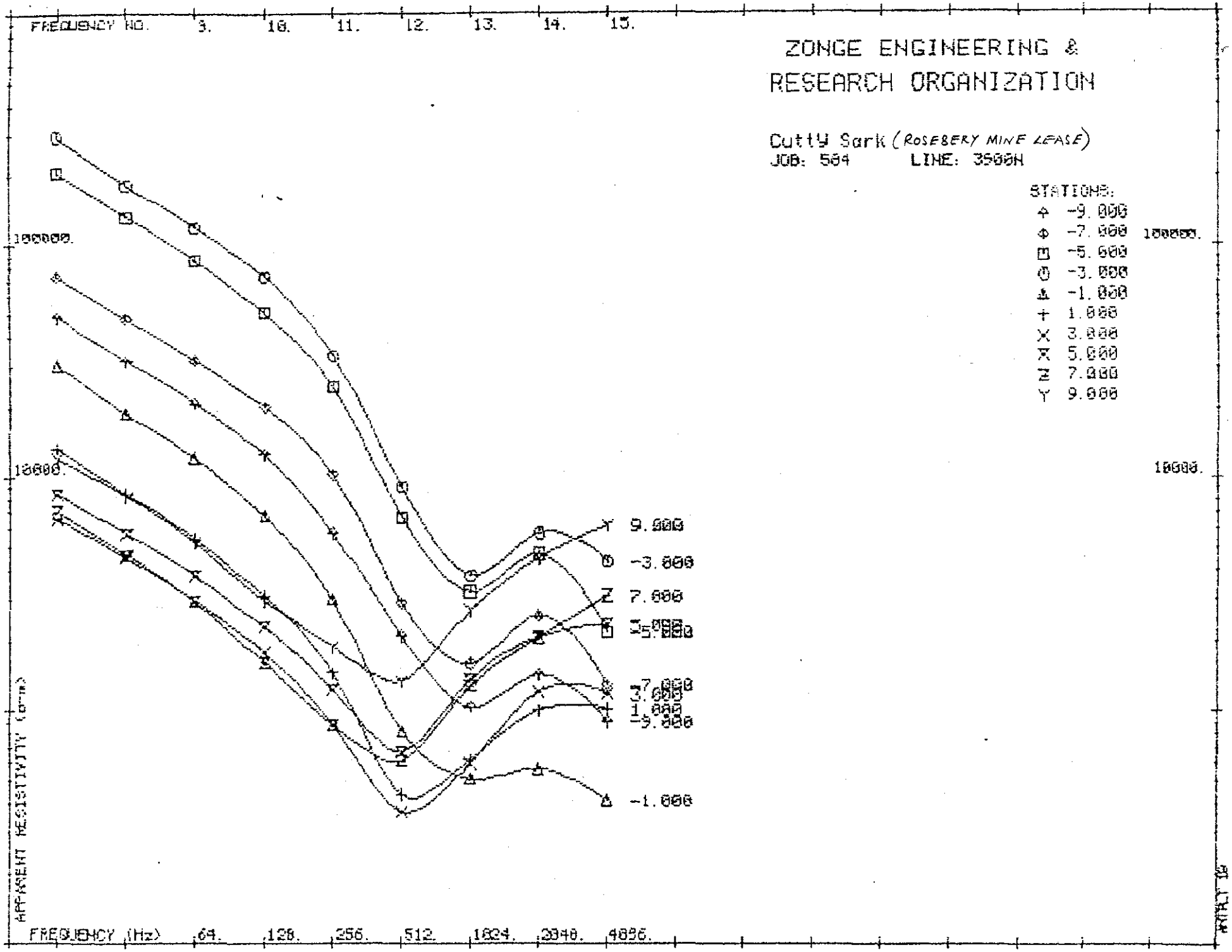
281

S 78 W -9 -7 -5 -3 -1 1 3 5 7 9 N 78 E

4096 Hz	339.	357.	396.	388.	380.	348.	342.	1028.	892.	851.
2048 Hz	566.	458.	438.	461.	393.	930.	1063.	1069.	1072.	1024.
1024 Hz	584.	572.	509.	521.	639.	935.	1111.	1139.	1150.	1165.
512 Hz	-73.	-63.	-167.	-219.	-110.	381.	564.	753.	861.	869.
256 Hz	-69.	-48.	-111.	-115.	-114.	96.	273.	354.	432.	534.
128 Hz	78.	98.	73.	55.	47.	146.	223.	285.	296.	334.
64 Hz	152.	188.	196.	181.	147.	185.	251.	294.	258.	259.
32 Hz	259.	222.	233.	233.	166.	230.	356.	303.	236.	297.
16 Hz	187.	191.	282.	196.	124.	156.	255.	253.	227.	264.

4096 Hz	
2048 Hz	
1024 Hz	
512 Hz	
256 Hz	
128 Hz	
64 Hz	
32 Hz	
.6 Hz	

960287


FREQUENCY NO. 3. 10. 11. 12. 13. 14. 15.
ZONGE ENGINEERING &
RESEARCH ORGANIZATION
Cutty Sark (ROSEBERY MINE LEASE)
JOB: 504 LINE: 3500N
STATIONS:
-9.000
-7.000
-5.000
-3.000
-1.000
1.000
3.000
5.000
7.000
9.000
100000.
10000.
9.000
-3.000
7.000
-5.000
-7.000
3.000
1.000
-9.000
-1.000
APPARENT RESISTIVITY (ohm-m)
FREQUENCY (Hz) 64. 128. 256. 512. 1024. 2048. 4096.

288

960288

Line 7000N (METRIC)
Cutty Sark
for
BILLITON AUSTRALIA

ZONGE # 579
PLOT BY CPLOT 3i
PLOTTED 13 NOV 96

CSAMT SURVEY DATA
CAGNIARD RESISTIVITY

values in ohm-meters
<RHO-C

RECEIVER DATA
Length . 100.m Line . East
SPacing. 100.m DiPole. East

Surveyed Feb 96

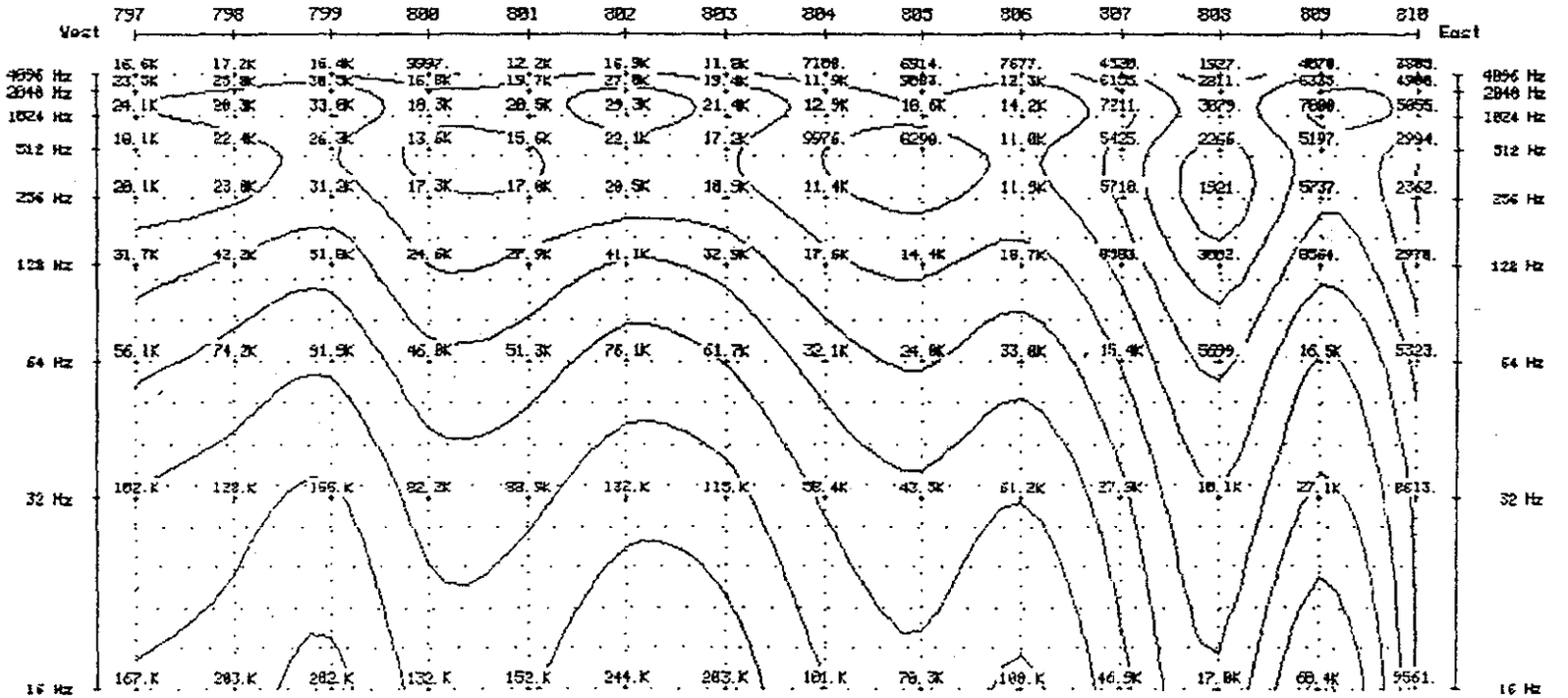
TRANSMITTER DATA
Length . 3.1 Km
Orient. . N 85 E
Distance. 6.0 Km
Rx to Tx. South

CPlot Liethal and LOGARITHMIC CONTOURS
(Interval. 0.20)

1264.K	15.8K
251.K	10.0K
158.K	6310.
100.K	3981.
63.1K	2512.
39.8K	(1582.3
25.1K	

5 cm

CONTACT



9602689

Line 7000N
Cutty Sark
for
BILLITON AUSTRALIA

ZONGE # 579
PLOT BY GPLOT 3i
PLOTTED 28 NOV 96

CSAMT SURVEY DATA
RESISTIVITY from PHASE

USING PHASE FOR STATIC CORRECTIONS, ALSO
RHO. 2000. PHZ. 489.. FREQ 14. 2048. 8 Hz
<RHO-C>PHZRHO>RESRHO

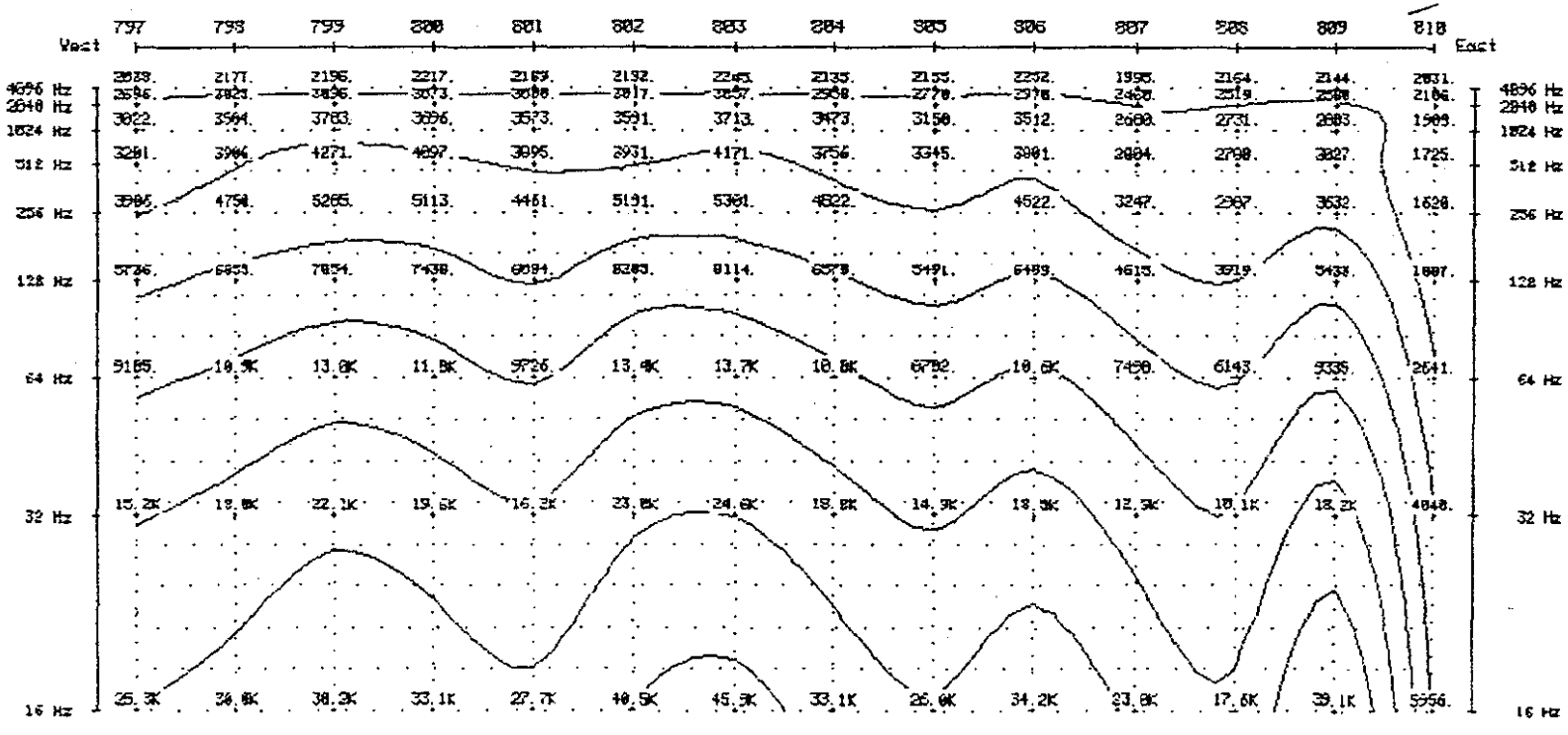
RECEIVER DATA
Length . 100.m Line . East
Spacing 100.m Dipole. East

Surveyed. Feb 96

TRANSMITTER DATA
Length . 1.1 Km
Orient. . N 85 E
Distance 6.6 Km
Rx to Tx. South

[Plot limited and LOGARITHMIC CONTOURS
(Interval, 0.20)
[46.4K]
39.8K
25.1K
15.8K
10.0K
6318.
3981.
2512.
[1615.]

5 cm



Line 7000N
Cutty Sark
for
BILLITON AUSTRALIA

CSAMT SURVEY DATA
PHASE DIFFERENCE ~~E-W Phase~~

values in milli-radians
<PDIFF

RECEIVER DATA
Length , 100.m Line , East
SPacing 100.m XiPole East

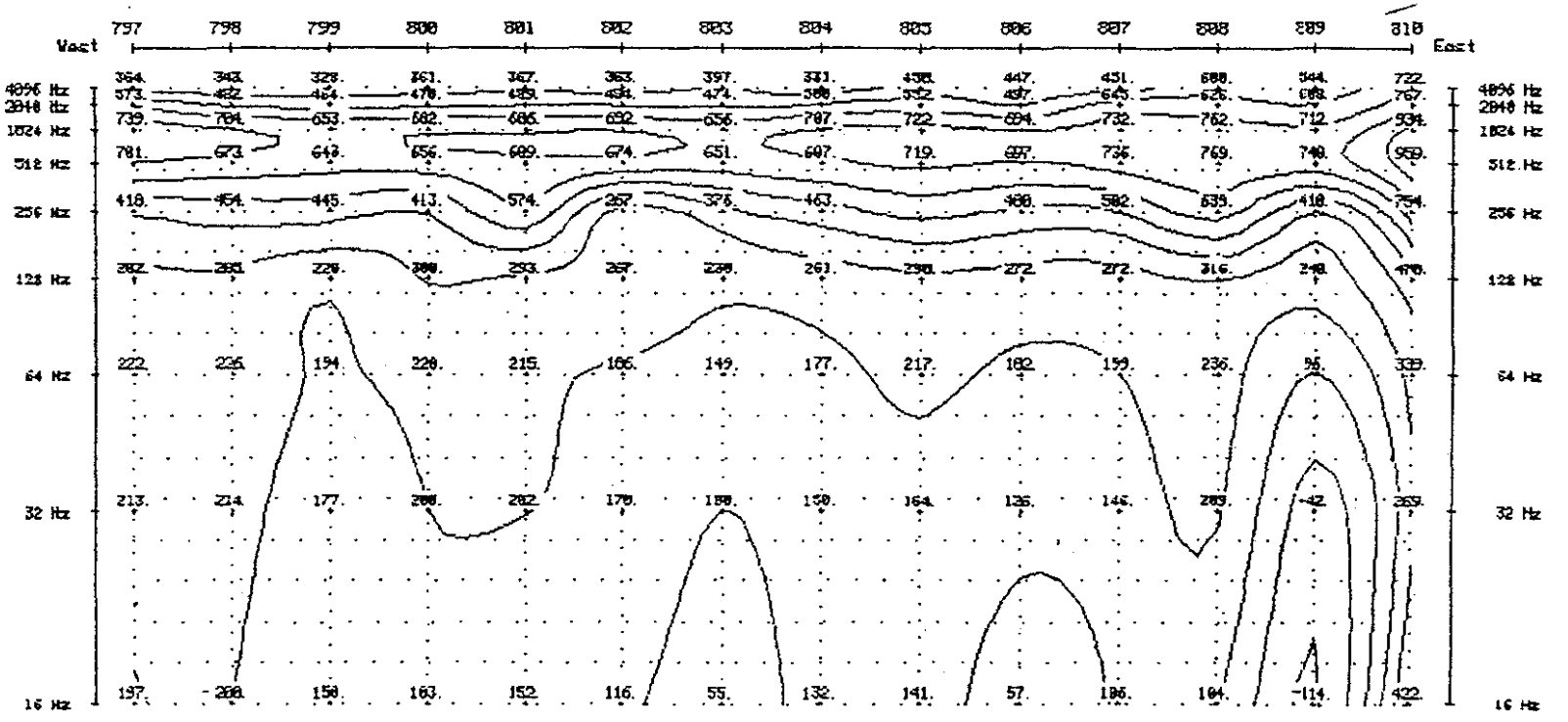
Surveyed Feb 86

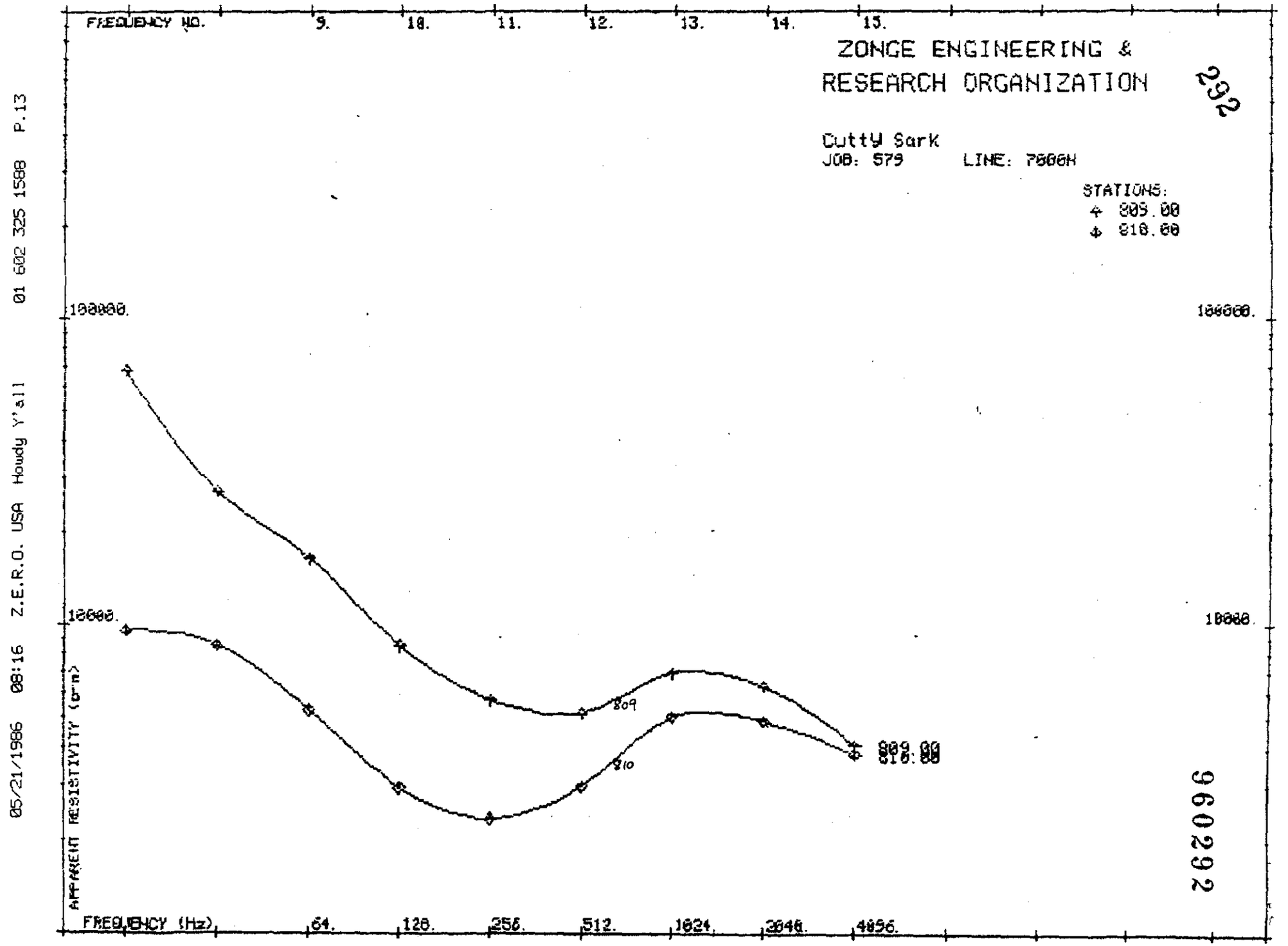
TRANSMITTER DATA
Length , 3.1 Km
Orient. , N 85 E
Distance 6.8 Km
Rx to Tx South

[Plot limited and ARITHMETIC CONTOURS
(Interval 100.00)
[977.] 300.
900. 200.
800. 100.
700. 0.00
600. -100.
500. [-114.]
400.

5 cm

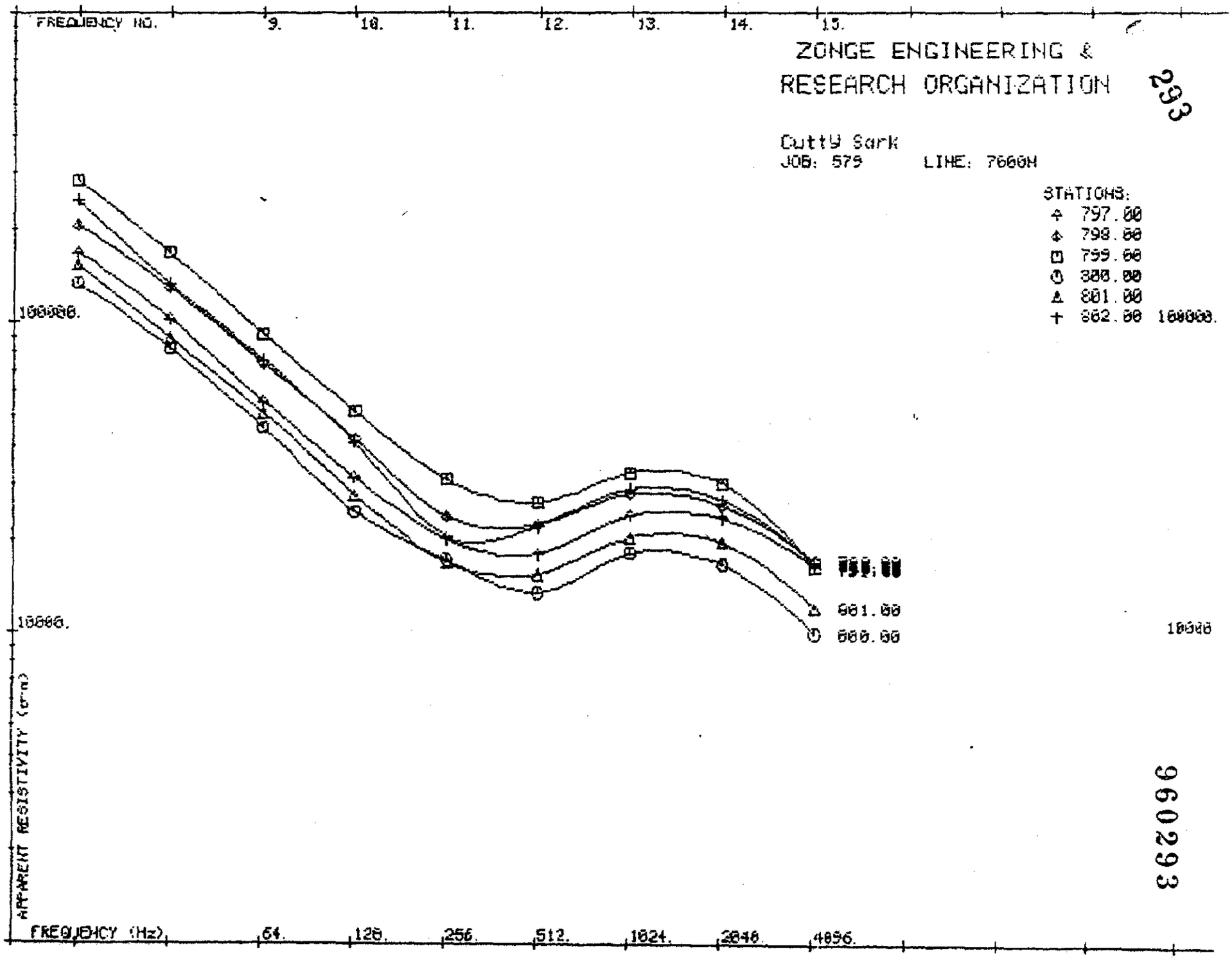
ZONCE # 573
PLOT BY CPLOT 3i
PLOTTED 13 NOV 86

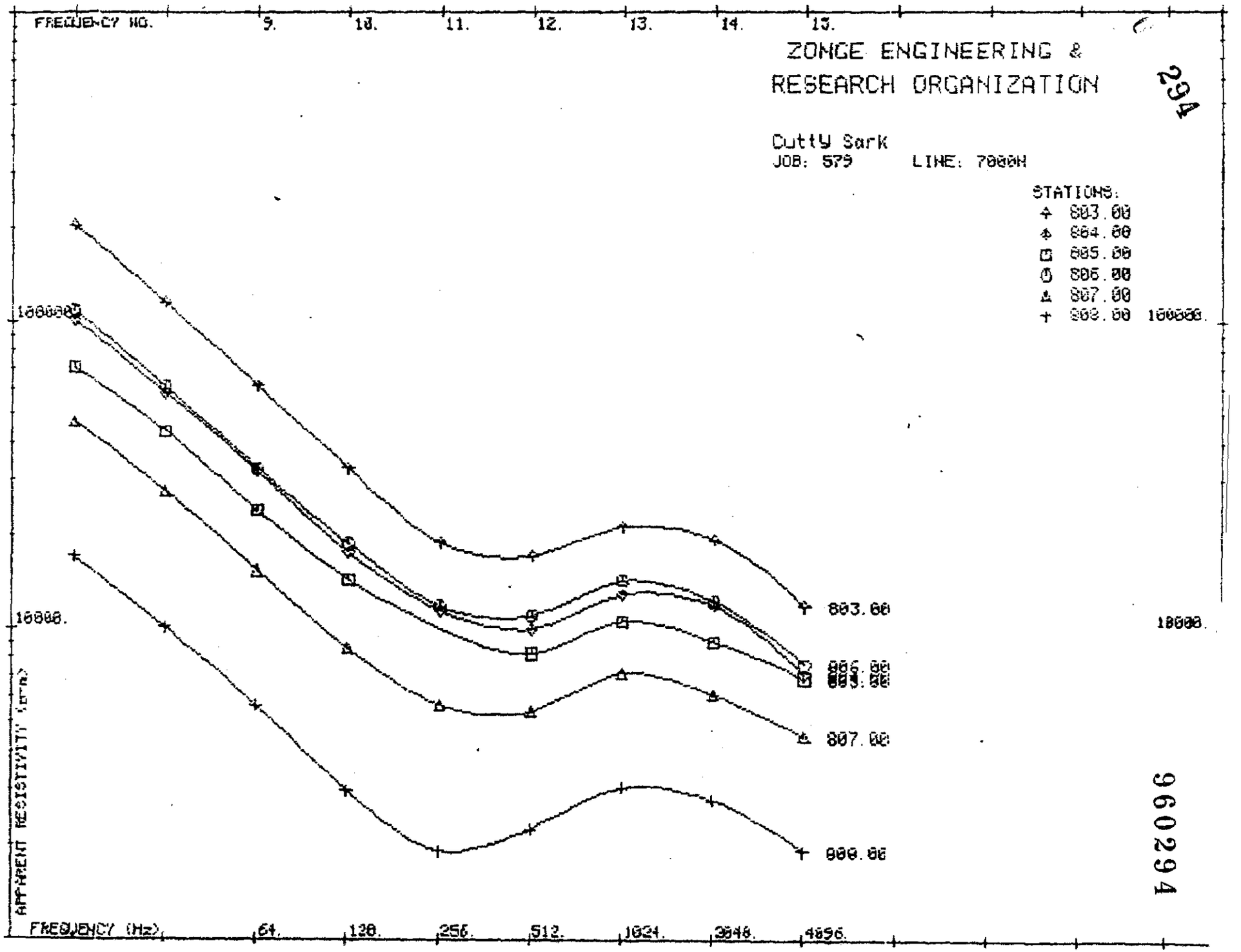



FREQUENCY NO.
9.
10.
11.
12.
13.
14.
15.
ZONGE ENGINEERING &
RESEARCH ORGANIZATION
292
Cutty Sark
JOB: 579
LINE: 7500N
STATIONS:
809.00
810.00
100000.
10000.
809
810
809.00
810.00
APPARENT RESISTIVITY (ohm-m)
FREQUENCY (Hz)
64.
128.
256.
512.
1024.
2048.
4096.
960292
05/21/1986 08:16 Z.E.R.O. USA Howdy Y'all 01 602 325 1588 P.13

ZONGE ENGINEERING &
RESEARCH ORGANIZATION

Cutty Sark
JOB: 579 LINE: 7600N




FREQUENCY NO.
9.
10.
11.
12.
13.
14.
15.
ZONGE ENGINEERING &
RESEARCH ORGANIZATION
294
Cutty Sark
JOB: 579
LINE: 7000N
STATIONS:
803.00
804.00
805.00
806.00
807.00
808.00
100000.
100000.
16000.
16000.
803.00
806.00
807.00
808.00
APPARENT RESISTIVITY (OHM-M)
FREQUENCY (Hz)
64.
128.
256.
512.
1024.
3848.
4096.
960294
05/21/1986 08:17 Z.E.R.O. USA Howdy Y'all 01 602 325 1588 P.15

Line 7300N (METRIC)
Cutty Sark
for
BILLITON AUSTRALIA

CSAMT SURVEY DATA
CAGNIARD RESISTIVITY

values in ohm-meters
<RHO-C

[Plot limited and LOGARITHMIC COL
(Interval, 0.20)

[45.9K	2512.
29.8K	1585.
25.1K	1000.
15.8K	631.
10.0K	398.
6310.	[295.]
3981.	

295

ZONGE # 579
PLOT BY GPLOT 3i
PLOTTED 13 MAY 96

5 cm

RECEIVER DATA
Length . 100.m Line . East
SPacing. 100.m BiPole. East

Surveyed. Feb 96

TRANSMITTER DATA
Length . 1.1 Km
Orient. . N 55 E
Distance. 6.0 Km
Rx to Tx. South

MORE RESISTIVE @ DEPTH ← → MORE CONDUCTIVE @ DEPTH

CONDUCTOR

STATIC OFFSET ??

CONDUCTOR (SEE PHASE)

788	789	790	791	792	793	794	795	796
West								East

4096 Hz	536.	1328.	3834.	527.	695.	9431.	4255.	3873.	2241.
2048 Hz	554.	1848.	4358.	810.	954.	9168.	6816.	3985.	3792.
1024 Hz	559.	1721.	4452.	796.	1023.	5717.	6835.	4186.	4788.
512 Hz	299.	1151.	2968.	496.	653.	4862.	4829.	3246.	3747.
256 Hz	554.	1568.	4856.	1085.	959.	4194.	5743.	3320.	4116.
128 Hz	1127.	3254.	9357.	1729.	1485.	4798.	6229.	3558.	6317.
64 Hz	2193.	6378.	19.2K	3359.	2786.	5361.	14.6K	9671.	16.9K
32 Hz	3524.	10.6K	32.9K	5282.	4366.	9236.	23.5K	16.6K	17.4K
16 Hz	4896.	14.8K	45.9K	6886.	5660.	9489.	31.6K	25.3K	25.6K

NEAR FIELD

9600295

Line 7300N
Cutty Sark
for
BILLITON AUSTRALIA

CSAMT SURVEY DATA
RESISTIVITY from PHASE

RHO: 3000, PHZ: 429., FREQ 14: 2048.0 Hz
<RHO-C>PHZRHO>REDRHO

[Plot limited and LOGARITHMIC CON
(Interval. 0.20)
[34.5K]
25.1K
15.8K
10.0K
6310.
3981.
2512.
1585.
[1316.]

296

ZONGE # 579
PLOT BY CPLOT 3i
PLOTTED 30 MAY 86

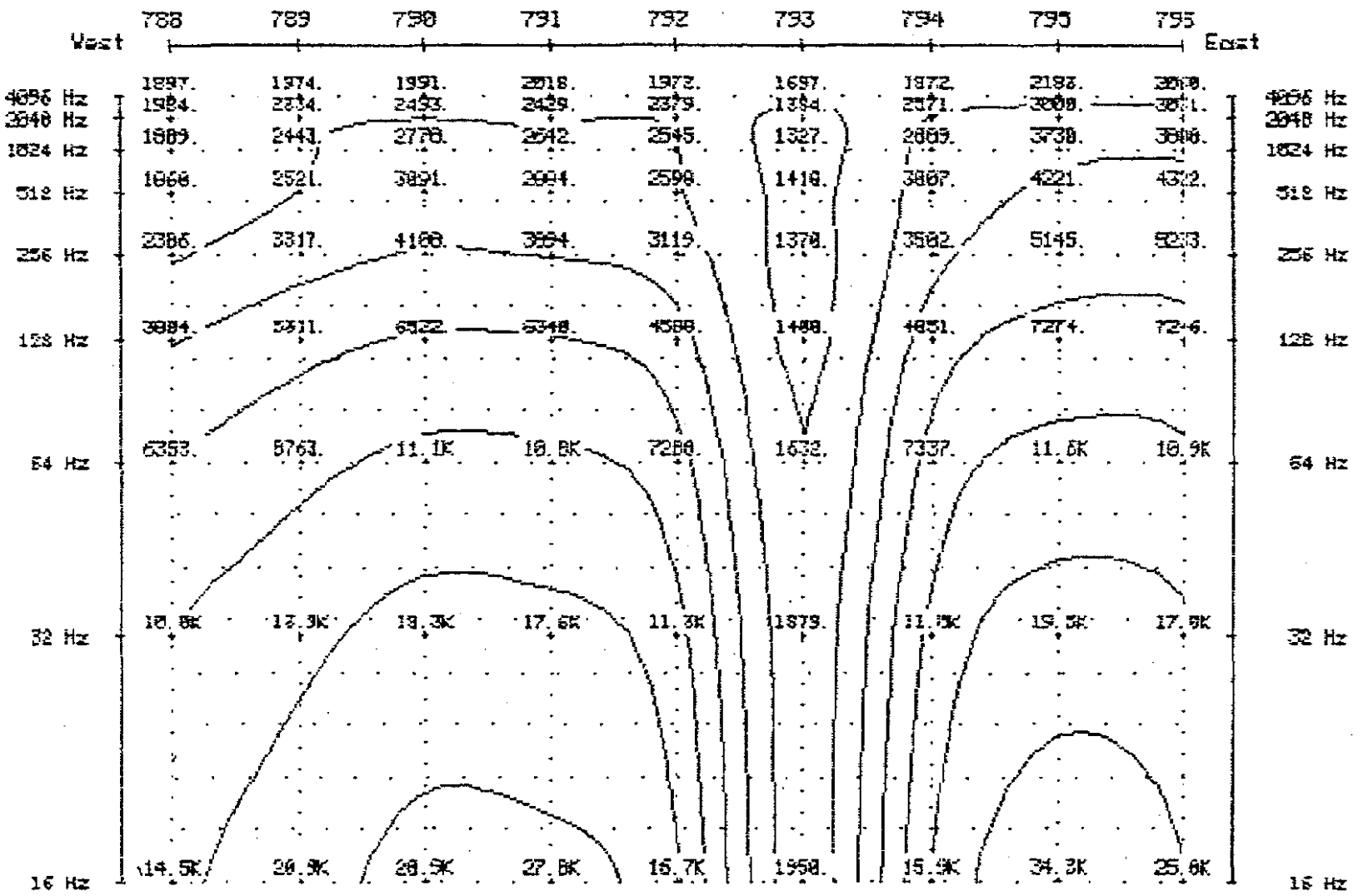
5 cm

RECEIVER DATA
Length . 100.m Line . East
SPacing. 100.m DiPole East

Surveyed Feb 86

TRANSMITTER DATA
Length . 1.1 Km
Orient. . N 85 E
Distance. 6.0 Km
Rx to Tx. South

VERTICAL?
CONDUCTOR



05/21/1986 08:14 Z.E.R.U. USA Howdy Y'all 01 602 325 1588 P.11

9602296

05/21/1986 08:15 Z.E.R.O. USA Howdy Y'all 01 602 325 1588 P.12

Line 7300N
Cutty Sark
for
BILLITON AUSTRALIA

CSAMT SURVEY DATA
PHASE DIFFERENCE

values in milli-radians
<PDIFF

ZONCE # 579
PLOT BY CPLOT 3i
PLOTTED 13 NOV 86

5 cm

RECEIVER DATA
Length . 100.m Line . East
Spacing. 100.m Dipole. East
Surveyed Feb 86

TRANSMITTER DATA
Length . 3.1 Km
Orient. . N 85 E
Distance. 6.8 Km
Rx to Tx. South

[Plot limited and ARITHMETIC CO
(Interval. 100.00)
[1055.]
[900.
800.
700.
600.
500.
400.
300.
200.
[128.]

297

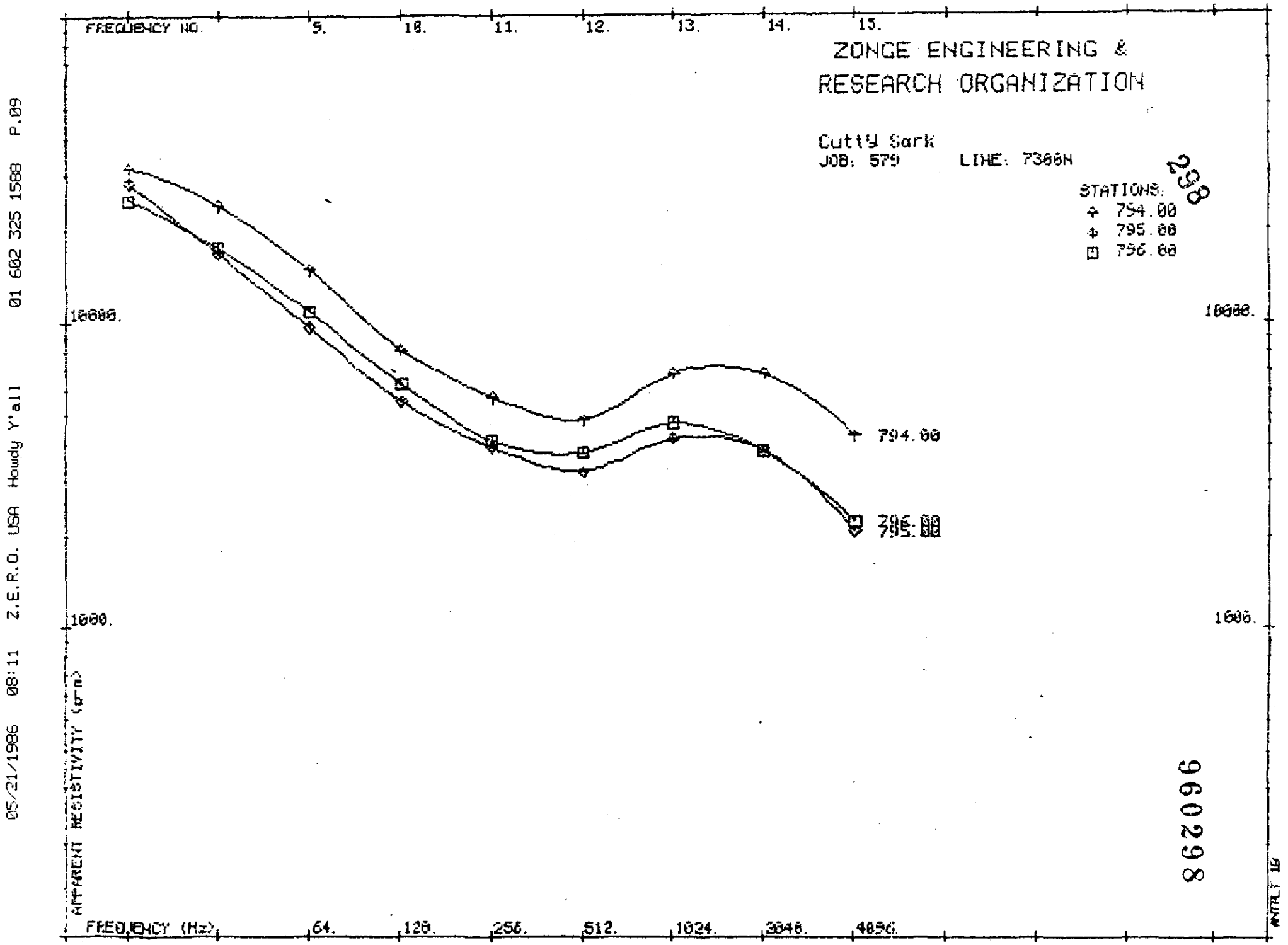
TOPO

788 789 790 791 792 793 794 795 796
West East

4096 Hz
2048 Hz
1024 Hz
512 Hz
256 Hz
128 Hz
64 Hz
32 Hz
16 Hz

716. 554. 487. 556. 534. 386. 382. 421. 275.
744. 535. 574. 555. 610. 1037. 539. 429. 421.
920. 842. 751. 765. 686. 629. 756. 649. 633.
679. 658. 570. 587. 719. 791. 724. 642. 651.
326. 291. 349. 383. 436. 659. 582. 481. 487.
186. 213. 174. 163. 239. 649. 338. 385. 345.
223. 225. 192. 200. 263. 587. 303. 217. 295.
318. 296. 244. 264. 316. 664. 349. 166. 273.
414. 355. 290. 273. 364. 623. 388. 128. 358.

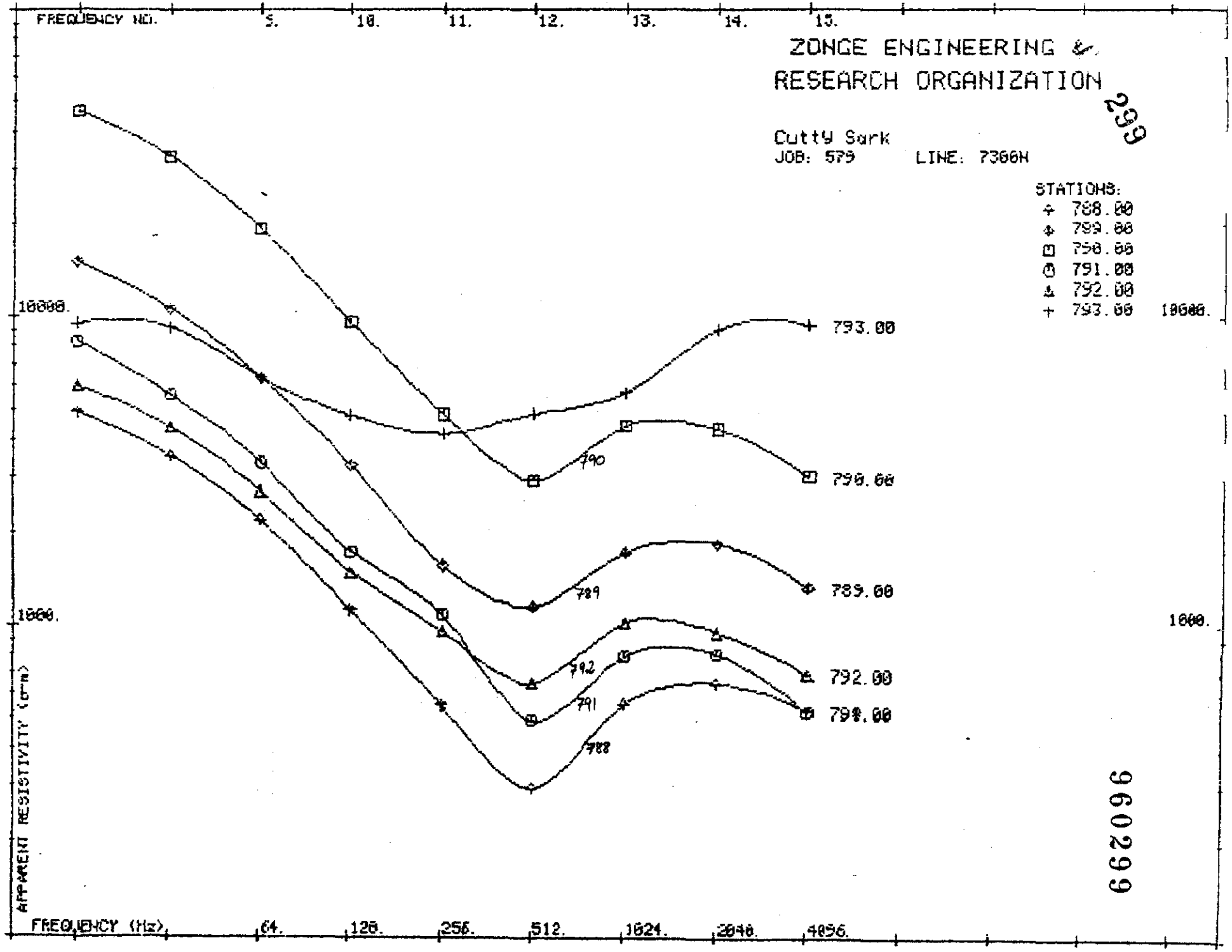
960297



05/21/1986 08:11 Z.E.R.O. USA Howdy Y'all 01 602 325 1588 P.09

238

8602098


FREQUENCY NO.
5.
10.
11.
12.
13.
14.
15.
ZONGE ENGINEERING &
RESEARCH ORGANIZATION
299
Cutty Sark
JOB: 579
LINE: 7300N
STATIONS:
788.00
789.00
790.00
791.00
792.00
793.00
10000.
1000.
793.00
790.00
789.00
792.00
791.00
788.00
790
789
792
791
788
APPARENT RESISTIVITY (ohm)
FREQUENCY (Hz)
64.
128.
256.
512.
1024.
2048.
4096.

660299

Line 9900N (IMPERIAL GRID)
Cutty Sark
for
BILLITON AUSTRALIA

CSAMT SURVEY DATA
CAGNIARD RESISTIVITY

values in ohm-meters
<RHO-E

ZONE # 579
PLOT BY CPLOT 3i
PLOTTED 13 NOV 95

RECEIVER DATA
Length . 100.m Line . N 78 E
Spacing. 100.m Bipole. N 78 E

Surveyed Feb 95

TRANSMITTER DATA
Length . 3.1 Km
Orient. . N 85 E
Distance. 5.7 Km
Rx to Tx. South

Plot limited and LOGARITHMIC CONTOURS
(Interval. 0.30)

169.K	10.0K
158.K	6318.
100.K	3981.
63.1K	2512.
39.8K	1585.
25.1K	1000.
15.8K	6656.3

5 cm

CONDUCTIVE

FAULT OR OFF-MINE CONDUCTOR

RESISTIVE NEAR SURFACE

CONTACT

S 78 W

-33 -30 -27 -24 -21 -18 -15 -12 -9 -6 -3 0 3 6 CS-2 9 12 15

N 78 E

4096 Hz
2048 Hz
1024 Hz
512 Hz
256 Hz
128 Hz
64 Hz
32 Hz
16 Hz

1260. 4327. 1791. 5357. 3742. 2422. 1657. 1819. 2972. 2131. 1814. 1163. 1854. 3816. 1378. 2690. 3484.
1989. 4198. 2035. 4893. 4011. 2897. 1691. 1554. 2791. 2274. 877. 778. 1114. 3911. 2377. 2238. 2564.
1793. 4667. 2749. 5834. 3951. 3177. 1983. 1567. 2859. 1956. 882. 745. 782. 2688. 1508. 1617. 1982.
2032. 5068. 3781. 7108. 6961. 3166. 1414. 1333. 2928. 2033. 779. 753. 902. 3537. 1731. 1258. 1859.
1649. 6956. 4616. 11.2K 10.1K 3131. 1569. 4589. 5816. 4478. 2266. 2524. 2974. 14.7K 7492. 5350. 2794.
2136. 7791. 8386. 16.7K 18.9K 8897. 4775. 9789. 14.9K 11.3K 4916. 5496. 7402. 31.7K 16.4K 12.8K 6648.
2677. 11.8K 14.4K 27.9K 34.2K 17.3K 7731. 18.6K 24.8K 20.2K 9427. 18.8K 14.2K 64.9K 33.4K 35.8K 13.7K
3799. 16.3K 22.7K 42.7K 53.9K 26.6K 18.6K 16.2K 39.4K 33.6K 15.3K 17.8K 24.3K 105.K 53.3K 42.8K 22.8K
4650. 20.9K 31.6K 55.2K 67.1K 38.1K 13.4K 21.5K 56.2K 50.3K 22.3K 27.2K 36.9K 169.K 84.4K 67.7K 33.6K

05-21-1986 08:07 Z.E.R.O. USA Howdy Y'all 01 Aug 25 1988 P.05

301

Line 9900N
Cutty Sark
for
BILLITON AUSTRALIA

ZONGE & 579
PLOT BY CPLOT 3i
PLOTTED 30 NOV 86

CSAMT SURVEY DATA
RESISTIVITY from PHASE

USING PHASE FOR STATIC CORRECTION, ALSO
RHO. 2200. PHZ. 766.. FREQ 14. 2048. 0 Hz
<RHO-C>PHZ<RHO>=EDP<HO

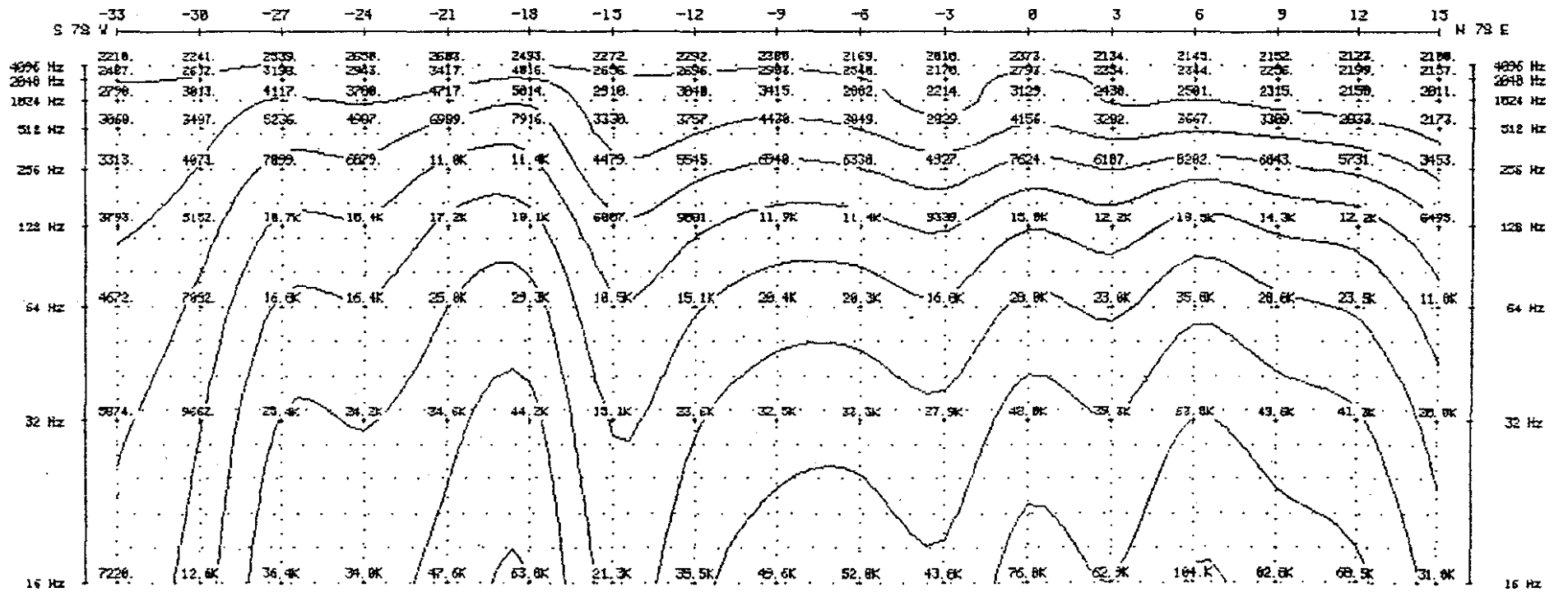
RECEIVER DATA
Length . 186.m Line . N 78 E
Spacing 186.m Bipole. N 78 E

Surveyed Feb 86

TRANSMITTER DATA
Length . 1.1 Km
Orient. . N 25 E
Distance 5.7 Km
Rx to Tx South

CPlot limited and LOGARITHMIC CONTOURS
(Interval. 0.20)
(1134. K)
188. K
63. 1K
39. 8K
25. 1K
15. 8K
10. 0K
<210.
3981.
2512.
(2038.)

5 cm



9603301

Line 9900N
Cutty Sark
for
BILLITON AUSTRALIA

ZONGE # 579
PLOT BY CPLOT 3i
PLOTTED 28 Nov 96

CSAMT SURVEY DATA
PHASE DIFFERENCE (E Phase
values in milli-radians
<PDIFF

RECEIVER DATA
Length . 100.m Line . N 78 E
SPacing 100.m DiPole N 78 E

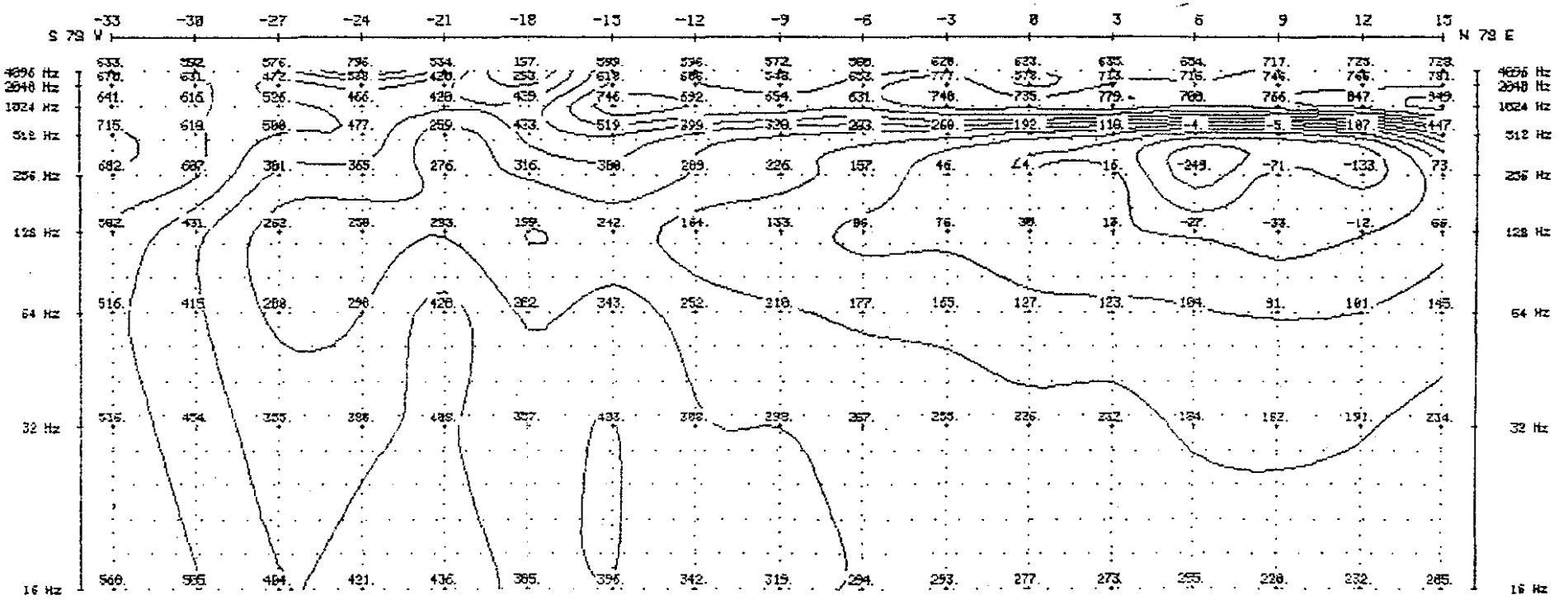
Surveyed Feb 96

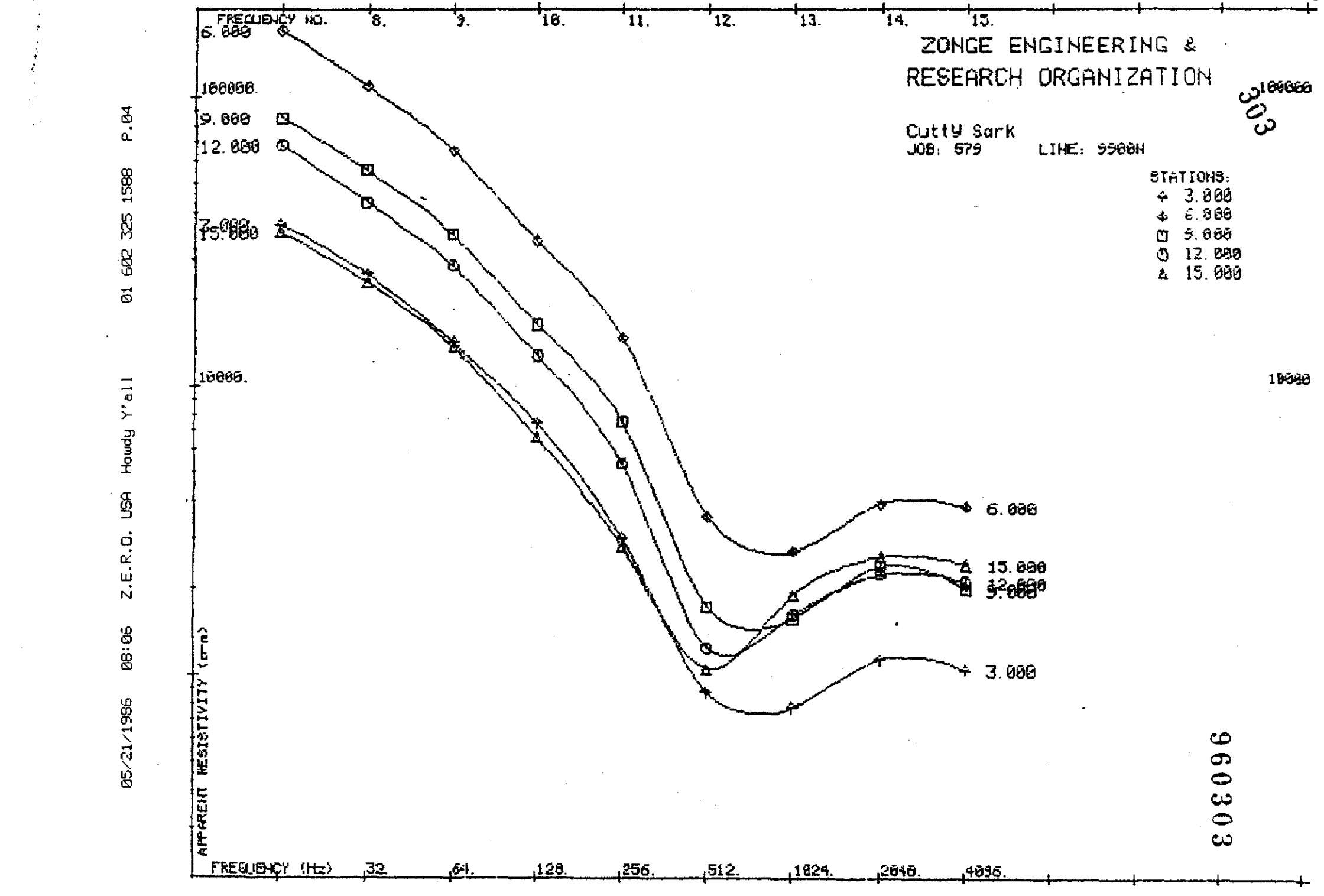
TRANSMITTER DATA
Length . 1.1 Km
Orient. . N 85 E
Distance 3.7 Km
Rx to Tx. South

[Plot Initial and ARITHMETIC CONTOURS
(Interval. 100.00)

[949.1	300.
900.	200.
800.	100.
700.	0.00
600.	-100.
500.	-200.
400.	[-263.1

5 cm

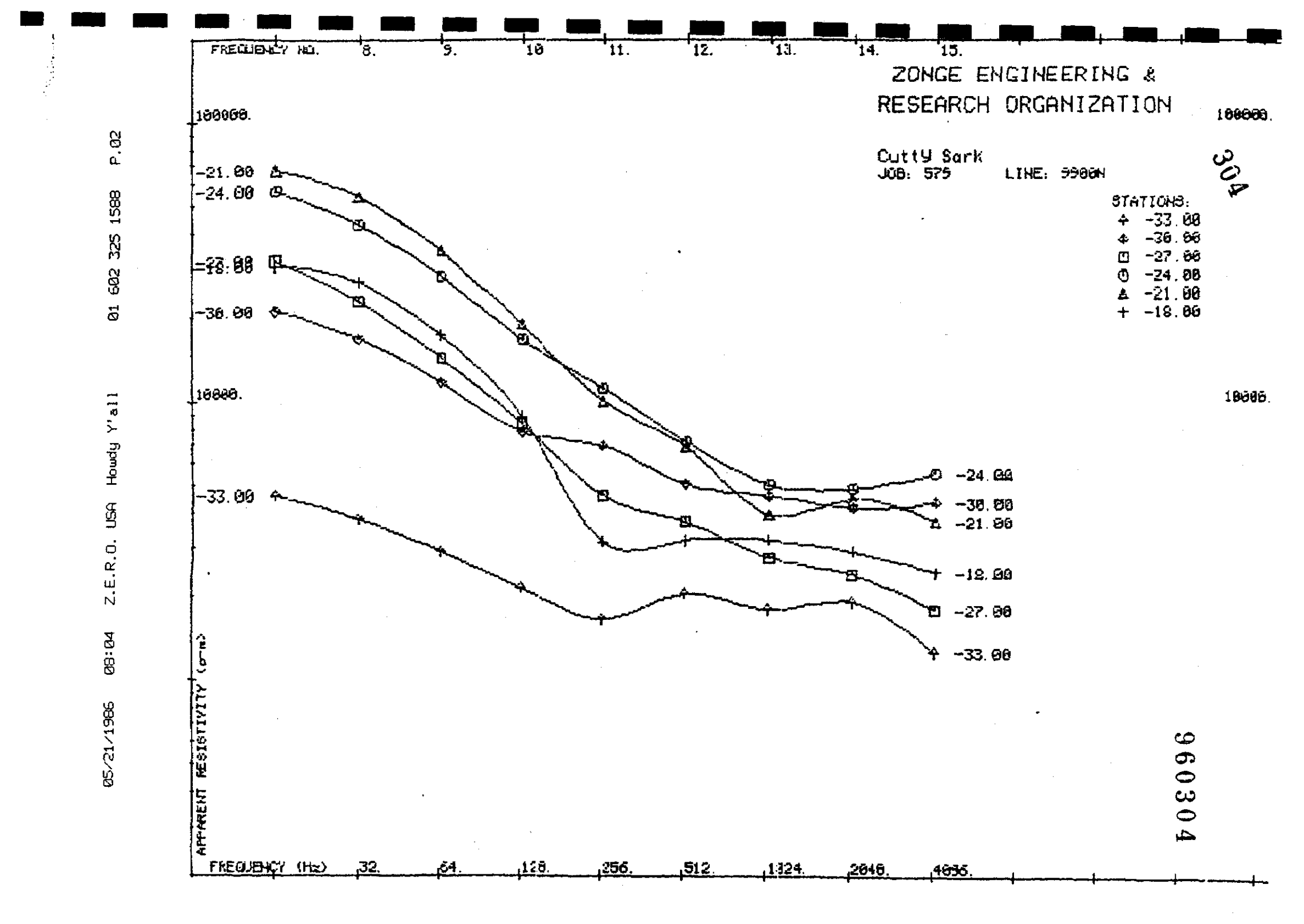


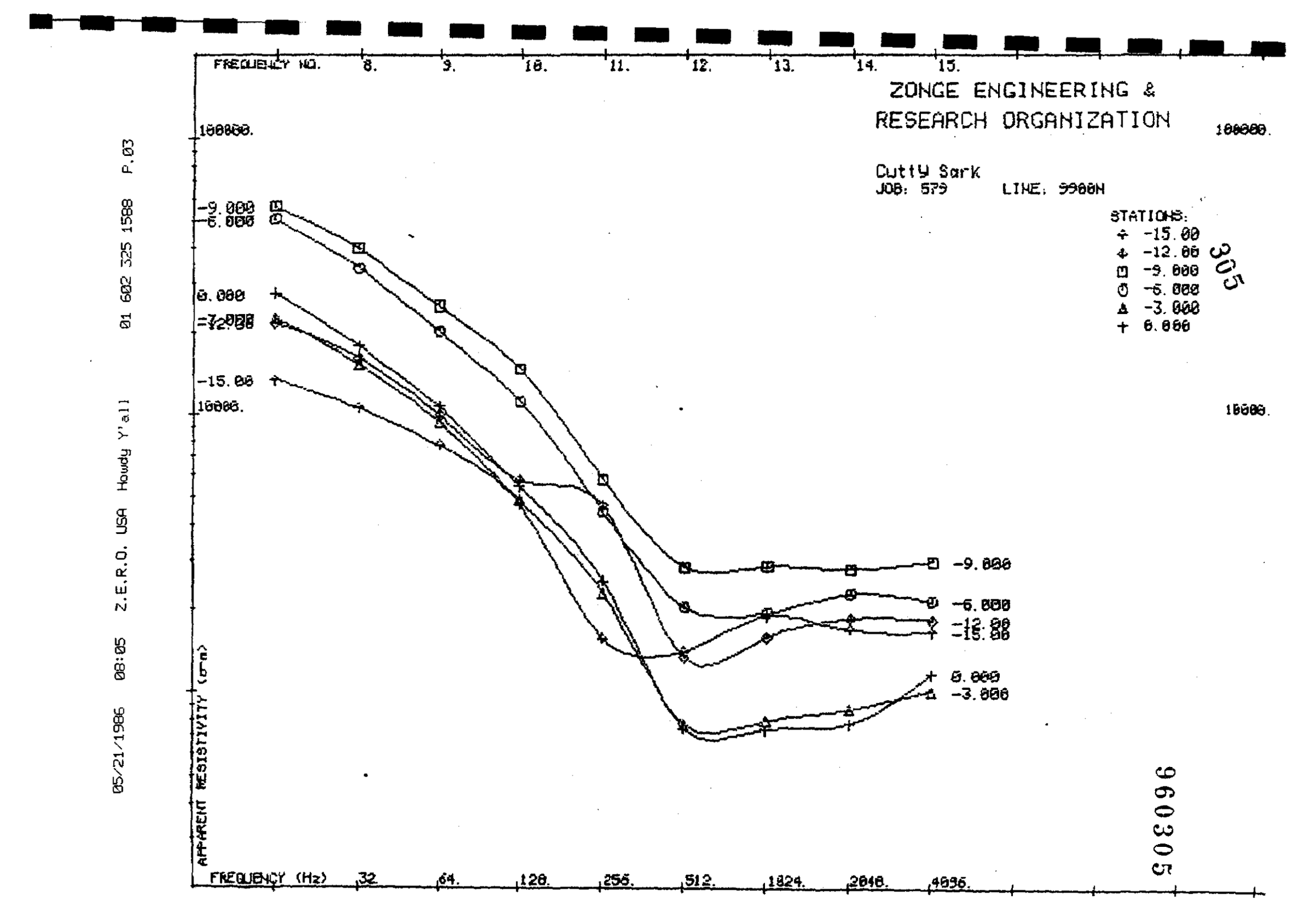


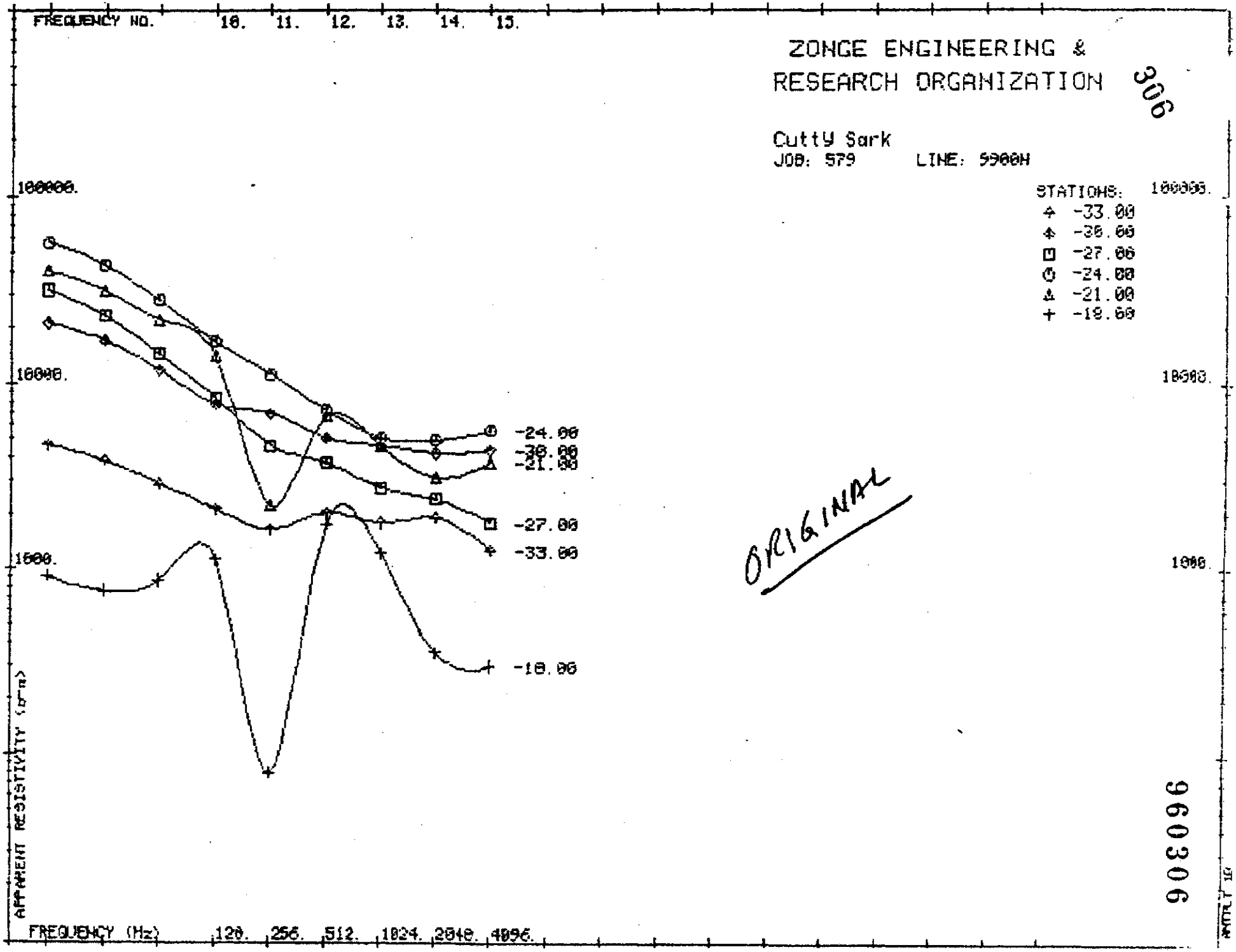
05/21/1986 08:06 Z.E.R.O. USA Howdy Y'all 01 602 325 1588 P.04

303

960303


FREQUENCY No.
8.
9.
10
11.
12.
13.
14.
15.
ZONGE ENGINEERING &
RESEARCH ORGANIZATION
100000.
Cutty Sark
JOB: 575
LINE: 9900N
304
STATIONS:
-33.00
-30.00
-27.00
-24.00
-21.00
-18.00
-21.00
-24.00
-18.00
-27.00
-30.00
-33.00
10000.
APPARENT RESISTIVITY (ρ-m)
FREQUENCY (Hz)
32.
64.
128.
256.
512.
1024.
2048.
4096.
960304
05/21/1986 08:04 Z.E.R.O. USA Howdy Y'all 01 602 325 1588 P.02


FREQUENCY NO. 8. 9. 10. 11. 12. 13. 14. 15.
ZONGE ENGINEERING &
RESEARCH ORGANIZATION
100000.
Cutty Sark
JOB: 579 LINE: 9900N
STATIONS:
-15.00
-12.00
-9.000
-6.000
-3.000
6.000
305
-9.000
-6.000
0.000
-12.00
-15.00
10000.
-9.000
-6.000
-12.00
-15.00
6.000
-3.000
APPARENT RESISTIVITY (ohm)
FREQUENCY (Hz) 32 64. 128. 256. 512. 1024. 2048. 4096.
960305
05/21/1986 08:05 Z.E.R.O. USA Howdy Y'all 01 602 325 1588 P.03


FREQUENCY NO. 10. 11. 12. 13. 14. 15.
ZONGE ENGINEERING &
RESEARCH ORGANIZATION
306
Cutty Sark
JOB: 579 LINE: 5900N
STATIONS:
-33.00
-30.00
-27.00
-24.00
-21.00
-18.00
100000.
10000.
1000.
100000.
10000.
1000.
-24.00
-30.00
-21.00
-27.00
-33.00
-18.00
APPARENT RESISTIVITY (ohm-m)
FREQUENCY (Hz) 128. 256. 512. 1024. 2048. 4096.
ORIGINAL
960306
05/21/1986 08:06 Z.E.R.O. USA Howdy Y'all 01 602 325 1588 P.05

308

APPENDIX III

Bulk Cyanide Leach & Stream Sediment Analyses

309

960308

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

Head Office and
Central Laboratory
305 South Road,
Mile End South,
Sth. Aust. 5031.
Tel: (08) 43 5722
Telex: AA89323

NATA REGISTERED No. 1526

OUR REF.: COM860345

YOUR REF.: 08330/LJ50/JPR/004

Mr. J. Randell
The Shell Co. of Aust. Ltd.
30 Mersey Main Rd
Spreyton
DEVONPORT
TAS 7310

March 21, 1986

RESS = Rosebery East Stream Sediment

Dear Jeff

RE: JOB COM860345

Enclosed are the assays for the samples delivered to our laboratory on March 18, 1986

The requested statistical analysis will be sent by TNT courier on Monday.

Yours Sincerely,
COMLABS PTY LTD

per

Report Length 16 pages

960309

310

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345
O/N : 08330/LJ50/JPR/004

SAMPLE	Cu	Zn	Ag	Au
RESS 1 -20+40#	7	14	<1	<0.02
RESS 2 -20+40#	60	1150	32	<0.02
RESS 3 -20+40#	16	2100	3	<0.02
RESS 4 -20+40#	2	12	<1	<0.02
RESS 5 -20+40#	2	16	<1	<0.02
RESS 6 -20+40#	<2	7	<1	<0.02
RESS 8 -20+40#	<2	5	<1	<0.02
RESS 9 -20+40#	5	10	<1	<0.02
RESS 10 -20+40#	5	42	<1	<0.02
RESS 11 -20+40#	<2	14	<1	<0.02
RESS 12 -20+40#	<2	14	<1	<0.02
RESS 13 -20+40#	5	20	<1	<0.02
RESS 14 -20+40#	<2	10	<1	<0.02
RESS 15 -20+40#	<2	7	<1	<0.02
RESS 16 -20+40#	3	38	<1	<0.02
RESS 17 -20+40#	2	36	<1	<0.02
RESS 18 -20+40#	2	60	<1	<0.02
RESS 19 -20+40#	5	50	<1	<0.02
RESS 20 -20+40#	<2	10	<1	<0.02
RESS 21 -20+40#	4	36	<1	<0.02
RESS 22 -20+40#	<2	9	<1	<0.02
RESS 23 -20+40#	8	32	<1	<0.02
RESS 24 -20+40#	<2	14	<1	0.12
RESS 25 -20+40#	14	180	<1	<0.02
RESS 26 -20+40#	6	60	<1	<0.02
UNITS	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	AAS5B

311

960310

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345
O/N : 08330/LJ50/JPR/004

SAMPLE	Cu	Zn	Ag	Au
RESS 27 -20+40#	5	24	<1	<0.02
RESS 30 -20+40#	16	185	<1	<0.02
RESS 31 -20+40#	6	50	<1	<0.02
RESS 32 -20+40#	2	55	<1	<0.02
RESS 33 -20+40#	<2	18	<1	<0.02
RESS 34 -20+40#	2	7	<1	<0.02
RESS 35 -20+40#	5	20	<1	<0.02
RESS 36 -20+40#	2	5	<1	<0.02
RESS 37 -20+40#	7	42	<1	<0.02
RESS 38 -20+40#	14	90	<1	<0.02
RESS 39 -20+40#	7	85	<1	<0.02
RESS 40 -20+40#	7	70	<1	<0.02
RESS 41 -20+40#	9	120	<1	<0.02
RESS 42 -20+40#	7	130	<1	<0.02
RESS 43 -20+40#	2	6	<1	<0.02
RESS 44 -20+40#	5	80	<1	<0.02
RESS 45 -20+40#	14	55	<1	<0.02
RESS 46 -20+40#	3	14	<1	<0.02
RESS 47 -20+40#	<2	10	<1	<0.02
RESS 48 -20+40#	30	920	1	<0.02
RESS 49 -20+40#	18	170	<1	<0.02
RESS 1 -40+80#	3	30	<1	<0.02
RESS 2 -40+80#	80	1150	48	<0.02
RESS 3 -40+80#	18	280	4	<0.02
RESS 4 -40+80#	2	18	<1	<0.02
UNITS	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	AAS5B

960311

312

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345
O/N : 08330/LJ50/JPR/004

SAMPLE	Cu	Zn	Ag	Au
RESS 5 -40+80#	2	12	<1	<0.02
RESS 6 -40+80#	2	6	<1	<0.02
RESS 8 -40+80#	2	4	<1	<0.02
RESS 9 -40+80#	2	16	<1	<0.02
RESS 10 -40+80#	2	28	<1	<0.02
RESS 11 -40+80#	<2	10	<1	0.08
RESS 12 -40+80#	2	14	<1	<0.02
RESS 13 -40+80#	3	14	<1	<0.02
RESS 14 -40+80#	2	10	<1	<0.02
RESS 15 -40+80#	2	8	<1	<0.02
RESS 16 -40+80#	4	28	<1	<0.02
RESS 17 -40+80#	3	24	<1	<0.02
RESS 18 -40+80#	3	44	<1	<0.02
RESS 19 -40+80#	5	38	<1	<0.02
RESS 20 -40+80#	2	7	<1	<0.02
RESS 21 -40+80#	5	46	<1	<0.02
RESS 22 -40+80#	2	7	<1	<0.02
RESS 23 -40+80#	9	32	<1	<0.02
RESS 24 -40+80#	2	10	<1	<0.02
RESS 25 -40+80#	14	150	<1	<0.02
RESS 26 -40+80#	4	36	<1	<0.02
RESS 27 -40+80#	5	20	<1	<0.02
RESS 30 -40+80#	14	135	<1	<0.02
RESS 31 -40+80#	7	42	<1	<0.02
RESS 32 -40+80#	3	36	<1	<0.02
UNITS	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	AAS5B

c 313

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345
O/N : 08330/LJ50/JPR/004

SAMPLE	Cu	Zn	Ag	Au
RESS 33 -40+80#	3	16	<1	<0.02
RESS 34 -40+80#	2	7	<1	<0.02
RESS 35 -40+80#	7	24	<1	<0.02
RESS 36 -40+80#	3	6	<1	<0.02
RESS 37 -40+80#	6	34	<1	<0.02
RESS 38 -40+80#	14	85	<1	<0.02
RESS 39 -40+80#	8	130	<1	<0.02
RESS 40 -40+80#	8	75	<1	<0.02
RESS 41 -40+80#	10	160	<1	<0.02
RESS 42 -40+80#	3	12	<1	<0.02
RESS 43 -40+80#	<2	7	<1	<0.02
RESS 44 -40+80#	7	80	<1	<0.02
RESS 45 -40+80#	12	42	<1	<0.02
RESS 46 -40+80#	4	16	<1	<0.02
RESS 47 -40+80#	2	7	<1	<0.02
RESS 48 -40+80#	26	860	1	<0.02
RESS 49 -40+80#	10	95	<1	<0.02
RESS 1 -80+120#	5	55	<1	<0.02
RESS 2 -80+120#	120	1600	80	<0.02
RESS 3 -80+120#	32	4900	7	<0.02
RESS 4 -80+120#	5	95	1	<0.02
RESS 5 -80+120#	3	28	1	<0.02
RESS 6 -80+120#	3	20	<1	<0.02
RESS 8 -80+120#	5	8	<1	<0.02
RESS 9 -80+120#	3	10	1	<0.02
UNITS	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	AAS5B

960313

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345

O/N : 08330/LJSO/JPR/004

SAMPLE	Cu	Zn	Ag	Au
RESS 10 -80+120#	4	34	<1	<0.02
RESS 11 -80+120#	2	14	<1	<0.02
RESS 12 -80+120#	2	30	<1	<0.02
RESS 13 -80+120#	6	18	<1	<0.02
RESS 14 -80+120#	3	16	<1	<0.02
RESS 15 -80+120#	3	10	<1	<0.02
RESS 16 -80+120#	6	38	<1	<0.02
RESS 17 -80+120#	6	30	<1	<0.02
RESS 18 -80+120#	7	48	<1	<0.02
RESS 19 -80+120#	6	46	<1	<0.02
RESS 20 -80+120#	2	9	<1	<0.02
RESS 21 -80+120#	7	50	<1	<0.02
RESS 22 -80+120#	2	10	<1	<0.02
RESS 23 -80+120#	12	44	<1	<0.02
RESS 24 -80+120#	4	12	<1	<0.02
RESS 25 -80+120#	18	160	<1	<0.02
RESS 26 -80+120#	5	30	<1	<0.02
RESS 27 -80+120#	8	22	<1	<0.02
RESS 30 -80+120#	16	140	<1	<0.02
RESS 31 -80+120#	7	40	<1	<0.02
RESS 32 -80+120#	4	32	1	<0.02
RESS 33 -80+120#	4	16	<1	<0.02
RESS 34 -80+120#	2	8	<1	<0.02
RESS 35 -80+120#	12	30	<1	<0.02
RESS 36 -80+120#	3	7	<1	<0.02
UNITS	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	AAS5B

960314

315 C

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345
O/N : 08330/LJ50/JPR/004

SAMPLE	Cu	Zn	Ag	Au
RESS 37 -80+120#	6	34	<1	<0.02
RESS 38 -80+120#	16	85	<1	<0.02
RESS 39 -80+120#	12	185	<1	<0.02
RESS 40 -80+120#	16	95	<1	<0.02
RESS 41 -80+120#	14	230	<1	<0.02
RESS 42 -80+120#	2	12	<1	<0.02
RESS 43 -80+120#	6	8	<1	<0.02
RESS 44 -80+120#	10	125	<1	<0.02
RESS 45 -80+120#	12	44	<1	<0.02
RESS 46 -80+120#	6	26	<1	<0.02
RESS 47 -80+120#	3	10	<1	<0.02
RESS 48 -80+120#	32	1350	1	<0.02
RESS 49 -80+120#	10	110	<1	<0.02
RESS 1 -120#	7	44	<1	<0.02
RESS 2 -120#	200	1950	160	<0.02
RESS 3 -120#	48	7700	10	<0.02
RESS 4 -120#	4	18	<1	<0.02
RESS 5 -120#	5	28	<1	<0.02
RESS 6 -120#	3	14	<1	<0.02
RESS 8 -120#	2	12	<1	0.08
RESS 9 -120#	2	10	<1	<0.02
RESS 10 -120#	5	44	<1	<0.02
RESS 11 -120#	4	16	<1	<0.02
RESS 12 -120#	3	55	<1	<0.02
RESS 13 -120#	9	36	<1	<0.02
UNITS	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	AAS5B

316

960315

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345
O/N : 08330/LJ50/JPR/004

SAMPLE	Cu	Zn	Ag	Au
RESS 14 -120#	6	22	<1	<0.02
RESS 15 -120#	5	14	<1	<0.02
RESS 16 -120#	9	46	<1	<0.02
RESS 17 -120#	7	38	<1	<0.02
RESS 18 -120#	10	65	<1	<0.02
RESS 19 -120#	9	60	<1	<0.02
RESS 20 -120#	6	16	<1	<0.02
RESS 21 -120#	10	60	<1	<0.02
RESS 22 -120#	3	16	<1	<0.02
RESS 23 -120#	14	55	<1	<0.02
RESS 24 -120#	6	20	<1	<0.02
RESS 25 -120#	18	190	<1	<0.02
RESS 26 -120#	5	28	<1	<0.02
RESS 27 -120#	9	32	<1	<0.02
RESS 30 -120#	16	160	<1	<0.02
RESS 31 -120#	8	44	<1	<0.02
RESS 32 -120#	5	46	<1	<0.02
RESS 33 -120#	4	26	<1	<0.02
RESS 34 -120#	4	12	<1	<0.02
RESS 35 -120#	14	44	<1	<0.02
RESS 36 -120#	4	10	<1	<0.02
RESS 37 -120#	9	70	<1	<0.02
RESS 38 -120#	16	90	<1	<0.02
RESS 39 -120#	16	260	<1	<0.02
RESS 40 -120#	18	170	<1	<0.02
UNITS	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	AASSB

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345
O/N : Q8330/LJ50/JPR/004

SAMPLE	Cu	Zn	Ag	Au
RESS 41 -120#	22	390	<1	<0.02
RESS 42 -120#	4	22	<1	<0.02
RESS 43 -120#	6	14	<1	<0.02
RESS 44 -120#	14	195	<1	<0.02
RESS 45 -120#	14	46	<1	<0.02
RESS 46 -120#	7	34	<1	<0.02
RESS 47 -120#	2	12	<1	<0.02
RESS 48 -120#	65	2400	1	<0.02
RESS 49 -120#	20	220	1	<0.02
UNITS	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	AAS5B

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345
O/N : 08330/LJ50/JPR/004

SAMPLE	As	Ba	Pb	Sn	W
RESS 1 -20+40#	<2	110	4	14	10
RESS 2 -20+40#	330	350	9000	<4	10
RESS 3 -20+40#	36	155	1600	8	<10
RESS 4 -20+40#	5	150	18	<4	<10
RESS 5 -20+40#	3	260	12	6	<10
RESS 6 -20+40#	2	95	12	<4	10
RESS 8 -20+40#	4	75	<4	8	<10
RESS 9 -20+40#	<2	230	16	8	<10
RESS 10 -20+40#	8	280	18	12	<10
RESS 11 -20+40#	5	470	4	6	10
RESS 12 -20+40#	12	230	55	24	10
RESS 13 -20+40#	7	370	8	6	<10
RESS 14 -20+40#	5	270	8	10	<10
RESS 15 -20+40#	2	100	4	6	<10
RESS 16 -20+40#	9	260	22	14	10
RESS 17 -20+40#	7	300	24	14	<10
RESS 18 -20+40#	7	290	20	12	<10
RESS 19 -20+40#	5	330	20	12	10
RESS 20 -20+40#	5	175	14	8	<10
RESS 21 -20+40#	10	350	8	10	30
RESS 22 -20+40#	5	310	12	<4	<10
RESS 23 -20+40#	14	320	34	8	<10
RESS 24 -20+40#	7	350	8	18	15
RESS 25 -20+40#	16	250	50	12	<10
RESS 26 -20+40#	9	240	28	14	<10
UNITS	ppm	ppm	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1	XRF1	XRF1

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345
O/N : 08330/LJ50/JPR/004

SAMPLE	As	Ba	Pb	Sn	W
RESS 27 -20+40#	7	135	20	14	<10
RESS 30 -20+40#	16	260	30	6	<10
RESS 31 -20+40#	26	220	26	14	<10
RESS 32 -20+40#	4	110	22	8	<10
RESS 33 -20+40#	12	190	16	<4	15
RESS 34 -20+40#	5	60	6	<4	<10
RESS 35 -20+40#	12	200	26	<4	<10
RESS 36 -20+40#	4	110	6	8	<10
RESS 37 -20+40#	6	340	14	4	<10
RESS 38 -20+40#	7	360	22	8	15
RESS 39 -20+40#	12	440	50	4	<10
RESS 40 -20+40#	14	410	65	<4	<10
RESS 41 -20+40#	10	420	70	4	<10
RESS 42 -20+40#	10	430	70	6	10
RESS 43 -20+40#	10	270	18	<4	<10
RESS 44 -20+40#	7	500	42	6	15
RESS 45 -20+40#	75	450	120	8	10
RESS 46 -20+40#	26	460	38	4	<10
RESS 47 -20+40#	3	290	14	10	<10
RESS 48 -20+40#	60	670	550	<4	<10
RESS 49 -20+40#	46	330	90	6	<10
RESS 1 -40+80#	2	115	12	10	10
RESS 2 -40+80#	260	310	1.36%	<4	10
RESS 3 -40+80#	30	140	1600	6	15
RESS 4 -40+80#	4	115	24	4	<10
UNITS	ppm	ppm	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1 XRF2	XRF1	XRF1

320

960319

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345
O/N : 08330/LJ50/JPR/004

SAMPLE	As	Ba	Pb	Sn	W
RESS 5 -40+80#	5	190	10	4	<10
RESS 6 -40+80#	3	75	<4	4	10
RESS 8 -40+80#	<2	55	<4	12	<10
RESS 9 -40+80#	3	135	12	8	<10
RESS 10 -40+80#	8	210	22	12	<10
RESS 11 -40+80#	3	290	8	12	10
RESS 12 -40+80#	7	165	55	28	<10
RESS 13 -40+80#	5	260	12	10	10
RESS 14 -40+80#	5	200	14	16	<10
RESS 15 -40+80#	3	110	6	12	20
RESS 16 -40+80#	10	210	36	30	<10
RESS 17 -40+80#	4	210	24	36	<10
RESS 18 -40+80#	7	210	20	24	15
RESS 19 -40+80#	7	250	24	22	<10
RESS 20 -40+80#	2	135	10	<4	<10
RESS 21 -40+80#	3	390	12	4	10
RESS 22 -40+80#	3	185	4	<4	15
RESS 23 -40+80#	10	280	32	14	<10
RESS 24 -40+80#	3	290	12	38	<10
RESS 25 -40+80#	14	195	40	14	15
RESS 26 -40+80#	12	190	16	26	<10
RESS 27 -40+80#	8	155	24	10	25
RESS 30 -40+80#	12	250	30	8	<10
RESS 31 -40+80#	16	160	34	14	<10
RESS 32 -40+80#	7	115	26	4	<10
UNITS	ppm	ppm	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1	XRF1	XRF1

960320

c 321

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345
O/N : 08330/LJ50/JPR/004

SAMPLE	As	Ba	Pb	Sn	W
RESS 33 -40+80#	9	165	12	<4	15
RESS 34 -40+80#	4	65	4	4	<10
RESS 35 -40+80#	12	175	32	<4	<10
RESS 36 -40+80#	3	95	8	<4	<10
RESS 37 -40+80#	5	270	16	<4	10
RESS 38 -40+80#	7	310	24	<4	15
RESS 39 -40+80#	12	370	65	4	<10
RESS 40 -40+80#	10	380	60	4	<10
RESS 41 -40+80#	14	410	90	10	<10
RESS 42 -40+80#	9	380	38	6	<10
RESS 43 -40+80#	10	290	18	4	10
RESS 44 -40+80#	8	430	55	6	<10
RESS 45 -40+80#	65	430	115	4	<10
RESS 46 -40+80#	28	450	46	<4	<10
RESS 47 -40+80#	2	290	10	4	<10
RESS 48 -40+80#	44	520	530	<4	<10
RESS 49 -40+80#	22	250	70	6	<10
RESS 1 -80+120#	4	190	18	8	<10
RESS 2 -80+120#	580	320	2.40%	<4	<10
RESS 3 -80+120#	65	175	2500	8	<10
RESS 4 -80+120#	6	155	8	<4	<10
RESS 5 -80+120#	6	165	10	6	<10
RESS 6 -80+120#	4	70	6	4	<10
RESS 8 -80+120#	4	70	4	12	<10
RESS 9 -80+120#	4	125	8	20	<10
UNITS	ppm	ppm	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1 XRF2	XRF1	XRF1

960321

322

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345.
O/N : 08330/LJ50/JPR/004

SAMPLE	As	Ba	Pb	Sn	W
RESS 10 -80+120#	3	210	26	26	<10
RESS 11 -80+120#	3	270	14	14	<10
RESS 12 -80+120#	14	170	70	20	<10
RESS 13 -80+120#	8	260	18	20	<10
RESS 14 -80+120#	5	240	24	36	10
RESS 15 -80+120#	5	155	12	12	<10
RESS 16 -80+120#	4	230	34	70	<10
RESS 17 -80+120#	8	220	26	24	<10
RESS 18 -80+120#	5	210	18	26	<10
RESS 19 -80+120#	6	260	22	30	<10
RESS 20 -80+120#	4	140	10	16	<10
RESS 21 -80+120#	10	320	18	6	<10
RESS 22 -80+120#	3	240	6	<4	<10
RESS 23 -80+120#	12	260	46	16	<10
RESS 24 -80+120#	6	280	22	65	<10
RESS 25 -80+120#	9	180	46	10	<10
RESS 26 -80+120#	3	160	20	26	<10
RESS 27 -80+120#	8	135	32	14	<10
RESS 30 -80+120#	12	260	24	4	<10
RESS 31 -80+120#	20	135	28	12	<10
RESS 32 -80+120#	7	120	22	4	<10
RESS 33 -80+120#	12	165	16	<4	<10
RESS 34 -80+120#	5	85	12	4	<10
RESS 35 -80+120#	12	220	65	<4	15
RESS 36 -80+120#	5	105	6	<4	<10
UNITS	ppm	ppm	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1	XRF1	XRF1

323

960322

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345
O/N : 08330/LJ50/JFR/004

SAMPLE	As	Ba	Pb	Sn	W
RESS 37 -80+120#	9	250	20	<4	<10
RESS 38 -80+120#	3	260	42	6	<10
RESS 39 -80+120#	14	360	90	6	<10
RESS 40 -80+120#	10	320	85	<4	<10
RESS 41 -80+120#	18	470	175	<4	<10
RESS 42 -80+120#	12	390	44	6	<10
RESS 43 -80+120#	14	270	38	<4	<10
RESS 44 -80+120#	9	420	105	6	<10
RESS 45 -80+120#	65	400	130	6	<10
RESS 46 -80+120#	48	560	115	4	<10
RESS 47 -80+120#	3	330	22	4	<10
RESS 48 -80+120#	46	470	690	12	<10
RESS 49 -80+120#	22	230	85	4	<10
RESS 1 -120#	6	210	60	6	10
RESS 2 -120#	500	340	3.15%	<4	70
RESS 3 -120#	95	250	4000	18	15
RESS 4 -120#	7	165	55	<4	<10
RESS 5 -120#	8	165	14	<4	<10
RESS 6 -120#	5	85	20	8	20
RESS 8 -120#	6	65	22	4	15
RESS 9 -120#	6	110	16	34	<10
RESS 10 -120#	10	185	34	14	<10
RESS 11 -120#	8	240	16	10	15
RESS 12 -120#	20	180	120	10	<10
RESS 13 -120#	9	320	40	8	10
UNITS	ppm	ppm	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1	XRF1	XRF1

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345
O/N : 08330/LJ50/JPR/004

SAMPLE	As	Ba	Pb	Sn	W
RESS 14 -120#	12	230	26	14	<10
RESS 15 -120#	4	210	18	4	20
RESS 16 -120#	6	200	26	32	<10
RESS 17 -120#	7	200	30	14	<10
RESS 18 -120#	9	220	24	10	<10
RESS 19 -120#	12	250	22	14	<10
RESS 20 -120#	4	125	12	18	<10
RESS 21 -120#	5	380	38	<4	10
RESS 22 -120#	10	270	8	<4	<10
RESS 23 -120#	18	310	55	10	10
RESS 24 -120#	10	270	26	16	25
RESS 25 -120#	9	170	55	8	<10
RESS 26 -120#	7	150	14	12	<10
RESS 27 -120#	14	135	36	8	15
RESS 30 -120#	12	270	30	8	<10
RESS 31 -120#	20	120	30	10	20
RESS 32 -120#	4	130	34	<4	<10
RESS 33 -120#	16	155	26	12	15
RESS 34 -120#	7	90	10	4	<10
RESS 35 -120#	20	220	110	<4	10
RESS 36 -120#	4	135	8	4	10
RESS 37 -120#	2	260	38	<4	15
RESS 38 -120#	8	270	44	4	<10
RESS 39 -120#	16	350	125	4	<10
RESS 40 -120#	26	430	165	6	<10
UNITS	ppm	ppm	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1	XRF1	XRF1

325

960324

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860345
O/N : 08330/LJ50/JPR/004

SAMPLE	As	Ba	Pb	Sn	W
RESS 41 -120#	24	710	320	<4	<10
RESS 42 -120#	30	400	130	8	10
RESS 43 -120#	26	330	80	4	15
RESS 44 -120#	20	450	185	<4	<10
RESS 45 -120#	80	430	130	<4	<10
RESS 46 -120#	55	660	120	6	<10
RESS 47 -120#	5	410	30	6	<10
RESS 48 -120#	55	520	970	6	<10
RESS 49 -120#	28	340	165	8	<10
UNITS	ppm	ppm	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1	XRF1	XRF1

326
C

960325

COMLABS Pty. Ltd.

COMPUTERISED ANALYTICAL LABORATORIES

Head Office and
Central Laboratory
305 South Road,
Mile End South,
Sth. Aust. 5031.
Tel: (08) 43 5722
Telex: AA89323

NATA REGISTERED No. 1526

OUR REF.: COM 860450

YOUR REF.:
08331

Mr. J. Randell,
The Shell Co. of Aust. Ltd.,
30 Mersey Main Road,
Spreyton,
Devonport,
TAS 7310,

April 24, 1986

REBL = Rosebery East Bulk Leach

Dear Jeff,

RE: JOB COM 860450

Enclosed are the assays for the samples delivered to our laboratory on the 3rd April, 1986.

Yours sincerely,
COMLABS PTY LTD

per :

Report Length : 2 Pages

960326

327

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860450 O/N : 08331/LJ50/JPR/005

Results in ppb

SAMPLE	Wt(kg)	Au
REBL 27	4.07	<0.1
REBL 30	5.47	0.1
REBL 31	7.24	0.2
REBL 32	9.13	<0.1
REBL 33	2.53	5.3
REBL 34	6.64	0.2
REBL 35	7.64	0.3
REBL 36	7.97	<0.1
REBL 37	7.86	<0.1
REBL 38	5.74	<0.1
REBL 39	7.24	<0.1
REBL 40	7.91	<0.1
REBL 41	6.82	0.3
REBL 42	5.77	<0.1
REBL 43	6.44	0.4
REBL 44	6.86	<0.1
REBL 45	6.59	<0.1
REBL 46	6.52	<0.1
REBL 47	6.81	0.4
REBL 48	5.73	0.1
REBL 49	6.57	<0.1

Method of Analysis : AAS5D

328

960327

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860450 O/N : 08331/LJ50/JPR/005

Results in ppb

SAMPLE	Wt(kg)	Au
REBL 1	13.58	3.8
REBL 2	9.40	3.3
REBL 3	8.85	0.6
REBL 4	13.14	<0.1
REBL 5	5.87	<0.1
REBL 6	12.56	<0.1
REBL 8	11.78	<0.1
REBL 9	11.08	0.2
REBL 10	10.03	0.1
REBL 11	11.51	<0.1
REBL 12	11.54	<0.1
REBL 13	13.76	0.2
REBL 14	5.82	1.7
REBL 15	9.99	0.9
REBL 16	10.65	0.2
REBL 17	6.46	<0.1
REBL 18	6.19	<0.1
REBL 19	7.55	<0.1
REBL 20	4.90	<0.1
REBL 21	6.97	<0.1
REBL 22	6.51	<0.1
REBL 23	5.94	0.3
REBL 24	5.32	<0.1
REBL 25	6.23	0.6
REBL 26	5.72	0.1

329

960328

COMLABS SERVICES PTY. LTD.

305 South Road, Mile End South, South Australia 5031 Telephone (08) 43 5722 Telex LABCOM AA89323

COM860765

08336

Mr. J. Randell
The Shell Co. of Aust. Ltd.
30 Mersey Main Rd
Spreyton
DEVONPORT
TAS 7310

June 3, 1986

REBL = Rosebery East Bulk Leach

Dear Jeff

RE: JOB COM860765

Enclosed are the assays for the samples delivered to our laboratory on May 22, 1986

Yours Sincerely,
COMLABS PTY LTD

per :

Report Length 6 pages

330

960329

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860765
O/N : 08336

SAMPLE	Au
REBL 1	<0.1
REBL 2	0.1
REBL 3	0.1
REBL 7	0.5
REBL 8	0.4
REBL 11	<0.1
REBL 14	0.1
REBL 15	0.2
REBL 24	4.8
REBL 25	<0.1
REBL 33	<0.1
REBL 49	0.5
REBL 50	0.6
UNITS	ppb
SCHEME	AAS5D

331

960330

COMLABS SERVICES PTY. LTD.

305 South Road, Mile End South, South Australia 5031 Telephone (08) 43 5722 Telex LABCOM AA89323

COM860738

08337/LJ50/JPR/011

Mr. J. Randell
The Shell Co. of Aust. Ltd.
30 Mersey Main Rd
Spreyton
DEVONPORT
TAS 7310

May 31, 1986

RESS = Rosebery East Stream Sediment

Dear Jeff

RE: JOB COM860738

Enclosed are the assays for the samples delivered to our laboratory on May 20, 1986

Yours Sincerely,
COMLABS PTY LTD

per :

Report Length 1 pages

332

960331

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860738
O/N : 08337/LJ50/JPR/011

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
RESS 1 -20+40#	6	18	<1	<0.01	8	4	120
RESS 2 -20+40#	28	350	14	0.02	3000	22	280
RESS 3 -20+40#	12	550	2	<0.01	1100	40	135
RESS 8 -20+40#	4	24	<1	<0.01	<4	3	65
RESS 11 -20+40#	3	14	<1	<0.01	8	4	490
RESS 14 -20+40#	4	9	<1	<0.01	8	9	210
RESS 15 -20+40#	3	3	<1	<0.01	20	3	230
RESS 24 -20+40#	5	8	<1	<0.01	8	4	400
RESS 25 -20+40#	14	155	2	0.02	55	10	220
RESS 33 -20+40#	4	16	<1	<0.01	8	14	190
RESS 1 -120#	5	70	1	<0.01	36	3	145
RESS 2 -120#	65	430	70	<0.01	7100	<2	260
RESS 3 -120#	20	2000	7	0.02	2800	32	180
RESS 8 -120#	3	6	<1	0.25	<4	5	65
RESS 11 -120#	8	26	1	<0.01	22	2	280
RESS 14 -120#	3	12	<1	0.17	26	8	210
RESS 15 -120#	3	14	<1	0.05	40	8	400
RESS 24 -120#	8	22	1	0.07	24	7	310
RESS 25 -120#	14	170	1	0.05	48	7	170
RESS 33 -120#	3	14	<1	<0.01	10	12	105
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

APPENDIX IV

Petrological Descriptions from Various Localities

335

960333

Geochempet Services

PETROLOGICAL and GEOCHEMICAL CONSULTANTS

REGISTERED IN QUEENSLAND
Principal : A.S. Joyce B.Sc.(Hons), Ph.D.
200 Chapel Hill Road
Chapel Hill, Qld. 4069

Telephone: (07) 375 5258
A/H 378 6467

PETROLOGICAL REPORT ON SEVEN SAMPLES FROM THE ROSEBERY REGION, TASMANIA

prepared for

BILLITON AUSTRALIA

Order No. : 08333

Ref : J.P. Randell

Stan Joyce

A. S. Joyce, B.Sc.(Hons), Ph.D.

21st May, 1986.

960334

336

GENERAL COMMENTS

1. All seven samples are considered to be of andesitic derivation, but the samples from N.E. of Rosebery do carry minor quartz, including some as phenocrysts and phenoclasts.

2. Three of the samples from S.E. of Rosebery seem to have originated as andesitic crystal tuff, two of them with
21926 apparently welded vitric matrices suggesting ashflow
27 deposition. All are partly chloritized, two are heavily albitized (with epidote in one case) and one is heavily sericitized; two carry traces of pyrite.

   The fourth sample (21927) is completely epidotized and silicified, but seems to have been porphyritic andesite.

3. Two of the samples from N.E. of Rosebery are regarded as porphyritic andesite lava, but the third (21931) is fine andesitic tuff, quite possibly of airfall origin. Sample 21930 is moderately sericitized and chloritized, 21931 is lightly carbonated, chloritized, pyritized and moderately sericitized, and 21932 is moderately sericitized and carries gash veinlets of quartz-chlorite-pyrite.

4. The assemblage of lava, welded ashflow tuff and airfall tuff is compatible with subaerial deposition.

21926 – sericitized chloritized andesitic vitric crystal tuff
(Stitt K.) – welded
– major sericitization
21927 – epidotized and silicified andesitic lava
(Stitt K)
21928 – albitized, chloritized epidotized welded andesitic vitric xtal tuff
(Stitt ") – ashflow origin ⇒ subaerial.
21929 – brecciated and chloritized, albitized andesitic crystal tuff
(Stitt R) – pumiceous
21930 – sericitized chloritized porphyritic andesite lava
(Langdons)
21931 – sericitized carbonated chloritized pyritized fine andesitic tuff
(Langdons) – airfall origin [illegible] ⇒ subaerial
[illegible]
21932 – sericitized felsic andesitic lava
(Langdons) – [illegible] veining

960335

337

Sam R. 700000N 807000E

Sample Number : 21926

Identification : Heavily sericitized, moderately chloritized, andesitic, vitric crystal tuff

Description :

The sample is a moderately weathered hand specimen which displays many small, greyish orange phenocrysts or clasts of feldspar (ranging up to 3mm) and aligned dark greenish grey wisps (about 1 to 3mm), set in a light olive grey matrix.

A cobaltinitrite staining test revealed no K-feldspar.

In thin section the sample displays many fractured, tabular, twinned, subhedral crystals of andesine (about 0.3 to 2mm in size) and some small leucoxenized grains of inferred ilmenite or titaniferous magnetite (0.2 to 0.7mm) and chloritized, leucoxenized mafic silicates (about 1mm) set in a wispy, moderately foliated, sericite-rich matrix.

Much of the foliation in the matrix could be interpreted as being of tectonic origin, butthere are a few locations in which sericitic pods 1 to 3mm long resemble former vitric blebs or shards. Much of the groundmass is a sutured mosaic of untwinned feldspar, about 0.05 to 0.1mm in grainsize, liberally flecked with sericite and chlorite.

Goethite pseudomorphs after 0.1 to 0.2mm crystals of pyrite occur in one chloritized, sericitized bleb.

An approximate mode is :

30-35%	plagioclase phenocrysts or clasts
2-3%	leucoxenized former titaniferous oxide grains
1-2%	chlorite-leucoxene aggregates after inferred mafic silicates
30-40%	matrix feldspar (probably albite)
15-20%	matrix sericite
5-7%	matrix chlorite
tr	oxidized pyrite

Comments and Interpretations :

Primary textures are not well preserved, but it seems likely that this rock originated as an andesitic vitric crystal tuff, possibly welded. It may have been quite similar to Sample 21928.

The alteration style differs from that in 21928 in featuring major sericite in the matrix. Plagioclase phenoclasts have been fractured (by tectonic processes) but not altered.

960336

338

Sample Number : 21927

Identification : Completely epidotized and silicified, probable andesite

Description : (lava)

The sample is a hard, lightly weathered hand specimen of mottled, altered appearance. Vague greyish orange, altered phenocrysts (ranging up to 3mm in size) are set in a greenish grey, altered groundmass. Some altered phenocrysts have been rendered porous by weathering.

A cobaltinitrite staining test revealed several patches of K-feldspar.

In thin section the sample is seen to be intensely altered. Many subhedral phenocrysts, about 0.5 to 3mm in size, have been pseudomorphed by aggregates of epidote with quartz and rimmed by finer epidote. The epidote in the altered phenocrysts is subhedral, prismatic and about 0.2 to 0.4mm long. The epidote replacing adjacent groundmass is anhedral and about 0.02mm in grainsize. Some pseudomorphs have shapes plainly consistent with former plagioclase, but others are of uncertain derivation and could represent former mafic silicates. The quartz within the pseudomorphs is sutured, strained and about 0.1 to 0.4mm in size.

Subhedral, equant grains of opaque oxide, about 0.5 to 0.7mm in size have been largely converted to leucoxene.

The groundmass between the altered phenocrysts and their epidotized haloes has been replaced by cherty quartz, about 0.02mm in grainsize.

There are several straight, mildly strained, thin (0.1mm) fissure veins of quartz which post-date the epidote.

An approximate mode is :

50-55%	epidote
40-45%	quartz
0.5-1%	leucoxenized opaques
tr	K-feldspar

Comments and Interpretations :

Remnant textures suggest that this rock originally displayed abundant phenocrysts, including plagioclase and minor titaniferous magnetite or ilmenite, set in a fine groundmass. Probably it was porphyritic andesite. There are no suggestions of tuffaceous textures and no quartz phenocrysts.

Intense alteration has completely altered the rock to an assemblage of epidote, quartz and leucoxene.

There are no sulphides or sulphide textures.

339

960337

Sample Number : 21928

Identification : Heavily albitized, moderately chloritized and epidotized, moderately welded, andesitic, vitric crystal tuff

Description :

The sample is a lightly weathered hand specimen which displays many greyish orange phenocrysts or clasts of feldspar and some greyish orange and olive grey, moderately aligned wispy structures set in a greenish grey matrix or groundmass.

A cobaltinitrite staining test revealed traces of fine K-feldspar.

In thin section the sample displays many altered subhedral phenoclasts (about 0.3 to 3mm in size) and a few inconspicuous lithic clasts (about 4 to 7mm) set in a feldspathic, finely recrystallized matrix with moderately preserved remnant textures consistent with moderately welded or compressed vitric shards about 1 to 2mm long.

The phenoclasts are mainly tabular, twinned plagioclase, generally of unbroken form and all moderately epidotized. The grains are optically positive, consistent with albite. Equant opaque oxide phenoclasts (up to 0.4mm) have been pseudomorphed by leucoxene. Some small prismatic mafic silicate clasts have been pseudomorphed by chlorite and leucoxene and others by epidote. The lithic clasts are epidotized and chloritized microdiorite, composed originally of 0.5 to 1mm grains of plagioclase, mafic silicates, opaque oxides and minor quartz.

The matrix which appears to have originally consisted mainly of vitric shards, now consists of poikiloblastic, sutured grains of untwinned albite, about 0.1 to 0.2mm in size, and some wisps of fine chlorite, sericite and green biotite. A few inferred vitric shards have been replaced by quartz, now mildly strained.

There are sparsely disseminated subhedral to euhedral crystals of heavily oxidized pyrite, about 0.05 to 0.15mm in grainsize.

An approximate mode is :

30-35%	phenoclasts of moderately epidotized plagioclase
3-4%	mafic phenoclasts variously pseudomorphed by chlorite-leucoxene or epidote
1-2%	leucoxenized oxide phenoclasts
2-3%	lithic clasts of epidotized, chloritized microdiorite
45-55%	matrix albite
5-7%	matrix chlorite and leucoxene
2-3%	matrix quartz
1-2%	matrix sericite
tr	matrix green biotite
tr	matrix K-feldspar
0.1%	disseminated oxidized pyrite

Comments and Interpretations :

This rock is interpreted to have originated as a moderately welded vitric crystal tuff of andesitic composition. It was probably deposited by ashflow processes in a terrestrial setting.

The rock has since been albitized, epidotized, chloritized and impregnated with traces of fine pyrite.

341

960339

Sample Number : 21929

Identification : Moderately brecciated and chloritized, heavily albitized, andesitic crystal tuff

Description :

The sample is a lightly weathered hand specimen with vague pyroclastic textures involving moderate orange pink clasts and a web-like, dark greenish grey matrix.

A cobaltinitrite staining test revealed no K-feldspar.

In thin section the sample displays subhedral and broken, well twinned phenoclasts (about 0.2 to 2mm) of plagioclase (now optically positive, consistent with albite) mainly set in a matrix of sutured, allotriomorphic, untwinned and poorly twinned albite, about 0.02 to 0.03mm in grainsize. There are also euhedral crystals of partly hematized magnetite, about 0.1 to 0.5mm in size, and some chlorite-sphene pseudomorphs of small prismatic mafic silicates. A few very subtle, ghosted structures composed of fine albite and minor chlorite resemble former clasts of pumice, about 1 to 2mm in size.

The sample also displays inhomogeneous patterns of brecciation which have given rise to veinlets and replacement patches of chlorite. There are a few thin veins (0.1mm wide) of sericite which post-date the brecciation and chloritization.

An approximate mode is :

25-30%	phenoclasts of albite
3-4%	chlorite-sphene pseudomorphs of mafic silicate clasts
0.5-1%	partly hematized magnetite crystals
40-45%	fine albite
20-30%	chlorite in fracture controlled veins and replacements
0.2-0.3%	sericite veins

Comments and Interpretations :

This rock seems to have originated as a tuff, composed of phenoclasts of plagioclase, mafic silicates and magnetite and a few pumice fragments, set in a fine matrix. It was presumably andesitic, but there has been pervasive albitization, affecting not only the phenoclasts of inferred andesine, but also the fine matrix. Moderate brecciation has controlled the development of irregular veinlets and replacement patches of chlorite. Magnetite has been partly hematized, not apparently by weathering processes. After chloritization a few veinlets of sericite formed.

There are no sulphides.

342

960340

Sample Number : 21930

Identification : Incipiently foliated, moderately sericitized and chloritized, porphyritic andesite

Description :

The sample is a lightly weathered hand specimen which seems to display many small phenocrysts of light grey to greyish orange feldspar and chloritized mafic silicates, and a few quartz phenocrysts set in a light greenish grey to greyish orange groundmass. There is a 15mm xenolith of finer grained, darker rock.

A cobaltinitrite staining test produced some weak reaction with sericite, but revealed no K-feldspar.

In thin section the sample is seen to have moderate pervasive sericitization and incipient metamorphic foliation but primary textures are well preserved and are of volcanic porphyritic to glomeroporphyritic style. Subhedral phenocrysts are about 0.3 to 2mm in size and the groundmass is allotriomorphic and about 0.03mm in grainsize.

The main phenocrysts are tabular, twinned plagioclase moderately altered to weakly limonite-stained sericite. Quartz occurs quite sparsely as deeply embayed phenocrysts about 1 to 2mm in size. Small phenocrysts of prismatic mafic silicate have been variously pseudomorphed by mainly chlorite or by quartz and chlorite rimmed by opaque oxide. Small phenocrysts of ilmenite or titaniferous magnetite have been partly leucoxenized. A few phenocrysts of inferred biotite have been pseudomorphed by coarse sericite. The groundmass consists of anhedral, untwinned feldspar (probably recrystallized), minor anhedral quartz and pervasive fine sericite and minor chlorite and partly leucoxenized opaques.

The xenolith is of microdioritic or coarsely andesitic appearance with randomly orientated plagioclase laths (0.2 to 0.5mm), minor quartz, chlorite, leucoxenized opaques and pervasive sericite.

An approximate mode of the specimen is :

20-25%	moderately sericitized plagioclase phenocrysts
6-8%	completely altered mafic silicate phenocrysts
0.5-1%	quartz phenocrysts
0.2-0.3%	opaque phenocrysts, partly leucoxenized
30-40%	groundmass plagioclase
1-2%	groundmass quartz
4-6%	groundmass chlorite
0.1-0.2%	groundmass opaques
25-30%	groundmass sericite
tr	microdioritic/andesitic xenolith

Comments and INterpretations :

This sample is interpreted to represent porphyritic andesite lava which has been moderately altered to produce sericite, chlorite and leucoxene. The rock is also weakly imprinted with a sericitic foliation of incipient regional metamorphic origin.

There are no sulphides or sulphide textures.

960341

343

Langdon

Sample Number : 21931

Identification : Fine andesitic tuff, lightly carbonated, chloritized and pyritized and moderately sericitized

Description :

The sample is a lightly weathered hand specimen of fine-grained, dark greenish grey rock with many light grey specks resembling phenoclasts smaller than 1mm in size.

A staining test revealed traces of fine K-feldspar within small clasts.

In thin section the sample displays finely tuffaceous textures. Broken crystals of carbonated plagioclase and less commonly quartz, generally 0.1 to 0.5mm in size, are scattered through a sericitic, feldspathic, fine matrix. There are also a few other types of clasts, including wispy, sericitic and less commonly chloritic structures which may have been vitric shards about 0.5 to 2mm in size, and a 3mm lithic clast of interlocked, carbonated plagioclase grains. The matrix consists of anhedral, untwinned feldspar and minor quartz, finer than 0.03mm, abundant sericite, minor chlorite and equant opaque oxides, about 0.01mm in size.

Anhedral to subhedral pyrite occurs as disseminated grains and aggregates, about 0.01 to 0.5mm in size, commonly partly replacing small clasts.

An approximate mode is :

10-15%	clasts of partly carbonated plagioclase
1-2%	clasts of quartz
2-3%	sericitic and chloritic inferred vitric clasts
tr	potassic clasts
rare	feldspathic lithic clasts
50-55%	matrix plagioclase
20-25%	matrix sericite
3-4%	matrix chlorite
2-3%	matrix quartz
1-2%	matrix opaque oxides
0.3-0.4%	disseminated sulphides

Comments and Interpretations :

This rock is interpreted to have originated as a fine tuff, composed of small clasts of feldspar and minor quartz and some vitric shards scattered through a fine matrix. The tuff may well have been deposited by airfall processes, since there are no indications of welding (which might suggest an ashflow), nor of sorting (which might suggest aqueous influences).

The volcanic source may well have been slightly quartzose andesite, comparable to either 21930 or 21932.

The rock has been lightly carbonated, chloritized and pyritized, and moderately sericitized.

960342

344

Sample Number : 21932

Identification : Moderately sericitized, felsic andesite with oxidized pyritic quartz-chlorite gash veinlets and two incipient sericitic foliations

Description :

The sample is a lightly weathered hand specimen of fine-grained, light olive grey rock with an incipient rhombic jointing pattern delineated by porous and non-porous structures stained with dark Fe-Mn oxides.

A cobaltinitrite staining test revealed minor fine K-feldspar.

In thin section the sample is seen to have moderate pervasive sericitization and incipient metamorphic foliations, but well preserved primary textures are of porphyritic and glomeroporphyritic volcanic style. Many subhedral phenocrysts, about 0.5 to 2mm in size, are set in an allotriomorphic, possibly recrystallized groundmass with grainsizes of 0.03 to 0.1mm.

The phenocrysts are tabular, twinned plagioclase, finely speckled with sericite. They are now optically positive, consistent with albite. The groundmass consists of untwinned feldspar, minor chlorite and abundant sericite with two preferred orientations producing rhombic patterns.

The porous joints are seen to correspond with gash veinlets, up to 0.7mm wide, carrying strained and partly recrystallized quartz and chlorite. Equant pores, about 0.2 to 0.5mm in size, may reflect carbonate and/or pyrite, but some incompletely oxidized pyrite is present. The gash veins bisect the two sericitic foliation directions but other Fe-Mn oxide stains correspond with them.

An approximate mode is :

5-8%	plagioclase phenocrysts, flecked with sericite
40-45%	groundmass plagioclase
30-40%	groundmass sericite
5-7%	groundmass orthoclase
2-3%	groundmass quartz
3-4%	groundmass chlorite
3-4%	porous gash veins of quartz and chlorite with traces of oxidized pyrite
0.3-0.4%	Fe-Mn oxide pigments

Comments and Interpretations :

This rock is interpreted to have originated as an intermediate, porphyritic lava. Its composition is best described as felsic andesite, since it carried no mafic phenocrysts and apparently only small amounts of groundmass mafics.

There is moderate pervasive sericitization and two incipient sericitic foliations of regional metamorphic origin. Porous gash veinlets carrying quartz, chlorite and oxidized pyrite may well be related also to dynamothermal metamorphism.

The original composition of the plagioclase phenocrysts may well have been andesine but they are now albite, probably adjusted by

960343

345

Geochempet Services

PETROLOGICAL and GEOCHEMICAL CONSULTANTS

REGISTERED IN QUEENSLAND
Principal : A.S. Joyce B.Sc.(Hons), Ph.D.
200 Chapel Hill Road
Chapel Hill, Qld. 4069

Telephone: (07) 375 5258
A/H 378 6467

PETROLOGICAL REPORT ON TWENTY-FOUR SAMPLES

FROM THE ROSEBERY AREA, TASMANIA

prepared for

BILLITON AUSTRALIA

Order Code : 08340/LJ50/JPR/014

Ref: J.P. Randell

Stan Joyce

A.S. Joyce B.Sc.(Hons),Ph.D.

9th July, 1986

960344

343

COMMENTS

1. The samples 21970-72 all reveal a similar history, involving tensional or expansive brecciation of intensely silicified, chloritized and lightly to moderately sericitized probable andesite and then hydrothermal cementation by quartz-siderite-chlorite-galena.

There is no significant sulphide in the andesites themselves and galena is the only sulphide in the cavity fillings.

The samples 21934 and 21937 from the same location are also interpreted to have been andesites, now silicified, sericitized and chloritized but devoid of significant sulphides. Sample 21946 is a different type of quartz-bearing but not silicified andesite ; it is sericitized, chloritized and carbonated, but lacking in sulphides.

The sample 21969 is also brecciated, intensely chloritized and silicified andesite, but it is fissure veined by only quartz with some associated wall rock magnetite.

2. Samples 21964 and 21965 seem to represent intrusive quartz trachyandesite porphyry with moderate to heavy alteration which may be of deuteric origin. The samples are not silicified. It is feasible that gold may have accumulated in late magmatic fluids and become trapped with quartz and epidote in drusy pockets such as those detected in 21964.

3. Sample 21968 is an intermediate, unwelded, pumiceous pyroclastic which could have been deposited on land or in water.

4. The three samples MP32/127.6, Mp32/178 and MP32/269 are quite similar types of moderately sorted volcanolithic arenite, considered to have been derived by erosion and brief aqueous transport of detritus from a dacitic welded tuff source. Light alteration involves sericite, carbonate, chlorite, sphene and traces of pyrite. MP32/127.6 is also fissure veined by quartz with carbonate and traces of chlorite and pyrite. Former glass is now cherty quartz and albite and plagioclase clasts are now albite. Mild deformation post-dates the veining.

5. The two samples MP30/299 and MP30/332 were deposited as probably dacitic volcanolithic arenites quite comparable to the three samples from MP32, but they differ in having experienced intense sericitization with no associated carbonate in one case and only a small amount in the other.

The most intensely sericitized sample MP30/299 carries traces of fine sphalerite and pyrite as disseminations and within deformed quartz veins. The other sample has no veins and traces of only pyrite.

..../2

COMMENTS CONT.

6. The other two samples from MP30 are of greywacke style. MP30/373 was derived dominantly from metasedimentary sources and MP30/191 was derived probably from mixed metasedimentary and volcanic sources. Both carry traces of disseminated pyrite and display moderate alteration to carbonate.

7. All four samples from MP88 are richly sericitic and display a slaty foliation. They seem to represent various tuffaceous sediments ranging from a rock type resembling rhyodacitic crystal tuff (MP88/329) to slaty acid vitric crystal tuff (MP88/45 and MP88/556) and laminated quartz-sericite slate. All show light to moderate alteration to carbonate in addition to dominant sericitization. All carry traces of pyrite. Three display apparently late fissure veins of quartz with carbonate and in some cases chlorite, sericite, apatite, galena and pyrite.

8. The two samples from TP133 are texturally similar foliated volcanolithic coarse arenites (or perhaps strictly pebble conglomerates) showing heavy sericitization and moderate alteration to carbonates. One (TP133/78) was apparently generated by erosion and brief transport of sand and fine pebbles derived from several types of andesitic lava and possibly tuff, but the other had a single source of acid rock, probably welded vitric tuff.

The former carries a calcite-quartz fissure vein only slightly affected by deformation, but the latter has heavily disturbed ankerite replacement veins.

9. The sample TP135/38 was apparently andesite, now intensely altered to sericite-albite-carbonate-chlorite, veined by siderite-pyrite, then calcite-quartz, then deformed.

10. Collectively the samples of core from the MP and TP series display mainly mildly to moderately deformed, lightly to intensely altered, poorly to moderately sorted sediments, mainly coarsely sandy to finely pebbly. The samples vary in provenance : some are derived from single types of pyroclastic and volcanic rock in the compositional range from andesite to rhyodacite, some are derived from low grade regional metamorphic source rocks and some are of mixed provenance.

The likely depositional setting is a marine environment, deep enough to preclude significant sorting and rounding by currents and waves, and fed by intermittent slumping of immature detritus derived locally from tuffs, lavas and less commonly metasediments.

960346

348

Sample Number : 21934

Identification : Weathered intensely silicified and sericitized porphyritic intermediate lava.

Description :

The sample is a porous, leached hand specimen. Sawn surfaces reveal many 1 to 2mm ragged pores (resembling leached phenocrysts), disseminated through a moderately hard, olive grey to brownish, fine groundmass. A thin weathering skin is quite silicified.

A staining test revealed no K-feldspar but some stain was absorbed by the pores.

In thin section the sample displays altered, weathered and eroded subhedral phenocrysts, about 0.5 to 2mm in size, set in a finely sericitic matrix with abundant disseminated aggregates, about 0.1 to 0.3mm in size, of mildly strained quartz. Mass extinction characteristics of the very fine sericite suggest two incipient foliation directions intersecting at a high angle.

In places there are remnant tabular phenocrysts of twinned plagioclase, cracked and limonite stained by weathering: there are also silicified pseudomorphs of tabular inferred feldspar and many porous, eroded remnants of both types of phenocrysts. Mafic phenocrysts are harder to recognize, but there are some small limonitic pseudomorphs which resemble formerly chloritized silicates. There are also a few limonite stained leucoxene pseudomorphs of platy phenocrysts of inferred ilmenite or titaniferous magnetite. The disseminated aggregates of quartz in the groundmass resemble crude pseudomorphs of tabular mineral grains.

An approximate mode is :

20-25%	silicified, weathered, stained and eroded phenocrysts of plagioclase
3-4%	limonitized, inferred chloritized mafic silicate phenocrysts
tr	limonitized, leucoxenized inferred opaque phenocrysts
35-40%	groundmass sericite
30-35%	groundmass quartz

Comments and Interpretations :

This rock is interpreted to have originated as a crystalline porphyritic igneous rock, probably an intermediate lava, but possibly a subvolcanic intrusive : it was not a tuff. There has been intense hydrothermal silicification and sericitization, then incipient tectonic foliation, then weathering. There is mild limonitic staining of weathered phenocrysts, but no textural evidence to suggest the former presence of any sulphides.

Prior to alteration the rock was probably intermediate, since there are no indications of any quartz phenocrysts.

960347

349

Sample Number : 21937

Identification : Weathered, deavily sericitized, lightly silicified, porphyritic intermediate lava cut by many thin porous veins carrying quartz and chlorite.

Description :

The sample is a moderately weathered hand specimen of moderately hard, greyish orange, altered porphyritic volcanic or tuffaceous rock cut by many thin anastomosing veins, variously dark grey and porous.

A staining test revealed no K-feldspar.

In thin section this sample displays sparse, inconspicuous, subhedral phenocrysts of tabular, heavily sericitized plagioclase (about 0.5 to 2mm in size) set in a heavily sericitized groundmass of sutured, recrystallized, poorly twinned plagioclase (about 0.05mm grainsize) and disseminated coarser, strained, sutured grains of quartz (about 0.1mm). There are a few small phenocrysts pseudomorphed by chlorite with leucoxene (presumably after mafic silicates) and leucoxene alone (presumably after titaniferous opaques. The groundmass also carries minor chlorite and leucoxene.

Cutting the rock is an anastomosing, crudely rhombic pattern of fracture-controlled but partly replacement style veins, about 0.03 to several millimetres wide carrying bright green chlorite and mildly strained quartz. The thick veins are commonly irregularly porous and carry cavity filling style quartz up to at least 1mm in size. In a few cases there are brown oxidation products after possible anhedral sulphide within the veins.

An approximate mode is :

8-10%	heavily sericitized phenocrysts of plagioclase
1-2%	mafic phenocrysts, altered to chlorite and leucoxene
60-65%	groundmass plagioclase heavily sericitized
10-15%	groundmass quartz
2-3%	groundmass chlorite and leucoxene
10-15%	veins, carrying quartz, chlorite, pores and brown oxidation products after possible sulphide.

Comments and Interpretations :

This rock is interpreted to have originated as a porphyritic intermediate lava (carrying fewer phenocrysts than 21934). Hydrothermal alteration has heavily sericitized and lightly silicified and chloritized the rock (all or most of the groundmass quartz has finely porphyroblastic, introduced textures). Many fracture-controlle but partly replacement style veins , carrying quartz, chlorite and possibly some anhedral sulphide, were introduced probably at a later stage (since they are devoid of sericite). Mild deformation is indicated by strain in the quartz in the altered host rock and in the veins, but the sericite has not been significantly re-orientated. Weathering has oxidized and removed some component of the veins and mildly stained the host rock.

350

960348

Sample Number : 21946

Identification : Weathered, mildly foliated, heavily sericitized, chloritized and carbonated porphyritic quartz-andesite.

Description :

The sample is a hand specimen of mildly foliated, moderately hard greenish grey volcanic rock with a thick zone of bleaching adjacent to its weathering surfaces. The foliation is demonstrated by olive and manganese stained wispy sericitic structures.

A staining test revealed no K-feldspar.

In thin section the sample displays an abundantly porphyritic to glomeroporphyritic, volcanic texture, modified by heavy sericitization, incipient foliation and weathering.

The main phenocrysts are subhedral, tabular, heavily sericitized twinned plagioclase, about 0.5 to 2mm in size. There are also some 0.5 to 4mm phenocrysts of smoothly corroded, deeply embayed quartz. Neither the plagioclase nor the quartz phenocrysts display any broken shapes. There are many prismatic pseudomorphs of mafic silicate phenocrysts (resembling hornblende), now composed of chlorite with carbonate and secondary opaque oxides : sizes range up to 1.5mm. There are also opaque oxide phenocrysts up to 0.4mm, partly leucoxenized. The groundmass consists of sutured, finely recrystallized, untwinned , heavily sericitized and carbonated plagioclase (about 0.1mm grainsize), minor quartz (0.02mm) and some chlorite and opaque oxides. In parts of the sample the carbonate is represented only by fine pores.

The wispy structures (which falsely suggest vitric shards in hand specimen) are seen to correspond with sericitic incipient foliation, accentuated, by local preferential staining with limonite and manganese oxides (probably derived from chlorite and carbonate).

An approximate mode is :

15-20%	heavily sericitized plagioclase phenocrysts
6-8%	chlorite-carbonate-opaque pseudomorphs of mafic silicate phenocrysts
3-5%	quartz phenocrysts
0.5-1%	opaque oxide phenocrysts
65-70%	groundmass plagioclase, heavily sericitized and carbonated
2-3%	groundmass chlorite
0.4-0.6%	groundmass opaques

Comments and Interpretations :

Despite its wispy, pseudo-tuffaceous appearance in hand specimen, this rock has primary textures quite consistent with a porphyritic lava of quartz-bearing andesitic composition. Heavy hydrothermal alteration has produced a sericite-calcite-chlorite assemblage. Then the rock was mildly foliated and later weathered There are no indications of any sulphides. The rock is not silicified : its quartz content is primary.

351

Sample Number : 21964

Identification : Heavily sericitized chloritized and epidotized quartz tranchyandesite porphyry.

Description :

The sample consists of two moderately weathered hand specimens. Outer zones have been bleached by weathering to greyish orange colours but the least weathered cores of the specimens display abundant small phenocrysts of feldspar and chloritized mafic silicates set in a pale red groundmass.

A cobaltinitrite staining test revealed that the groundmass is rich in K-feldspar.

In thin section the sample displays textures consistent with intruxive porphyry. Abundant altered subhedral phenocrysts (0.5 to 2mm) and clusters of phenocrysts are set in a micrographic groundmass with grainsizes of 0.1 to 1mm.

The main phenocrysts are heavily sericitized, tabular plagioclase Numerous prismatic phenocrysts (former pyroxene or hornblende) have been pweudomorphed by chlorite with epidote. There are also many small phenocrysts (less than 0.5mm) of equant, subhedral opaque oxide. The groundmass displays many stumpy laths of sericitized plagioclase, chloritized silicates and primary opaque oxides (all minerals less than about 0.1mm) poikilitically enclosed by much coarser micrographic grains of K-feldspar with minor quartz. The groundmass textures suggest annealing. There are a few groundmass pods, resembling late drusy pockets, containing subhedral quartz and epidote.

An approximate mode is :

20-25%	heavily sericitized phenocrysts of plagioclase
5-7%	chlorite-epidote pseucomorphs of mafic phenocrysts
1-2%	opaque oxide phenocrysts
35-40%	groundmass orthoclase
15-20%	groundmass plagioclase
5-7%	groundmass quartz
3-4%	groundmass chlorite and minor epidote
0.5-1%	groundmass opaques
2-3%	drusy pockets of quartz and epidote.

Comments and Interpretations :

This rock is interpreted with a fairly high degree of confidence to have originated as a subvolcanic intrusion (stock, sill or dyke). There is only a slight possibility that it was a lava and none that it was a tuff. The magna was of quartz-bearing trachyandesitic composition (alternatively describable as quartz latite). Heavy

..../2

21964 (cont)

hydrothermal alteration has produced sericite, chlorite and epidote: the alteration is probably of deuteric origin during the late stages of crystallization, in view of the crusy, late pockets of epidote with quartz. The rock is quartz bearing but not silicified.

Since the rock is apparently a subvolcanic intrusion which has "stewed" in its own late, siliceous fluids, I would speculate that any associated gold mineralization (as indicated by a previous assay) originates from within the intrusion itself. The gold would probably report in the drusy pockets.

960351

Sample Number : 21965

Identification : Moderately epidotized and chloritized but only slightly sericitized quartz trachyandesite porphyry.

Description :

The sample is a hand specimen which displays a bleached weathering jacket of few millimetres width surrounding a hard massive core of finely porphyritic crystalline rock. Light grey phenocrysts of plagioclase, less than about 2mm in size, are scattered through a moderately chloritic groundmass with abundant dark reddish brown feldspar.

A staining test revealed that K-feldspar is moderately abundant in the groundmass.

In thin section the sample displays porphyritic and glomero-porphyritic textures, with subhedral phenocrysts and altered phenocrysts (about 0.3 to 2mm) set in an hypidiomorphic to weekly poikiloblastic and micrographic groundmass (mainly 0.1mm grainsize.).

The main phenocrysts are tabular plagioclase (andesine), lightly flecked with sericite. Mafic silicate phenocrysts were smaller and had subhedral prismatic shapes consistent with pyroxene : they have been speudomorphed by epidote and subordinate chlorite. Partly leucoxenized opaque oxides occur as small phenocrysts and much smaller groundmass grains. The groundmass consists of stumpy laths and equant grains of twinned plagioclase, anhedral, somewhat poikilo - blastic orthoclase, minor anhedral quartz and some epidote and chlorite. Some epidote and chlorite has been mobilized into veinlets and there is one tiny quartz vein.

An approximate mode is :

20-25%	slightly sericitized phenocrysts of plagioclase
5-7%	epidote-chlorite pseudomorphs of pyroxene phenocrysts
1-2%	opaque oxide phenocrysts
30-35%	groundmass orthoclase
20-25%	groundmass plagioclase
5-7%	groundmass quartz
4-5%	groundmass epidote and minor chlorite
0.5-1%	groundmass opaques and leucoxene
0.2-0.3%	veinlets of epidote and chlorite

Comments and Interpretations :

This rock is interpretated to be a textural variant of the same porphyritic crystalline trachyandesite represented by 21964. It probably represents a subvolcanic porphyry which has not been annealed It is not as heavily altered as 21964 and does not carry the drusy groundmass pockets of quartz and epidote which characterize 21964. Thus it may be a chilled version of the porphyry.

I would speculate that this sample is less likely to report gold than the more annealed, more altered and drusy sample 21964.

Sample Number : 21968

Identification : Heavily albitized, moderately sericitized and chloritized, potassic modesitic pumiceous tuff.

Description :

The sample consists of two lightly weathered hand specimens of altered pyroclastic appearance. There are many phenocrysts of moderate orange pink feldspar set in a groundmass which creates an impression of large, foliated dark greenish grey fiamme alternating with large clasts or pods of moderate orange pink felsic material.

A staining test revealed moderately abundant fine K-feldspar.

In thin section the sample displays scattered phenocrysts of plagioclase (0.4 to 1.5mm) and a few aggregates of plagioclase set in a finely recrystallized mosaic of lightly sericitized, poorly twinned and untwinned feldspar and quartz (about 0.02 to 0.03mm grainsize). The plagioclase phenocrysts are subhedral, tabular, twinned grains with an optically positive character, consistent with albite : they are lightly to moderately sericitized. There are a few small phenocrysts (0.2mm) of cloudy leucoxene after inferred titaniferous opaque oxides and a few very crude epidote-chlorite pseudomorphs after mafic silicates.

The recrystallized matrix has very poorly displayed ghost textures suggestive of former pumiceous clasts (ranging up to a few millimetres in size) and other vitric or felsic lithic clasts. The pumiceous structures display minor chlorite. The rock has a crudely banded and foliated appearance but does not seem to have been welded. There is a tiny quartz fissure vein and several weathered, tiny chlorite veins.

An approximate mode is :

5-7%	lightly to moderately sericitized phenocrysts (? clasts) of plagioclase
0.2-0.3%	epidotized and chloritized mafic silicates
0.1-0.2%	leucoxenized opaque oxides
55-65%	fine albite
15-20%	fine K-feldspar
(?)5-10%	fine quartz
5-7%	groundmass sericite
3-5%	groundmass chlorite

Comments and Interpretations :

This sample seems to have originated as a very pumiceous, unwelded pyroclastic rock of probably quartose, potassic andesitic composition. In the absence of quartz phenocrysts/clasts it is unlikely that it was an acid rock, but there certainly is difficulty in estimating the abundance of groundmass quartz, since it occurs with untwinned albite and orthoclase.

The rock seems to have suffered compression (but not welding), pervasive albitization and moderate sericitization and chloritization.

It is difficult to recognize any special significance in this

21968 (cont)

rock. It is an apparently intermediate, unwelded, pumiceous pyroclastic which could have been deposited on land or in water. It is altered, but not sulphide mineralized.

960354

Sample Number : 21969

Identification : Brecciated porphyritic andesite, intensely chloritized, silicified and fissure veined by quartz with accompanying magnetite.

Description :

The sample is a lightly weathered, dark greenish grey, chloritic, but moderately hard hand specimen. Sawn surfaces reveal brecciated textures with greyish orange volcanic clasts, rangine up to about 15mm, visible within a dominantly chloritic host.

A staining test revealed no K-feldspar.

In thin section the sample plainly displays brecciation, intense chloritization and silicification and fissure veining. The greyish orange clasts are weathered remnants of least altered, abundantly porphyritic, intermediate crystalline volcanic rock. Phenocrysts of tabular, twinned andesine, about 0.3 to 1.5mm in size,-and completely chloritized larger phenocrysts of prismatic pyroxene or hornblende are set in a iron-stained, heavily chloritized, finely feldspathic (0.05 to 0.1mm) groundmass. Most of the rock displays more heavily altered clasts of the same rock type : phenocrysts have been completely replaced by aggregates of quartz or by chlorite and the groundmass has also been completely replaced by variable proportions of chlorite and fine quartz.

There are remnant leucoxenized sphene pseudomorphs of former subhedral small phenocrysts (0.2 to 0.5mm) of inferred ilmenite or titaniferous magnetite, but there are also smaller (mainly less than 0.2mm) more euhedral grains of magnetite developed mainly near and within numerous fissure veins (0.03 to 1mm wide) carrying mildly strained, anhedral to crudely toothy quartz. Minor chlorite occurs in some quartz veins.

An approximate mineralogical mode is :

50-60%	chlorite
30-35%	quartz
8-10%	remnant plagioclase
1-2%	replacement and vein magnetite
0.2-0.3%	remnant leucoxenized sphene after primary opaques.

Comments and Interpretations :

This rock originated as an abundantly porphyritic crystalline andesite : it was probably a flow or just possibly a subvolcanic intrusion but not a tuff. It was heavily brecciated, then intensel chloritized, silicified and fissure veined by quartz. The alteration commenced with chlorite then proceeded through siliceous replacement to culminate in quartz fissure veining. Minor chlorite occurs in the veins. Magnetite developed in and near the quartz veins.

This sample does have some similarities to the 21970-72 samples, being intensely chloritized, silicified, brecciated and veined by quartz. However, the presence of vein-related magnetite and absence of carbonate and galena seem to indicate a higher

960355

357

Sample Number : 21970

Identification : Intensely silicified, sericitized and chloritized andesite with veins and breccia fillings of quartz-siderite-chlorite-galena.

Description :

The sample is a superficially weathered hand specimen of hard, dark greenish grey rock with vaguely volcanic textures and cut by a few fracture-controlled, dark chloritic veins with some galena.

A cobaltinitrite staining test, revealed no K-feldspar.

In polished thin section the bulk ot the sample displays abundant, subhedral, completely altered phenocrysts, about 0.5 to 1mm in size, set in a fine-grained, completely altered groundmass. Tabular phenocrysts which may have been feldspar have been completely replaced by fine quartz (0.1mm) with sericite and chlorite and other tabular to prismatic phenocrysts (formerly (?) mafic silicates) have been completely replaced by chlorite. The groundmass consists of quartz, sericite and minor chlorite and sphene. There are rare disseminated subhedral grains of pyrite (about 0.05 to 0.2mm).

In the vicinity of a regime of dense veining the rock is heavily silicified and depleted in sericite. There is one small cluster of subhedral arsenopyrite grains, about 0.05 to 0.3mm in grainsize.

The thickest veins are clearly of fissure filling style, about 1 to 3mm wide, and forming patterns consistent with local brecciation of the host rock. They are variously filled or lined by "toothy", subhedral, unstrained to faintly strained quartz (commonly 0.1 to 1mm) with variable central fillings of anhedral, partly oxidized siderite (ranging up to 1.5mm), followed by radial encrustations of fine chlorite, followed by anhedral galena (ranging up to 2mm). In some places the siderite has been pseudomorphed by chlorite with abundant earthy Fe-Mn oxides delineating former cleavages and growth zones. Some thin fissure veins carry solely quartz or solely chlorite.

An approximate mode of the bulk sample is :

20-25%	silicified phenocrysts
5-7%	chloritized phenocrysts
30-35%	groundmass quartz
25-30%	groundmass sericite
5-7%	groundmass chlorite
0.2-0.3%	groundmass sphene
rare	pyrite and arsenopyrite
4-6%	veins of quartz-siderite-chlorite-galena

..../2

358

21970 cont.

Comments and Interpretations :

This sample seems to have originated as an abundantly porphyritic intermediate volcanic rock, probably andesite. It has been subjected to intense silicification, sericitization and chloritization and to local tensional brecciation. Host rock silicification is most intense in the brecciated zones. Cavity fillings in the fractures show a distinct paragenesis involving toothy quartz followed by siderite, then chlorite, then galena. Some siderite has been replaced by chlorite and earthy Fe-Mn oxides.

960357

Sample Number : 21971

Identification : Breccia of intensely silicified, chloritized and lightly sericitized andesite cemented by quartz-chlorite-siderite-galena

Description :

The sample is a very superficially weathered hand specimen of brecciated and mineralized appearance. The host rock is very hard, greenish grey material of felsic volcanic appearance, brecciated to clast sizes of a fraction of a millimetre to about 20mm. The clasts appear veined and cemented by dark chlorite accompanied by segments up to 3mm thick of galena.

A cobaltinitrite staining test revealed no K-feldspar.

In polished thin section the breccia clasts are seen to consist of intensely altered rock with poorly preserved porphyritic intermediate volcanic textures. Phenocrysts up to 1mm in size have been pseudomorphed variously by fine quartz or by chlorite with and without quartz. Small, subhedral phenocrysts, (up to 0.4mm) of inferred ilmenite or titaniferous magnetite have been altered to leucoxene and fine sphene. The groundmass has been completely altered to fine quartz (less than 0.1mm) chlorite and sericite. There are rare subhedral grains of subhedral pyrite about 0.1mm in size. A generalized mode of the clasts is

75-85%	quartz
10-15%	chlorite
5-10%	sericite
0.1-0.2%	leucoxene/sphene
rare	pyrite

Between the clasts there are cavity fillings which in many places consist of chlorite intermingled with toothy to acicular quartz crystals (about 0.1to 1mm long) and earthy Fe-Mn oxides crudely pseudomorphing carbonate. Such fillings appear mildly disturbed. Some thicker (up to 4mm) less disturbed cavity fillings carry coarse, undeformed anhedral galena (up to about 2mm grainsize) as a core within cavities which have margins of intermingled, randomly orientated, acicular quartz crystals and chlorite. Some siderite occurs adjacent to galena. One very simple cavity filling displays thin layers of radial, encrusting chlorite coating small quartz crystals, and a thick core of undeformed galena.

An overall mode is about :

55-65%	clasts of altered andesite
15-20%	chlorite in cavity fillings
8-10%	quartz in cavity fillings
8-10%	galena in cavity fillings
3-4%	siderite, generally replaced by earthy oxides

..../2

21971 cont.

Comments and Interpretations :

It seems that this rock originated as a porphyritic intermediate volcanic, probably andesite, but it suffered expansive or tensional brecciation, intense silicification, chloritization and mild sericitization, and cementation by quartz-chlorite-siderite-galena. During deposition fo early quartz and chlorite as cavity fillings there was enough fluid disturbance (but not shearing) to cause random orientations of quartz but fluids were more passive by the time galena crystallized.

Sample Number : 21972

Identification : Breccia of intensely silicified chloritized, and lightly sericitized andesite cemented by siderite and galena with minor quartz and chlorite.

Description :

The sample is a large hand specimen of lightly weathered, mineralized breccia. It displays angular clasts (up to about 15mm) of dark greenish grey, fine-grained rock scattered abundantly through a matrix of hard, pale brown carbonate. Galena is locally abundant as irregular cavity fillings ranging up to 8mm thick. There are some drusy cavities, possibly, but not necessarily of weathering origin.

Cobaltinitrite stain revealed no K-feldspar.

In a polished thin section of the most galena rich material breccia clasts are seen to have remnant porphyritic, intermediate volcanic textures, but phenocrysts (up to 1mm) have been variously pseudomorphed by quartz or by siderite and chlorite and the groundmass consists of fine quartz (less than 0.1mm) chlorite and sericite. There are rare grains of subhedral pyrite (about 0.01 to 0.02mm) and subhedral arsenopyrite (less than 0.05mm). There are some thin fissure veins of quartz, truncated by the cementing minerals between the clasts. A typical mode within the clasts is :

75-80%	quartz
15-20%	chlorite
3-5%	sericite
0.5-1%	siderite
rare	pyrite and arsenopyrite

The cavity fillings involve mainly siderite, about 0.3 to 4mm in grainsize, commonly partly altered to earthy Fe-Mn oxides. The fillings vary in mineral assemblage from place to place and show some cross-cutting relationships related to renewed tensional or expansive brecciation. However, there is a clear paragenetic sequence involving minor early, relatively fine, "toothy" quartz, then abundant coarser siderite, then finely botryoidal encrusting chlorite, then coarse, anhedral galena (up to at least 5mm).

A crude estimate of the mode of the bulk sample is :

30-40%	clasts of altered andesite
45-55%	cementing siderite
10-12%	cementing galena
2-3%	cementing quartz
2-3%	cementing chlorite

..../2

21972 cont.

Comments and Interpretations :

This rock seems to have originated as a porphyritic, intermediate volcanic, probably andesite, but it suffered expansive or tensional brecciation, intense silicification, chloritization and minor sericitization, and cementation by siderite and galena with minor quartz and chlorite. Earthy oxides in the siderite probably reflect incipient weathering.

960361

368

Sample Number : MP30/191

Identification : Deformed, moderately carbonated, labile arenite (or greywacke) of mixed provenance.

Description :

The sample is a small drill core specimen of medium grey, epiclastic rock. It displays fine sand clasts and many stretched carbonaceous clasts whcih range in size from a fraction of a millmetre to about 10mm long. The stretched clasts are orientated almost normal to the core axis.

A staining test revealed many small sand grains containing potassic feldspar.

In thin section the sample plainly displays moderately sorted, stretched sandy textures. Quartz is prominent as angular fragments, about 0.05 to 0.5mm in size : the largest have suggestions of broken, corroded β form. Clasts of twinned and untwinned feldspar are angular and show a similar size range to the quartz : most are plagioclase (some carbonated and slightly sericitized), but some are microcline (with cross-hatched twinning). There are rare 0.3mm detrital flakes of muscovite. Abundant ovoid, stretched, subrounded clasts (about 0.1 to 1mm) consist of "cherty" untwinned feldspar and quartz : they are probably of volcanic or vitroclastic origin. Many other very stretched, platy clasts (0.2 to 10mm) consist of fine-grained carbonaceous slate.

Calcite is speckled throughout the rock as an alteration mineral. It also occurs in a few replacement veins and some concordant veins or pods (ranging up to 3mm wide). Pale chlorite, very fine sericite and disseminated fine pyrite occur in trace abundances.

An approximate mode is :

50-60%	clasts of "cherty" feldspar and quartz(some potassic, most not)
10-15%	clasts of quartz
10-15%	clasts of carbonaceous slate
3-5%	clasts of plagioclase
2-3%	clasts of microcline
rare	clasts of muscovite
10-15%	calcite as disseminations,veins and pods
traces	chlorite, sericite, pyrite

Comments and Interpretations :

This sample is interpreted to have originated as a moderately sorted labile arenite developed by aqueous transport and sorting of "cherty" quartzofeldspathic clasts (probably derived from dacitic and rhyodacitic volcanics or welded tuffs), carbonaceous slate or shale, quartz, plagioclase, microcline and rare muscovite. At least some of the quartz appears to be of volcanic derivation. The origin of the feldspar is uncertain in view of the presence of microcline (not feasible as a directly volcanic mineral, but feasible as an inverted mineral derived from sanidine or orthoclase). The rare flakes of muscovite are not compatible with a volcanic source.

MP30/191 cont.

In some classification schemes the rock would qualify as greywacke, but it lacks the muddy matrix required by others.

The rock has been stretched by tectonic compression. Alteration is confined mainly to development of disseminated and vein carbonate and deformation textures suggest that the veins pre-date stretching.

960363

Sample Number : MP30/299

Identification : Chloritized and intensely sericitized acid volcanolithic arenite cut by deformed thin veins of quartz with minor sphalerite, pyrite and chlorite.

Description :

The sample is a small drill core specimen of medium grey rock of finely sandy, volcaniclastic appearance.

A staining test revealed no K-feldspar.

In thin section the sample is seen to be intensely sericitized, but its remnant primary textures are consistent with densely packed moderately sorted clasts of quartz, feldspar and acid tuff. The most abundant clasts are those interpreted to have been tuff. They range from about 1 to 5mm in sizeand are equant to stretched ovoid. Many consist solely of mildly foliated sericite and subordinate fine quartz, but the largest examples also carry broken phenoclasts of quartz and completely sericitized pseudomorphs of tabular, inferred plagioclase phenoclasts. Other discrete, strained phenoclasts of quartz and completely sericitized inferred plagioclase are about 0.2 to 1mm in grainsize. Fine secondary sphene occurs as disseminated grains and small aggregates. Pale green chlorite occurs as a few aggregates (up to 1mm) and as inconspicuous disseminated grains mingled with sericite. There are a few wisps of finely carbonaceous sericitic and chloritic slate.

Traces of anhedral, translucent grey brown sphalerite (less than 0.5mm) and less abundant cubes of pyrite are disseminated through the rock as individual grains and as small aggregates in altered clasts. There are also numerous mildly deformed and finely recrystallized quartz fissure veins about 0.03 to 0.5mm wide, carrying minor anhedral sphalerite and subhedral pyrite and in some cases chlorite.

An approximate mode is :

60-70%	sericite, developed from clasts of tuff and feldspar
12-18%	fine quartz, developed from tuff
5-8%	quartz phenoclasts
0.2-0.3%	clasts of carbonaceous slate
5-8%	chlorite
0.1-0.2%	sphene
0.2-0.3%	disseminated sphalerite and pyrite
3-4%	quartz veins with minor sphalerite pyrite and chlorite

Comments and Interpretations:

This sample is interpreted to have originated as moderately sorted volcanolithic arenite very similar in textures and composition to the samples MP32/127.6, MP32/178 and MP32/269. It was apparently derived by aqueous transport of acid tuffaceous debris (probably dacitic). It differs in displaying intense sericitization with some accompanying chlorite, but no carbonate. It carries small amounts of sphalerite and pyrite as disseminated fine replacement grains and as components of deformed, thin quartz fissure veins. There

960364

Sample Number : MP30/332

Identification : Intensely sericitized slightly chloritized and carbonated, dacitic volcanolithic arenite

Description :

The sample is a small drill core specimen of volcaniclastic appearance. Densely packed phenoclasts (up to 2mm) of light grey plagioclase and colourless quartz are set in a medium grey matrix which is foliated at about 60^{0} to the core axis.

A staining test revealed very minor K-feldspar as short irregular veinlets and patches.

In thin section the sample is seen to be intensely sericitized and incipiently foliated but remnant primary textures are consistent with densely packed, moderately sorted clasts of acid tuff and related phenoclasts. Stretched, equant to ovoid clasts which are interpreted to have been tuff are about 1 to 8mm in size and sub-angular to subrounded : some carry distinct phenoclasts of quartz and altered feldspar and a very few have remnant textures suggestive of welded tuff. The matrix components have been completely altered to fine sericite, subordinate cherty quartz and traces of chlorite. Quartz phenoclasts are about 0.1 to 2mm in size, occurring within tuff clasts and as discrete clasts : the largest have broken embayed B forms. Plagioclase phenoclasts have been moderately to heavily altered to sericite and minor calcite. Fine sphene is a trace component, occurring mainly in somewhat stylolitic foliation structures.

Fine subhedral sulphide (apparently pyrite), about 0.01 to 0.5mm in size occurs sparsely as disseminated grains and small aggregates. The largest grains partly replace altered clasts but others are mobilized along the incipient foliation.

An approximate mode is :

55-65%	sericite
12-18%	fine quartz
5-8%	quartz phenoclasts
10-15%	remnant plagioclase in phenoclasts
1-2%	K-feldspar
0.5-1%	chlorite
0.1-0.2%	sphene
0.2-0.3%	calcite
0.2-0.3%	pyrite

Comments and Interpretations :

This rock is interpreted to have been deposited as a moderately sorted, dacitic volcanolithic arenite quite comparable to that represented by MP30/299 and the three samples from MP32. Its alteration and subsequent incipient metamorphic foliation is generally similar to that in M30/299, but less intense and lacking the quartz

367

MP30/332 cont.

veins and the sphalerite. It also carries traces of calcite, a mineral lacking in M30/299 but prominent in the samples from MP32.

368

Sample Number : MP30/373

Identification : Moderately carbonated greywacke, dominated by metasedimentary clasts.

Description :

The sample is a small drill core specimen of foliated, coarsely sandy textured, light and medium grey rock. Clasts ranging in size from less than a millimetre to about 5mm have been stretched to produce a mild foliation at about 80° to the core axis.

Cobaltinitrite stain revealed no K-feldspar.

In thin section the sample displays moderately sorted stretched, subrounded lithic clasts, about 1 to 4mm in size, set in a matrix of finer, angular clasts, about 0.05 to 0.5mm in size.

The lithic clasts include metamorphic quartzite, quartz-muscovite-chlorite schist, carbonaceous slate, some finely cherty clasts and several clasts of chloritized, crystalline andesite. Another 8mm clast displays phenocrysts of quartz and carbonated plagioclase set in a chloritized, apparently volcanic groundmass. One chlorite clast carries picotite. The lithic clasts are variously lightly carbonated.

The fine matrix consists of angular quartz, muscovite, carbonate and small quartzose metamorphic rock fragments. Most of the quartz clasts are only about 0.1 to 0.1mm in grainsize and appear likely to be derived from quartz schist or quartzite. A few are larger, equant, mildly strained grains (up to 1mm) which may be of volcanic origin. There are a few disseminated grains of subhedral pyrite, about 0.05 to 0.5mm.

A crude mode is:

50-60%	clasts of quartz-muscovite-chlorite schist of varied appearance
10-15%	cherty clasts
5-10%	clasts of quartzite
5-10%	clasts of quartz, mainly fine
2-3%	clasts of carbonaceous slate
1-2%	clasts of fine muscovite
1-2%	clasts of intermediate volcanic rock
rare	chlorite-picotite clast (?ex-ultramafic)
8-12%	calcite, as an alteration mineral
tr	disseminated pyrite

..../2

MP30/373 cont.

Comments and Interpretations :

This sample is considered to be adequately described as greywacke (though its matrix is finely sandy rather than muddy). Its components seem to have been derived mainly from low-grade regionally metamorphosed rocks (quartz-muscovite-chlorite schists and quartzite) but there are a few clasts of apparently intermediate volcanic rock (probably andesite) and perhaps even one clast of chloritized ultramafic. Some cherty clasts are of uncertain origin and could be true chert or finely crystallized volcanic or tuffaceous material.

The rock carries chlorite as a primary component, but there is promenent calcite as an apparent replacement mineral. There are also a few grains of diagenetic or introduced pyrite.

370

960368

Sample Number : MP32/127.6

Identification : Lightly carbonated, sericitized and chloritized, dacitic volcanolithic arenite cut by fissure veins of quartz with carbonate,chlorite and pyrite.

Description :

The sample is a small drill core specimen which displays tuffaceous textures involving many phenoclasts of light grey feldspar and quartz set in a greenish grey, very hard matrix. There are many thin, straight veins of light carbonate and quartz.

A cobaltinitrite staining test revealed very minor K-feldspar within irregular microveinlets, especially within plagioclase.

In thin section the sample displays densely packed, moderately sorted clasts of "cherty", recrystallized vitric tuff and related phenoclasts. The clasts of inferred vitric tuff are equant and about 1 to 5mm in size. Margins are difficult to discern confidently but seem to be subrounded. Many of the clasts carry broken subhedral clasts of plagioclase and embayed quartz and such minerals also occur as discrete, angular mineral sand grains. The plagioclase clasts are about 0.5 to 2mm in size, twinned, optically positive (consistent with albite), generally lightly sericitized and in some cases, moderately altered to calcite; tiny veins (maximum 0.05mm width) of K-feldspar occur in many clasts in a fashion suggestive of local mobilization.

Fine chlorite and sphene are minor components of the rock, occurring as disseminated small aggregates and subtle stylolites. Sericite forms a few wisps, patches and crude veins in the cherty clasts as well as within phenoclasts. Fine, subhedral pyrite (less than about 0.1mm) forms rare small replacement aggregates.

Mildly strained and recrystallized fissure veins of quartz, about 0.1 to 1mm wide,are common. Some carry calcite and traces of chlorite and pyrite. The thickest carries more ankerite or dolomite than quartz, along with traces of chlorite and pyrite.

An approximate mode is :

40-40%	cherty quartz and albite in devitrified clasts of welded acid tuff
30-35%	phenoclasts of plagioclase
5-7%	phenoclasts of quartz
3-5%	sericite
2-3%	calcite
1-2%	K-feldspar
0.2-0.3%	chlorite
0.1%	sphene
rare	pyrite
6-8%	veins of quartz with calcite, ankerite or dolomite and trace pyrite

Comments and Interpretations :

This rock is interpreted to be a moderately sorted volcanolithic arenite generated by erosion and aqueous transport of dacitic welded tuff.

Vitroclastic fragments have devitrified to "cherty" quartz and albite and plagioclase clasts have been subtly altered to albite. More obvious alteration involves production of minor sericite, calcite sphene and chlorite and development of many thin straight fissure veins carrying quartz with subordinate calcite, traces of chlorite and pyrite and in one case, prominent ankerite or dolomite. Quartz in the veins has since been mildly deformed and partly recrystallized.

372

960370

Sample Number : MP32/178

Identification : Lightly sericitized, carbonated and chloritized, dacitic volcanolithic arenite.

Description :

The sample is a small specimen of drill core of tuffaceous appearance. Many light grey phenoclasts (up to 2mm) of plagioclase and some of quartz are set in a medium grey matrix.

Cobaltinitrite stain revealed minor K-feldspar as irregular microveinlets within plagioclase and other clasts.

In thin section the sample is seen to consist of densely packed, moderately sorted clasts of "cherty", recrystallized vitric tuff and related phenoclasts. Clasts which are interpreted to have been vitric tuff commonly range from about 1 to 5mm (10mm in one case) and are subrounded : many carry phenoclasts of plagioclase and quartz and a few have very poorly preserved welded vitric textures. Such clasts now consist mainly of cherty quartz and untwinned albite (about 0.01mm in grainsize) with traces of chlorite and minor sericite. Phenoclasts within the clasts of devitrified tuff and occurring as discrete sand grains range from about 0.5 to 2mm and are subhedral, corroded and angular. Most are twinned plagioclase (optically positive- consistent with albite), lightly sericitized and carbonated and with subtle microveinlets of K-feldspar of locally mobilized appearance. There are a few small aggregates of sphene and others of chlorite after mafic components.

Throughout the section sericite and to a lesser extent calcite forms patchy to vaguely replacement vein-like patterns of alteration. There are several very thin fissure veins (0.03mm) of calcite. Chlorite forms a few somewhat stylolitic veins. Fine subhedral pyrite about 0.1mm in grainsize forms rare replacement patches.

An approximate mode is :

40-50%	cherty quartz and albite in devitrified clasts of welded acid tuff
30-35%	phenoclasts of plagioclase
5-7%	phenoclasts of quartz
5-7%	sericite
3-4%	calcite
3-4%	K-feldspar
2-3%	chlorite
tr	sphene
rare	pyrite

Comments and Interpretations :

This rock is interpreted to be a moderately sorted volcanolithic arenite generated by erosion and aqueous transport of dacitic welded tuff.

The rock is lightly sericitized, carbonated and chloritized. Plagioclase clasts have been inconspicuously albitized. It also carries traces of replacement pyrite, either introduced or locally mobilized by diagenesis.

960371

373

Sample Number : MP32/269

Identification : Lightly chloritized and carbonated, moderately sericitized and foliated, dacitic volcanolithic arenite.

Description :

The sample is a small specimen of drill core of tuffaceous appearance. It displays many light grey phenoclasts (up to 2mm) of plagioclase and some of quartz set in a medium grey matrix with a wispy foliation inclined acutely to the core axis.

A staining test revealed minor K-feldspar as microveinlets within plagioclase and other clasts.

In thin section the sample displays densely packed, moderately sorted clasts of "cherty", recrystallized vitric tuff and related phenoclasts. Clasts which are interpreted to have been welded vitric tuff are subrounded,mildly stretched bodies, about 1 to 5mm in size, composed of fine quartz and poorly twinned albite (0.01 to 0.02mm) along with minor chlorite and foliated streaks of sericite (variously wrapping around and passing through clasts : most also carry phenoclasts of subhedral broken plagioclase and embayed quartz. Plagioclase and quartz also occur as discrete phenoclasts, about 0.3 to 2mm in size. The plagioclase is lightly sericitized and carbonated, twinned albite. Aggregates of fine sphene crudely pseudomorph inferred grains of ilmenite or titaniferous magnetite. Sphene also occurs in stylolites crudely concordant with the sericitic foliation.

There are several fissure veins of calcite (up to 0.3mm wide) disrupted by the sericitic foliation. There are rare grains of disseminated pyrite, the largest about 0.2mm.

An approximate mode is :

35-45%	cherty quartz and albite within devitrified clasts of welded tuff
30-40%	phenoclasts of plagioclase
8-10%	phenoclasts of quartz
10-15%	sericite
5-7%	chlorite
3-4%	K-feldspar
0.5-1%	calcite
0.3-0.4%	sphene
rare	pyrite

Comments and Interpretations :

This rock is interpreted to be a moderately sorted volcanolithic arenite generated by erosion and aqueous transport of dacitic welded tuff.

The rock is chloritized, slightly carbonated, moderately sericitized and tectonically foliated. The sericitic foliation disrupts minor calcite fissure veining. The plagioclase clasts have been inconspiculusly albitized. There are rare disseminated grains of pyrite.

This sample is similar to that from MP32/178 but more altered

Sample Number : MP88/211

Identification : Moderately carbonated banded quartz-sericite slate with a late vein of dolomite with quartz, galena and chlorite.

Description :

The sample is a small drill core specimen which displays slate composed of thin bands (a fraction of a millimetre to about 3mm) of light grey siliceous material and light olive grey sericite. The bands display an open simple kink fold with the dominant limbs inclined at about 30^{0} to the core axis with the short limb about normal to the core. A thin carbonate vein carrying some galena cuts accross the fold.

A staining test revealed no K-feldspar.

In thin section the sample is seen to consist of quartz-sericite slate with disturbed banding and some distinct and indistinct veining. The sericitic bands display small angular clasts of quartz, about 0.05 to 0.2mm in size, disseminated through a foliated matrix of sericite with "dusty" streaks of fine rutile. The silcieous bands consist of sutured, strained and partly recrystallized mosaics of quartz and dolomitic carbonate, both commonly 0.03 to 0.2mm in grainsize. There are also many patches and veins of coarser (0.1 to 0.5mm) strained quartz and anhedral dolomite. Subhedral cubes (0.05 to 0.3mm) and small aggregates of pyrite are sparsely disseminated throughout the rock.

The vein noted in hand specimen is seen to be of irregular fracture filling style, about 1 to 3mm wide and only very faintly strained. It cuts across the folded schistosity. It carries mainly subhedral to euhedral dolomite (rhombs with curved crystal faces), about 0.5 to 1mm in grainsize, with associated anhedral quartz (barely strained), anhedral galena and small radial aggregates of chlorite.

An approximate mode is:

50-60%	sericite
30-35%	quartz
10-15%	anhedral dolomite
0.5-1%	rutile
tr	pyrite
2-3%	vein of subhedral dolomite with quartz, galena and chlorite

Comments and Interpretations :

This sample is interpreted to have originated as a laminated sediment, composed of alternating layers of slightly sandy mud and siltstone or fine quartz sandstone.

It was metamorphosed or altered and deformed to produce folded laminated quartz-sericite slate. Carbonate (apparently dolomite) was introduced at some stage before completion of the deformation, much of it seems to have permeated the quartzose bands but some formed veins with quartz. After deformation a vein of dolomite with quartz, galena and chlorite formed. The few disseminated grains of pyrite in the rock may be diagenetic or introduced.

375

960373

Sample Number : MP88/329

Identification : Foliated, heavily sericitized, lightly carbonated rhyodacitic crystal tuff or related sediment.

Description :

The sample is a small drill core specimen of speckled light and medium grey volcaniclastic rock. Densely packed phenoclasts, mainly less than 1mm in size, are set in a matrix with a mild sericitic foliation orientated at about 50° to the core axis.

A staining test revealed that many clasts carry potassic feldspar.

In thin section the sample displays many phenoclasts of quartz and altered feldspar, about 0.1 to 1.5mm in size, disseminated through a well foliated sericitic matrix. The small quartz clasts are quite angular, but the largest grains are unbroken and slightly broken examples of embayed crystals with β form. Feldspar clasts include twinned plagioclase (now albite) and orthoclase, both moderately to heavily carbonated. The sericitic matrix carries some fine quartz and untwinned feldspar, some with lenticular distribution patterns which hint at the prior existence of lithic or vitroclastic fragments. Fine sphene forms a few small aggregates and streaks. Pyrite occurs in trace abundances as cubes about 0.15mm in size.

An approximate mode is :

10-15%	carbonated orthoclase phenoclasts
5-8%	quartz phenoclasts
5-8%	carbonated plagioclase clasts
70-80%	sericitic foliated matrix with minor quartz and feldspar
0.1%	sphene
tr	pyrite

Comments and Interpretations :

This sample can be described as a foliated, heavily sericitized, lightly carbonated, rhyodacitic crystal tuff with traces of fine, disseminated pyrite.

Textures are not definitive, but the rock may well have been deposited as a volcaniclastic sediment rather than a directly pyroclastic rock. If so, it probably consisted of phenoclasts and a few vitroclastic or finely crystalline lithic clasts scattered through a shale matrix. It does not seem to have been as sorted and sandy as the rocks sampled from MP32.

376

960374

Sample Number : MP88/415

Identification : Sericitic, slaty, acid vitric crystal tuff with fissure veins of quartz with dolomite or ankerite and apatite.

Description :

The sample is a small drill core specimen of fine-grained, medium grey, vaguely slaty rock.

A staining test revealed no K-feldspar.

In thin section the sample displays sparse phenoclasts, up to 0.5mm in size, set in a foliated sericitic matrix with many plainly recognisable, unwelded vitric shards, about 0.2 to 0.3mm in size, now pseudomorphed by aggregates of fine quartz. The most obvious phenoclasts are quartz with corroded, embayed and broken shapes. Less obvious clasts are represented by sericite-carbonate-chlorite pseudomorphs after inferred feldspar. The carbonate is anhedral but has a high relief and is probably dolomite. There are sparsely disseminated cubes and related forms of pyrite, less than about 0.3mm in size.

Very mildly deformed, thin veins (about 0.1 to 2mm) carry faintly strained quartz, anhedral dolomite or ankerite and subhedral, stumpy apatite. The thickest vein has quartz as coarse as 2mm, apatite up to 0.7mm and anhedral carbonate up to 0.5mm. It also carries a single grain of pyrite. The veins follow two preferred transgressive orientations.

An approximate mode is :

2-3%	quartz phenoclasts
2-3%	sericte-carbonate-chlorite pseudomorphs of inferred feldspar clasts
50-60%	matrix sericite
20-30%	quartz pseudomorphs of vitric shards
0.2-0.3%	disseminated pyrite
8-10%	veins of quartz with dolomite or ankerite and apatite.

Comments and Interpretations :

This sample is interpreted to be a sericitic, slaty, acid vitric crystal tuff. The shards and phenoclasts may well have showered into or washed into a shaley depositional environment. Subsequent alteration produced sericitic from the muddy and vitroclastic components, silicified many vitric shards (probablyby local chemical adjustments rather than introduced silica) and altered feldspar to sericite-chlorite-carbonate. Traces of pyrite formed by diagenesis or alteration.

Fissure veins carrying quartz, dolomite or ankerite, and apatite have experienced only very mild deformation and seem to form sets which may relate to late jointing.

377

960375

Sample Number : MP88/556

Identification : Sericitic, slaty, acid vitric crystal tuff with fissure veins carrying quartz, calcite, sericite and chlorite.

Description :

The sample is a small drill core specimen of medium grey, finely sandy textured and slaty rock. Its mild foliation is orientated normal to the core axis and there are some very thin light grey veins inclined at about 45° to the axis.

A cobaltinitrite staining test revealed K-feldspar within many clasts resembling vitric shards.

In thin section the sample desplays many small phenoclasts (0.2 to 1mm) of quartz and completely sericitized and carbonated (apparently calcite) feldspar set in a foliated sericitic matrix with some very indistinct, "cherty" quartzofeldspathic structures suggestive of unwelded vitric shards (up to 0.3mm). There are a few pyrite cubes about 0.1 to 0.2mm in size, some with strain shadows of quartz (indicating that they pre-date the foliation). There are cloudy streaks of (?) carbonaceous matter along the foliation.

A set of subparallel fissure veins, about 0.05 to 1mm in size, is orientated across the foliation but the veins are only slightly disturbed by it. They carry faintly strained quartz and anhedral calcite, along with a few radial sheafs of sericite and rare radial aggregates of chlorite.

An approximate mode is :

3-4%	quartz phenoclasts
3-4%	sericite-calcite pseudomorphs of inferred feldspar clasts
55-65%	matrix sericite
20-30%	fine matrix K-feldspar and quartz
tr	(?) carbonaceous pigment
0.1%	disseminated pyrite
1-2%	veins of quartz with calcite and traces of sericite and chlorite

Comments and Interpretations :

This sample is interpreted to be a sericitic, slaty, acid (perhaps rhyodacitic) vitric crystal tuff, similar to MP88/415 but carrying more phenoclasts and retaining some K-feldspar in its vitroclastic matrix. The tuffaceous components may have showered into or washed into a shaley depositional setting.

Thin fissure veins composed mainly of quartz and calcite form a trangressive set and show little disturbance capable of being related to the sericitic foliation: thus they may be later. They carry traces of non-foliated sericite and chlorite. Traces of pyrite are confined to the host rock.

Sample Number : TP 133/78

Identification : Foliated, heavily sericitized moderately chloritized and carbonated, andesitic volcanolithic arenite with veins of calcite and quartz.

Description :

The sample is a drill core specimen of speckled yellowish grey and medium grey tuffaceous volcanoclastic rock. Densely packed clasts range up to several millimetres in size and the darkest components delineate a moderate foliation orientated at about 60° to the core axis. There are subtle thin, veins of light grey to pinkish grey carbonate.

A staining test revealed no K-feldspar.

In thin section the sample is seen to consist of densely packed, ovoid to lenticular, stretched, altered lithic clasts about 1 to 5mm in size, and a few mineral clasts. The lithic clasts are of varied intermediate volcanic and tuffaceous type with textures blurred by alteration and deformation. The most common types display sparse phenocrysts or phenoclasts of heavily sericitized and lightly carbonated plagioclase, up to 1mm in size, set in a finely feldspathic, heavily sericitized and commonly carbonated groundmass or matrix. A very few lithic clasts carry phenocrysts/clasts of quartz and a few carry minor fine quartz. Disseminated darker clasts consist of more mafic, distinctly chloritic, intermediate volcanic or pyroclastic rock, also sericitized and carbonated. A few clasts of quartz and altered feldspar seem to be discrete sand grains. There are a few grains of leucoxenized opaque oxides and related streaks of sphene, especially in the chloritic clasts.

Several fissure veins, less than about 0.5mm wide, are filled with anhedral calcite and minor fine, "toothy" quartz. The veins are mildly disturbed by the tectonic foliation. Fine, subhedral pyrite (less than 0.1mm) occurs as partial replacements of clasts and as streaks.

An approximate mineralogical mode is :

50-60%	sericite
20-30%	remnant plagioclase
5-10%	chlorite
5-10%	calcite
3-5%	quartz
0.2-0.3%	leucoxene and sphene
0.1%	pyrite
0.5-1%	veins of calcite and minor quartz

..../2

TP 133/78 cont.

Comments and Interpretations :

This rock is interpreted to have originated as a moderately sorted volcanolithic arenite composed of coarse sand grains derived from a variety of intermediate volcanic and probably tuffaceous rock types (essentially andesitic). Deposition is thought to have occurred after brief aqueous transport.

After deposition the rock was heavily sericitized, moderately chloritized and carbonated, then tectonically deformed. Traces of fine pyrite replaced a few clasts as a result of diagenesis or alteration before deformation. Thin fissure veins of calcite with quartz occurred late in the history of deformation.

960378

Sample Number : TP 133/235

Identification : Foliated, heavily sericitized, moderately carbonated, acid volcanolithic arenite.

Description :

The sample is a small specimen of medium dark grey rock of volcaniclastic or tuffaceous appearance : vague clasts range up to several millimetres and there is a moderate foliation approcimately normal to the core axis.

A staining test revealed no K-feldspar.

In thin section the sample plainly displays densely packed lenticular, stretehed, lithic clasts (about 1 to 5mm), all heavily altered to foliated sericite and subordinate ankerite. The clasts all appear to have been derived from the same rock type, probably acid tuff. Many of the clasts display one or more phenoclasts of quartz (ranging from obviously broken small grains to smoothly embayed grains as coarse as 4mm) set in a matrix composed of variable amounts of very fine quartz and foliated sericte. The most siliceous clasts retain subrounded outlines but others have been streaked to lenticular shapes. There are no feldspar phenoclasts but there are many aggregates of pale brownish ankerite which resemble crude pseudomorphs of feldspar. Many such aggregates are connected to veins of ankerite which have been heavily disrupted by shearing at the boundaries of lithic clasts. Patches of fine green mica may reflect mafic phenoclasts . There are a few leucoxenized opaque clasts and some related sphene. There are rare tiny, disseminated grains of pyrite.

An approximate mineralogical mode is :

20-30%	fine quartz
6-8%	quartz phenoclasts
50-60%	sericite
8-10%	ankerite
1-2%	green mica
0.1%	leucoxene and sphene
rare	pyrite

Comments and Interpretations :

This sample deformed, volcanolithic coarsely sandy to finely pebbly textures quite similar to those displayed in TP133/78. However, it differs in consisting of lithic clasts which were drawn from a single source, probably acid welded tuff. After deposition the clasts were pervasively sericitized and inferred plagioclase clasts were replaced by ankerite which entered as a vein network. Mafic silicates may have been chloritized but are now represented by fine green mica (probably a slightly upgraded mineral generated from fine chlorite). Tectonic deformation apparently post-dates the alteration. Rare specks of disseminated pyrite may be diagenetic or introduced.

Sample Number : TP135/38

Identification : Mildly foliated porphyritic andesite with intense alteration to sericite-albite-carbonate-chlorite and veins of siderite-pyrite and calcite-quartz.

Description :

The sample is a small specimen of drill core displaying scattered greenish grey altered phenocrysts (ranging up to 2mm) set in a lighter greenish grey matrix, mildly foliated at about 60° to the core axis. There are disrupted segments of whitish carbonate veins and a foliated or V-shaped vein of dusky brown siderite.

A staining test revealed no K-feldspar.

In thin section the sample displays coarsely sericitized pseudomorphs of subhedral, tabular, inferred plagioclase (0.5 to 2mm in size) and a few chlorite pseudomorphs of mafic phenocrysts set in a heavily altered and incipiently foliated groundmass with moderately preserved textures suggestive of former feldspar laths and mafic silicates about 0.1 to 0.2mm in size. The overall impression is consistent with former porphyritic andesite. The groundmass now consists of sericite, chlorite, cloudy sphene, secondary albite and carbonate. There are a few disseminated subhedral grains and aggregates of fine pyrite (about 0.01 to 0.1mm).

The disrupted whitish veins are seen to be of fissure style and composed of calcite with minor, fine, "toothy" quartz. One of them cuts through a folded and disrupted segment of heavily iron-stained, weathered siderite fissure veins (0.5 to several millimetres thick) which contain a few subhedral grains of pyrite (0.2 to 0.4mm).

An approximate mode is :

15-20%	sericite pseudomorphs of inferred plagioclase phenocrysts
1-2%	chlorite pseudomorphs of mafic phenocrysts
40-45%	groundmass sericite
8-12%	groundmass albite
8-12%	groundmass carbonate
5-7%	groundmass chlorite
2-3%	groundmass leucoxene and sphene
0.2-0.3%	disseminated pyrite
8-10%	vein siderite with minor pyrite
3-4%	vein calcite with quartz

Comments and Interpretations :

This sample is interpreted to have originated as porphyritic andesite (lava or related subvolcanic intrusion) and to have experienced intense alteration to sericite, carbonate, albite, chlorite, sphene/leucoxene and traces of pyrite. Fissure veins of siderite with pyrite and later fissure veins of calcite with quartz have been deformed and disrupted by a pervasive mild foliation.

382

960380

APPENDIX V

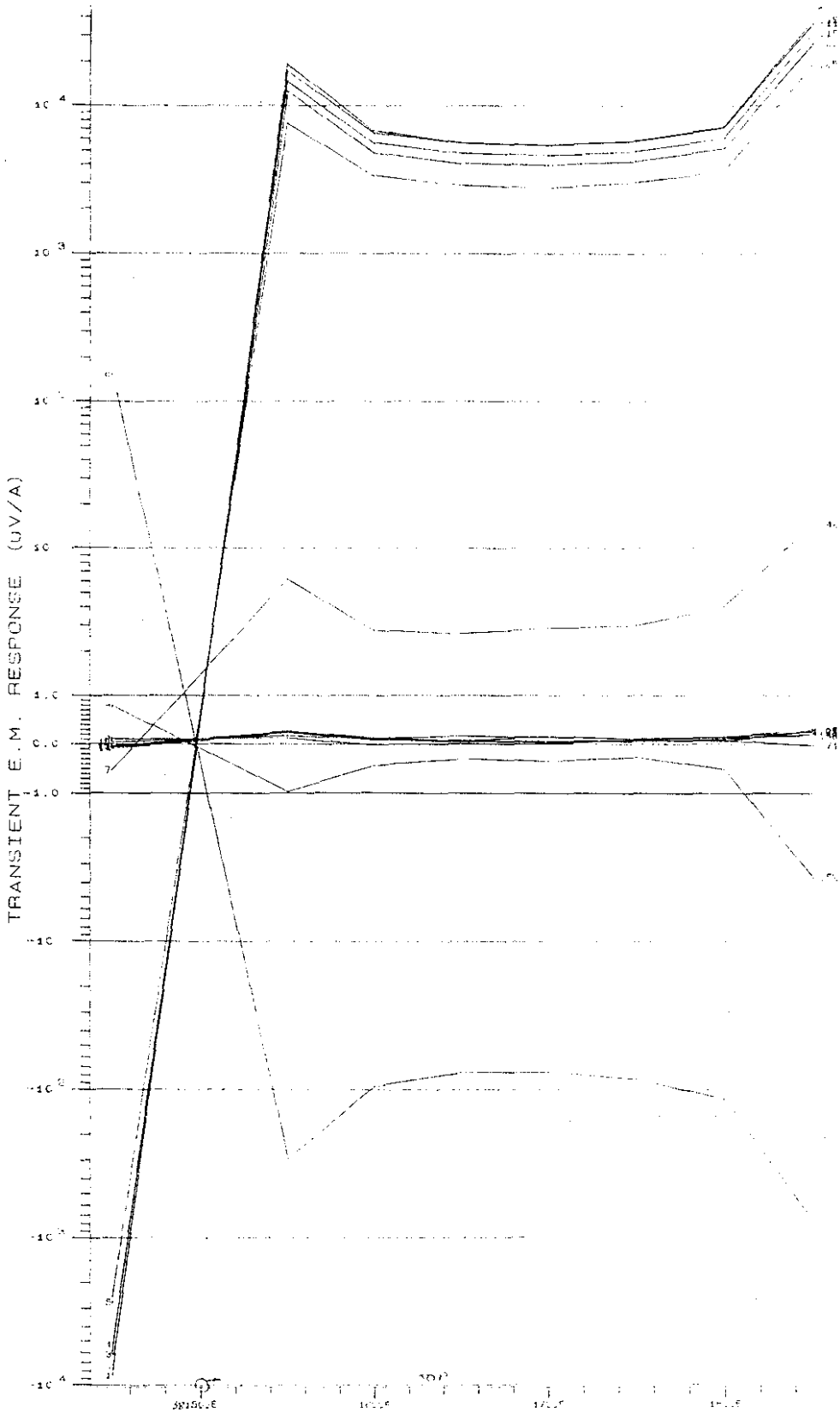
SIROTEM Survey Profiles

A.D.P.
22 DEC 1986
DEPT. OF MINES
REF. No. 12,969/86

OPEN FILE

383

960381

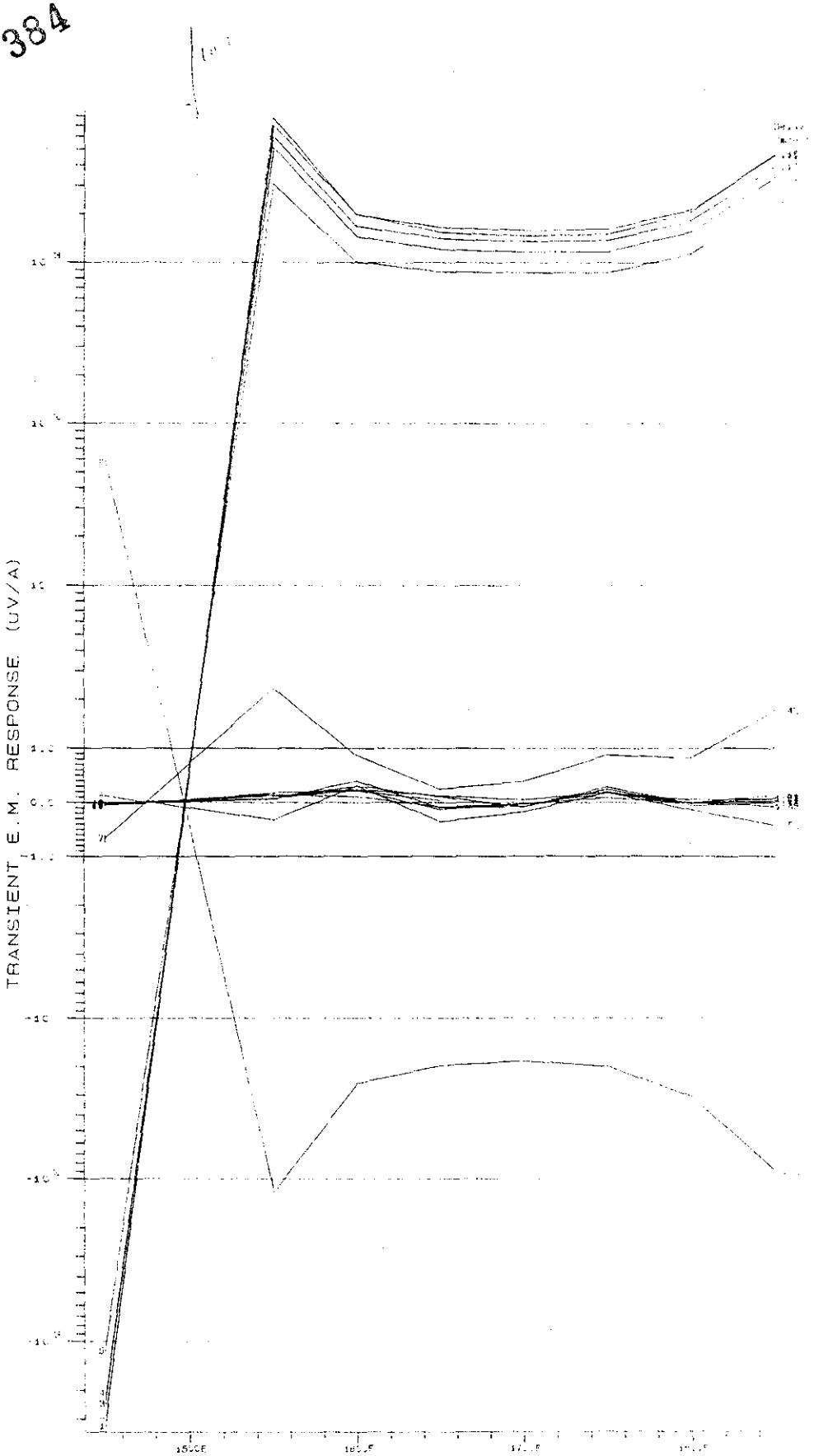


SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7750 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (Z component)
Plotted : 10:00 PM 10/11/96

5 cm

960382

384

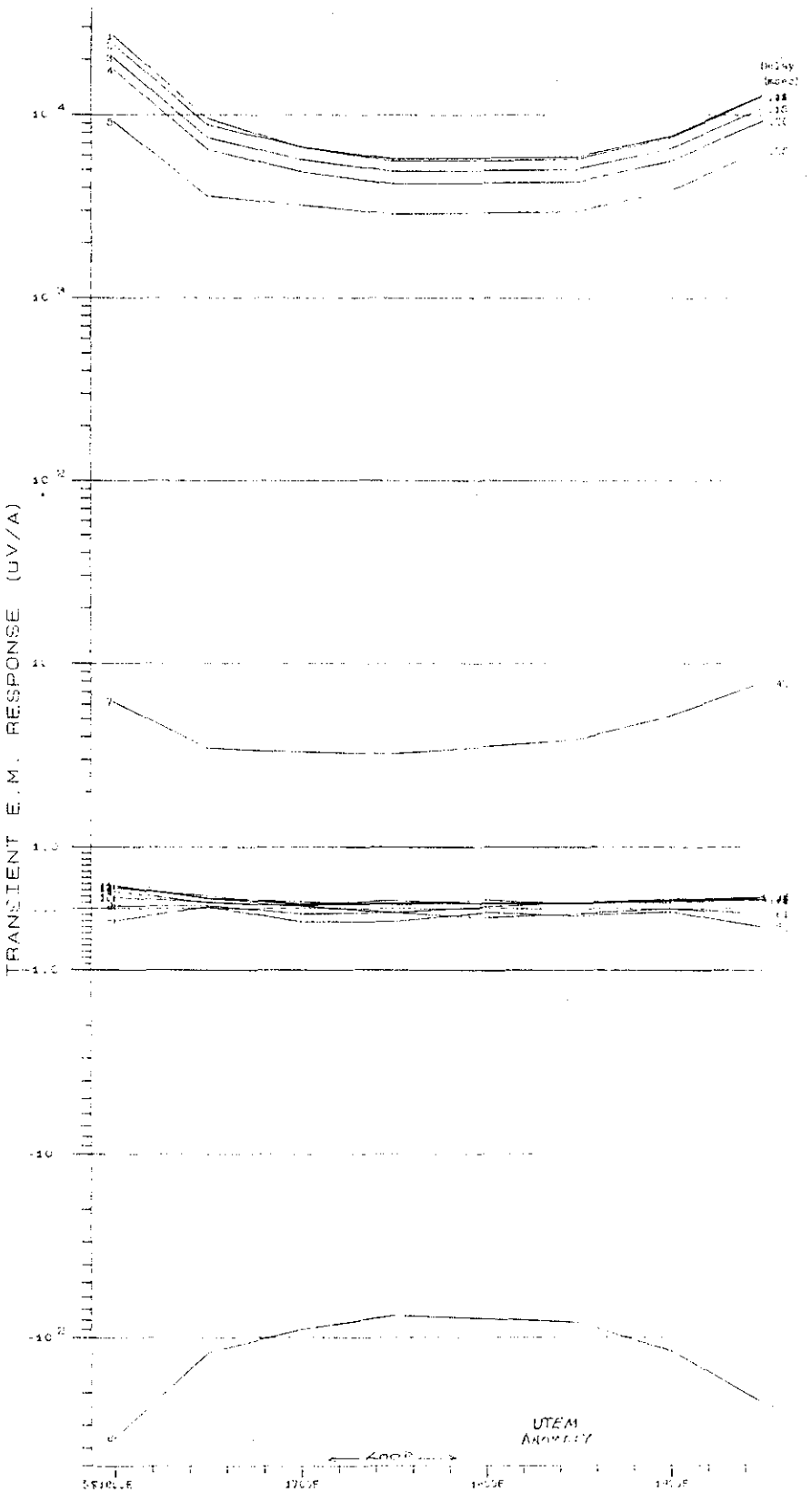


SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7750 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (X component)
Plotted : 8:50 PM 10/11/96

5 cm

385

S60383

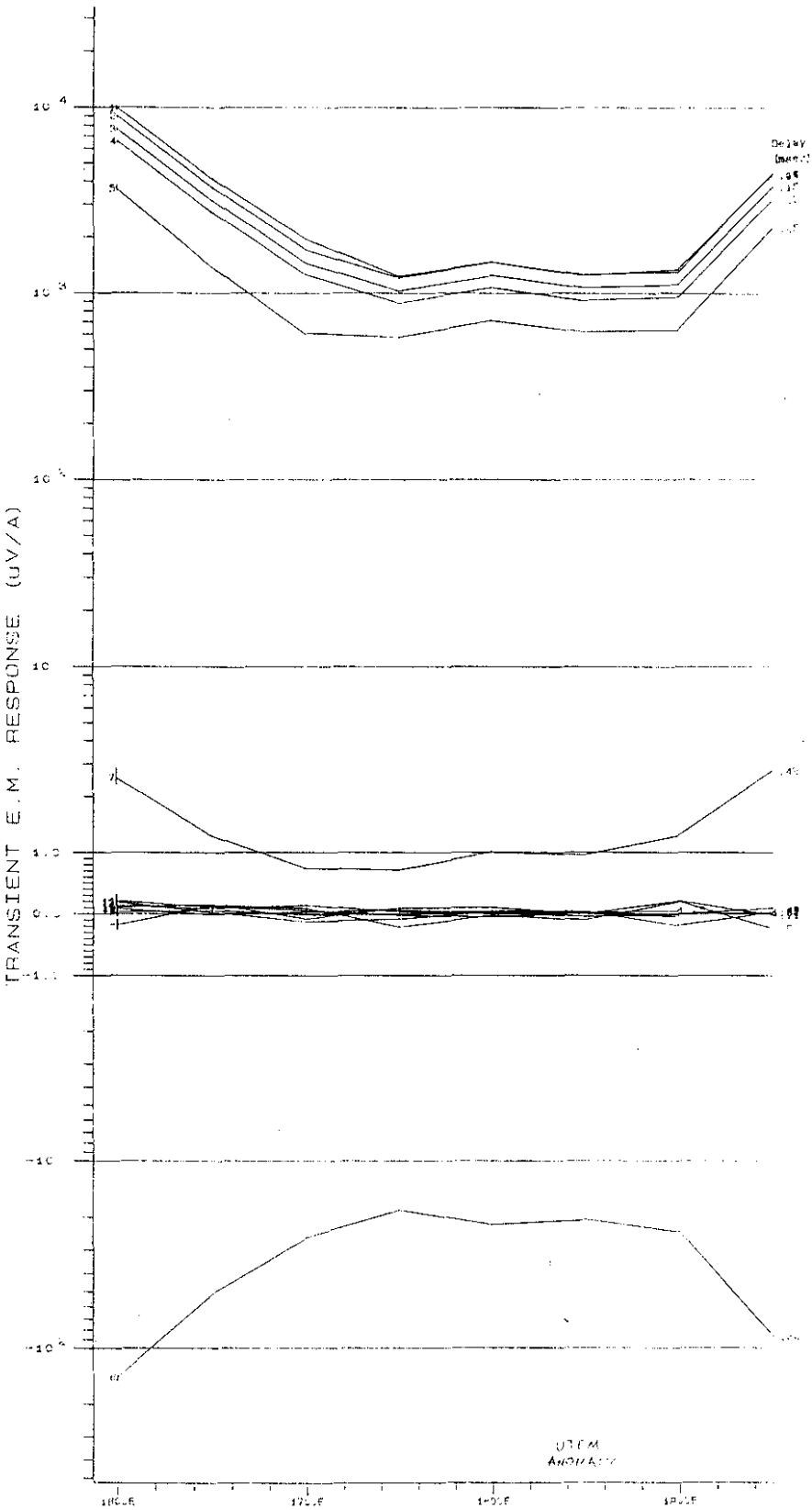


SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7500 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (Z component)
Plotted : 9:57 PM 10/11/86

5 cm

386

960384



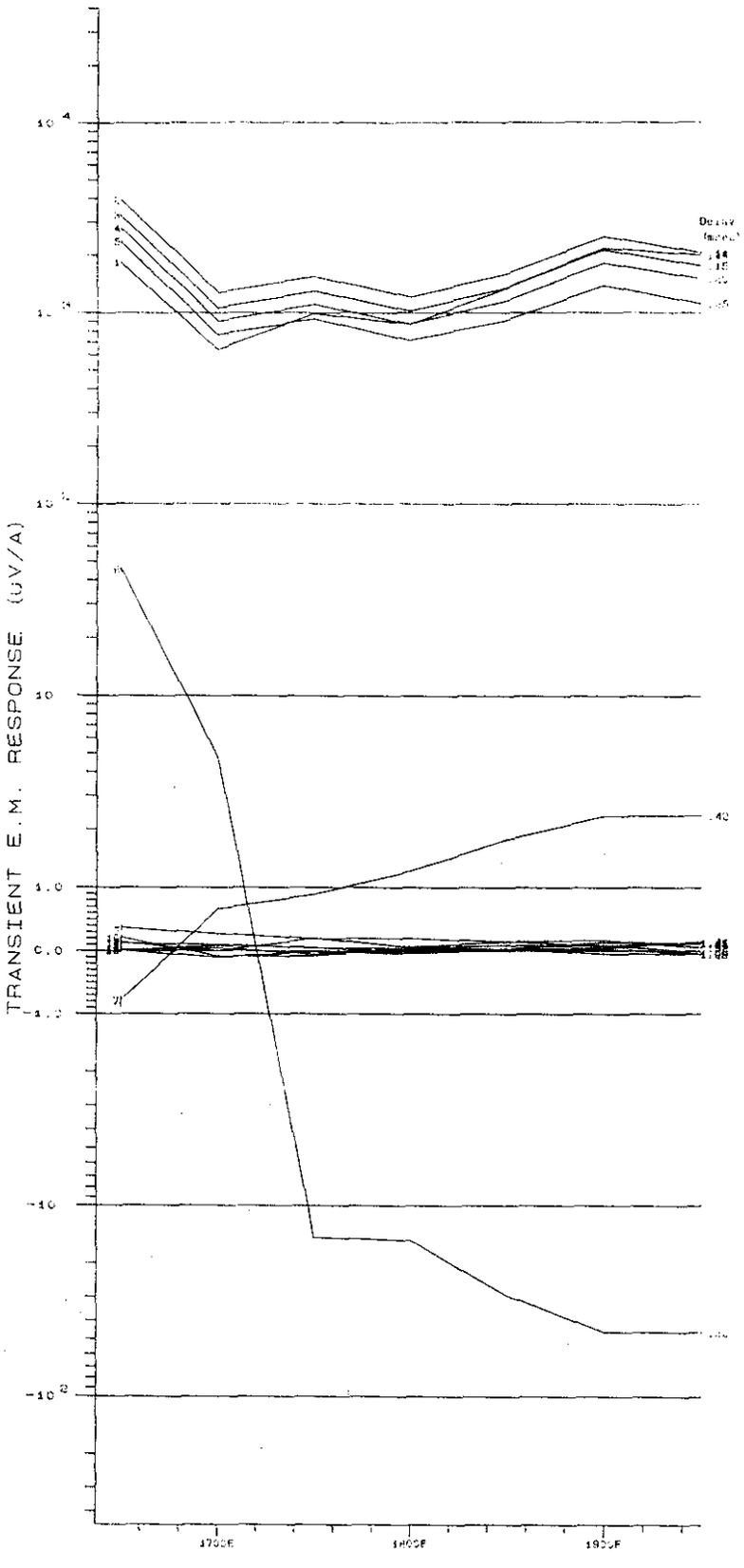
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7500 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (X component)
Plotted : 9:47 PM 10/11/86

5 cm

SOLO

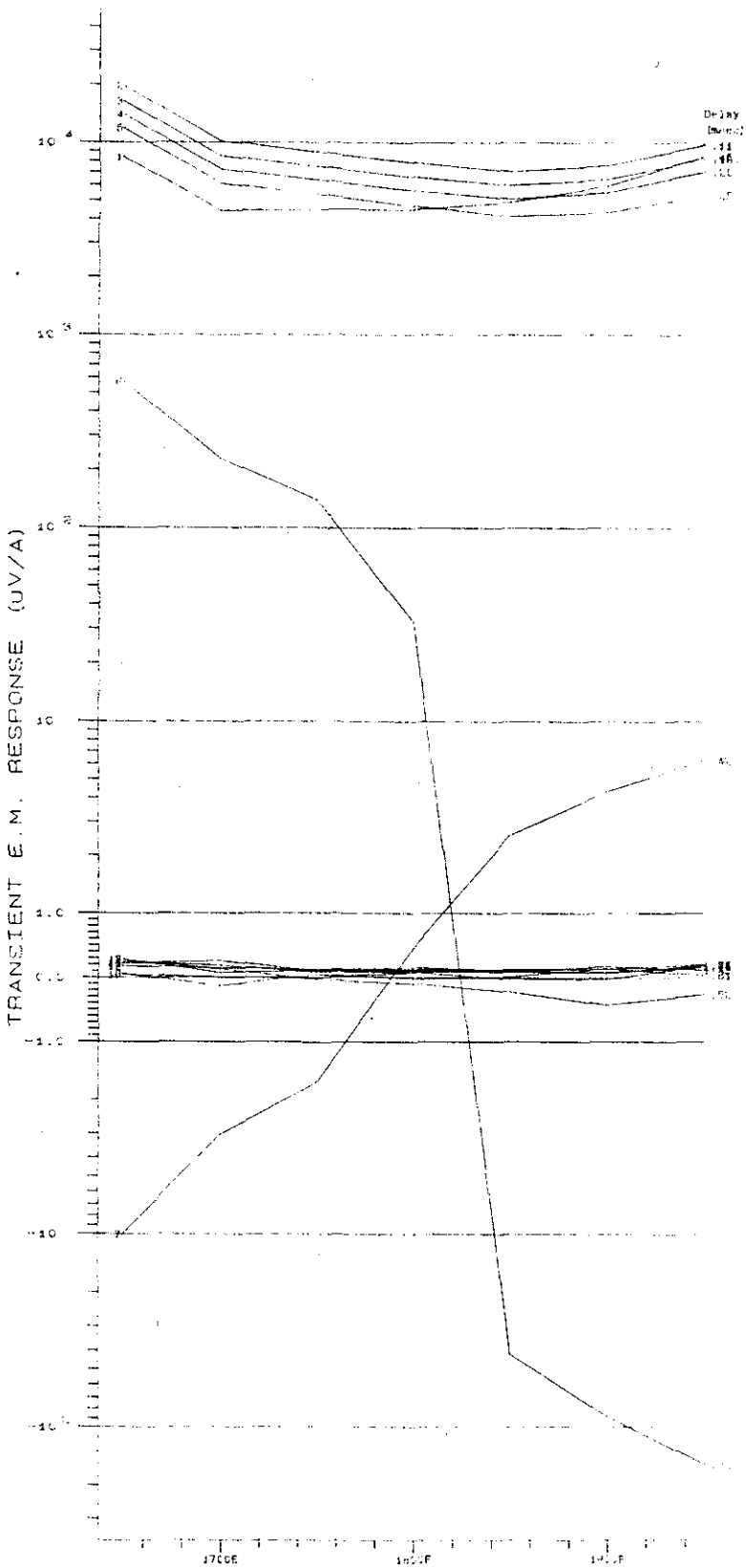
960385

387


TRANSIENT E.M. RESPONSE (uV/A)
10 4
10 3
10 2
10
1.0
0.0
-1.0
-10
-10 2
.40
.44
.48
.52
.56
.60
.64
.68
.72
.76
.80
.84
.88
.92
.96
1.00
1.04
1.08
1.12
1.16
1.20
1.24
1.28
1.32
1.36
1.40
1.44
1.48
1.52
1.56
1.60
1.64
1.68
1.72
1.76
1.80
1.84
1.88
1.92
1.96
2.00
2.04
2.08
2.12
2.16
2.20
2.24
2.28
2.32
2.36
2.40
2.44
2.48
2.52
2.56

960386

388



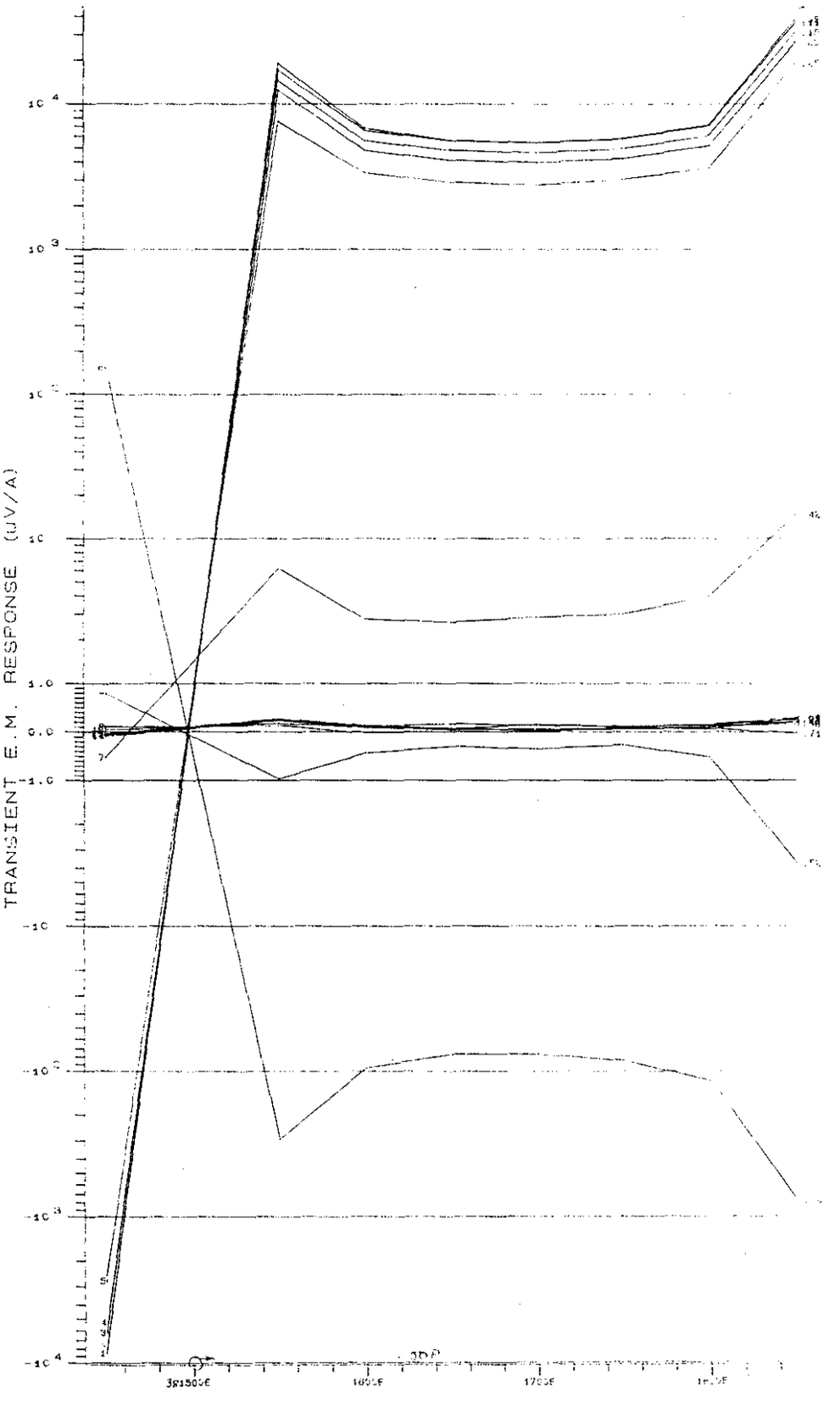
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY . TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7400 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (Z component)
Plotted : 9:54 PM 10/11/86

5 cm

SOLO

960387

389

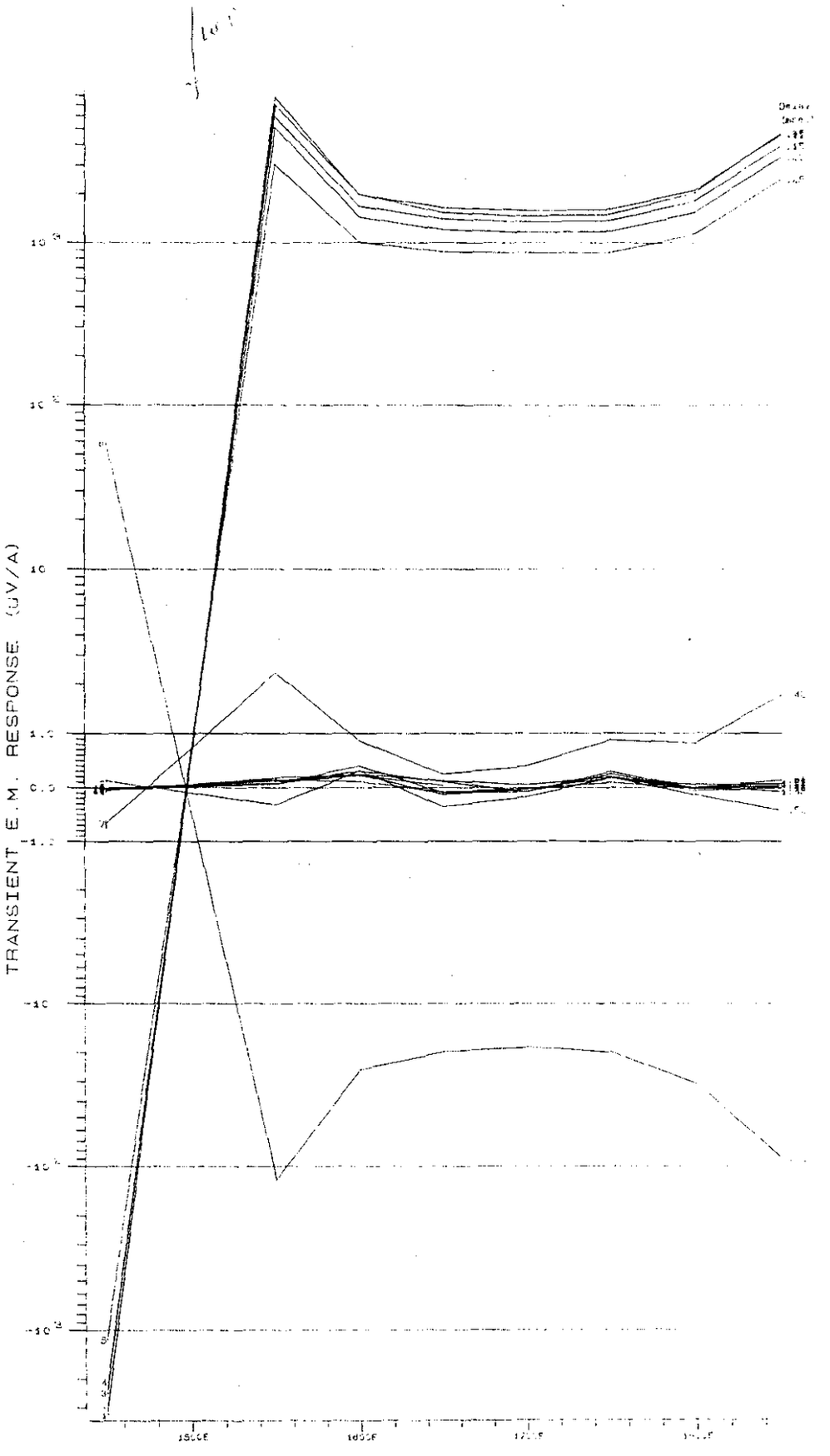


SHELL AUSTRALIA PTY LTD.
MOUNT BLACK ANOMALY 8A.
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7750 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (Z component)
Plotted : 10:00 PM 10/11/86

5 cm

390

960388



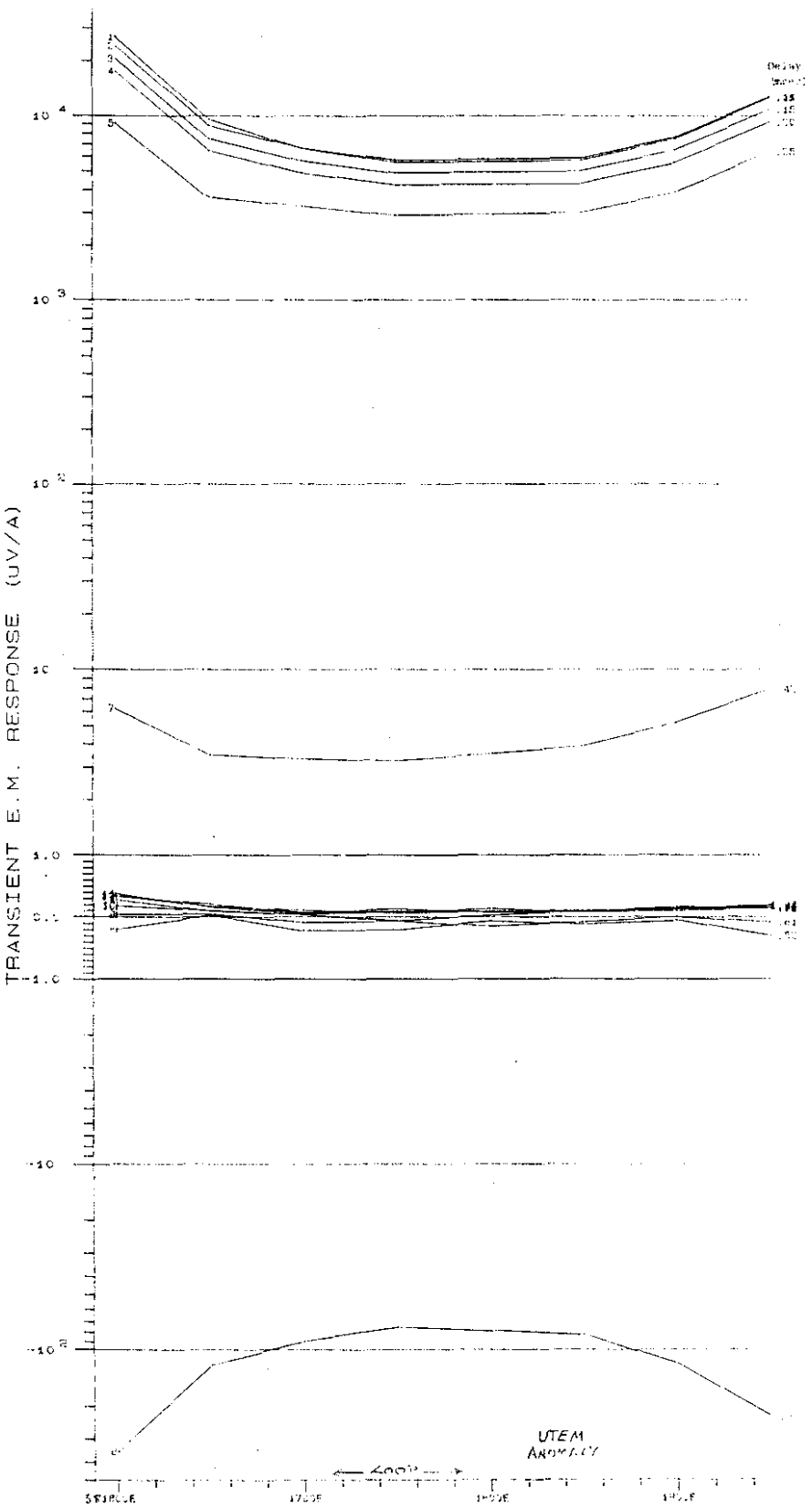
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7750 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (X component)
Plotted : 9:50 PM 10/11/86

5 cm

SOLO

960389

391

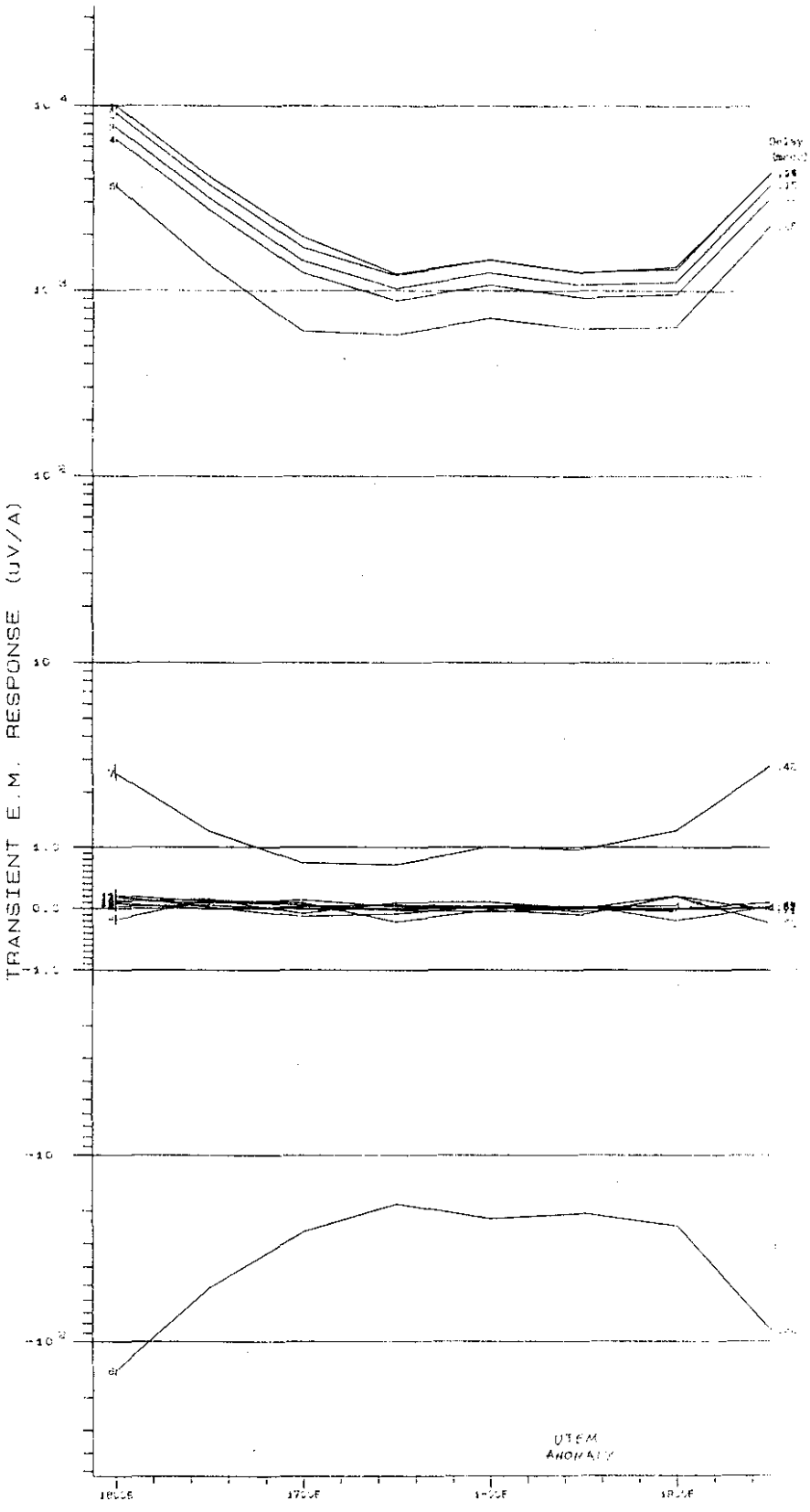


SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7500 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (Z component)
Plotted : 9:57 PM 10/11/86

5 cm

392

960390



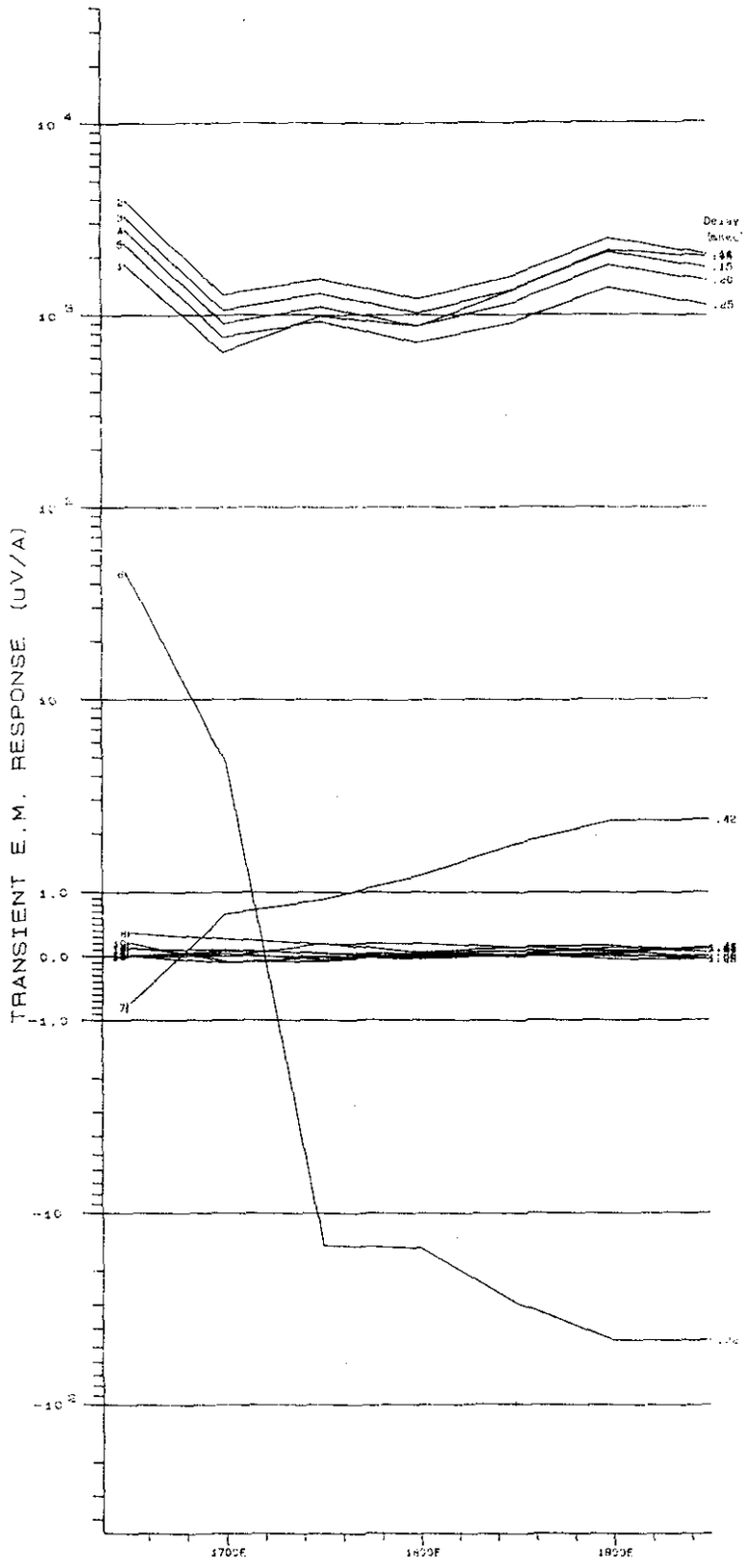
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7500 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (X component)
Plotted : 9:47 PM 10/11/86

5 cm

SOLO

393

960391



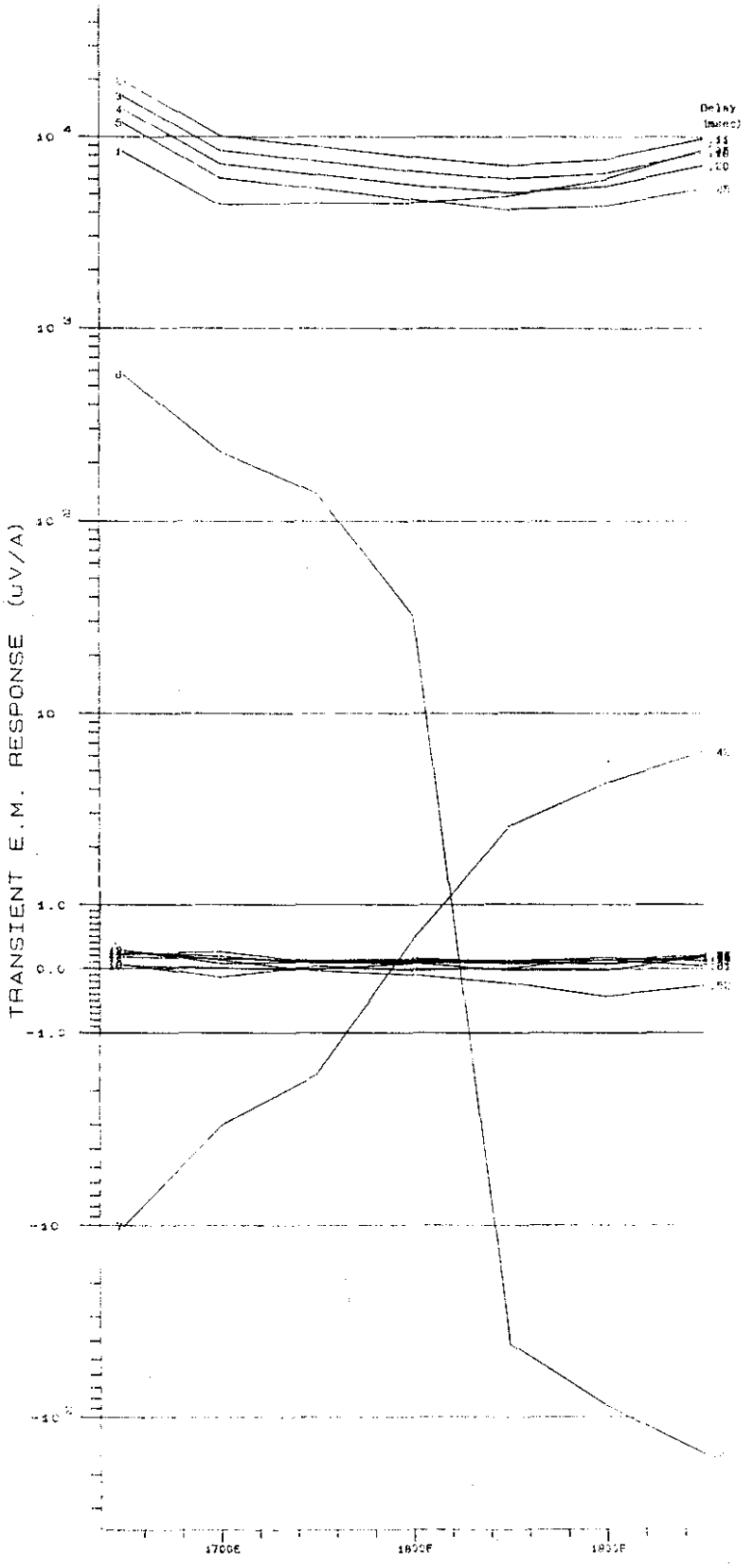
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7400 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (X component)
Plotted : 9:44 PM 10/11/86

SOLO

5 cm

394

960392



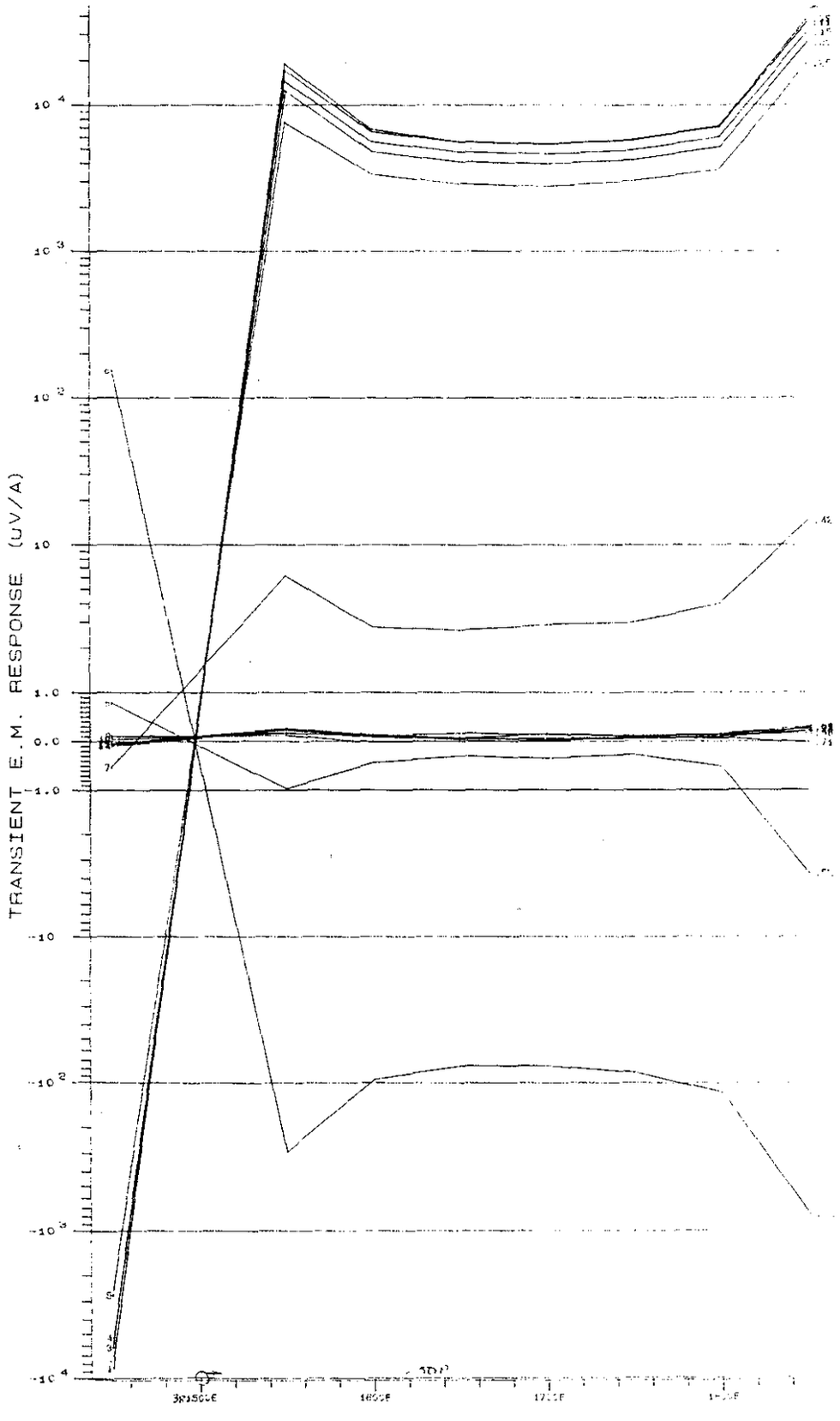
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7400 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (Z component)
Plotted : 9:54 PM 10/11/88

5 cm

SOLO

960393

395



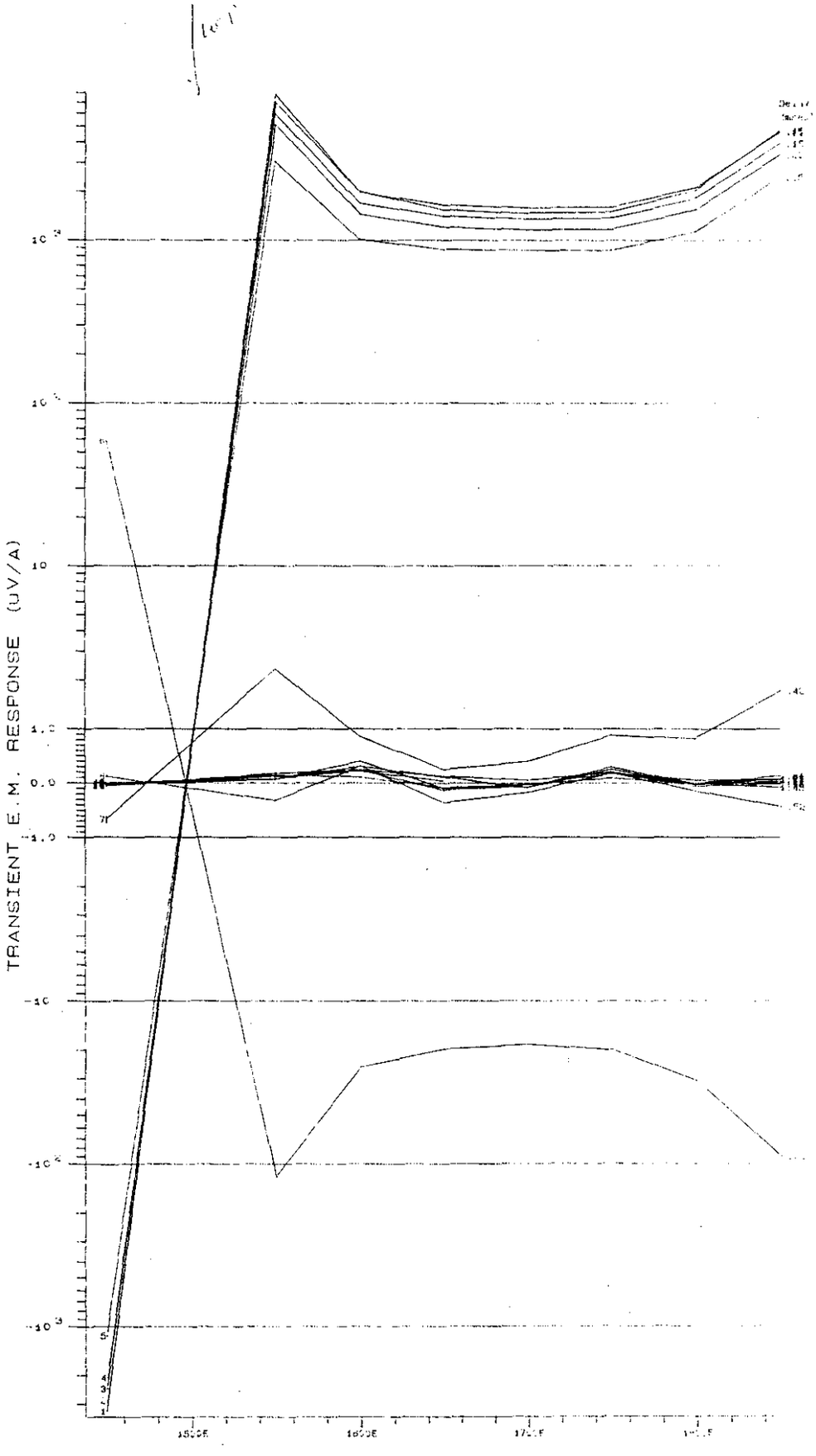
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7750 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (Z component)
Plotted : 10:00 PM 10/11/86

5 cm

SOLO

960394

396



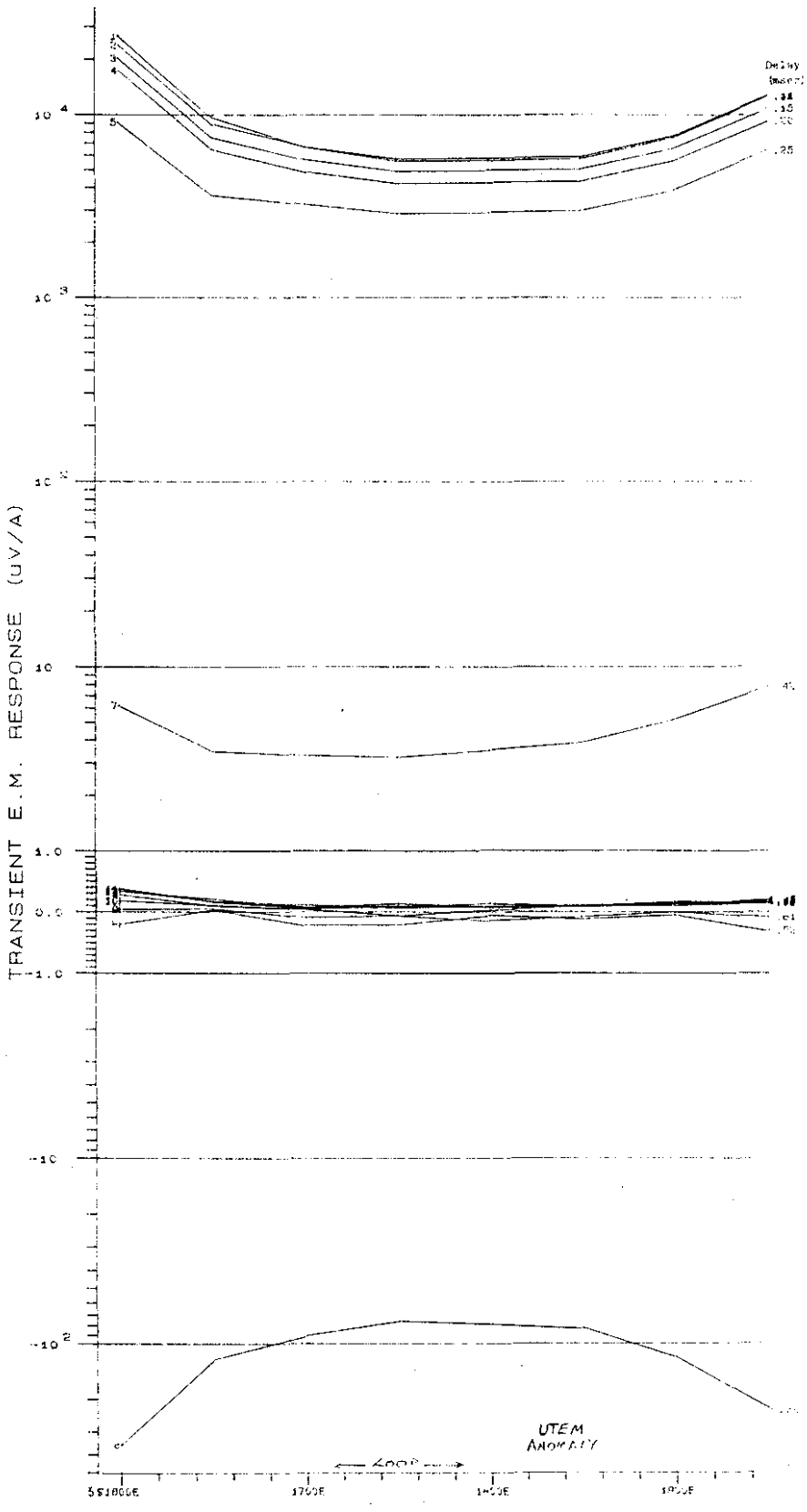
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7750 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (X component)
Plotted : 9:50 PM 10/11/86

5 cm

SOLO

960395

397

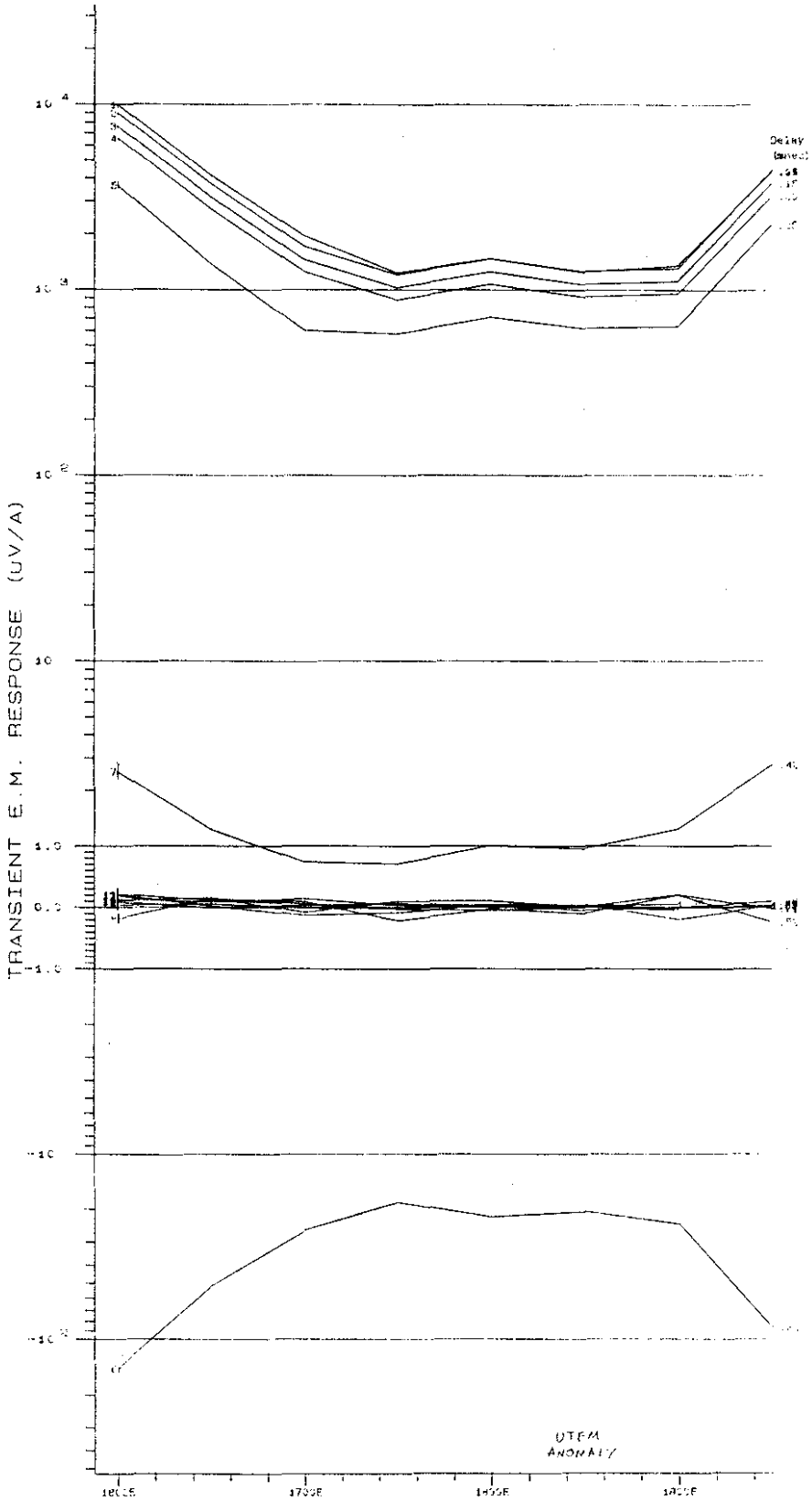


SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY PA
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7500 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (Z component)
Plotted : 8:57 PM 10/11/86

5 cm

960396

398



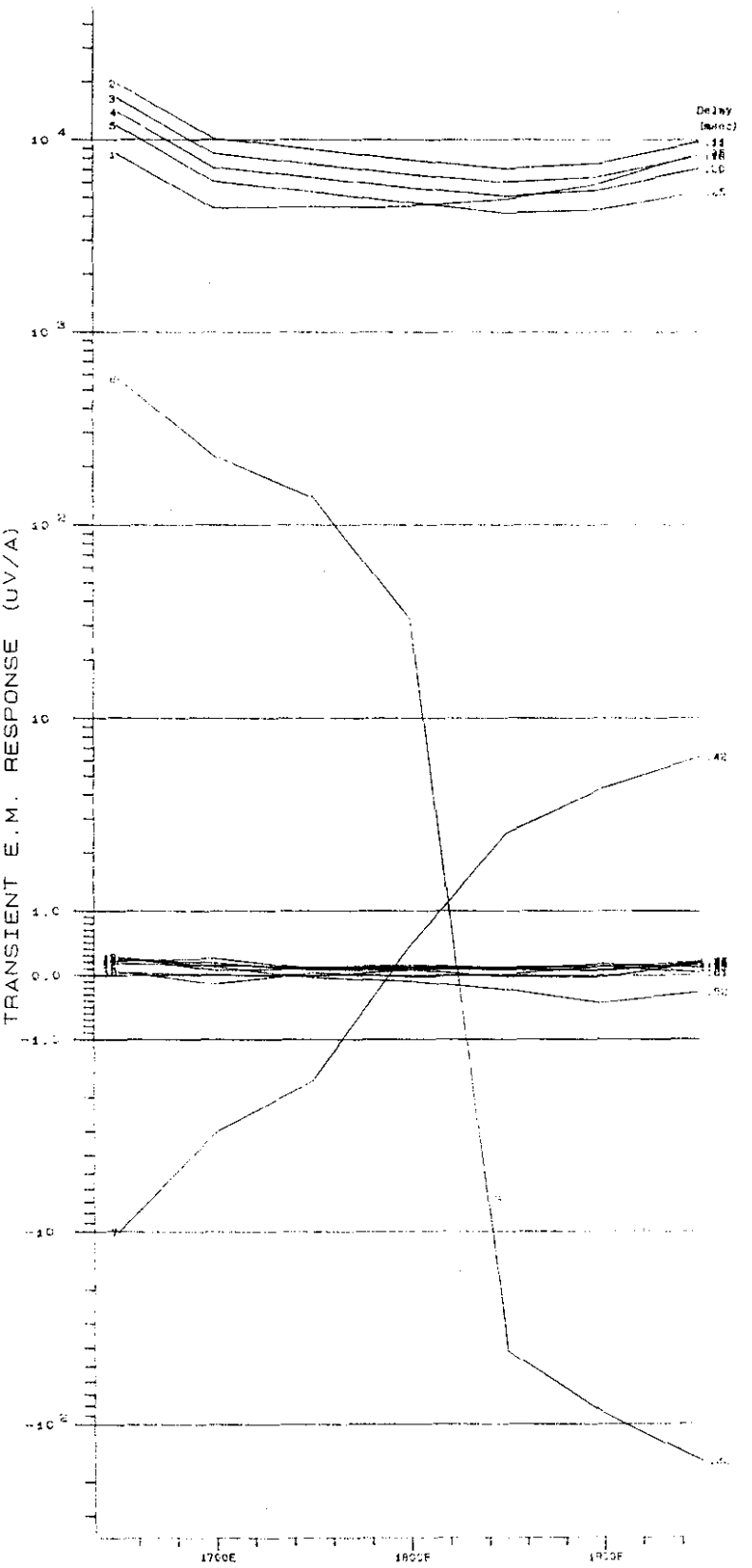
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY . TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7500 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (X component)
Plotted : 9:47 PM 10/11/86

5 cm

SOLO

399

960397



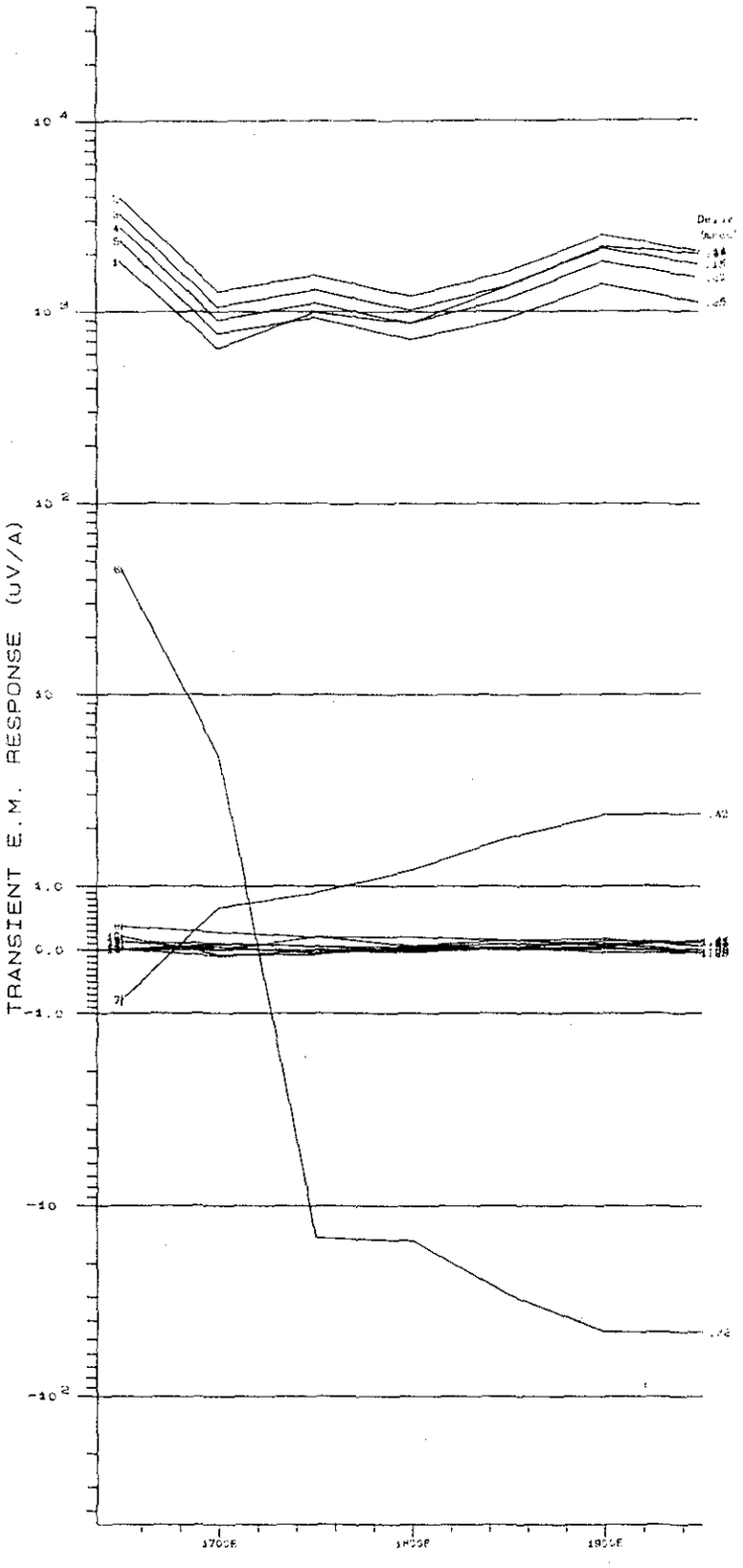
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7400 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (Z component)
Plotted : 9:54 PM 10/11/86

5 cm

SOLO

960398

400



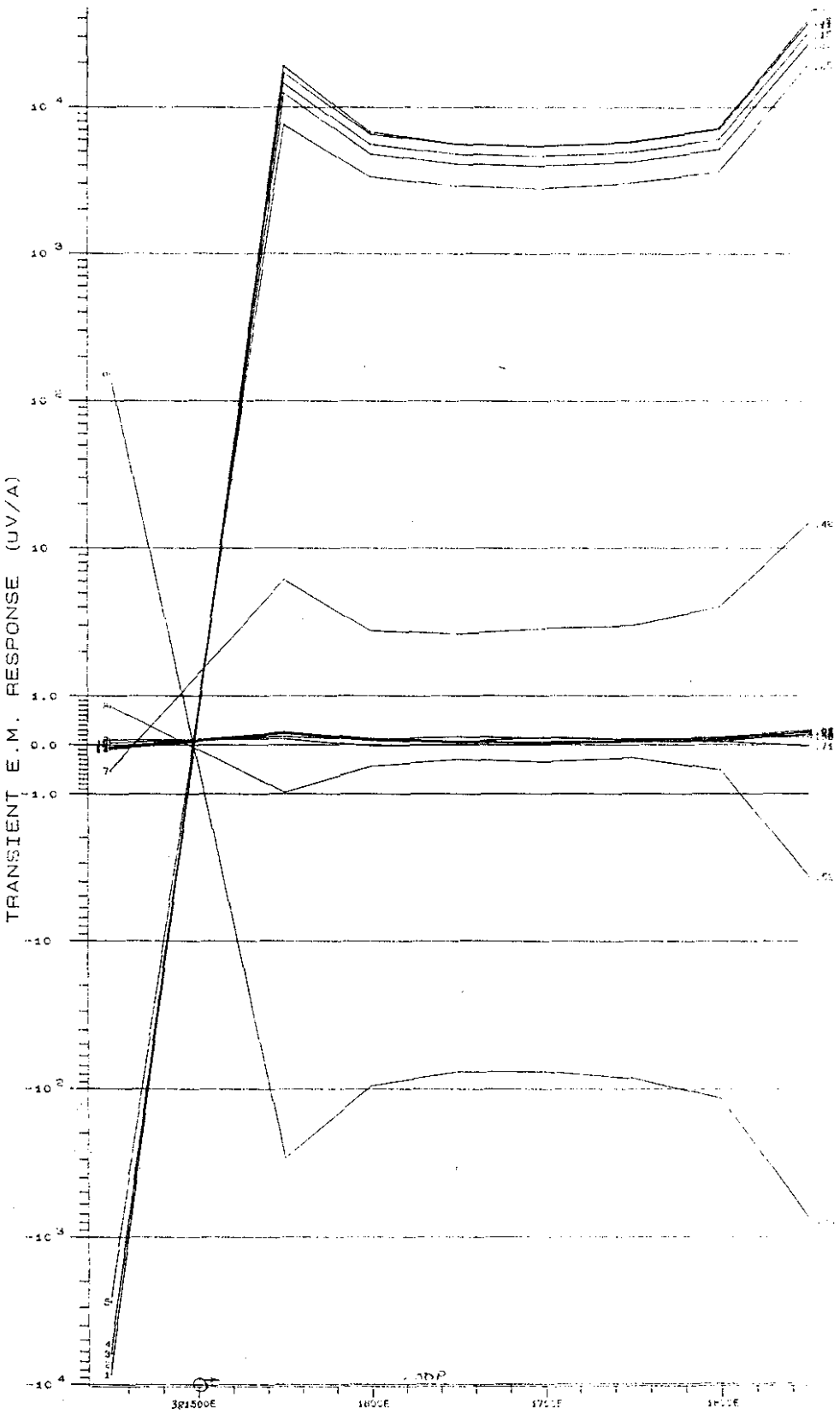
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY . TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7400 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (X component)
Plotted : 9:44 PM 10/11/86

5 cm

SOLO

960399

401

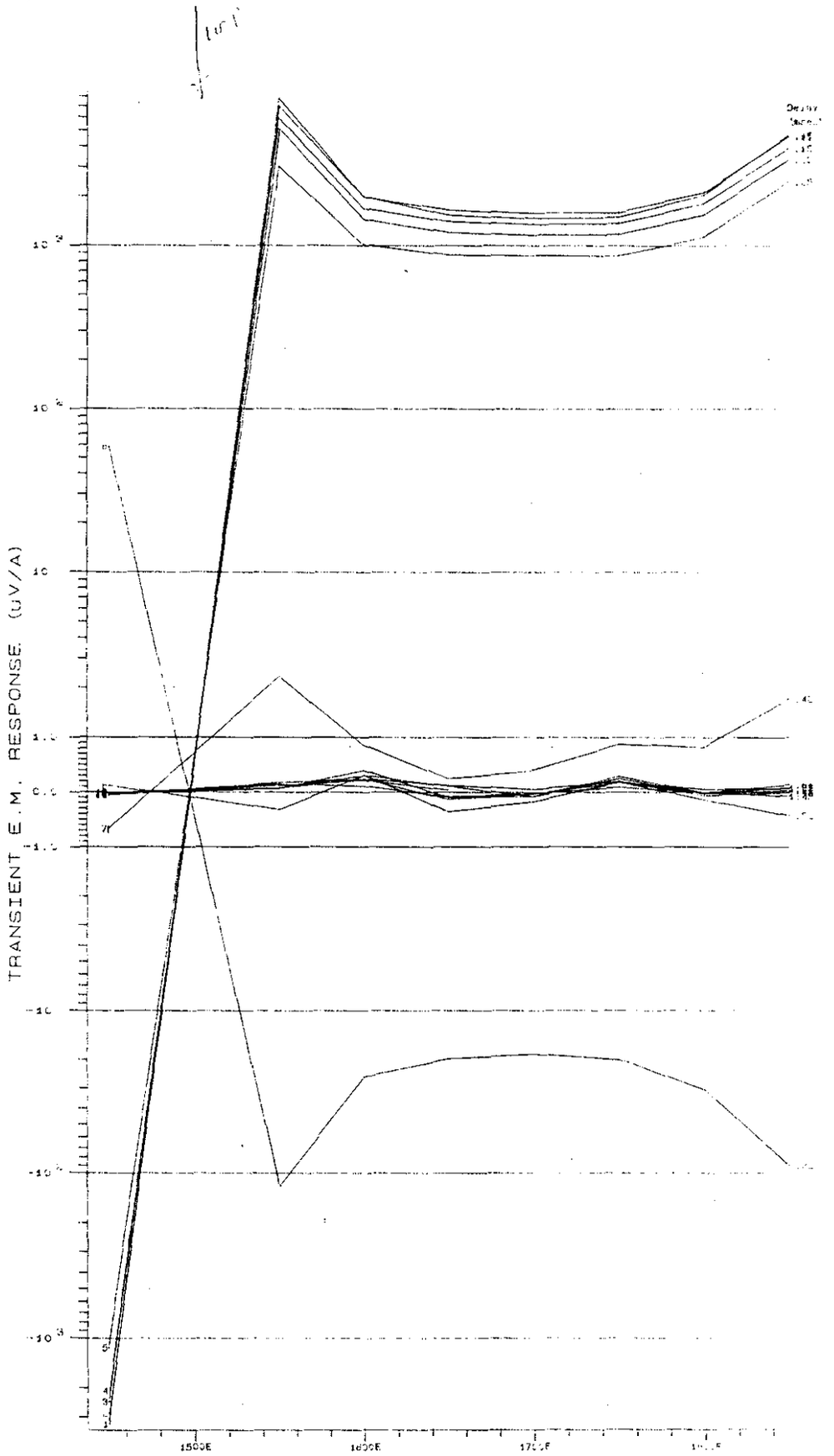


SHELL AUSTRALIA PTY LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7750 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (Z component)
Plotted : 10:00 PM 10/11/86

5 cm

960400

402

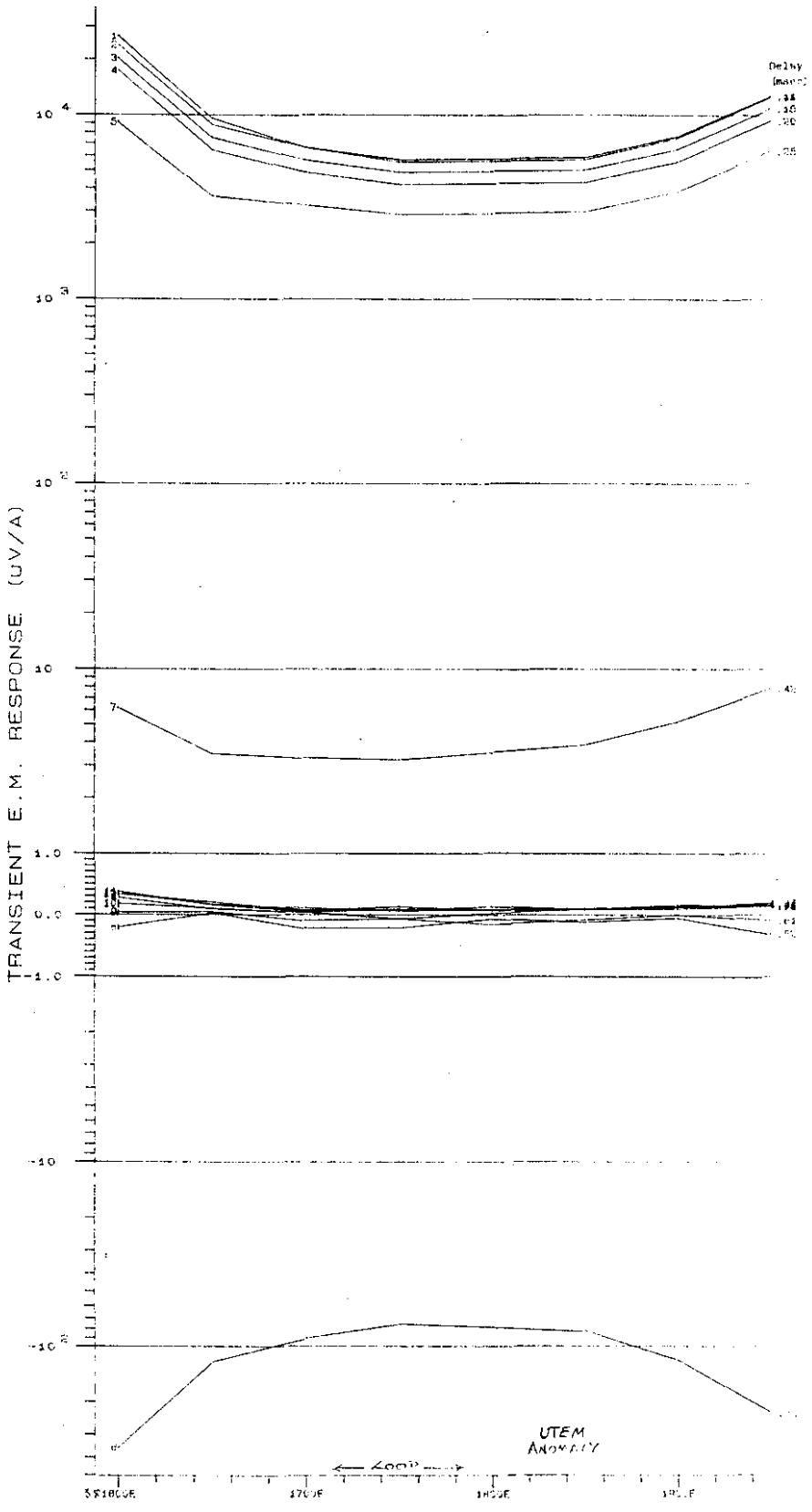


SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7750 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (X component)
Plotted : 9:50 PM 10/11/86

5 cm

403

960401

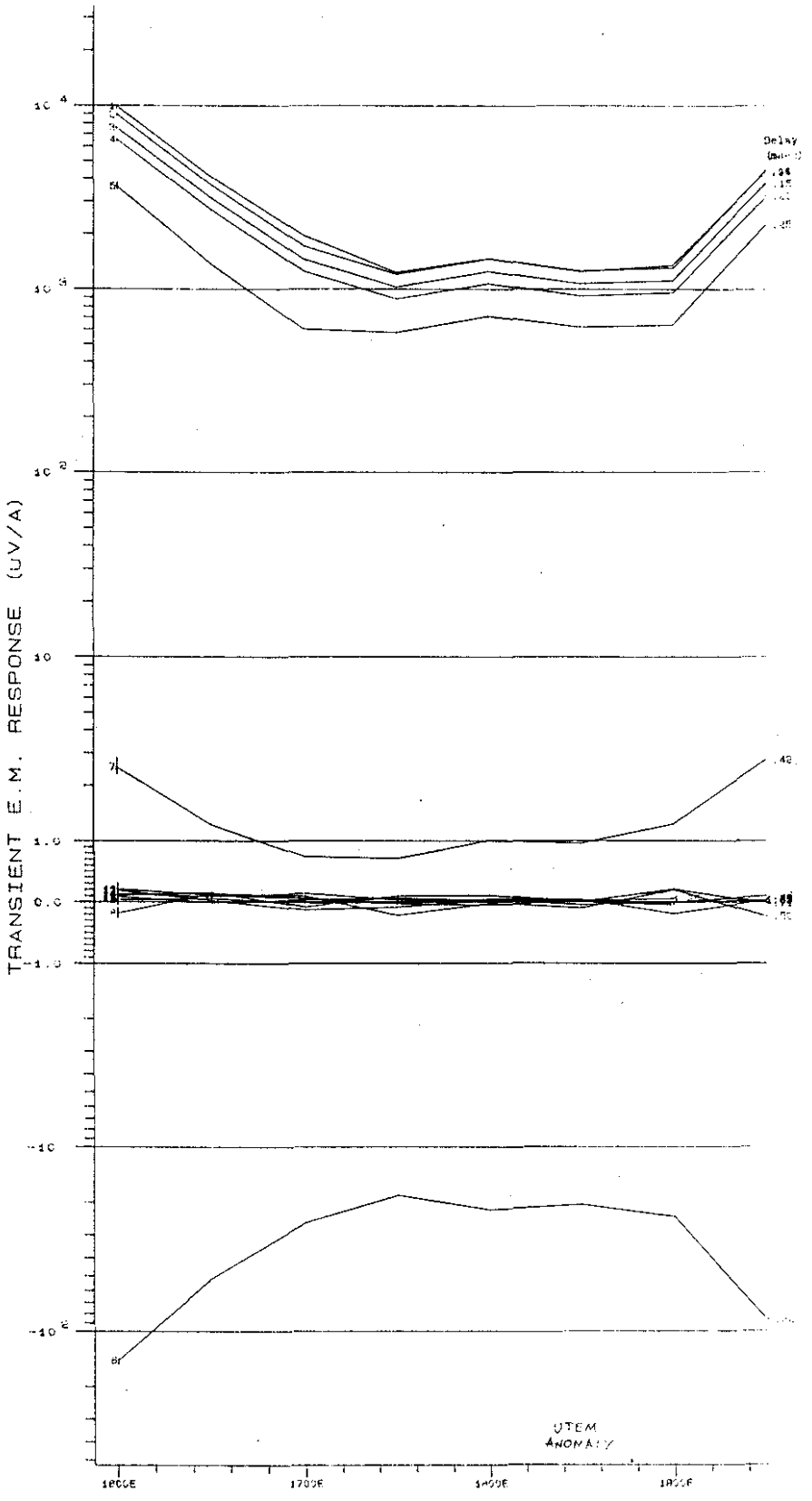


SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY . TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7500 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (Z component)
Plotted : 9:57 PM 10/11/86

5 cm

404

960402



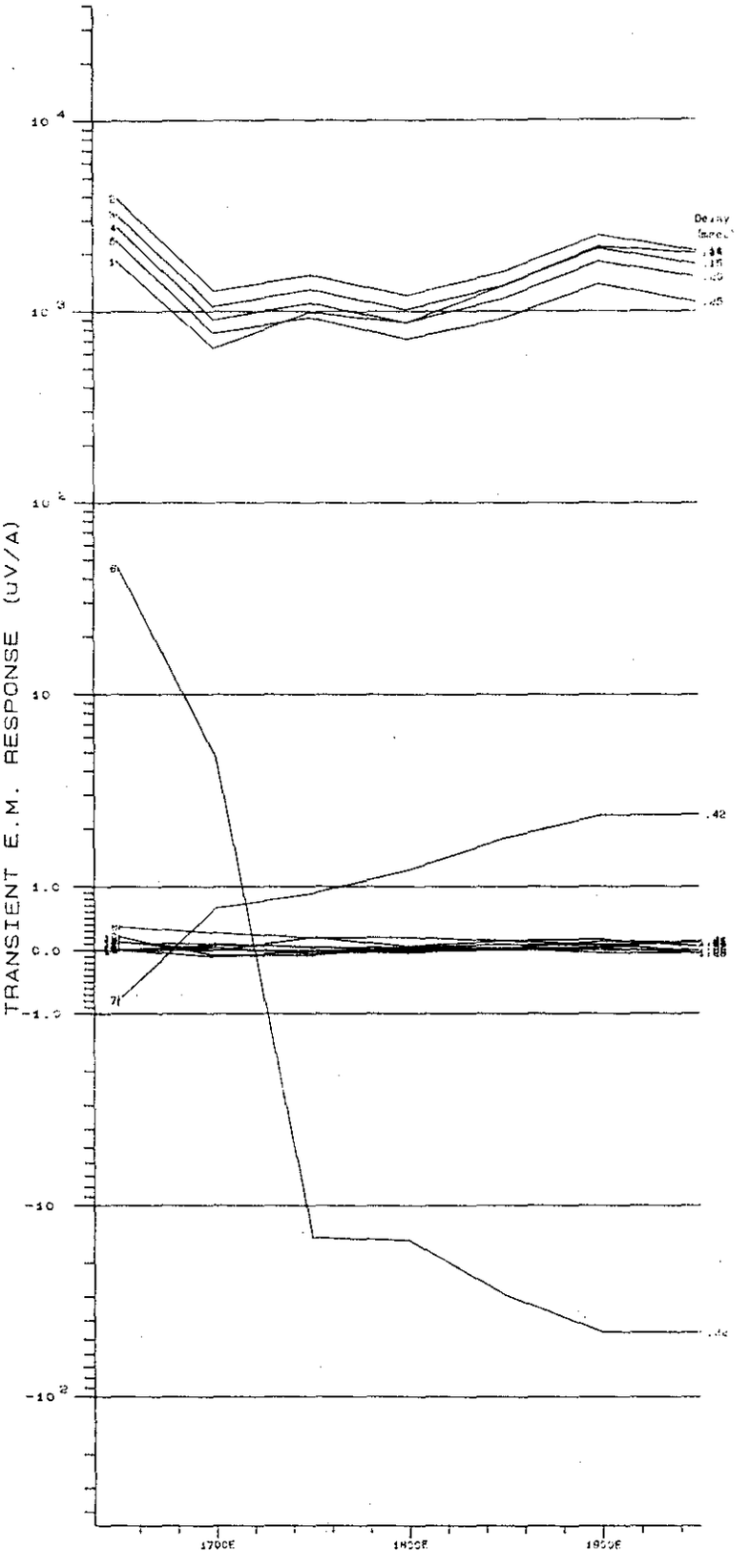
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY . TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7500 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (X component)
Plotted : 9:47 PM 10/11/86

5 cm

SOLO

405

960403



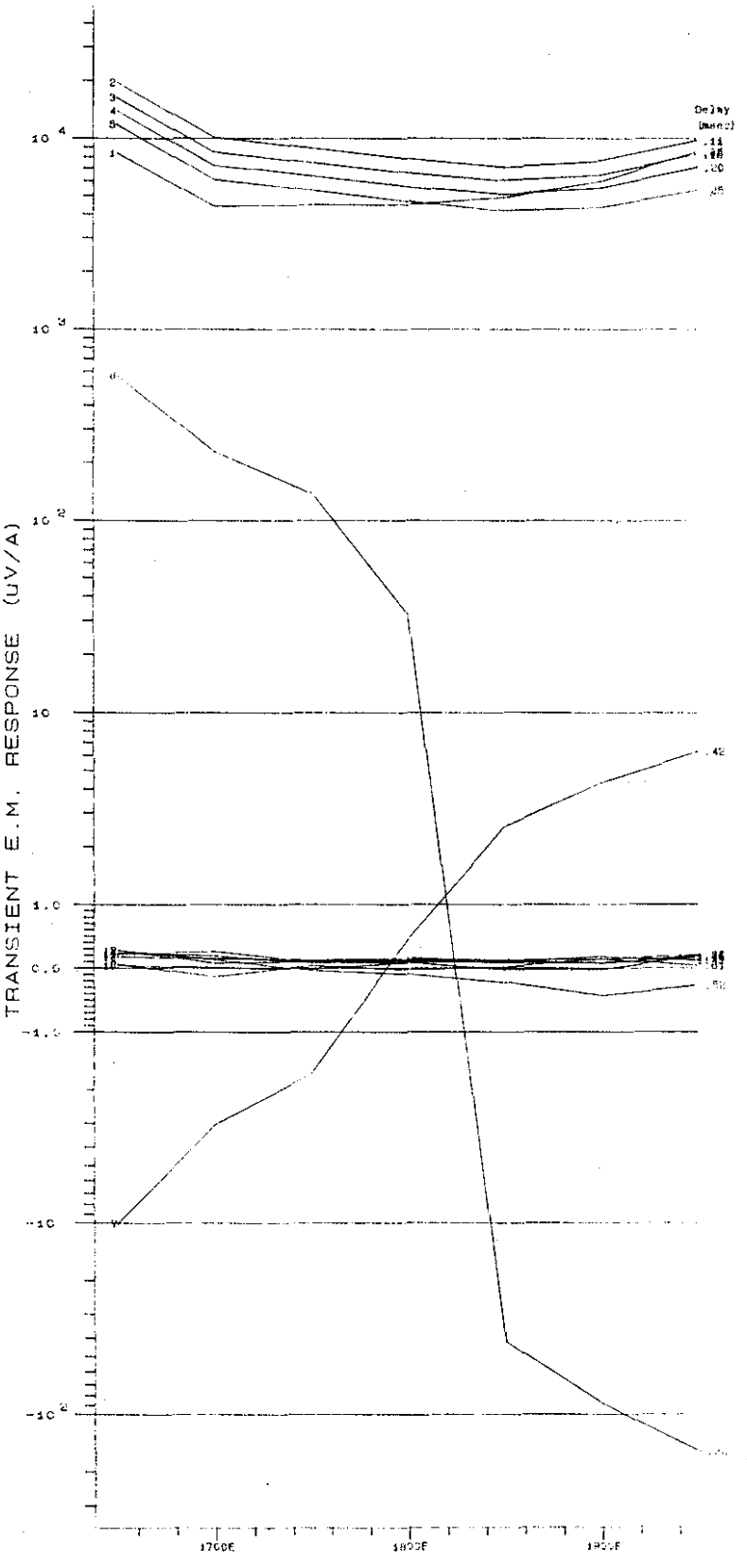
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7400 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (X component)
Plotted : 9:44 PM 10/11/86

5 cm

SOLO

960404

406

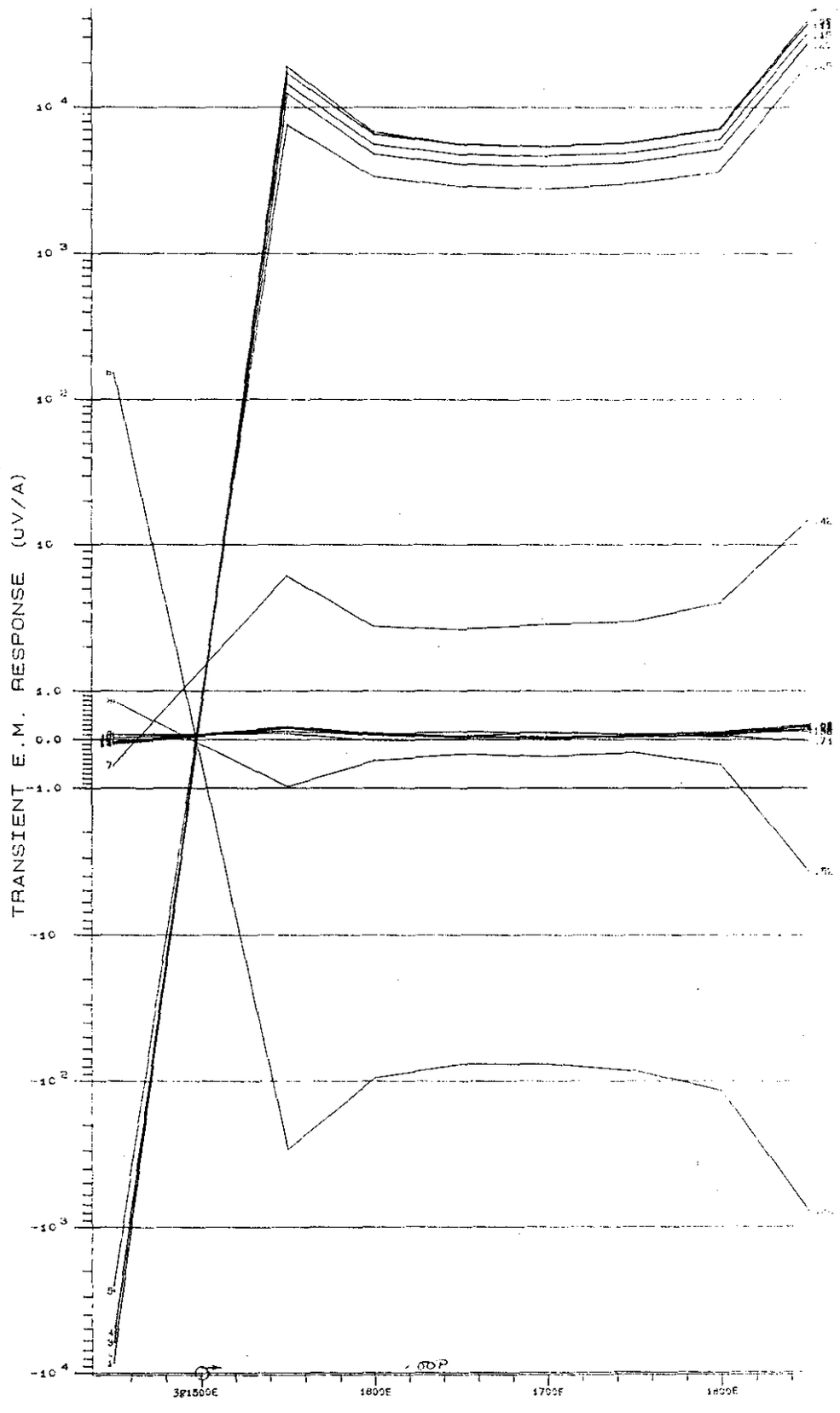


SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY . TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7400 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (Z component)
Plotted : 4:54 PM 10/11/86

5 cm

407

960405

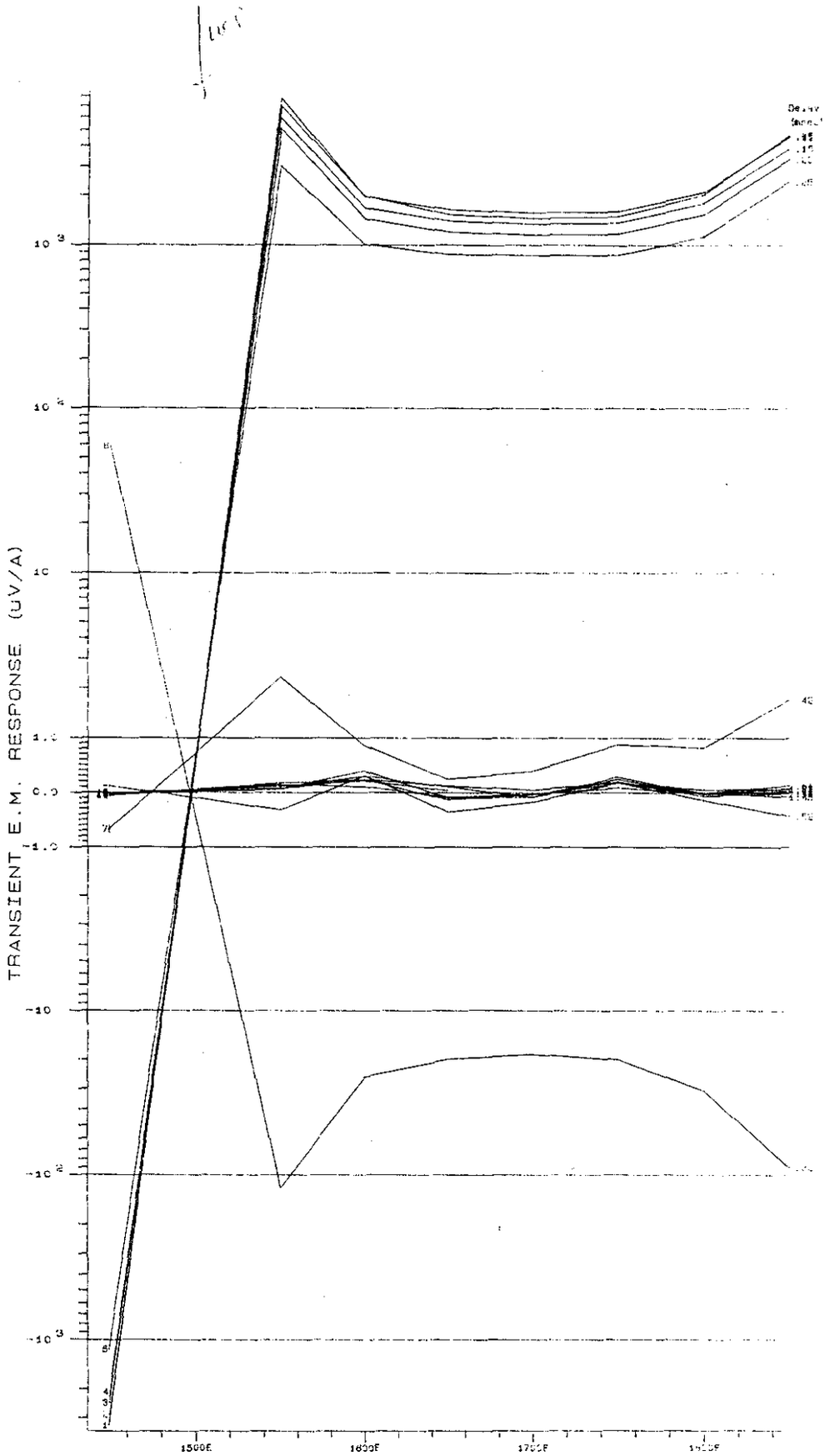


SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A.
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7750 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (Z component)
Plotted : 10:00 PM 10/11/86

5 cm

408

960406



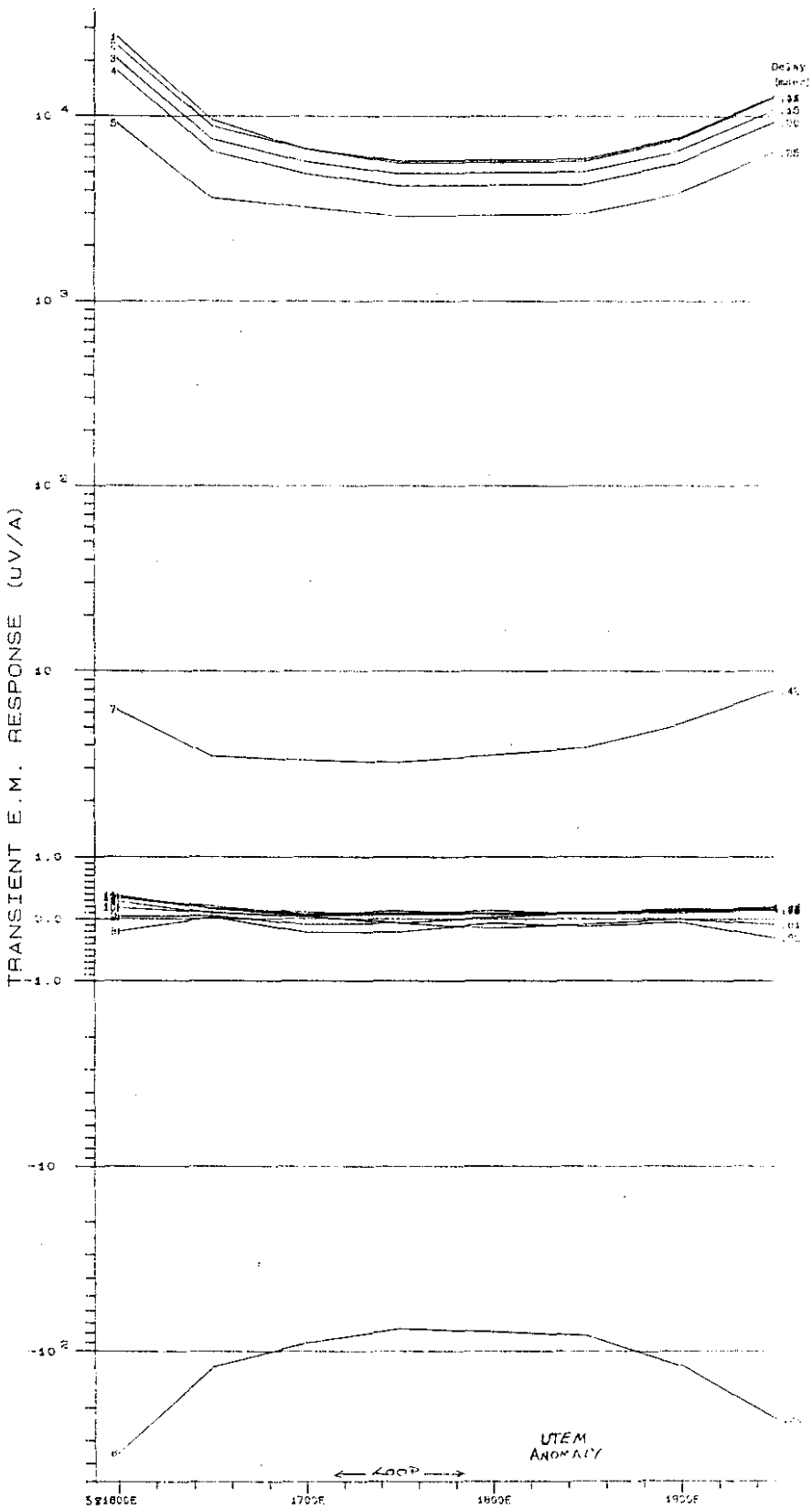
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7750 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (X component)
Plotted : 9:50 PM 10/11/86

5 cm

SOLO

409

960407

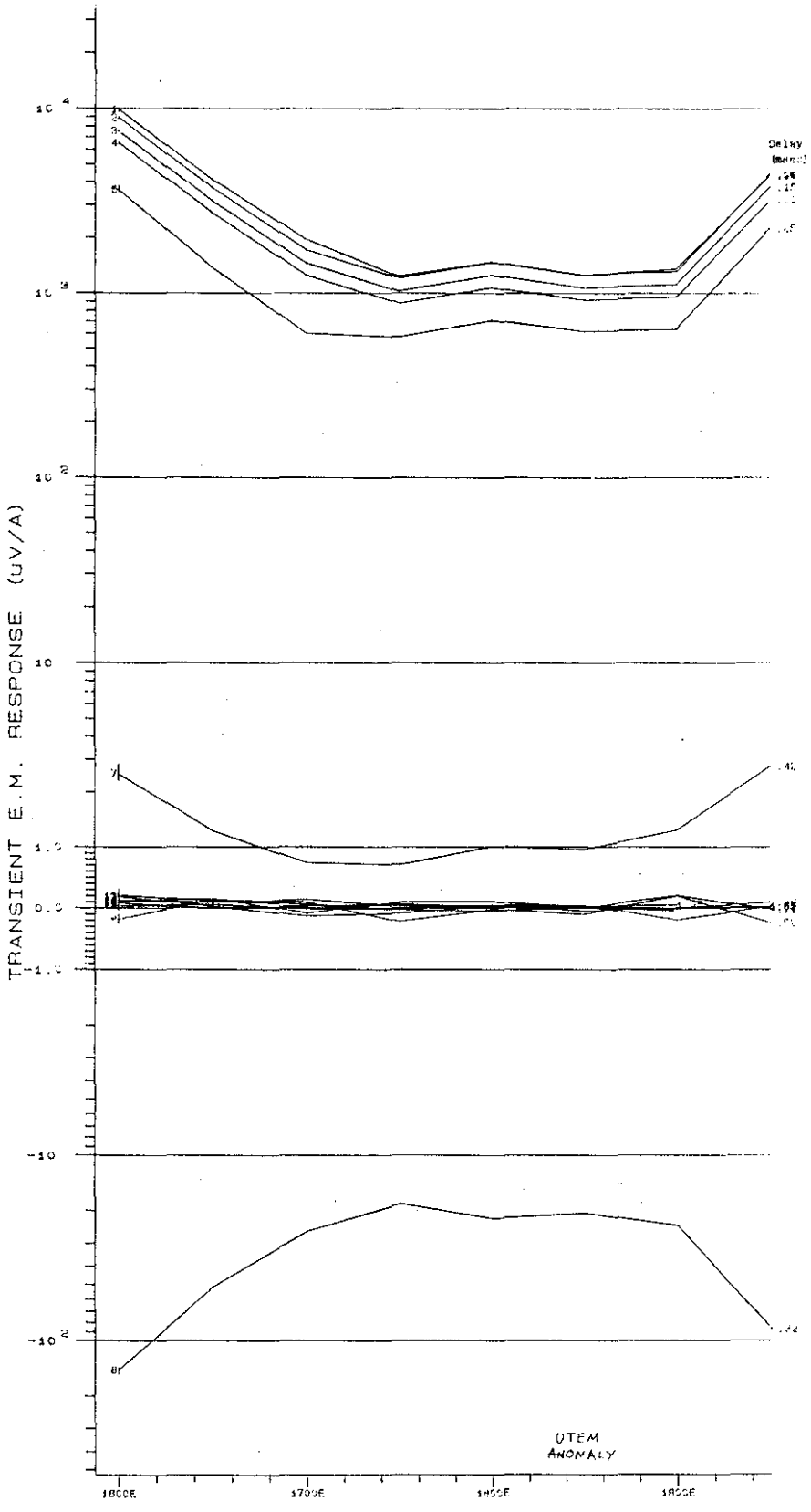


SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY . TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7500 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (Z component)
Plotted : 9:57 PM 10/11/88

5 cm

410

960408



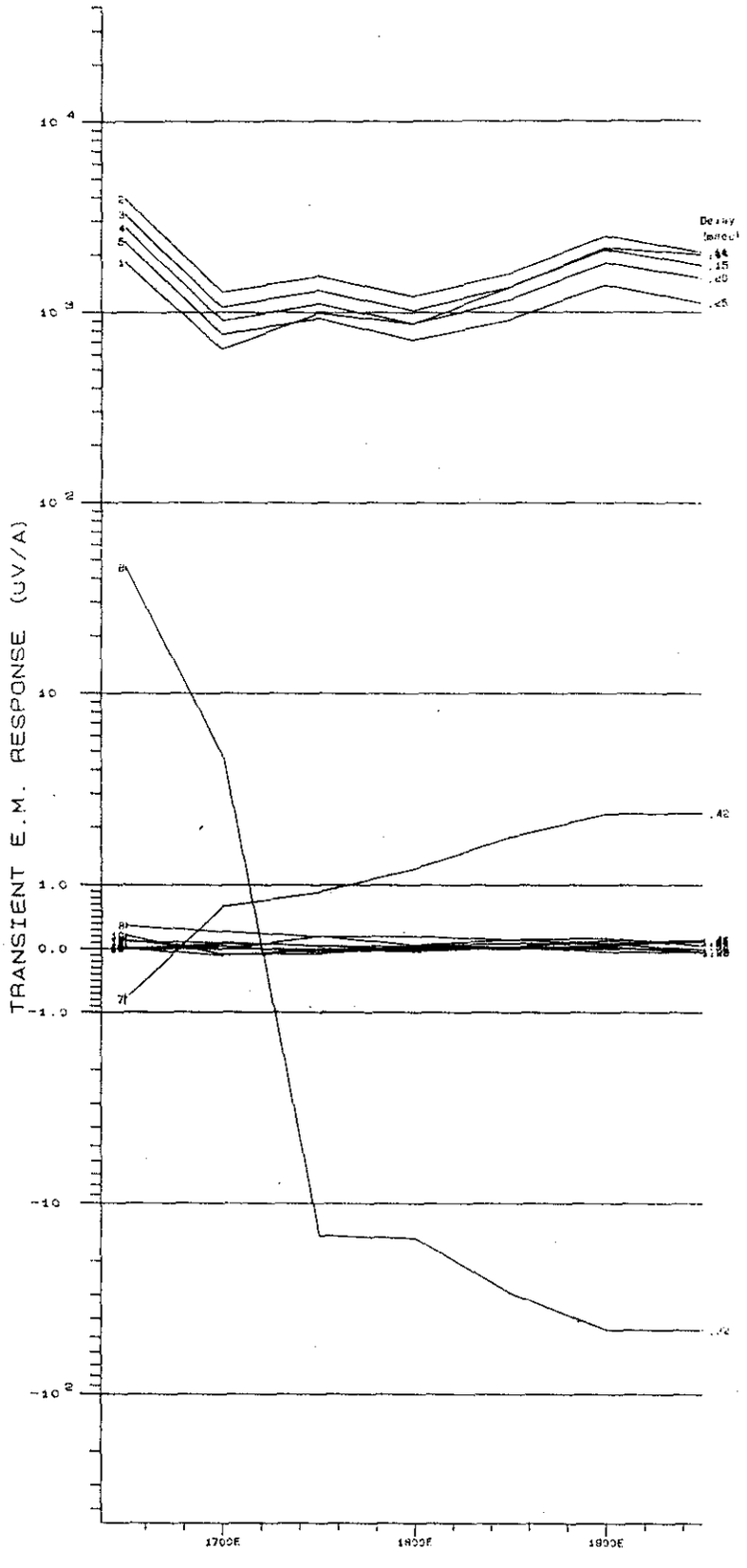
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY . TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7500 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (X component)
Plotted : 9:47 PM 10/11/86

5 cm

SOLO

411

960409



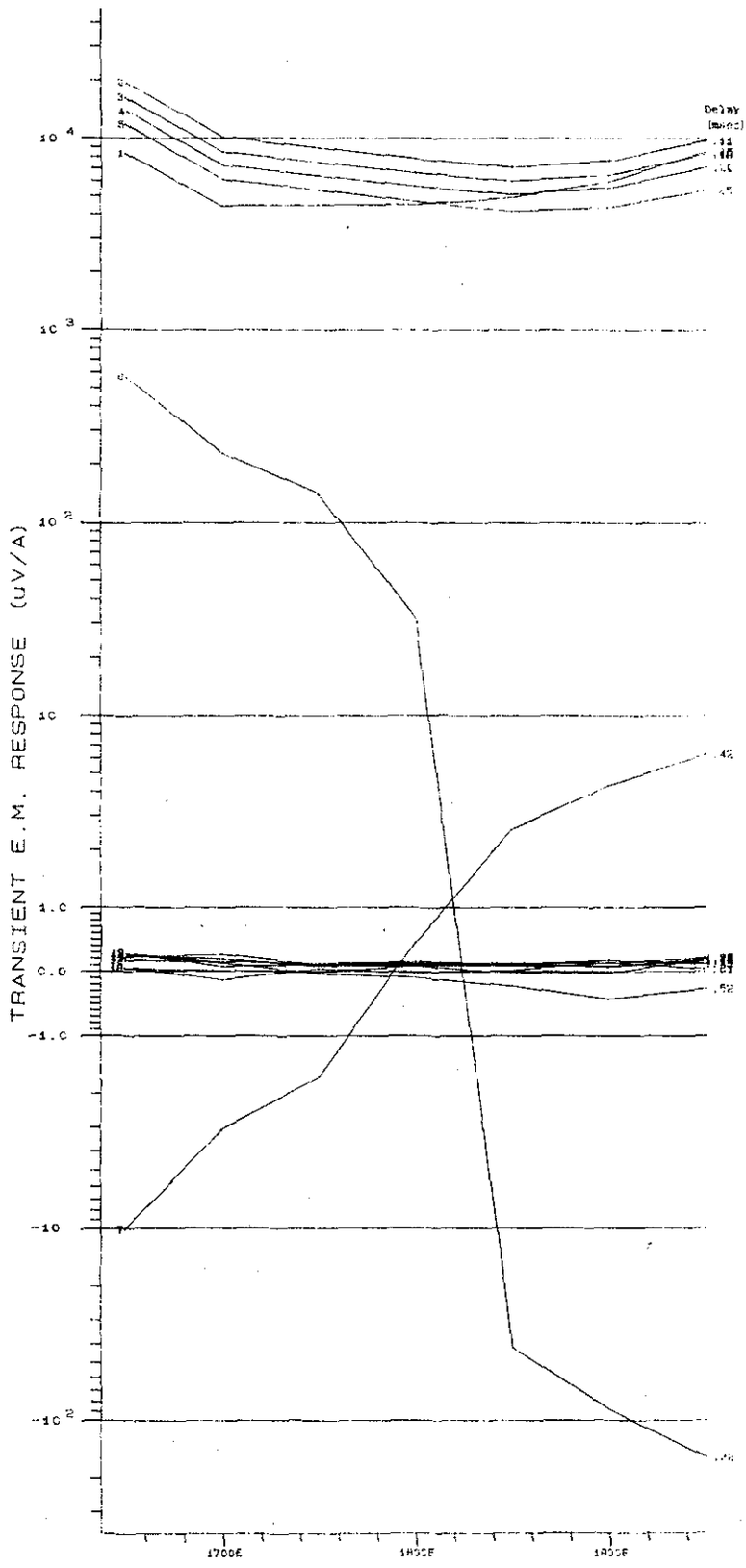
SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY , TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7400 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (X component)
Plotted : 9:44 PM 10/11/86

5 cm

SOLO

960410

412



SHELL AUSTRALIA PTY.LTD.
MOUNT BLACK ANOMALY 8A
ROSEBERY . TASMANIA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 7400 NORTH Reading interval 50.0 m
SCALE 1 : 2500 750X400M
LOOP configuration : TURAM mode (Z component)
Plotted : 9:54 PM 10/11/86

5 cm

SOLO

508.

TRANSIENT E.M. RESPONSE (uV/A)

Decay (msec)
.19
.25
.32
1.05
1.25
1.45
1.64
1.84
2.03
2.22
2.41
2.60
.71
.81
.92
1.05
1.05ms
1.45
1.94
2.72

Depth (m)

SHELL COMPANY OF AUSTRALIA
TASMANIA
(JOB NO.632A) CUTTY SARK.
DH CS-1 EARLY TIMES 700X800 FT.
SIROTEM Survey by SOLO Geophysics & Co. 23/ 5/86
SOLO hole ref.701 Reading interval 1.0 m
SCALE 1 : 1000 Loop size : 700 FT.
LOOP configuration . Drill hole
Plotted : 4.01 PM 20/ 6/86

LOOP DIAGRAM

A = (11800N, 1000E)
B = (11100N, 1000E)
C = (11100N, 300E)
DH= (11500N, 850E)

5 cm

960411

APPENDIX XI.3

960412

413

APPENDIX VI

Rock Chip Geochemistry

SAMPLE RECORD

Sheet 1 of ___.

Shell METALS DIVISION

SAMPLE TYPE: Rock Chip LOCATION / PROJECT: Rosebery East SAMPLER: J. Randell DATE: Feb-Nov '86 MAP / PHOTO REF: ___

ASSAY LAB: Comlabs SAMPLE DESPATCH ORDER Nº: 08329, 08336 ASSAY REPORT Nos: ___

SAMPLE STORAGE: ___

A14

SAMPLE No.	LOCATION N	LOCATION E	INTER'L (m)	LOCATION DESCRIPTION	ANALYSES (see Appendices)	DESCRIPTION
21901	376700	380660		Top of Mt Black track		Fine laminated chlorite - sericite tuff
21902	376880			Mt. Black		Coarsely [illegible]ded very fine grained white/ translucent chert. Nc pyrite
21903	377350	380700		At track junction		Yellow/brown ferruginous silty sandy tuff
21904	377350	380700		At track junction		Fine grain cherty interbeds, massive oo pyrite
21905	376000	381400				Siliceous massive rock with coarse grained pyrite veins & disseminations + minor magnetite veinlets
21906	376000	381400				Silicified + quartz veined chloritic feldspar phyric andesite
21907	376000	381400				Massive weakly cleaved chlorite rock, minor magnetite veinlets
21908	376000	381490				Strongly chloritic, siliceous + quartz veined andesite
21909	376000	381500				Well banded quartz with lam hematite & rare coarse pyrite
21910	376000	381500				Banded quartz-chlorite-hematite plus pyrite with matrix of andesite
21911				On walking track		Nco laminated orange brown silty sediment with minor feldspar clasts. Float only
21912	376500	381540				Feldspathic vascted silty oco laminated oc banded
21913	376500	381540				Silty grey brown weakly laminated sediment
21914	376020	382000				Massive magnetite-hematite (pyrite) chert
21915	376020	382000				Siliceous chloritic andesite with siliceous (+magnetite) veins
21916	376020	382000				Weakly ferruginous layered quartz vein

MARKS: ___

960413

SAMPLE RECORD

Sheet 2 of ___.

Shell METALS DIVISION

SAMPLE TYPE: ROCK CHIP LOCATION / PROJECT: ROSEBERY EAST SAMPLER: J. RANDELL DATE: FEB-NOV '86 MAP / PHOTO REF: ___

ASSAY LAB: COMLABS SAMPLE DESPATCH ___ ASSAY REPORT NOS: ___

ORDER NO: 08332, 08334, 08339

SAMPLE STORAGE: ___ NTS

SAMPLE No.	LOCATION N	LOCATION E	INTER'L (m)	LOCATION DESCRIPTION	ANALYSES (see Appendices)	DESCRIPTION
21917	376020	382000				Poorly banded weakly ferruginous siliceous rock (vein or chert?)
21918	378000	383130		Mt Sale		Massive chloritic feldspar phyric andesite with 2-3% disseminated hematite/magnetite
21919				Langdons - at drive on track, Face sample.		Massive cherty + siderite hematite + galena sphalerite.
21920				Langdons - dump sample from 2nd dump below track.		Massive green (chloritic) cherty rock with blebs galena & veinlets hematite/ galena ± sphalerite.
21921				Langdons - dump sample from 2nd dump below track.		Strongly ferruginous vuggy & cherty oxidised ore + 2° cavity fill (quartz & siderit
21922				Langdons - dump sample from 2nd dump below track.		Dense black coarse grained hematite rock with some galena & cherty fragmen ± siderite.
21923				Langdons - dump sample from 2nd dump below track		Weakly chloritic siliceous galena veined (network veinlets) + hematite & coarse siderite.
21924				Top dump - below track		Siliceous very weakly chloritic massive fine grain rock. Rare quartz veins. Some fine ? sericite.
21925				Langdons in drillhole 30m E of top dump		Strongly silicified weakly chlorite veined feldspar phyric acid/volcanic. Weathered surface shows quartz veinlet stockwork.
21926	370000	380700		Stitt River		T.S. Fine medium feldspar phyric andesitic ?ignimbrite - fine chlorite.
21927	370000	380840		Stitt River		Massive silicified weakly feldsp phyric volcanic (dacite-) with rare glassy shards.
21928	370000	380880				M. feldspar phyric dacitic - andesitic lava with weak layering defined by chloritic wisps.

REMARKS: ___

9604414

SAMPLE RECORD

METALS DIVISION

SAMPLE TYPE: ROCK CHIP LOCATION / PROJECT: ROSEBERY EAST SAMPLER: J RANDELL DATE: FEB-NOV '86 MAP / PHOTO REF: ___

ASSAY LAB: COMLABS SAMPLE DESPATCH ORDER NO: 08334 ASSAY REPORT NOS: ___

SAMPLE STORAGE: ___

SAMPLE No.	LOCATION N	LOCATION E	INTER'L (m)	LOCATION DESCRIPTION / ANALYSES (see Appendices)	DESCRIPTION
21929	370900	330890			Coarse feldspar phyric chloritic andesitic volcanic with chloritic lithics & minor dacitic elongate lenses.
21930				Langdons on track TS + assay	Massive feldspar-phyric acid volcanic with 5-7% acicular Fe-chlorite.
21931				Langdons on track TS + assay	Massive siliceous fine feldspar phyric acid lava with chloritic lentoules (trace pyrite + carbonate clots
21932				Langdons on track TS + assay	Well layered? fiamme bearing acid volcanic feldspar phyric. Thin developments clasty fiamme ex
21933	378900	330350		Langdons	Cleaved medium feldspar phyric acid volcanic with carbonate patches & spotting 2-3% chloritic.
21934	378900	330420		Langdons TS + assay	Cleaved feldspar phyric acid volcanic carbonated as disseminations & patches.
21935	378900	330525		Langdons	Leached feldspar phyric acid volcanic with thin quartz cross cutting veinlets (Couldn't get fresh sample)
21936	378900	330685			Fine laminated/banded sandstone/siltstone/cherts Banding chert developed on weathered surface. Tr-1% fine rare fresh pyrite.
21937	378900	330740			Massive siliceous acid volcanic intensely fine fractured & infilled with chlorite. Some semblance to fiamme. Small spots of carbonate.
21938	378900	330750			Massive chalcedonic silica? acid volcanic with fine carbonate.
21939	378900	330785			Massive siliceous acid volcanic with quartz veinlets
21940	378945	330500		Langdons	Fresh unaltered feldspar phyric acid/intermediate lava with 0.5cm quartz veinlets
21941	379000	330435		Langdons	Strongly quartz veined feldspar/phyric acid volcanic

REMARKS: ___

9960417

SAMPLE RECORD

Hall METALS DIVISION

SAMPLE TYPE: ROCK CHIP LOCATION / PROJECT: ROSEBERY EAST SAMPLER: J. RANDELL DATE: FEB-NOV '86 MAP / PHOTO REF: ___

ASSAY LAB: COMLABS SAMPLE DESPATCH ORDER NO: 08334 ASSAY REPORT NOS: ___

SAMPLE STORAGE: ___

SAMPLE No.	LOCATION N	LOCATION E	INTER'L (m)	LOCATION DESCRIPTION	ANALYSES (see Appendices)	DESCRIPTION
21942	379000	330280				Weathered feldspar phyric acid/intermediate volcanics with clear quartz vein stockwork. No obvious ferr or alteration.
21943	379100	380200		T.S.		Siliceous acid volcanic with angular acid fragmentals (feldspar phyric).
21944	379100	380020		Langdons		Medium grain feldspar phyric acid volcanic with 3-5% ? carbonate spars + chloritic crystal texture & ? fiamme??
21945	379100	379920				Weakly feldspar phyric acid lava with strong ferr patches some ex carbonate others exotic limonite. boswacks.
21946	379100	379680		T.S.		Massive siliceous acid lava with flattened chlorite lenticles 0.2-0.5cm fiamme?
21947	379000	380180		Langdons At gouging.		Massive very fine grained siliceous cherty volcanics with 2% disseminated carbonate and/or pyrite and/or chlorite
21948	379000	380180		Langdons. At gouging.		As above.
21949	379000	380180		Langdons At gouging		As above.
21950	379000	380300				1cm quartz veins (ferruginous) in massive feldspar phyric acid/intermediate lava.
21951	379000	380640		Langdons		Siliceous banded ferruginous (ex fine pyrite) cherty rock. Possibly quartz banded acid lava flow.
21952	379000	380640		Langdons		As above.
21953	378980	380650		South of grid line.		Cherty bands + sandy layers & coarse lenses in a feldspar phyric acid intermediate lava. Minor ferr
21954	379000	380665				Weak feldspar phyric acid/intermediate lava with strong quartz subparallel veining
21955	379000	380725				Coarse acid/pyroclastic breccia (2-5cms) weathered & silicified
21956	378300	380520				Silicified acid lava with moderate quartz veining

MARKS: ___

960411

SAMPLE RECORD

Sheet 5 of ___

Shell METALS DIVISION

SAMPLE TYPE: ROCK CHIP LOCATION / PROJECT: ROSEBERY EAST SAMPLER: J. RANDELL DATE: FEB-NOV 86 MAP / PHOTO REF: ___

ASSAY LAB: COMLABS SAMPLE DESPATCH ___ ASSAY REPORT NOS: ___

ORDER NO: 08334, 08339, 08343

SAMPLE STORAGE: ___

SAMPLE No.	LOCATION N	LOCATION E	INTER'L (m)	LOCATION DESCRIPTION	ANALYSES (see Appendices)	DESCRIPTION
21957	379800	330640				White massive quartz, minor ferruginization in feldspar phyric acid/intermediate lava.
21958	379300	330700				Cleaved, siliceous acid volcanic with fine quartz veinlets throughout. Minor ferruginization
21959	378900	330210				Silicified acid volcanic with fine network of slightly ferruginous quartz veinlets.
21960	379100	330690				Vaguely laminated very fine grained siliceous rock (Chert?) with trace fine
21961	378700	330705				Very fine, cherty rock with fine trace pyrite. Possible 2° silica from original acid volcanic
21962	378700	330340				Shows laminations in weathered outcrop? Well laminated fine grain siliceous rock - chert, no ferruginization evident
21963	378700	330810				Coarse quartz veins in feldspar pyric acid/intermediate lava.
21964	378000	333180		Mt Sale T.S. + assay. Resample of 21918		Massive siliceous pink ? lava with 5-7% chlorite clots & trace disseminated ? hematite/magnetite.
21965	378000	333200		Mt Sale T.S. Float.		Massive siliceous ? lava with 5% chlorite laths + rare blotches As pyrite. This location sampled by ISA-83206E 738-83206E
21966	377300	331110				Weathered acid/intermediate lava with 10% conjugate chlorite/pyrite veinlets
21967				Que River		'3' lens gossan
21968	377500	331900		T.S.		Coarse pyroclastic breccia part banded intermediate andesitic
21969	376000	331450		Mt Black T.S.		Massive chlorite - magnetite - hematite rock
21970				Langdons dump T.S.		Siliceous chloritic lava with fine disseminated galena
21971				Langdons dump P.T.S.		Chlorite - sericite breccia with clasts galena, sphalerite, magnetite.
21972				Langdons dump P.T.S.		Chlorite - sericite - carbonate breccia with coarse galena sphalerite
21973				South Stitt HEC line, east of track		Quartz hematite manganese veined weakly bleached andesite.

REMARKS: ___

960417

SAMPLE RECORD

METALS DIVISION

MPLE TYPE: ROCK CHIP | LOCATION / PROJECT: ROSEBERY EAST | SAMPLER: J. RANDELL | DATE: FEB-NOV '86 | MAP / PHOTO REF: ___

ASSAY LAB: COMLABS | SAMPLE DESPATCH ORDER NO: 08343 | ASSAY REPORT NOS: ___

SAMPLE STORAGE: ___

SAMPLE No.	LOCATION N	LOCATION E	INTER'L (m)	LOCATION DESCRIPTION	ANALYSES (see Appendices)	DESCRIPTION
21974				Henty Fault		Pink sugary quartz heavily ferruginously stained
21975				Henty Fault		Quartz breccia chloritic and siliceous breccia andesitic remnants
21976	377930	383140		Mt Sale		Medium feldspar phyric andesite with 10% irregular vugs filled with ferruginous material + quartz.
21977	377900	383150		Mt. Sale		Medium feldspar phyric andesite with 2-3% euhedral and irregular clots of hematite. Some sericitic alteration ± chlorite.
21978	377900	383195		Mt Sale		Massive silicified feldspar phyric andesitic ?intrusive with trace 2% irregular pyrite.
21979	377900	383220				Pink medium feldspar phyric andesite with trace small vugs + very fine hematite
21980	377900	383175				Minor feldspar phyric andesite with 2-4% coarse irregular late stage vugs filled with limonite material and feldsp quartz.
21981	377900	383155				Massive white feldspar quartz ?vein
21982	378020	383140		Mt Sale		Medium feldspar phyric andesite with 2-3% irregular vugs quartz and chlorite
21983	378100	383155				Milky bleached sericite and ? carbonate medium feldspar phyric lava with banded quartz feldspar vein material
21984	378100	383155				Medium feldspar phyric chloritic ?int with trace disseminated hematite.
21985	378100	383160				Medium feldspar phyric andesite with 2-4% med grained ferruginous vugs.
21986	378100	383165				Massive extreme silicified ex andesitic lava
21987	378100	383165				Moderately ferruginous feldspar phyric andesite with 2-4% small ferruginous vugs

EMARKS: ___

96044

SAMPLE RECORD

METALS DIVISION

SAMPLE TYPE: ROCK CHIP LOCATION / PROJECT: ROSEBERY EAST SAMPLER: J. RANDELL DATE: FEB-NOV'86 MAP / PHOTO REF: ___

ASSAY LAB: COMLABS SAMPLE DESPATCH ___ ASSAY REPORT NOS: ___

ORDER NO: 08343

SAMPLE STORAGE: ___

SAMPLE No.	LOCATION N	LOCATION E	INTER'L (m)	LOCATION DESCRIPTION	ANALYSES (see Appendices)	DESCRIPTION
21988	378100	383165				Massive silicified porphyritic quartz ferruginous vug andesite.
21989	377900	383190				Ferruginous vuggy med-feldspar phyric andesite.
21990	377900	383180				Feldspar phyric andesite with minor ferruginous irregular vugs.
21991	377900	383170				Medium feldspar phyric andesite with 3-5% coarse irregular ferruginous vugs.
21992	378000	383175				Heavily vugged ferruginous feldspar phyric andesite.
21993	378000	383175				Weathered ferruginous pale green pink feldspar porphy with minor small vugs.
21994	377750	380610		Mt Black		2-3% ferruginous vugged ex pyrite with quartz veins in siliceous epidote andesite.
21995	378000	380720		Mt Black Langdons		Orange white weathered ? andesite from EZ pits.

MARKS: ___

9604419

960420

421

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

Head Office and Central Laboratory
305 South Road,
Mile End South,
Sth. Aust. 5031.
Tel: (08) 43 5722
Telex: AA89323

NATA REGISTERED No. 1526

OUR REF.: COM860286

YOUR REF.: 08329/LJ50/JPR/003

Mr. J. Randell
The Shell Co. of Aust. Ltd.
30 Mersey Main Rd
Spreyton
DEVONPORT
TAS 7310

March 12, 1986

Dear Jeff

RE: JOB COM860286

Enclosed are the assays for the samples delivered to our laboratory on March 6, 1986

Yours Sincerely,
COMLABS PTY LTD

per

Report Length 2 pages

960421

422

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

JOB COM860286

ANALYTICAL REPORT O/N : 08329/LJ50/JPR/003

SAMPLE	Cu	Zn	Ag	Au
21901	2	6	<1	7
21902	4	2	<1	<5
21903	4	10	<1	10
21904	3	6	<1	10
21905	3	9	<1	<5
21906	3	32	<1	9
21907	3	220	<1	<5
21908	3	125	<1	6
21909	3	16	<1	<5
21910	3	22	<1	8
21911	115	150	<1	6
21912	12	50	<1	<5
21913	46	105	<1	<5
21914	5	18	<1	<5
21915	4	38	<1	<5
21916	3	6	<1	<5
21917	3	8	<1	<5
UNITS	ppm	ppm	ppm	ppb
SCHEME	AAS1	AAS1	AAS3	AAS5C

A23

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860286
O/N : 08329/LJ50/JPR/003

SAMPLE	As	Pb	Ba	Sn	W
21901	4	<4	900	10	<10
21902	5	<4	15	8	<10
21903	5	4	630	<4	<10
21904	<2	6	400	<4	<10
21905	4	<4	15	4	10
21906	6	<4	50	<4	<10
21907	6	<4	<10	<4	25
21908	2	<4	10	4	<10
21909	6	<4	10	4	<10
21910	3	<4	<10	6	<10
21911	38	145	330	<4	<10
21912	18	16	920	8	<10
21913	115	65	80	<4	<10
21914	6	4	40	4	50
21915	5	4	85	<4	15
21916	5	<4	20	8	<10
21917	5	<4	10	4	<10
UNITS	ppm	ppm	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1	XRF1	XRF1

960423

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

Head Office and
Central Laboratory
305 South Road,
Mile End South,
Sth. Aust. 5031.
Tel: (08) 43 5722
Telex: AA89323

NATA REGISTERED No. 1526

OUR REF.:

YOUR REF.: COM860428

08332/LJ50/JPR/006

Mr. J. Randell
The Shell Co. of Aust. Ltd.
30 Mersey Main Rd
Spreyton
DEVONPORT
TAS 7310

April 10, 1986

Dear Jeff

RE: JOB COM860428

Enclosed are the assays for the samples delivered to our laboratory on April 1, 1986

Yours Sincerely,
COMLABS PTY LTD

per :

P R Harvey

Report Length 2 pages

960424

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860428
O/N : 08332/LJ50/JPR/006

SAMPLE	Cu	Zn	Ag	Au	Au1	Au2	Au3
21918	32	40	5	6.6	7.5	6.5	5.8
21919	24	3700	18	0.14	-	-	-
21920	40	4200	16	4.8	5.0	4.3	4.4
21921	300	2.20%	530	<0.01	-	-	-
21922	28	4600	34	<0.01	-	-	-
21923	40	1.49%	85	<0.01	-	-	-
21924	9	1900	10	<0.01	-	-	-
21925	5	360	4	<0.01	-	-	-
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1 AAS1A	AAS3 AAS4	FAS1	FAS1	FAS1	FAS1

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860428
O/N : 08332/LJ50/JPR/006

SAMPLE	Pb	As	Sn	W	Ba
21918	34	5450	<4	10	460
21919	1.32%	3300	<4	<10	230
21920	1.37%	2500	<4	15	260
21921	24.0%	<0.01%	<4	<10	55
21922	2.35%	470	<4	<10	105
21923	6.80%	1200	<4	15	350
21924	6100	270	<4	<10	290
21925	2800	110	4	15	230
UNITS	ppm	ppm	ppm	ppm	ppm
SCHEME	XRF1 XRF2	XRF1	XRF1	XRF1	XRF1

960426

427

COMLABS SERVICES PTY. LTD.

305 South Road, Mile End South, South Australia 5031 Telephone (08) 43 5722 Telex LABCOM AA89323

COM860650

08334/LJ50/JPR/008

Mr. J. Randell
The Shell Co. of Aust. Ltd.
30 Mersey Main Rd
Spreyton
DEVONPORT
TAS 7310

May 21, 1986

"L 50W = Location 50 metres"
west of Langdons diggings
on track.

Dear Jeff

RE: JOB COM860650

Enclosed are the assays for the samples delivered to our laboratory on May 6, 1986

Yours Sincerely,
COMLABS PTY LTD

per :

Report Length 10 pages

960427

428

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860650
O/N : 08334/LJ50/JPR/008

SAMPLE	Cu	Zn	Ag	Au	Ba	Pb	As
21930	12	46	<1	<0.01	660	34	4
21931	16	60	<1	<0.01	590	24	5
21932	6	155	<1	<0.01	530	30	5
21933	3	18	<1	<0.01	340	4	3
21934	4	145	<1	<0.01	370	200	5
21935	7	105	<1	<0.01	450	30	8
21936	6	42	<1	<0.01	460	14	6
21937	6	16	<1	<0.01	710	6	6
21938	4	26	<1	0.02	660	18	16
21939	3	9	<1	0.01	680	4	4
21940	2	20	<1	<0.01	390	<4	2
21941	3	7	<1	0.01	300	6	3
21942	2	4	<1	0.01	420	8	<2
21943	3	14	<1	<0.01	300	10	<2
21944	2	8	<1	<0.01	330	<4	3
21945	3	44	<1	<0.01	260	10	2
21947	3	24	<1	<0.01	930	6	5
21948	9	32	<1	<0.01	950	20	6
21949	5	24	<1	0.01	1000	12	3
21950	4	16	<1	<0.01	800	10	6
21951	4	4	<1	<0.01	490	<4	16
21952	4	3	<1	<0.01	490	4	32
21953	3	20	<1	<0.01	360	<4	5
21954	3	6	<1	0.01	280	<4	4
21955	10	14	<1	<0.01	640	6	5
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

C 429
COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860650
O/N : 08334/LJ50/JPR/008

SAMPLE	Cu	Zn	Ag	Au	Ba	Pb	As
21956	8	6	<1	<0.01	580	<4	3
21957	4	3	<1	<0.01	10	<4	3
21958	10	3	<1	0.03	430	<4	28
21959	2	14	<1	<0.01	480	6	7
21960	3	14	<1	<0.01	760	<4	6
21961	3	6	<1	0.01	200	<4	4
21962	24	20	<1	0.01	620	14	6
21963	4	6	<1	0.02	220	<4	10
21964	3	18	<1	<0.01	790	10	6
21966	2	8	<1	<0.01	670	<4	3
21967	50	10	2	<0.01	145	16	170
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860650
O/N : 08334/LJ50/JPR/008

SAMPLE	Cd	Sn	W	Sb
21967	<1	8	<10	22
UNITS	ppm	ppm	ppm	ppm
SCHEME	AAS1	XRF1	XRF1	XRF1

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860650
O/N : 08334/LJSO/JPR/008

SAMPLE	Cu	Zn	Ag	Au	Ba	Pb	As
L 10W	10	10	<1	<0.01	390	26	7
L 20W	7	9	1	<0.01	730	6	6
L 30W	8	22	1	<0.01	710	22	6
L 40W	5	14	<1	<0.01	320	<4	9
L 50W	6	7	<1	<0.01	480	4	3
L 60W	5	22	<1	<0.01	360	145	4
L 70W	7	20	<1	<0.01	570	10	14
L 80W	6	16	1	<0.01	580	10	22
L 90W	5	10	1	<0.01	390	6	2
L 130W	4	22	<1	<0.01	390	42	12
L 140W	4	9	<1	<0.01	520	4	12
L 150W	5	24	1	<0.01	520	10	8
L 160W	14	420	1	<0.01	430	120	28
L 170W	10	48	1	<0.01	550	40	24
L 180W	5	16	<1	<0.01	440	8	10
L 190W	4	14	<1	N.A.	330	55	6
L 200W	4	30	<1	<0.01	370	42	55
L 210W	3	32	<1	<0.01	460	24	7
L 220W	4	8	<1	<0.01	530	<4	7
L 230W	3	75	1	<0.01	380	145	34
L 240W	3	16	1	<0.01	430	8	10
L 250W	5	4	<1	<0.01	540	<4	5
L 260W	4	7	<1	<0.01	440	<4	16
L 270W	5	18	<1	<0.01	820	6	12
L 310W	5	50	<1	<0.01	590	18	7
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860650
O/N : 08334/LJ50/JPR/008

SAMPLE	Cu	Zn	Ag	Au	Ba	Pb	As
L 320W	5	28	<1	<0.01	490	26	7
L 330W	4	9	<1	<0.01	650	6	3
L 10E	3	32	1	<0.01	290	130	20
L 20E	3	10	1	<0.01	440	50	6
L 30E	3	5	<1	<0.01	490	6	6
L 40E	7	6	<1	<0.01	440	12	7
L 50E	4	4	<1	<0.01	400	<4	5
L 60E	5	5	<1	<0.01	400	<4	5
L 70E	4	6	1	<0.01	560	<4	22
L 100E	5	<2	<1	<0.01	560	<4	5
L 110E	4	3	<1	<0.01	520	<4	4
L 130E	3	12	<1	<0.01	460	24	8
L 140E	3	12	1	<0.01	400	<4	7
L 150E	4	22	<1	<0.01	440	4	5
L 160E	3	22	1	<0.01	460	10	8
L 170E	3	28	<1	<0.01	260	40	4
L 180E	3	60	<1	<0.01	380	32	9
L 190E	3	10	<1	<0.01	370	<4	5
L 200E	3	18	<1	<0.01	390	<4	6
L 220E	3	9	1	<0.01	470	14	5
L 230E	4	10	1	<0.01	420	6	7
L 260E	3	36	1	<0.01	860	<4	5
L 310E	3	8	<1	<0.01	380	<4	3
L 330E	3	16	1	<0.01	440	10	3
L 340E	3	4	<1	<0.01	340	<4	5
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

433

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860650
O/N : 08334/LJ50/JPR/008

SAMPLE	Cu	Zn	Ag	Au	Ba	Pb	As
L 360E	5	60	<1	<0.01	350	10	12
L 370E	7	30	1	<0.01	440	4	5
L 390E	3	32	<1	<0.01	350	28	20
L 400E	3	16	<1	<0.01	690	<4	3
L 410E	3	8	1	<0.01	370	<4	4
L 420E	3	55	<1	<0.01	480	10	16
L 430E	2	12	<1	<0.01	570	<4	6
L 440E	3	14	<1	<0.01	440	4	8
L 450E	2	22	<1	<0.01	560	6	6
L 460E	3	14	1	<0.01	500	<4	10
L 470E	6	2	<1	0.08	500	<4	4
L 480E	6	7	1	<0.01	580	<4	3
L 490E	5	18	<1	<0.01	600	6	8
L 500E	3	5	<1	<0.01	600	<4	4
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

434

960433

COMLABS SERVICES PTY. LTD.

305 South Road, Mile End South, South Australia 5031 Telephone (08) 43 5722 Telex LABCOM AA89323

COM860765

08336

Mr. J. Randell
The Shell Co. of Aust. Ltd.
30 Mersey Main Rd
Spreyton
DEVONPORT
TAS 7310

June 3, 1986

Dear Jeff

RE: JOB COM860765

Enclosed are the assays for the samples delivered to our laboratory on May 22, 1986

Yours Sincerely,
COMLABS PTY LTD

per :

Report Length 6 pages

435

960434

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860765
O/N : 08336

SAMPLE	Mo	Hg	Sb	Te	Bi
21905	12	<0.05	6	<10	8
21906	8	<0.05	6	<10	6
21907	6	<0.05	8	<10	6
21908	4	<0.05	10	<10	<4
21909	10	<0.05	10	<10	4
21910	8	<0.05	8	<10	4
UNITS	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS3	AAS7	XRF1	XRF1	XRF1

960435

436

COMLABS SERVICES PTY. LTD.

305 South Road, Mile End South, South Australia 5031 Telephone (08) 43 5722 Telex LABCOM AA89323

NATA REGISTERED No. 1526

OUR REF.: COM860986

YOUR REF.: 08339/LJ50/JPR/013

Mr. J. Randell
The Shell Co. of Aust. Ltd.
30 Mersey Main Rd
Spreyton
DEVONPORT
TAS 7310

July 2, 1986

Dear Jeff

RE: JOB COM860986

Enclosed are the assays for the samples delivered to our laboratory on June 26, 1986

Yours Sincerely,
COMLABS PTY LTD

per : Tony Holbrook

Report Length 15 pages

437

960436

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860986
O/N : 08339/LJ50/JPR/013

SAMPLE	Au
21918	<0.01
21964	7.1
UNITS	ppm
SCHEME	FAS1

438

960437

COMLABS SERVICES PTY. LTD.

305 South Road, Mile End South, South Australia 5031 Telephone (08) 43 5722 Telex LABCOM AA88323 Facsimile No. (08) 234 0321

NATA REGISTERED No. 1626

OUR REF.: COM861305

YOUR REF.: 08343/LJ50/JPR

Mr. J. Randell
The Shell Co. of Aust. Ltd.
30 Mersey Main Rd
Spreyton
DEVONPORT
TAS 7310

August 18, 1986

Dear Jeff

RE: JOB COM861305

Enclosed are the assays for the samples delivered to our Laboratory on August 11, 1986

Yours Sincerely,
COMLABS PTY LTD

per :

Report Length 4 pages

439

960438

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM861305
O/N : 08343/LJ50/JPR

SAMPLE	Cu	Zn	Ag	Au
21973	7	95	<1	<0.01
21974	210	210	1	<0.01
21975	7	18	<1	<0.01
21976	3	20	<1	<0.01
21977	10	26	<1	<0.01
21978	7	30	<1	<0.01
21979	6	28	<1	<0.01
21980	6	26	<1	<0.01
21981	2	7	<1	<0.01
21982	4	22	<1	<0.01
21983	14	14	<1	<0.01
21984	5	18	<1	<0.01
21985	7	22	<1	<0.01
21986	5	16	<1	<0.01
21987	8	12	<1	<0.01
21988	5	18	<1	<0.01
21989	5	22	<1	<0.01
21990	3	24	<1	<0.01
21991	4	32	<1	<0.01
21992	5	24	<1	<0.01
21993	4	16	<1	<0.01
MP28/ 0	70	85	<1	<0.01
MP28/ 10	70	85	<1	<0.01
MP28/ 20	50	85	<1	<0.01
MP28/ 30	50	75	<1	<0.01
UNITS	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1

440

960439

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM861305
O/N : 08343/LJSO/JPR

SAMPLE	As	Pb	Ba	Sn
21973	2	10	105	8
21974	8	280	120	<4
21975	5	4	<10	6
21976	4	<4	490	<4
21977	4	<4	490	6
21978	5	16	530	10
21979	7	14	640	10
21980	4	40	650	4
21981	2	<4	140	8
21982	8	4	390	6
21983	7	32	110	6
21984	<2	8	470	10
21985	7	4	500	6
21986	5	8	710	<4
21987	6	4	85	4
21988	3	4	610	6
21989	7	6	520	4
21990	4	4	560	6
21991	3	6	640	6
21992	3	8	490	6
21993	2	6	550	8
MP28/ 0	14	14	310	10
MP28/ 10	9	18	410	8
MP28/ 20	9	18	330	6
MP28/ 30	10	14	360	4
UNITS	ppm	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1	XRF1

442

APPENDIX VII

Auger Assay Results - Mt. Black Locality

443

960441

COMLABS SERVICES PTY. LTD.

305 South Road Mile End South South Australia 5031 Telephone (08) 43 5722 Telex LABCOM AA88303

NATA REGISTERED No. 1526

OUR REF: COM860812

YOUR REF: 08338/LJ50/JPR

Mr. J. Randell
The Shell Co. of Aust. Ltd.
30 Mersey Main Rd
Spreyton
DEVONPORT
TAS 7310

June 11, 1986

Dear Jeff

RE: JOB COM860812

Enclosed are the assays for the samples delivered to our laboratory on June 2, 1986

Yours Sincerely,
COMLABS PTY LTD

per :

Report Length 6 pages

444

960442

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

JOB COM860812

ANALYTICAL REPORT

O/N : 08338/LJ50/JPR

SAMPLE	Cu	Zn	Ag	Au
76000N 81900E	8	32	<1	<0.01
76000N 81925E	5	28	<1	<0.01
76000N 81950E	4	12	<1	<0.01
76000N 81975E	2	24	<1	<0.01
76000N 82000E	3	48	<1	<0.01
76000N 82025E	2	9	<1	<0.01
76000N 82050E	3	12	<1	<0.01
75500N 81800E	4	18	<1	<0.01
75500N 81825E	5	30	<1	<0.01
75500N 81850E	4	18	<1	<0.01
75500N 81875E	6	65	<1	<0.01
75500N 81900E	5	32	<1	<0.01
75500N 81925E	18	30	<1	<0.01
75500N 81950E	14	36	<1	<0.01
75500N 81975E	10	26	<1	<0.01
75500N 82000E	8	32	<1	<0.01
75500N 82025E	5	20	<1	<0.01
75500N 82050E	5	18	<1	<0.01
75500N 82075E	4	24	<1	<0.01
75500N 82100E	3	14	<1	<0.01
76750N 81850E	2	9	<1	<0.01
76750N 81875E	2	10	<1	<0.01
76750N 81900E	2	10	<1	<0.01
76750N 81925E	2	7	<1	<0.01
76750N 82000E	2	3	<1	<0.01
UNITS	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1

445

960443

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860812
O/N : 08338/LJ50/JPR

SAMPLE	Cu	Zn	Ag	Au
76750N 82025E	3	8	<1	<0.01
76750N 82050E	5	20	<1	<0.01
75000N 81800E	8	14	<1	<0.01
75000N 81825E	10	16	<1	<0.01
75000N 81850E	9	26	<1	<0.01
75000N 81875E	6	36	<1	<0.01
75000N 81900E	6	22	<1	<0.01
75000N 81925E	4	24	<1	<0.01
75000N 81950E	10	44	<1	<0.01
75000N 81975E	6	38	<1	<0.01
75000N 82000E	20	50	<1	<0.01
75000N 82025E	5	18	<1	<0.01
75000N 82050E	5	20	<1	<0.01
75000N 82075E	3	14	<1	<0.01
75000N 82100E	2	4	<1	<0.01
75700N 81800E	2	12	<1	<0.01
75700N 81825E	3	16	<1	<0.01
75700N 81850E	4	24	<1	<0.01
75700N 81875E	3	26	<1	<0.01
75700N 81900E	4	34	<1	<0.01
75700N 81925E	2	12	<1	<0.01
75700N 81950E	3	10	<1	<0.01
75700N 81975E	4	16	<1	<0.01
75700N 82000E	4	14	<1	<0.01
75700N 82025E	9	40	<1	<0.01
UNITS	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

JOB COM860812

ANALYTICAL REPORT

O/N : 08338/LJ50/JPR

SAMPLE	Cu	Zn	Ag	Au
75700N 82050E	6	18	<1	<0.01
75700N 82075E	3	12	<1	<0.01
75700N 82100E	5	14	<1	<0.01
75700N 82125E	2	12	<1	<0.01
75700N 82150E	3	36	<1	<0.01
75700N 82175E	2	16	<1	<0.01
75700N 82200E	5	4	<1	<0.01
75700N 82700E	9	28	<1	<0.01
75700N 82725E	9	44	<1	<0.01
75700N 82750E	7	24	<1	<0.01
75700N 82775E	5	24	<1	<0.01
75700N 82800E	6	46	<1	<0.01
75700N 82825E	6	40	<1	<0.01
75700N 82850E	8	44	<1	<0.01
75700N 82875E	16	70	<1	<0.01
75700N 82900E	6	26	<1	<0.01
75700N 82925E	7	24	<1	<0.01
75700N 82950E	5	14	<1	<0.01
75700N 82975E	5	6	<1	<0.01
75700N 83000E	4	10	<1	<0.01
UNITS	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1

447

960445

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

JOB COM860812

ANALYTICAL REPORT

O/N : 08338/LJ50/JPR

SAMPLE	Pb	Ba	As	Sb
76000N 81900E	14	410	6	4
76000N 81925E	14	390	6	6
76000N 81950E	8	300	4	6
76000N 81975E	<4	400	4	6
76000N 82000E	12	410	4	6
76000N 82025E	8	260	6	12
76000N 82050E	6	270	<2	4
75500N 81800E	8	170	9	4
75500N 81825E	12	155	4	<4
75500N 81850E	14	175	8	4
75500N 81875E	20	270	14	8
75500N 81900E	10	220	9	<4
75500N 81925E	20	150	12	6
75500N 81950E	8	135	10	4
75500N 81975E	4	150	10	8
75500N 82000E	14	180	12	4
75500N 82025E	12	165	12	<4
75500N 82050E	14	115	7	10
75500N 82075E	16	240	10	8
75500N 82100E	14	120	10	<4
76750N 81850E	6	65	6	10
76750N 81875E	8	65	2	4
76750N 81900E	6	75	3	<4
76750N 81925E	10	140	5	6
76750N 82000E	<4	400	4	6
UNITS	ppm	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1	XRF1

448

960446

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860812
O/N : 08338/LJ50/JPR

SAMPLE	Pb	Ba	As	Sb
76750N 82025E	6	170	5	4
76750N 82050E	22	210	<2	8
75000N 81800E	20	180	28	<4
75000N 81825E	14	160	12	8
75000N 81850E	14	220	10	4
75000N 81875E	8	280	16	8
75000N 81900E	8	250	9	<4
75000N 81925E	14	210	12	<4
75000N 81950E	32	370	7	8
75000N 81975E	18	350	<2	6
75000N 82000E	24	145	10	10
75000N 82025E	4	120	12	4
75000N 82050E	18	100	12	4
75000N 82075E	8	130	2	6
75000N 82100E	<4	290	<2	<4
75700N 81800E	8	135	8	6
75700N 81825E	10	155	5	4
75700N 81850E	6	220	7	6
75700N 81875E	8	170	6	8
75700N 81900E	14	145	3	<4
75700N 81925E	6	200	5	6
75700N 81950E	14	250	2	4
75700N 81975E	14	200	5	8
75700N 82000E	10	370	5	<4
75700N 82025E	8	330	6	4
UNITS	ppm	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1	XRF1

449

960447

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860812
O/N : 08338/LJSO/JPR

SAMPLE	Pb	Ba	As	Sb
75700N 82050E	4	230	8	12
75700N 82075E	6	190	7	10
75700N 82100E	6	155	7	4
75700N 82125E	<4	200	<2	<4
75700N 82150E	12	290	<2	4
75700N 82175E	18	230	10	4
75700N 82200E	<4	85	8	6
75700N 82700E	10	125	10	6
75700N 82725E	10	90	14	6
75700N 82750E	22	105	14	4
75700N 82775E	12	100	20	10
75700N 82800E	20	180	18	<4
75700N 82825E	26	210	26	10
75700N 82850E	32	120	36	4
75700N 82875E	65	300	55	8
75700N 82900E	22	210	20	10
75700N 82925E	24	85	38	8
75700N 82950E	6	115	<2	<4
75700N 82975E	16	95	20	8
75700N 83000E	22	90	28	<4
UNITS	ppm	ppm	ppm	ppm
SCHEME	XRF1	XRF1	XRF1	XRF1

450

960448

COMLABS SERVICES PTY. LTD.

305 South Road, Mile End South, South Australia 5031 Telephone (08) 43 5722 Telex (ARCOM AA89323

NATA REGISTERED No. 1526

OUR REF.: COM860986

YOUR REF.: 08339/LJ50/JPR/013

Mr. J. Randell
The Shell Co. of Aust. Ltd.
30 Mersey Main Rd
Spreyton
DEVONPORT
TAS 7310

July 2, 1986

Dear Jeff

RE: JOB COM860986

Enclosed are the assays for the samples delivered to our laboratory on June 26, 1986

Yours Sincerely,
COMLABS PTY LTD

per : Tony Holbrook

Report Length 15 pages

451

960449

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full

ANALYTICAL REPORT JOB COM860986

O/N : 08339/LJ50/JPR/013

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
7525ON 8250OE	6	42	<1	<0.01	14	<2	160
7525ON 8252.5E	4	32	<1	<0.01	8	3	120
7525ON 8255OE	6	28	<1	<0.01	30	3	60
7525ON 8257.5E	4	16	1	<0.01	18	7	50
7525ON 8260OE	9	44	<1	<0.01	14	8	110
7525ON 8262.5E	5	100	<1	<0.01	10	7	90
7525ON 8265OE	10	90	2	<0.01	12	9	210
7525ON 8267.5E	10	50	3	<0.01	10	10	150
7525ON 8270OE	6	26	<1	<0.01	14	5	105
7525ON 8272.5E	14	42	<1	<0.01	14	18	230
7525ON 8275OE	9	34	<1	<0.01	14	14	175
7525ON 8277.5E	6	22	<1	<0.01	8	9	150
7525ON 8280OE	7	32	3	0.01	12	7	150
7500ON 8260OE	6	36	3	<0.01	18	12	175
7500ON 8262.5E	5	28	<1	<0.01	22	10	115
7500ON 8265OE	7	22	<1	<0.01	20	14	195
7500ON 8267.5E	9	26	<1	<0.01	16	18	135
7500ON 8270OE	6	24	2	<0.01	20	6	135
7500ON 8272.5E	3	26	2	<0.01	18	7	320
7500ON 8275OE	3	38	<1	<0.01	12	14	280
7500ON 8277.5E	6	38	<1	<0.01	30	18	110
7500ON 8280OE	14	16	<1	<0.01	14	4	115
7500ON 8282.5E	4	36	1	<0.01	8	12	80
7500ON 8285OE	4	18	3	<0.01	18	5	190
7500ON 8287.5E	10	38	<1	<0.01	12	5	100
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

452

960450

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT JOB COM860986

O/N : 08339/LJ50/JPR/013

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
75000N 82900E	7	28	<1	<0.01	<4	5	240
76000N 81700E	4	20	1	<0.01	6	10	270
76000N 81725E	5	30	1	0.04	<4	12	450
76000N 81750E	5	55	<1	0.18	6	10	350
76000N 81775E	6	28	<1	<0.01	16	<2	410
76000N 81800E	4	85	<1	<0.01	6	8	450
76000N 81825E	3	14	<1	<0.01	8	6	155
76000N 81850E	4	24	<1	<0.01	6	10	300
76750N 81950E	5	24	<1	<0.01	10	7	200
76750N 81975E	2	10	<1	<0.01	12	4	250
76750N 82075E	LNR	LNR	LNR	LNR	-	-	-
76750N 82100E	7	48	<1	<0.01	30	8	270
76750N 82125E	LNR	LNR	LNR	LNR	-	-	-
76750N 82150E	<2	3	<1	<0.01	12	<2	45
77000N 81800E	22	55	<1	<0.01	8	8	560
77000N 81825E	3	48	<1	<0.01	90	9	660
77000N 81850E	2	20	<1	<0.01	6	4	680
77000N 81875E	<2	18	<1	<0.01	4	4	480
77000N 81900E	3	80	<1	<0.01	6	5	580
77000N 81925E	2	55	<1	<0.01	<4	<2	840
77000N 81950E	3	100	<1	<0.01	18	10	580
77000N 81975E	3	32	<1	<0.01	6	4	640
77000N 82000E	5	135	<1	0.02	34	18	150
77000N 82025E	2	55	<1	<0.01	10	<2	20
77000N 82050E	4	90	<1	<0.01	20	16	830
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

453

960451

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT JOB COM860986

O/N : 08339/LJ50/JPR/013

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
77000N 82075E	5	38	<1	<0.01	12	7	185
77000N 82100E	3	28	<1	<0.01	10	7	170
77250N 81325E	3	145	<1	<0.01	8	12	140
77250N 81375E	<2	16	<1	<0.01	4	6	370
77250N 81400E	2	10	<1	<0.01	<4	2	320
77250N 81425E	<2	5	<1	<0.01	6	3	330
77250N 81450E	2	6	<1	<0.01	<4	4	320
77250N 81475E	2	8	<1	0.01	<4	6	350
77250N 81500E	<2	5	<1	<0.01	<4	5	320
77250N 81575E	2	16	<1	<0.01	<4	5	40
77250N 81600E	<2	30	<1	<0.01	8	2	45
77250N 81625E	<2	5	<1	<0.01	<4	3	85
77250N 81650E	2	14	<1	<0.01	<4	2	25
77250N 81675E	<2	10	<1	<0.01	4	3	125
77250N 81700E	3	14	<1	<0.01	<4	7	220
77250N 81725E	4	12	<1	<0.01	10	2	180
77250N 81750E	2	8	<1	<0.01	<4	5	175
77250N 82000E	<2	10	<1	<0.01	8	8	200
77250N 82025E	5	14	<1	<0.01	10	14	100
77250N 82050E	4	18	<1	<0.01	12	8	115
77250N 82075E	4	16	<1	<0.01	<4	16	100
77250N 82100E	4	24	<1	<0.01	12	6	150
77250N 82125E	4	12	<1	<0.01	4	8	150
77250N 82150E	6	20	<1	<0.01	14	10	190
77250N 82275E	5	22	<1	<0.01	10	7	240
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

454

960452

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full

ANALYTICAL REPORT JOB COM860986

O/N : 08339/LJ50/JPR/013

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
7525ON 81800E	7	38	<1	<0.01	12	14	115
7525ON 81825E	7	30	<1	<0.01	16	12	165
7525ON 81850E	14	85	<1	<0.01	24	14	185
7525ON 81875E	7	36	<1	0.03	24	10	140
7525ON 81900E	10	60	<1	<0.01	16	10	185
7525ON 81925E	95	32	<1	<0.01	18	12	135
7525ON 81950E	8	42	<1	<0.01	16	8	185
7525ON 81975E	9	55	<1	<0.01	20	6	270
7525ON 82000E	6	26	<1	<0.01	<4	8	250
7525ON 82025E	6	10	<1	<0.01	8	9	250
7525ON 82050E	65	34	<1	<0.01	<4	24	500
7525ON 82075E	9	32	<1	<0.01	8	14	210
7525ON 82100E	3	16	<1	<0.01	10	7	220
7600ON 82700E	7	14	<1	<0.01	4	12	150
7600ON 82725E	16	44	<1	<0.01	22	22	150
7600ON 82750E	360	18	<1	<0.01	16	9	75
7600ON 82775E	6	14	<1	<0.01	8	20	85
7600ON 82800E	140	20	<1	<0.01	18	18	35
7600ON 82825E	9	20	<1	<0.01	16	34	70
7600ON 82850E	5	14	<1	<0.01	20	6	100
7600ON 82875E	6	18	<1	<0.01	22	10	145
7600ON 82900E	8	24	<1	<0.01	26	32	175
7600ON 82925E	9	32	<1	<0.01	32	30	190
7600ON 82950E	6	30	<1	<0.01	16	22	120
7750ON 82075E	9	48	<1	<0.01	40	10	300
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

455

960453

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT JOB COM860986

O/N : 08339/LJ50/JPR/013

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
77500N 82100E	10	44	<1	<0.01	32	20	300
77500N 82125E	5	30	<1	<0.01	18	14	300
77500N 82150E	10	44	<1	0.01	18	12	185
77500N 82175E	6	28	<1	<0.01	12	14	210
77500N 82200E	5	16	<1	<0.01	8	7	270
77500N 82275E	5	28	<1	0.03	4	5	330
77500N 82300E	4	24	<1	0.01	12	12	145
77500N 82325E	5	36	<1	<0.01	14	9	210
77500N 82350E	5	24	1	<0.01	12	9	200
77500N 81675E	3	7	<1	<0.01	8	<2	390
77500N 81925E	4	18	<1	<0.01	10	12	280
77500N 81950E	4	24	<1	0.01	34	12	360
77500N 81975E	<2	16	<1	<0.01	4	8	620
77500N 82000E	3	14	<1	<0.01	<4	4	730
77500N 82025E	9	55	<1	0.01	24	6	430
77500N 82050E	4	24	<1	<0.01	48	16	360
77500N 81300E	2	14	<1	<0.01	4	4	690
77500N 81325E	<2	12	<1	<0.01	<4	5	630
77500N 81350E	3	10	<1	<0.01	<4	5	710
77500N 81375E	2	12	<1	<0.01	12	7	160
77500N 81400E	3	12	<1	<0.01	10	12	190
77500N 81425E	3	10	<1	<0.01	4	<2	700
77500N 81450E	2	9	<1	<0.01	4	3	610
77500N 81475E	2	12	<1	<0.01	6	<2	730
77500N 81500E	2	10	<1	<0.01	<4	5	780
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

456

960454

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT JOB COM860986
O/N : 08339/LJ50/JPR/013

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
77500N 81525E	2	8	<1	<0.01	<4	7	670
75500N 82650E	2	26	<1	<0.01	12	5	640
75500N 82675E	7	40	<1	<0.01	18	9	320
75500N 82700E	8	70	<1	<0.01	14	10	230
75500N 82725E	5	22	<1	<0.01	12	7	150
75500N 82750E	4	22	<1	<0.01	12	10	140
75500N 82775E	12	50	<1	<0.01	26	5	280
75500N 82800E	6	26	<1	<0.01	6	10	95
75500N 82825E	3	34	<1	<0.01	8	9	190
75500N 82850E	5	30	<1	<0.01	14	8	195
75500N 82875E	6	34	<1	<0.01	18	24	150
75500N 82900E	2	18	1	<0.01	6	12	145
75500N 82925E	3	20	<1	<0.01	8	6	300
75500N 82950E	7	20	1	0.02	10	9	260
MP86/ 48	2	14	<1	<0.01	<4	10	270
MP86/ 58	2	12	<1	<0.01	<4	2	250
MP86/ 68	2	14	<1	<0.01	<4	7	290
MP86/ 78	<2	22	<1	<0.01	6	<2	310
MP86/ 88	<2	20	<1	<0.01	<4	10	280
MP86/ 98	4	26	<1	<0.01	<4	10	270
MP86/108	2	20	<1	<0.01	<4	<2	250
MP86/118	2	14	<1	<0.01	<4	6	250
MP86/128	<2	14	<1	<0.01	4	4	290
MP86/138	2	10	<1	<0.01	<4	3	250
MP86/148	2	24	<1	<0.01	4	<2	290
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

457

960455

COMLABS SERVICES PTY. LTD.

305 South Road, Mile End South, South Australia 5031 Telephone (08) 43 5722 Telex LABCOM AA89323 Facsimile No. (08) 234 0321

NATA REGISTERED No. 1526

OUR REF.: COM861483

YOUR REF.: 08345/LJ50/JPR

Mr. J. Randell
The Shell Co. of Aust. Ltd.
30 Mersey Main Rd
Spreyton
DEVONPORT
TAS 7310

September 12, 1986

Dear Jeff

RE: JOB COM861483

Enclosed are the assays for the samples delivered to our laboratory on September 3, 1986

Yours Sincerely,
COMLABS SERVICES PTY LTD

per :

Report Length 6 pages

458

960456

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM861483
O/N : 08345/LJ50/JPR

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
7775ON 81000E	7	14	<1	<0.01	4	9	390
7775ON 81025E	6	18	<1	<0.01	6	<2	390
7775ON 81050E	7	10	<1	<0.01	6	2	580
7775ON 81075E	5	12	<1	0.01	8	<2	620
7775ON 81100E	4	7	<1	<0.01	<4	<2	470
7775ON 81125E	5	12	<1	0.03	8	3	730
7775ON 81150E	6	7	<1	<0.01	6	4	610
7775ON 81175E	5	9	<1	<0.01	10	2	700
7775ON 81200E	7	12	<1	<0.01	10	4	670
7775ON 81225E	5	12	<1	0.01	4	3	710
7775ON 81250E	4	12	<1	0.01	<4	<2	710
7775ON 81275E	3	12	<1	<0.01	10	<2	610
7775ON 81300E	4	9	<1	<0.01	4	<2	690
7775ON 81325E	5	12	<1	<0.01	<4	7	650
7775ON 81350E	4	9	<1	<0.01	<4	4	760
7775ON 81375E	5	10	<1	<0.01	<4	5	660
7775ON 81400E	7	7	<1	<0.01	<4	<2	680
7775ON 81425E	4	8	<1	<0.01	4	<2	620
7775ON 81450E	3	18	<1	<0.01	8	4	700
7775ON 81475E	4	12	<1	<0.01	<4	2	640
7775ON 81500E	4	10	<1	<0.01	6	4	670
7775ON 81525E	3	5	<1	<0.01	<4	<2	125
7775ON 81550E	3	5	<1	<0.01	<4	8	430
7775ON 81575E	3	5	<1	<0.01	4	4	155
7775ON 81600E	3	5	<1	0.01	4	6	150
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

459

960457

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM861483
O/N : 08345/LJ50/JPR

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
77750N 81625E	4	24	<1	0.01	<4	<2	75
77750N 81650E	4	12	<1	<0.01	16	4	165
77750N 81675E	5	20	<1	0.01	8	4	65
77750N 81700E	3	30	<1	0.01	34	2	90
77750N 81725E	4	7	<1	<0.01	10	<2	150
77750N 81750E	5	16	<1	0.01	12	<2	250
77750N 81775E	4	14	<1	<0.01	6	3	460
77750N 81800E	5	22	<1	0.01	14	<2	550
77750N 81825E	6	18	<1	0.02	4	5	670
77750N 81850E	3	4	<1	0.03	4	<2	170
77750N 81875E	3	4	<1	0.02	<4	<2	240
77750N 81900E	5	30	<1	0.02	<4	7	400
77750N 81925E	6	26	<1	0.02	<4	5	650
77750N 81950E	5	24	1	0.03	10	12	170
77750N 81975E	6	24	1	0.03	20	16	140
77500N 81000E	5	6	<1	0.03	12	<2	195
77500N 81025E	6	18	<1	0.02	10	6	450
77500N 81050E	4	9	<1	0.02	8	6	430
77500N 81075E	3	7	<1	0.03	18	<2	260
77500N 81100E	3	9	<1	0.02	12	4	230
77500N 81125E	4	6	<1	0.01	<4	<2	320
77500N 81150E	3	4	<1	0.02	8	<2	150
77500N 81175E	4	4	<1	0.18	4	6	165
77500N 81200E	4	8	<1	0.09	<4	4	880
77500N 81225E	145	85	<1	0.02	8	8	340
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM861483
O/N : 08345/LJ50/JPR

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
77500N 81250E	2	5	<1	0.03	<4	4	185
77500N 81275E	2	6	<1	0.01	<4	7	195
77500N 81300E	3	10	<1	0.02	<4	2	780
76 81700E	3	6	<1	0.02	6	8	130
76 81710E	4	18	<1	0.02	12	<2	290
76 81720E	7	48	<1	0.02	20	5	470
76 81730E	4	95	1	0.02	<4	20	50
76 81740E	3	50	<1	<0.01	12	<2	120
76 81750E	6	28	<1	<0.01	10	6	390
76 81760E	10	28	<1	<0.01	6	5	380
76 81770E	4	7	<1	0.01	8	10	155
76 81780E	3	6	<1	<0.01	8	6	165
76 81790E	3	6	<1	<0.01	8	3	320
76 81800E	2	10	<1	<0.01	8	6	250
76 81810E	5	14	<1	0.01	16	<2	280
76 81820E	3	4	<1	<0.01	16	4	260
76 81830E	2	6	<1	0.01	12	<2	210
76 81840E	2	22	<1	<0.01	16	3	160
76 81850E	4	8	<1	<0.01	14	9	160
76 82700E	12	30	1	<0.01	22	10	195
76 82710E	8	26	1	0.01	26	24	120
76 82720E	14	44	1	0.01	36	28	165
76 82730E	10	22	<1	<0.01	24	12	95
76 82740E	10	28	<1	<0.01	22	36	95
76 82750E	6	18	<1	<0.01	30	14	90
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM861483
O/N : 08345/LJSO/JPR

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
76 82760E	10	30	<1	<0.01	28	34	145
76 82770E	9	26	<1	<0.01	18	12	115
76 82780E	4	18	<1	<0.01	14	20	60
76 82790E	6	34	<1	<0.01	20	16	45
76 82800E	14	22	<1	<0.01	12	24	40
76 82810E	70	55	1	<0.01	28	14	65
76 82820E	10	26	<1	<0.01	26	20	135
76 82830E	5	12	<1	<0.01	22	22	75
76 82840E	7	14	<1	<0.01	22	14	85
76 82850E	7	20	<1	<0.01	28	18	120
76 82860E	16	60	<1	<0.01	38	6	370
76 82870E	12	38	<1	<0.01	38	8	230
76 82880E	8	20	<1	<0.01	18	20	145
76 82890E	6	16	<1	<0.01	26	20	150
76 82900E	8	26	<1	<0.01	36	34	170
76 81700E -85#	9	9	<1	<0.01	14	<2	115
76 81710E -85#	6	16	<1	<0.01	16	<2	240
76 81720E -85#	9	55	<1	<0.01	12	10	450
76 81730E -85#	5	85	1	<0.01	4	12	50
76 81740E -85#	5	55	1	<0.01	12	<2	105
76 81750E -85#	10	30	<1	<0.01	18	<2	340
76 81760E -85#	12	32	<1	<0.01	20	3	200
76 81770E -85#	6	8	<1	0.03	12	6	150
76 81780E -85#	3	8	<1	0.04	14	3	140
76 81790E -85#	3	6	<1	<0.01	10	7	240
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

462

960460

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM861483
O/N : 08345/LJ50/JPR

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
76 81800E -85#	2	12	<1	<0.01	14	6	300
76 81810E -85#	7	18	<1	<0.01	16	6	280
76 81820E -85#	2	5	<1	<0.01	14	<2	200
76 81830E -85#	2	5	<1	<0.01	125	<2	210
76 81840E -85#	2	16	<1	<0.01	10	3	110
76 81850E -85#	4	5	<1	<0.01	16	4	110
76 82700E -85#	14	28	1	<0.01	24	10	180
76 82710E -85#	7	28	1	<0.01	38	26	145
76 82720E -85#	14	42	1	<0.01	42	26	130
76 82730E -85#	12	24	<1	<0.01	30	18	115
76 82740E -85#	14	30	1	<0.01	22	28	90
76 82750E -85#	6	18	<1	<0.01	22	14	80
76 82760E -85#	12	34	1	<0.01	32	30	165
76 82770E -85#	10	32	<1	<0.01	18	8	110
76 82780E -85#	6	24	<1	0.06	22	7	70
76 82790E -85#	5	34	<1	<0.01	16	16	50
76 82800E -85#	16	24	<1	<0.01	32	12	40
76 82810E -85#	100	75	1	<0.01	40	12	95
76 82820E -85#	14	30	<1	<0.01	14	26	110
76 82830E -85#	7	14	<1	<0.01	18	28	60
76 82840E -85#	12	16	1	0.01	22	16	105
76 82850E -85#	9	20	<1	0.02	16	14	105
76 82860E -85#	24	70	<1	0.01	44	9	360
76 82870E -85#	14	28	<1	0.01	32	9	220
76 82880E -85#	10	22	<1	<0.01	30	18	165
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

463

960461

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM861483
O/N : 08345/LJSO/JPR

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
76 82890E -85#	9	16	<1	0.02	18	24	160
76 82900E -85#	14	32	<1	0.01	28	30	190
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

APPENDIX VIII

Auger Sampling, Mt. Sale Locality

466

960463

COMLABS SERVICES PTY. LTD.
305 South Road Mile End South South Australia 5031 Telephone (08) 43 5722 Telex LABCOM AA89323

COM860650

08334/LJ50/JPR/008

Mr. J. Randell
The Shell Co. of Aust. Ltd.
30 Mersey Main Rd
Spreyton
DEVONPORT
TAS 7310

May 21, 1986

"Sample numbers refer to co-ordinates
viz 78-83025 = 378000N 383025E".

Dear Jeff

RE: JOB COM860650

Enclosed are the assays for the samples delivered to our laboratory on May 6, 1986

Yours Sincerely,
COMLABS PTY LTD

per :

Report Length 10 pages

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860650
O/N : 08334/LJ50/JPR/008

SAMPLE	Cu	Zn	Ag	Au	Ba	Pb	As
78-83025	14	24	1	<0.01	480	4	10
78-83050	5	30	<1	0.01	450	<4	9
78-83075	4	24	1	0.01	420	4	6
78-83100	5	26	<1	<0.01	500	6	7
78-83125	6	30	<1	0.01	500	6	5
78-83150	6	24	<1	0.02	480	4	5
78-83200A	5	36	<1	0.02	560	6	8
78-83200B	5	32	<1	<0.01	510	10	7
78-83225	3	12	<1	<0.01	210	8	8
78-83250	5	10	<1	<0.01	110	6	6
78-83275	3	14	<1	<0.01	155	6	10
78-83300	7	10	1	<0.01	155	10	6
78-83325	3	8	1	<0.01	110	10	10
78-83350	3	9	1	<0.01	120	8	14
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

468

960465

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM860650
O/N : 08334/LJSO/JPR/008

SAMPLE	Cu	Zn	Ag	Au	Ba	Pb	As
78-83375	3	10	<1	<0.01	90	8	12
78-83400	4	14	1	<0.01	100	8	12
78-83425	4	12	<1	<0.01	100	4	14
78-83450	4	12	<1	<0.01	80	8	12
78-83475	4	10	<1	<0.01	220	6	7
78-83500	4	10	<1	<0.01	230	10	9
78-83525	4	16	<1	<0.01	180	10	14
78-83550	3	12	<1	<0.01	110	8	10
78-83575	3	12	<1	<0.01	140	12	12
78-83600	8	9	1	<0.01	135	4	12
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

APPENDIX IX

Cutty Sark Locality - Diamond Drill Re-logs 71R, CS1

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

HEADING SHEET

COLLAR INFORMATION	DATA TYPE	COLLAR CO-ORDINATES EASTING	NORTHING	ELEVATION	COLLAR SURVEY AZIMUTH	DIP	HOLE NAME	TOTAL DEPTH	HOLE TYPE	DESC CODE	REMARKS
	AMG	376834	4376395	480			71R	2357			

SURVEY INFORMATION	DISTANCE FROM COLLAR TO TOP	TO BOTTOM	AZIMUTH	DIP	REMARKS

PLOTTING KEY

SYMBOL DES. CODE	G /LOG	INTERVAL FROM	TO	SYMBOL DES. CODE	G /LOG	INTERVAL FROM	TO

PROJECT	MT BLACK, TASMANIA
LOGGED BY	J.G. PURVIS
CONTRACTOR	
CREW	
HOLE NAME	71R
TOTAL DEPTH	2357'
RIG	
DATE STARTED 24-11-74 FINISHED 13-2-75	

CORE STORAGE Nº OF TRAYS	LOCATION	SAMPLE STORAGE
165	EZ, ROSEBERY	
M&P LAB		ASSAY LAB

DESC.	SIZE	FROM	TO	TOTAL	REMARKS
NON CORE					
CORE	HQ	0	~~444'~~	~~444'~~	
	NQ	~~444'~~	1176'	732'	
	BQ	1176'	2357'	1181'	
CASING					
CASING LEFT					(S) steel (P) plastic

1830' 71R

Sample Number : 7970

Identification : Mildly sericitized and chloritized, slightly reworked, rhyodacitic crystal tuff

Description :

The sample is a 120mm slice of drill core which displays many clasts of light grey feldspar and quartz, up to 3mm in size, within a greenish matrix. There are several veins, the largest carry quartz, carbonate, pyrite, sphalerite and chalcopyrite.

A cobaltinitrite staining test produced a bright stain in the matrix, consistent with abundant K-feldspar.

In thin section the sample displays many phenoclasts and several volcanic lithic clasts set in a moderately sorted, finely sandy textured matrix.

The main phenoclasts are twinned plagioclase, lightly flecked with fine sericite and calcite : they range up to 3mm in size. Quartz phenoclasts are mainly embayed crystals with β form, about 1 to 3mm in size. There are a few chlorite-sphene aggregates after mafic silicates and some sphene aggregates after titaniferous oxides. The lithic clasts are about 1 to 15mm in size and of crystalline rhyodacitic type : they consist of 0.2 to 0.3mm crystals of plagioclase, orthoclase and quartz, along with minor sericite, chlorite and sphene.

The sandy matrix consists of subangular clasts of quartz and feldspar (much of it potassic), about 0.1 to 0.2mm in size, with interstitial sericite and minor chlorite and sphene. Some sericite has a web-like distribution, probably an incipient foliation.

Discordant, thin fissure veins (up to 0.5mm wide) carry quartz, chlorite, carbonate (dolomite or ankerite) and pyrite.

An approximate mode is :

20-25%	plagioclase phenoclasts
10-15%	quartz phenoclasts
2-3%	rhyodacitic lithic clasts
30-35%	matrix feldspar, mainly potassic
10-15%	matrix quartz
10-15%	matrix sericite
1-3%	chlorite and sphene after mafic components
1-1.5%	veins of quartz-chlorite-carbonate-pyrite

Comments and Interpretations :

This sample has predominantly tuffaceous textures but there are textural indications of sorting and slight rounding in its matrix. It is regarded as very slightly reworked tuff and may have been subjected to brief aqueous transport. The source magma was rhyodacitic.

The rock has been subjected to mild sericite-chlorite alteration

Sample Number : 7986

Identification : A band of rhyodacitic volcaniclastic arenite hosted by slightly reworked rhyodacitic crystal tuff, both with sericite-biotite-magnetite alteration assemblages and some veins

Description :

The sample is a 155mm slice of drill core. It displays a 25mm band of medium grey, fine-grained rock enclosed by light olive grey rock with many light grey phenoclasts of feldspar and quartz, ranging up to several millimetres in size.

A cobaltinitrite staining test revealed that both the fine rock and its coarser host are rich in fine K-feldspar.

In thin section the fine-grained band is seen to have moderately sorted, sandy textures with subangular, equant clasts of quartz, orthoclase and lightly sericitized plagioclase (all commonly 0.05 to 0.3mm) set in a matrix of mildly foliated sericite and subordinate brown biotite. Inferred mafic clasts have been crudely pseudomorphed by fine opaques (apparently magnetite) and sericite and less commonly by biotite. An approximate mode is :

20-30%	lightly sericitized plagioclase clasts
20-25%	orthoclase clasts
20-25%	quartz clasts
6-8%	mafic clasts, altered to magnetite-sericite and in some cases biotite
15-20%	matrix sericite
2-3%	matrix biotite

The rock which encloses the fine-grained band is of more tuffaceous appearance, with numerous phenoclasts of embayed quartz and corroded plagioclase set in a moderately sorted, finely sandy textured matrix similar to the fine band. The largest plagioclase clasts are partly recrystallised and lightly sericitised. An approximate mode is :

10-15%	plagioclase phenoclasts
8-10%	quartz phenoclasts
40-50%	matrix clasts of feldspar, much of it potassic
5-10%	matrix clasts of quartz
4-6%	mafic clasts, now magnetite with sericite and biotite
8-10%	matrix sericite
2-3%	matrix biotite

Discordant veins of fissure style, about 0.5 to 2mm wide, carry orthoclase, quartz, calcite, biotite and a sulphide which seems more like pyrrhotite than pyrite.

Comments and Interpretations :

This sample is interpreted to display a finely sandy band of volcaniclastic arenite (of rhyodacitic derivation) hosted by rhyodacitic crystal tuff of slightly reworked appearance.

Hydrothermal alteration involves pervasive production of sericite, and subordinate biotite and magnetite, and fissure veining by orthoclase-quartz-calcite-biotite-(?)pyrrhotite. High temperatures

Sample Number : 12908 (2164') 71R

Identification : Moderately foliated, heavily sericitised andesitic vitric crystal tuff with thin veins of albite-chlorite-calcite

Description :

The sample is a drill core specimen of pale olive grey moderately foliated rock with indistinct feldspar phenoclasts ranging up to about 2mm. The foliation is approximately normal to the core axis.

A staining test revealed no K-feldspar.

In thin section the sample is seen to be heavily sericitised and moderately foliated but remnant textures are distinctly tuffaceous. Moderately abundant phenoclasts of twinned, lightly to heavily sericitised plagioclase, about 0.3 to 3mm in size, are set in a matrix which is mainly untwinned albite and foliated fine sericite. Under low illumination there are many examples of albite aggregates plainly pseudomorphing former cuspate, unwelded vitric shards about 0.1 to 0.4mm in size. There are no obvious mafic clasts but there are a few streaks and small lenses which carry fine brown biotite and in some cases minor chlorite. Opaque oxides also occur as vague streaks and disseminated small grains (0.02 to 0.03mm), some with minor secondary sphene. There are sparse disseminated grains of anhedral brassy sulphide.

Fissure veins about 0.2 to 1mm thick, carry untwinned and poorly twinned albite, fine chlorite and anhedral carbonate, apparently calcite. In the thickest vein the carbonate fills the core and the albite lines the vein. The thin veins are mainly albite.

An approximate mode is :

20-30%	phenoclasts of lightly to heavily sericitised plagioclase
30-40%	matrix albite, some of it distinctly pseudomorphous after vitric shards
20-30%	matrix sericite
3-4%	fine brown biotite
tr	chlorite
2-3%	opaque oxides and minor sphene
tr	brassy sulphide (?pyrite)
2-3%	veins of albite-chlorite-calcite

Comments and Interpretations :

This sample has remnant textures which are plainly consistent with unwelded vitric crystal tuff and the composition was apparently andesitic. There are no indications of epiclastic sorting. There are no quartz phenocrysts.

The rock has been albitised, heavily sericitised, moderately foliated and cut by veins of albite-chlorite-calcite. The sericitisation was accompanied by the production of some fine brown biotite. In contrast the veins carry minor chlorite.

960467

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK, TASMANIA	HOLE NAME	71 R
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	2357'

*Tr = trace (<0.04 ppm Au)

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	Au	Cu	Pb	Zn	Ag	Ba	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
											NQ		
778'	781'	0.06	20	8	56	<1	1300	7932			NQ		
794'	801'6"	0.04	9	<5	66	<1	1100	7933			NQ		
801'6"	809'	Tr*	10	<5	105	<1	1040	7934			NQ		
809'	814'	0.04	7	<5	130	<1	450	7935			NQ		
817'	822'6"	Tr	12	<5	64	<1	980	7936			NQ		
911'	916'6"	Tr	76	<5	39	<1	970	7937			NQ		

ASSAY INFORMATION

DESCRIPTIVE LOG

718'9" – 746'6" : FELSIC LAVA

Pale grey-green, fi-med gr, massive. Non-schistose. Leached + vuggy.
Abundant tiny feldspars in siliceous + felsic groundmass.
Weakly silicified - locally strong. V wk chloritisation.
Abundantly fractured - mainly ± chlor ± py fillings. Many vuggy-after ccb?
1-2% dissem py. Mag-hem veins and dissem below 738'.
Sharp upper contact 48°/LCA.

746'6" – 756' : PYRITE - MAGNETITE BRECCIA ZONE

Semi-massive to massive mag > py in chloritic matrix ± frags of siliceous lava.
Massive py > mag above 751'6", massive mag > minor py at base.
Py xls to 4mm. Vague lineation of veins 40°/LCA.

756' – 891'6" : FELSIC LAVA

Grey-green, fi-med gr, massive. Overall texture v uniform but patchy subtle grainsize changes and indistinct brecciated texture, suggest ("autobrecciation/flow brecciation?)
Tiny feldspars and chloritised ferromags in silic, felsic and chloritic groundmass.
Wk-mod chloritisation (locally strong) - mainly in fractures - minor patchy silic + also carbonatisation.
Abundantly fractured and veined at all angles - often v vuggy above 822'. Mostly ± creamy-brown Mn stained carbonate, poss some siderite; some ± chlor.
794' - 794'9": fi gr layered zone ± indistinct irreg contacts - flow banding or bedding? 40°/LCA. 862' - 863': zone of marked lineation 20°/LCA - 1° glassy flow texture?
Strongly leached brecciated and broken zones: 780' - 782'; 803' - 804'6" (10°/LCA) - extends to 814'. These zones often ± py, mag, hem, chlor.
1-3% dissem + vein py throughout ± minor hem > mag, except: 794' - 809': 5% py, 5-10% mag, minor hem + Mn ox, in veins + breccia matrix. 817' - 822'6": 3-5% py, 2-3% mag. Best sulphides + mag usually in zones of strong chloritisation ± carb.

891'6" – 906' : ZONE OF MAGNETITE AND PYRITE VEINS

Massive and semi-massive mag > py as veins and breccia fillings in chlorite-qtz-calcite gangue, within felsic lava.
891'6" - 897'6": Semi-massive mag > py in intensely alt + brecciated zone. 897'9" - 901'3": mod chloritised lava ± 3% py, 5% mag-hem.
901'3" - 906': 35% mag, 5-10% py as patchy veins in lava.

906' – 911'6" : FELSIC VOLCANIC

Green, blotchy. Appears different rock type from lava above.
Plag xls to 2mm. Rock mod sericitised + carbonatised + chloritised.
Breccia texture - poss ?. 2-3% dissem py. Non-magnetic.
Basal contact irreg 40°/LCA.

911'6" – 941' :
SILICIFIED VOLCANIC

472
9604688

Sample Number : 7069 1800' 71R

Identification : Dacitic crystal tuff with an intensely sericitized matrix

DEC Description :

The sample is an 80mm slice of drill core displaying abundant phenoclasts of quartz and feldspar, up to about 3mm in size, set in a light olive grey matrix. There is a straight 1mm wide vein carrying light grey carbonate, stained light brown on the outer surface of the core.

A cobaltinitrite staining test revealed only a few specks of K-feldspar in the bulk of the rock, but thin zones of K-feldspar along the outer portions of the quartz-carbonate vein.

In thin section the sample displays tuffaceous textures, with many phenoclasts, about 0.03 to 3mm in size, and a few lithic clasts set in a mildly foliated sericitic matrix.

The main phenoclasts are well twinned plagioclase with alteration confined to sericite within fractures of tectonic origin. Quartz is prominent as deeply corroded crystals with β form and as broken fragments : it is only faintly strained. Mafic components are confined to small aggregates of cloudy sphene. Lithic clasts, the largest 4mm in size, occur rarely : they are of crystalline dacitic appearance, composed of plagioclase, quartz, sericitized mafics, secondary sphene and interstitial sericite. The matrix of the tuff consists of fine sericite, minor quartz and a few sphene grains.

The vein is of symmetrically zoned fissure style, with narrow outer zones of fine orthoclase passing inwards to ankerite or dolomite, then quartz with calcite and very local pyrite. There are a few subtle, very thin veins and patches of carbonate.

An approximate mode is :

25-30%	plagioclase phenoclasts
15-18%	quartz phenoclasts
rare	dacitic lithic clasts
50-60%	matrix sericite and minor quartz
1-2%	sphene
tr	carbonate
1-2%	vein of K-feldspar-carbonate-quartz-sulphide

Comments and Interpretations :

This sample is considered to have originated as dacitic crystal tuff. It reveals no indication of any epiclastic rounding or sorting.

Alteration has involved intense sericitization of the matrix with virtually no attack on the plagioclase phenoclasts. A zoned fissure vein carries K-feldspar, carbonate, quartz and traces of sulphide.

ASSAY INFORMATION

1103'

1046'

PETROL - 7938

PETROL - 7939

The Shell Company of Australia Limited
METALS DIVISION
DRILL LOG SHEET
CONTINUATION SHEET

PROJECT MT BLACK, TASMANIA	HOLE NAME 71R
LOGGED BY J.G. PURVIS	TOTAL DEPTH 2357'

Ag Ba | SAMPLE Nº | CORE ANGLE | ROCK TYPE | DIAM | DESC CODE | GRAPHIC LOG

DESCRIPTIVE LOG

Grey-green to brown. Hard. Fi gr.
Strongly silic'ific, mod sericitisation, sl chloritisation.
Weakly schistose - 48°/LCA @ 933'. Abund fine fracts - rock brecciated in places (some grds 1"). Fracts contain carb and/or haem - siderite.
916'-920': 1% py. 920'-941': minor py. Sev % haem + siderite - often replacing feldspars or lithics up to few mm, some in veinlets 10-20°/LCA.
Below 932' silif dec, rock inc clayey + bleached approaching major fault zone 939'-943' 45°/LCA. Fault barren.

941'—988': QUARTZ-FELDSPAR CRYSTAL-LITHIC TUFF
An epiclastic.
Pale greenish-grey. Massive. Weakly bleached, carbonatised, sericitised.
Subhedral to rounded feld > qtz xtals (to 4mm, av 1-2mm), with some lithics gen < 10mm @ rounded silic'ific clasts or angular pale grey to black tuff-shale clasts that were aff when emplaced.
All in sericitic and silicious f gr matrix.
Below 952'6" large clasts greyish, regularly-bedded mildly-pumic tuff-shale present - inc in size + abundance ± depth. Up to 400mm thick, down to 30mm. Angular - some clearly tuff when emplaced (eg: edges 'injected' into adjacent sof tuff). Orientated 30-65°/LCA. Look very like some Rosebery host rocks.
Clear bedding: 50°/LCA @ 978'6"; 40°/LCA @ 985'. Gen absent.
Abund spidery fracts. Clayey + bottom to 945', then sev bottom cones due to fracts °/LCA - some Fe + Mn ox assoc ± these fracts.
Minor disem py. Rare sp-gn.
Basal contact - bedding 49°/LCA.

988'—1097': LINEATED FELSIC VOLCANICLASTIC (IGNIMBRITE?)
Pale greenish-grey. Med gr. V uniform.
Abund subhedral Felds + variable angular (mostly subrounded) lithics, av 1-5mm, rarely to 15mm, strongly lineated in qtz-sericite matrix.
V rare qtz xtls to 4mm - subrounded.
Lithics incl glassy felsic frags and tuffaceous types. From 1040' to 1060' lithics are larger ± glassy frags to 15mm, drawn out into fiamme-like forms, shows almost 'eyes'. Poss eutaxitic texture @ 1046' + elsewhere.
Rock strongly carbonatised, v.st-mod sericitised + bleached.
Lineation (abt 1"): 50°/LCA @ 1012', 40°/LCA @ 1043', 45°/LCA @ 1092'.
Thin discontinuous carb veins.
Strong shears: 45°/LCA @ 1086' (1" Cl to min lin); 50°/LCA @ 1090½" (¼ min lin).
V minor disem py. 5% disem fine leucoxene (?).

1097'—1097'2": BED OF CHERTY TUFFACEOUS SEDIMENT.
Grey, f gr, hard. Minor py. Facing unkn - smooth top 65°/LCA, sl wavy base due to deposition of coarse gr rock below.

1097'2"—1098'9": FELSIC VOLCANICLASTIC
Similar to unit above 1097'. Abund feld, some lithics, rare qtz. Weak mineral lineation.

SHEET 2 OF 9

A13

960469

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK, TASMANIA	HOLE NAME	71 R
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	2357'

474

* Tr = Trace (< 0·04 ppm Au)

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	Au	Cu	Pb	Zn	Ag	Ba		SAMPLE No	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
1098'9"	1102'6"	Tr	15	42	590	<1	1600		7940			N	Q		1098'9"–1102'6": TUFFACEOUS CHERT Upper contact 75°/CA, lower (bedding) 50°/CA. Pale grey, v. fi gr, sericitic + siliceous. Brittle fractured & minor py on fracs. Two 100mm interbeds of soft sericitic + chloritic vitric material.
	1129'6"							PETROL	7941						1102'6"–1156': FELSIC VOLCANICLASTIC (NB: 1117'–1129' missing) Pale grey med gr hard, uniform. Subangular to subhedral fspl av 2mm, max 4mm; & lesser qtz xtals (subangular to subrounded) av 1–2mm, max 3mm, in siliceous + sericitic matrix. Above 1140' rare lithics < 5mm, below 1140' angular lithics to 20mm (2 ?) amygdaloidal vitr.
															Mod–strong sericitisation, fracturing, silif and carbonatisation. Minimal foliation almost absent – best below 1140'. Wk schistosity 45/CA. Minor dissem py.
															1156'–1181': FELSIC CRYSTAL–LITHIC VOLCANICLASTIC Creamy grey–grey Med gr Hard. Abund subangular to subhedral fspl av 2–3mm, lesser subhedral to subrounded qtz xtals to 6mm. Numerous lithics mostly angular, some subrounded, inc in abund + size & depth – at top av 5–20mm, at base 10–60mm.
1171'	1176	0·04	12	155	640	<1	1020		7942			N	Q		Lithics incl common clasts of distinctive grey, fi gr, finely-amygdaloidal lava (andesite or basalt) – amygdules of calcite or qtz. Other lithics qtz-poph vitrics, tuffs, cherts, and dk green mafic vitr. Some glass in the sericitic and siliceous matrix. Rock v. bleached, mod carbonatised, sericitised, silicified. Sl chloritisation of glass. Mod lineated – grab 1° 50°/CA ⊃ N68°E
															Common calcite veinlets + larger veins of carb–chlorite. Minor dissem py, sp, gn. Minor leucoxene.
1183'	1190	Tr	17	38	270	<1	910		7943			B	Q		1181'–1209': LITHIC–RICH VOLCANIC BRECCIA Possibly the basal part of above unit. Grey–green, hard.
1190'	1197'	Tr	17	60	170	<1	850		7944			B	Q		Abund lithics av 5–40mm, occ to 65mm angular to subangular. Some & delicate irreg edges – poss soft sed deformed.
1197'	1204	0·16	19	56	115	<1	930		7945			B	Q		Abund lithics of grey, amygdaloidal andesite or basalt lava. Amygdules as fmd or blk, occ to 3mm, gen calcite-filled. Other lithics: chert, mafic vitr, tuffs. Matrix is fold xtl tuff & bac qtz, both av 2–3mm. Some chloritic glassy zones in matrix. Mod sericitisation, carbonatisation, wk–mod silif, dec & depth. Qtz–carb veins throughout. Minor v. fi gr dissem sp–gn > py in both matrix and clasts.
															1209'–1315': FELSIC VOLCANICLASTIC Probably epiclastic. Creamish grey–grey. Massive. Hard. Feld xtals av 2–3mm, & minor qtz xtals (both feld + qtz subangular to

SHEET 3 OF 7

9604470

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK, TASMANIA	HOLE NAME	71R
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	2357'

475

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	Au	Cu	Pb	Zn	Ag	Ba	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
1227	1234	<0.01	6	210	400	<1	810	7946			BQ			Subhedral ± some xyl frags), with persistent lithics mostly <10mm, rarely to 50mm, in qtz-sericite matrix.
1234	1241	<0.01	4	100	80	<1	820	7947			BQ			Lithics angular to subrounded, incl cherts, creamy silif amygdaloidal lava ± qtz amygdalae, and rare small clasts of black shale.
1258	1265	<0.01	18	210	1600	1	820	7951			BQ			Variations in abundance and size of clasts suggests 1° layering, good sorting, however mineral and clast lineation gen weak or absent. Prob 1° layering: 40°/CA @ 1282'; 40°/CA @ 1296'. Weak schistosity 45°/CA @ 1279' + 1258'.
														Rock is mod-strongly silif, bleached + sericitised - all sufficient to render texture indistinct.
														Abund carb-qtz-chlor or qtz veins most at rt ∠s to lineation.
														Minor dissem py-sp-gn in both matrix + clasts.
														1315' – 1416'10": CRYSTAL-LITHIC COARSE VOLCANIC SANDSTONE
														Similar to above unit except finer gr and washed and reworked. Pale greenish-grey, hard, rather uniform coarsely sandy texture. Common lithics and feld + qtz xyls in siliceous matrix.
1358	1365	<0.01	10	155	830	<1	580	7952			BQ			Lithics av <5mm, rarely to 20mm, angular to subrounded, matrix-supported. Clasts of tuffs, grey + black tuff-shale, cherts, and 1 piece of creamy amygdaloidal lava.
														Abund feld + qtz xyls - angular to rounded - most <2mm.
														Sl bedding lineation throughout - best developed at base: 45°/CA @ 1351' + 1361', 52°/CA @ 1410'. Aff 1406' 5mm bed of grey shale.
														53°/CA - smooth top suggests facing uphole.
														Rock is mod sericitised, weakly bleached + silif. Felds carbonatised.
														Irreg qtz-carb veining ± chlorite.
														V strong fracture set 5°/CA 1325'-1328'. Ditto 1394'6"-1400' 25°/CA.
														Minor dissem py-sp-gn - some also in qtz veins. Rare arsenopy.
														Basal contact: bedding 50°/CA.
														1416'10" – 1439'8": COARSE CRYSTAL-LITHIC EPICLASTIC
														Pale green and creamy-grey. Hard. Rather siliceous, heavily qtz phyric.
1417	1424	0.04	14	55	210	<1	650	7953			BQ			Clasts to 120mm, angular to subrounded, dk grey Tuff-shale, Tuff, cherts, qtz + feld-porph volcs and rare black shale. In matrix mostly ½ qtz xyl grains - euhedral to rounded, av <3mm, max 5mm, locally feld ditto. Also abund tiny lithics in matrix.
REPEAT		<0.01												Mod sericitisation, wk patchy silif, bleaching and carbonatisation.
														Wk chloritisation - both pervasive and in veinlets.
														Minor qtz and carb veins.
														1438'2" – 1438'8": bedded dk grey shale 45°/CA.
														Minor dissem po > py 1416'10" – 1426', thereafter v minor py, rare sp-gn.
1439'8	1446'	<0.01	14	590	1650	<1	780	7954			BQ			1439'8" – 1446': DARK GREY TUFF-SHALE AND CHERT
														Upper contact: bedding 50°/CA. Lower contact disrupted.
														Sl carbonaceous, mod siliceous. Massive. Basal 1'6" is grey chert.
														Minor dissem + vein py, rare sp.
														1446' – 1469'6": SCHISTOSE VARIABLE EPICLASTICS
														Distinguished from units above by the mod-strong schistosity, also often

ASSAY INFORMATION

SHEET 1 OF 4

960471

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK TASMANIA	HOLE NAME	71R
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	2357'

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	Au	Cu	Pb	Zn	Ag	Ba	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
1454'6"	1457'6"	<0·01	3	46	70	<1	490	7955			BQ		
1506'	1513'	<0·01	65	70	190	<1	350	7956			BQ		
1513'	1520'	<0·01	70	22	105	<1	390	7957			BQ		
1520'	1527'	<0·01	75	22	125	<1	440	7958			BQ		
1577'	1584'	<0·01	60	16	75	<1	420	7959			BQ		
1682'	1690'	<0·01	60	120	310	<1	470	7960			BQ		
1690'	1698'	<0·01	55	16	150	<1	400	7961			BQ		
1698'	1709'6"	<0·01	70	16	65	<1	420	7962			BQ		
1720'	1728'	<0·01	28	65	760	<1	1050	7963			BQ		
1728'	1736'	<0·01	16	75	135	<1	1700	7964			BQ		
1736'	1744'	<0·01	8	55	90	<1	1050	7965			BQ		
1744'	1752'	<0·01	18	140	48	<1	1350	7966			BQ		
1752'	1760'	<0·01	22	22	38	<1	1350	7967			BQ		

DESCRIPTIVE LOG

disrupted bedding), a matrix that is more tuffaceous (sericitic) than xyl-rich, greater variation within the unit, and more altered lithics. Pale greenish-grey, variable texture. Smeared-out lithics and disrupted beds of varying-granitized material. Minor qtz xyls are <2mm, in 'siliceous' sericitic matrix.
Mod sericitisation, wk bleaching
Occ interbeds of fg sediments, largest: 1454'6"–1457'6" – bedded (53°/LCA) grey chert and tuff-siltst, 1457'6"–1460'6" – bedded (60°/LCA) tuff-siltstone.
Minor disem py.

1469'6"–1506': COARSE CRYSTAL-LITHIC EPICLASTIC with GREY SHALE CLASTS
Upper contact bedding 57°/LCA. Basal contact conformable but disturbed by carb veins. Pale greenish-grey.
Grey-black shale clasts up to 100mm thick – most long-thin // altered // to bedding. Mostly rounded but some ∈ angular delicate edges suggesting they were soft when emplaced. Numerous smaller tuff-shale clasts 5–20mm, angular to rounded.
Matrix – washed and reworked, siltgrade ∈ xyls of qtz + feld av <2mm, euhedral to rounded, also tiny lithics.
Rock is mod–strongly sericitised + bleached, ±ly silic in places. Mod–strong schistosity.
Coarser clasts are in zones suggestive of debris flows pulses eg: based at/bc. 1499'–1506': At 1483' bedding 60°/LCA; @ 1504' 55°/LCA.
Minor disem py > sp-gn, mostly in matrix. Minor po in based 10'.

1506'–1709'6": BLACK SHALE
Black, fg gr. Mod soft + fissile. Fine, v regular bedding. Extremely uniform – rare intervals of sandy qtz-xyl tuff to 150mm.
Sil'd schistose (rock is a phyllite). Mod carbonaceous ∈ some graphite on schistosity planes.
Appreciable carbonate content – mainly pervasive, but thin comb veinlets locally abund – most // bedding + contain calcite.
Bedding: 65°/LCA @ 1501'; 75°/LCA @ 1538'/schistosity: 55°/LCA; 70°/LCA @ 1569'; 65°/LCA @ 1604'; 79°/LCA @ 1641'; 80°/LCA @ 1692'
(NB: @ 1692' 80°/LCA strike + 80°/LCA dip components felt reasonable)
Graphitic shear zones: 1446'9"–1447'6": 10°/LCA. 1674' 90°/LCA.
Sulphides – po + py, rare trace sp + gn. – disem (some bedded), also in veinlets + patches + carb ± qtz. Rarely in thin laminae on bedding + schistosity. Po mostly disem, py mostly in veinlets (rare).
Av: 2–4% po > py (range from 1% to 5%)

1709'6"–1720': MISSING

1720'–1914'8": QUARTZ-FELDSPAR CRYSTAL TUFF
Probable epiclastic but reworking minimal – evidence for reworking clearest towards base. V uniform. Feld > qtz. Xyls gen show no preferred orientation. Rarely, some variations in relative xyl abund and vague hints of bedding.

960472

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK, TASMANIA	HOLE NAME	71R
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	2357'

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	Au	Cu	Pb	Zn	Ag	Ba	SAMPLE Nº	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
1760'	1768'	<0.01	4	55	370	<1	820	79681			BQ			Creamy green to dk grey. V hard.
1768'	1776'	<0.01	5	18	24	<1	1350	79711			BQ			Channelchised by abund rounded qtz xyls 1-4mm (av 2-3mm)
1776'	1784'	<0.01	5	10	18	<1	1350	79722			BQ			matrix-supported. Also subhedral felds 1-4mm. V rare lithics to
1784'	1792'	<0.01	6	14	14	<1	1400	79733			BQ			15mm. Matrix siliceous and sericitic. Qtz xyls often c white
1792'	1800'	<0.01	10	34	46	<1	1250	79744			BQ			inclusions and radial cracks.
1800'	1808'	<0.01	14	50	170	<1	1100	79755			BQ			Mod-strong (locally intense) silif - appears v fi qz and 'chert-
1808'	1816'	<0.01	8	10	42	<1	1550	79766			BQ			like' in pllas, same as ifreg bounded and diffuse 'veins' - poss
1816'	1824'	<0.01	6	16	42	<1	1600	79777			BQ			silica introduced as rock deformed at white stage. Minor wk
1824'	1832'	<0.01	10	16	60	<1	1400	79788			BQ			normal qtz ± chlor ± carb veins.
1832'	1840'	<0.01	8	34	50	<1	1800	79799			BQ			Mod-strong sericitisation and patchy bleaching. Wk chloritisation
1840'	1848'	<0.01	9	12	28	<1	1900	79801			BQ			below 1775' mod 1805'-1931' pervasive and in veinlets.
1848'	1856'	<0.01	12	22	50	<1	1550	79811			BQ			Common fracts at low angles to LCA - some bottom zones esp above 1750'
1856'	1864'	<0.01	9	22	36	<1	1800	79823			BQ			Some leaching, with voids due to removal of carbonate, above 1778'
1864'	1872'	<0.01	6	10	32	<1	1850	79834			BQ			esp near major shears @ 1738'(20°/LCA) + 1743'6"-1744'6"
1872'	1880'	<0.01	6	10	18	<1	1250	79845			BQ			Ubiquitous fine diffuse microfracts ± sericite ± chlorite veins.
1880'	1888'	<0.01	8	16	20	<1	1400	79856			BQ			Bedding @ 1735'6" 78°/LCA in thin cherty tuff bed. Poss bedding
1888'	1896'	<0.01	7	12	20	<1	1850	79867			BQ			@ 1806' 75°/LCA. Basal contact a 1" zone of qtz vnlts 85°/LCA.
1896'	1904'	<0.01	8	18	30	<1	1650	79878			BQ			1720'-1753': 1-2% dissem py. Rare trace sf-gn. Best sulfds in 'cherty' zones
1904'	1912'	<0.01	8	30	50	<1	1450	79889			BQ			Some sf-gn in qtz veins. 1753'-1781': V minor py > sf-gn. 1781'-1805':
	1800'							PETROL 79869			BQ			minor po > py. Trace sf, gn, cp. Some po in chlor veins // LCA.
	1830'							PETROL 79870			BQ			1805'-1914'8": 1-2% dissem ilmenite ± leucoxene. V minor py, po. Trace sf-gn.
	1914'8"							PETROL 79888			BQ			
1912'	1920'	<0.01	6	10	28	<1	1550	79900			BQ			1914'8"-1960': QUARTZ-FELDSPAR CRYSTAL TUFF
1920'	1928'	<0.01	10	65	60	<1	1300	79911			BQ			Same rock type as above except with zones which are xyl-deficient
1928'	1936'	<0.01	7	14	24	<1	1300	79922			BQ			and tuffaceous, and with sedimentary character inc bovian ± depth.
1936'	1944'	<0.01	18	75	160	<1	1150	79933			BQ			Dk grey, med gr, hard.
1944'	1952'	<0.01	48	18	300	<1	620	79944			BQ			Qtz >> feld xyls, mainly rounded but also angular xyl frags. To 4mm, av
1952'	1960'	<0.01	38	22	145	<1	1100	79955			BQ			2mm - decreasing fairly towards base. Zones ± few xyls, others
														qtz-xyl rich w/ clearly sorting variations. Matrix of fine qtz grains + sericite.
														Prominent radial cracks in some rounded qtz xyls below 1954'.
														Mod-strong silif, mod sericitisation, wk chloritisation, patchy bleaching.
														Mod carbonatisation in places. Carb veinlets + patches. Dlc qtz veins.
														1929'6": prob bedding 80°/LCA (strike component ditto). Bedding 83°/LCA
														@ 1941' 62°/LCA @ 1948' strong shear 25°/LCA @ 1936'9".
														Disrupted rock fabric ± abund diffuse microfracts ± sericite-chlorite films.
														Below 1941'6" irreg zones of bleaching (hydrothermal?)-rock brittle
														in situ into highly angular frags to 25mm in qtz-carb matrix.
														1914'8"-1936': Minor po > py > sf-gn. 1% ilmenite.
														1936'-1960': 1% po-py > sf-gn. Dissem. NB: Po is non-magnetic.
1960'	1968'	<0.01	14	50	260	<1	570	79966			BQ			1960'-1985'6": VOLCANIC BRECCIO-CONGLOMERATE
1968'	1976'	<0.01	4	95	330	<1	810	79977			BQ			Pale greenish-grey. Upper + lower contacts gradational.
1976'	1984'	<0.01	4	50	240	<1	730	79988			BQ			Abund matrix-supported variable wk lithic clasts to 130mm, av 10-15mm
														angular to rounded. In sandy matrix made up of tiny qtz and lithic
														grains, sericite, carbonate and fine silica. Most clasts rounded qtz xyls
														av <2mm. Matrix is 'washed' but many of the small lithics are angular
														suggesting reworking has been minimal.
														Lithics mostly fine, silic. - some silif. Others cherts or cherty tuffs, some
														qtz-porphyritic (qtz subangular to rounded - rocks poss volcanic clasts).
														Others non-silif qtz-feld porph. 2 dk tuff-shale. 1 qtz-granulated base

SHEET 1 OF 2

471

960473

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK, TASMANIA	HOLE NAME	71 R
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	2357'

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	Au	Cu	Pb	Zn	Ag	Ba	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
														Matrix and most clasts mod - strongly silif, sericitised and carbonatised. Wk chloritisation and bleaching.
														Bedding: 79/LCA @ 1964'.
														Numerous irreg carbo-qtz veins throughout.
														Minor po-py-sp-gn - dissem in both clasts and matrix. Minor ilmenite.
1984'	1992'	0·10	5	42	210	<1	460	7999			BQ			1985'6" — 2034'8": COARSE CRYSTAL-LITHIC SANDSTONE
														Hypabyssal. Characterised by strongly schistose matrix.
														Pale greenish-grey. Coarsely sandy texture - v. uniform.
														Qtz xyls (angular and fings to rounded xyl grains) to 5mm, av 2mm.
														Lesser tiny feld xyls. Slightly stretched matrix-supported wk lithics
														angular to subrounded, to 15mm av < 5mm. Lithics gen fine, silic.
														Matrix 1) fine qtz xyl fings and qtz-sericite-carbonate and minor
														chlorite (all overall mod). Some of the wk pasty silif is blue-grey,
														finely-banded, almost chalcedonic.
														Some minor variations in grainsize and amount of lithics - only clear
														bedding seen at 2009': 85°/LCA (// schistosity). Schistosity: 82°/LCA @ 1992'.
														Minor qtz, carb or chlor veins - many diffuse.
														2029' - 2034'8": Say rounded "cobbley"?? // underlying rock type to
														110mm - these highly silif but adjacent host rock wk not.
														V minor po-py > sp-gn (more 1996'-2000') 1% ilmenite + leucoxene.
2034'6"	2042'	<0·01	55	1050	450	2	90	8000			BQ			2034'8" — 2050'6": QUARTZ-FELDSPAR PORPHYRY.
2042'	2050'	<0·01	8	20	38	<1	180	12901			BQ			Upper contact 50°/LCA, later 68°/LCA ± some qtz-carb-chlor veining.
														Creamy-grey. Coarse gr. Intensely siliceous (silif) + externally bound
														Euhedral to subhedral qtz + feld bet 3mm (qtz to 5mm, feld to 8mm)
														in matrix 1) silica (transluscent). Minor chloritic flecks + veins - comm
														at base. Diffuse qtz ± carb veins.
														Confidently an igneous rock (intrusive or flow).
														2046'9" - 2050'6": complex mixture (gravel breccia?) 1) porphyry
														fings (angular, irreg) in sericitic + chloritic matrix containing subrounded
														xyls 1) qtz (like xyl-lithic sandstone) both rock types intensely silif.
														2032'8" - 2046'9": Minor sp-gn-cp dissem. Nil sulphides elsewhere.
2050'	2058'	<0·01	9	10	34	<1	550	12902			BQ			2050'6" — 2064': COARSE CRYSTAL-LITHIC SANDSTONE
2058'	2064'	<0·01	7	22	34	<1	590	12903			BQ			Same unit as above porphyry. Hypabyssal characterised by strong schistosity.
														Pale greenish-green. Hard. Little indication of layering or sorting.
														Abund qtz xyl grains + fings to 2mm, av < 1mm. Abund matrix-supported
														lithics to 15mm, av 5-10mm, most angular some subrounded. Mainly
														fine cherts and lithic. Some qtz-chlorite veins. Most long, thin - stretched
														+ deformed by schistosity (78°/LCA @ 2059'). Some equant.
														Matrix - fine qtz grains + feldspathic material, now mod sericitised,
														silif and chloritised.
														V. minor dissem py, po > sp.
														Basal contact interdigitating bedding 60°/LCA.
														HOST ROCK SEQUENCE
2064'	2072'	<0·01	2	42	50	<1	720	12904			BQ			2064' — 2078'6": TUFFACEOUS CHERTY SILTSTONES AND SHALES
2072'	2078'	<0·01	3	14	34	<1	730	12905			BQ			Greenish-grey + cream. Fine.
														A distorted and deformed finely banded sequence of sericitic,

ASSAY INFORMATION

478

9604774

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK, TASMANIA	HOLE NAME	71R
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	2357'

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	Au	Cu	Pb	Zn	Ag	Ba	Co	Hg	Cd	SAMPLE Nº	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
2090'6"	2097'	0·04	1750	115	60	2	1500	8	<1		129117			BQ		
2097'	2103'6"	0·01	2400	48	85	1	1200	4	<1		129118			BQ		
2103'6"	2111'6"	<0·01	7	4	50	<1	940				129106			BQ		
2111'6"	2120'	<0·01	9	8	55	<1	1050				129107			BQ		
2120'	2127'	0·01	170	38	540	1	980	8	1		129119			BQ		
2127'	2134'	0·01	50	44	410	1	830	6	1		129120			BQ		
2134'	2141'	<0·01	38	340	710	1	560	<4	2		129121			BQ		
2141'	2148'	<0·01	12	55	90	<1	410	<4	<1		129122			BQ		
2148'	2155'	0·02	115	105	400	1	1050	<4	1		129123			BQ		
2155'	2161'6"	<0·01	16	22	40	<1	880	<4	<1		129124			BQ		
	2164'								PETROL		129108			BQ		
2161'6"	2170'	<0·01	3	16	18	<1	640				129111			BQ		
2170'	2178'	<0·01	8	75	36	<1	780				129112			BQ		
2178'	2186'	<0·01	5	28	30	<1	640				129113			BQ		
2186'	2194'	<0·01	14	20	22	<1	930				129114			BQ		
2194'	2202'	<0·01	3	14	9	<1	900				129115			BQ		
	2192'								PETROL		129109			BQ		
	2195'6"								PETROL		129110			BQ		

DESCRIPTIVE LOG

Shale, siltstone and chert, with quartz-xyl siltstone predom below 2072'6" (qtz xyls av 2-3mm, some subrounded; occ feld xyls 1-2mm, occ fgr silic volc lithics to 5mm).
Mod-strongly sericitised and carbonatised. No silif.
Fine bedding highly disrupted and deformed - soft sediment deformation overprinted by mod-strong schistosity. Bedding: 87°/LCA @ 2065'; 75°/LCA @ 2072'6"; 90°/LCA @ 2077'.
Rare trace py>sp, dissem.

2078'6" – 2089'6": CORE MISSING

2089'6" – 2090'6": BASALT DYKE
Dk khaki colour fi gr, c pyroxene laths to 1mm. Non-magnetic.
Upper contact 75°/LCA, lower 81°/LCA

2090'6" – 2122'6": QUARTZ-CRYSTAL TUFF/SILTSTONE
An epiclastic. Grey, med gr. Uniform texture.
Qtz xyls and xyl frags to 4mm, av 2mm, some subrounded, c minor feld xyls ditto and rare strongly bleached lithics (towards base) in sericitic matrix that is rarely clearly
Mod-strongly sericitised and carbonatised. Sl bleached.
Strongly schistose. Bedding (gen not distinguishable), 78°/LCA @ 2095'; 85°/LCA @ 2112'6"; 88°/LCA @ 2117'.
2090'6" – 2094'6": 3-5% po-py, trace sp. Dissem, + in qtz±carb veins
2094'6" – 2100': 2-3% po-py, trace sp.
2100' – 2122'6": Minor po-py, trace sp.
Basal contact bedding @ 85°/LCA

2122'6" – 2161'6": TUFFACEOUS CHERT AND CHERTY SILTSTONE
Grey. V fi gr. Extremely hard c subconcoidal fracture.
Some xyl tuff bands below 2152'
Mod sericitised, mod schistose in upper part of unit.
To 2126'6" finely + regularly bedded 88°/LCA, thereafter still bedded but becoming more massive. Bedding: 85°/LCA @ 2130'; 83°/LCA @ 2154'6" Occ diffuse qtz veins.
2122'6" – 2126'6": 3-5% diss gem po>>py. Some bedded dissem.
2126'6" – 2131': 2% po>>py. Ultra fi gr dissem + some veinlets
2131' – 2161'6": V minor po-py. Rare trace sp-gn-cp. Dissem + in the altered brittle fracts.
Basal contact gradational.

FOOTWALL SEQUENCE

2161'6" – 2208'6": TRANSITION ZONE, BANDED TUFFACEOUS RHYODACITE-DACITIC VOLCANIC
Poss epiclastic in places. Banded and streaky, on a scale of 20-40mm.
Greenish-grey, fi-med gr.
Scattered feld xyls to 3mm, av <2mm, in strongly bleached sericitic and siliceous matrix. Felds euhedral (2°) to subrounded (due to deformation), gen uniformly sized and evenly distrib, but occ variations in grainsize and abund suggestive of 1° layering. Occ small "lithics" poss formed by in-situ brecciation of matrix

A13

960475

480

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK, TASMANIA	HOLE NAME	71R
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	2357'

DISTANCE FROM COLLAR: TO TOP | TO BOTTOM
SAMPLE Nº | CORE ANGLE | ROCK TYPE | DIAM | DESC CODE | GRAPHIC LOG

Sample Number : 12909 (2192') 71R

Identification : Moderately foliated, heavily sericitized andesitic vitric crystal tuff with many albite-dominated veins

Description :

The sample is a drill core specimen of pale olive grey rock with moderate foliation approximately normal to the core axis and with vague concordant banding and lenticular structures.

A cobaltinitrite staining test revealed no K-feldspar.

In thin section the sample is seen to be quite sericitic and moderately foliated but at low illumination there are plainly visible, relatively undisturbed, remnant textures consistent with many unwelded, cuspate, vitric shards, about 0.1 to 0.5mm in size. The shards have been pseudomorphed by aggregates of untwinned to poorly twinned albite. There are also disseminated subhedral clasts of plagioclase, about 0.1 to 0.5mm in size, some pseudomorphed by mosaics of fine albite and others persisting as single sericitized grains. Fine equant to platy opaque oxides are disseminated as single grains and small clusters (0.01 to 0.1mm). There are also a few disseminated subhedral grains of pyrite, about 0.2mm in size.

Many fissure veins, about 0.2 to 1mm thick and generally acutely discordant to the sericite foliation are filled by sutured aggregates of fine anhedral albite (mainly untwinned) with minor strained quartz and calcite and traces of chlorite and platy opaque oxide.

An approximate mode is :

10-15%	plagioclase phenoclasts, variously sericitized and albitized
30-40%	matrix albite, pseudomorphing vitric shards
35-40%	matrix sericite
0.2-0.3%	opaque oxides
tr	pyrite
10-12%	veins of albite-quartz-calcite-chlorite-opaques

Comments and Interpretations :

This sample has plainly recognisable remnant textures consistent with unwelded vitric crystal tuff of andesitic composition. It is analogous to sample 12908, but carries fewer and generally smaller plagioclase phenoclasts.

The rock has been albitized, heavily sericitized, moderately foliated and cut by many fissure veins carrying albite with some quartz, calcite, chlorite and opaque oxides.

There are indistinct suggestions of layering, but no clear evidence of aqueous sorting or rounding. Airfall deposition on land or directly into water seems likely.

Sample Number : 12910 (2195'6") 71R

Identification : Moderately foliated, heavily sericitized andesitic vitric crystal tuff with many albite-dominated veins

Description :

The sample is a drill core specimen of pale olive to medium light grey rock with moderate, lenticular foliation crudely normal to the core axis and with many indistinct feldspar phenoclasts ranging up to about 2mm in size.

A cobaltinitrite staining test revealed minor K-feldspar as small patches and subtle veinlets.

In thin section the sample is seen to consist mainly of fine secondary albite and moderately foliated sericite, but in many places there are distinct remnant textures consistent with former tuff. Phenoclasts about 0.3 to 3mm in size consist of moderately sericitized, twinned plagioclase or of albite mosaics after plagioclase. Fine albite pseudomorphs former cuspate, unwelded vitric shards, about 0.1 to 0.8mm in size and aggregates of albite and sericite replace clasts of pumice ranging up to several millimetres in size. Additional matrix sericite is foliated and lacking in remnant textures. Fine opaque oxides occur as small patches and streaks. There are a few disseminated, subhedral grains of pyrite (ranging up to 0.4mm).

Numerous discordant fissure veins, about 0.05 to 2mm wide, contain mainly fine anhedral, untwinned or poorly twinned albite with minor fine chlorite and carbonate (some of it apparently dolomitic and the rest resembling calcite). Trace components are opaque oxide and pyrite. Several of the veins carry some strained quartz.

An approximate mode is :

20-25%	plagioclase phenocrysts, variously sericitized and albitized
35-45%	matrix albite, some of it plainly pseudomorphing vitric shards and pumice
25-30%	matrix sericite
2-3%	K-feldspar
0.5-1%	matrix opaque oxides
tr	pyrite
6-8%	veins of albite-chlorite-carbonate-quartz-opaques

Comments and Interpretations :

This sample has remnant textures plainly consistent with an unwelded tuff composed of vitric shards, pumice and plagioclase phenoclasts. Its composition was apparently andesitic prior to pervasive alteration to albite and sericite. It is analogous to samples 12908 and 12909 in lacking evidence of epiclastic sorting or rounding. Airfall deposition seems likely.

DESCRIPTIVE LOG

Mod-strongly schistose and altered (sericite-silica, minor chlor)
Locally silst (or chertiness?) is v. strong
Poss sandy sediment band 2199'6"-2200'6" 75°/CA. Banding (schistosity?) 75°/CA @ 2174'
Qtz ± carb ± chlor veins, some ± diffuse margins
Minor py-mpy, trace sp-gn. 1% fine-grained ilmenite(?) ± leucoxene
Gradational basal contact

2208'6" – 2357': FELDSPAR-AUGEN SCHIST
After felsic volcaniclastic (pyroclastic?)
Grey-green and pink. Very strongly lineated, banded and shistose rock (strongly schistose + deformed).
Rounded deformed feld (some pink albite) to 4mm, av 2-3mm, in sericitic and siliceous matrix. Rare lithics to 10mm @ fragments.
Mod-strong alt destroys 1° texture in places. Sericitization - silif (patchy) - chloritization (patchy) and mod albitization (± silica - kaolinitization). Minor qtz ± carb ± chlorite veins.
Rare 1° layering - 60°/CA @ 2227' (schistosity 75°/CA); 75°/CA @ 2297', 75°/CA @ 2314'.
Some thin glassy bands (pumice?) below 2258'
Strong chatter bear 20°/CA(?) @ 2262'.
V. minor disseminated py.

END OF HOLE

SHEET 9 OF 9

9604476

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK, TASMANIA	HOLE NAME	CS 1
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	451.4m

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	Au	Cu	Pb	Zn	Ag	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
163·4	165·4	0·01	15	15	60	0·5	T394			NQ		
165·4	167·4	0·02	15	25	110	0·5	T395			NQ		
167·4	169·4	0·02	30	35	1600	1·0	T396			NQ		

DESCRIPTIVE LOG

0 – 107.4m: NOT LOGGED

107.4 – 139.25m: QUARTZ-FELDSPAR CRYSTAL-LITHIC TUFF
An epiclastic - matrix is sl 'washed'.
Pale grey-green. Med-coarse gr. Hard.
Abund feld and qtz xyls (lathy to 7mm), av 3mm. Feld euhedral to subhedral, qtz gen subrounded.
Lithics av < 10mm, gen subrounded, mainly fi gr pink or grey tuffs.
Mod sericite-chlorite alt (latter mainly in veinlets ± qtz-carb). Wk patchy silic esp assoc ± pink albite-hematite alt.
Bed of tuff-siltstone @ 138m 45°/LCA, bedded wlk sst 139.1-139.25m 62°/LCA
Strong fault 137.2m 35°/LCA.
Minor dissem py.

139.25 – 163.4m: COARSE QUARTZ CRYSTAL-LITHIC TUFF
Epiclastic - inc 'washed' and reworked silt depth. Similar to above unit but larger lithics (to 90mm), clast size and abund dec below 152.5m.
Conspicuously (due to bleaching), sl leached and clayey in places ± sheared + broken zones.
Clasts subrounded to rounded of bedded wlc silt + sst, fi gr qtz-comp vlcs, chalky tuff beds, 1 clast qtz-amygdaloidal vlc. (NB: No shale clasts)
Qtz xyls rounded in places, lesser feld - some pink albite.
Mod sericite alt, wk patchy chlor. Small fuchsitic patch @ 150.2m.
Bed grey tuff-shale @ 159.4m 55°/LCA.
Strong shear @ 149.2m 65°/LCA (// bedding)
Minor dissem py > sp-gn-cp, locally 1% below 157m. Some silicified in thin chal-stringers or conc in small clasts to 15mm.

163.4 – 170.5m: GREY SHALE AND SILTSTONE
Highly disrupted bedding - pods broken, crumpled, sheared at. Carbonaceous calcareous matrix - few beds of black shale. Some grease sst.
Bedding 168.5m 60°/LCA
Abund fine qtz-carb veinlets ± py. Large qtz veins (eg: 164.2 – 165.3m), ± minor py. Strongly sheared, broken zones eg 165.5 – 166.2m.
Upper contact irreg disrupted bedding 55°/LCA. Lower contact a shear.
Overall: minor dissem py > sp, also in veins as above.

170.5 – 175.1m: FELDSPAR CRYSTAL TUFF
Grey-green, med gr.
Abund feld, av 2mm, gen subhedral. V rare qtz xyls.
In siliceous matrix. Wk sericite-chlorite alt.
V minor dissem py + sp.
Fault at basal contact with 0.3m clayey prg.

175.1 – 181.2m: QUARTZ VEIN
A major fault zone.
White xylline qtz. Brecciated over 0.3m at upper contact ± stgs.
Some chlor stringers. Rare dissem py.
Brecciated aquid rock contact at the irreg basal contact.

481

9604772

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK, TASMANIA	HOLE NAME	CS1
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	451.4M

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	Au	Cu	Pb	Zn	Ag	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
189·2	191·2	0·02	15	25	375	0·5	T397			NQ		
191·2	193·2	0·03	40	100	1400	1·0	T398			NQ		
193·2	195·2	0·02	30	35	1400	1·0	T399			NQ		
195·2	197·2	0·02	40	235	2300	2·0	T400			NQ		
197·2	199·2	0·03	25	535	1600	2·0	T513			NQ		
199·2	201·2	0·02	20	60	190	1·0	T514			BQ		
201·2	203·2	0·02	45	970	4100	3·0	T515			BQ		
203·2	205·2	0·02	30	1200	4000	2·5	T516			BQ		
205·2	206·4	<0·005	10	2300	370	2·5	T517			BQ		
243·2	245·2	0·01	5	75	135	0·5	T518			BQ		
245·2	247·2	<0·01	10	10	180	0·5	T519			BQ		
247·2	249·2	0·02	10	15	410	1·0	T520			BQ		

ASSAY INFORMATION

DESCRIPTIVE LOG

181·2 — 206·4m: DARK GREY SHALE AND SILTSTONE

Irreg disrupted bedding in places, and schistose. Minimal carbonaceous content. These features, along with the qtz-carb veining and lack of evenly-disseminated po-py, distinguish this unit from the black shale in FR.
Minor interbeds of qtz and/or felsic-xyl lithic.

Abund irreg spidery qtz-carb veinlets at all angles. Qtz veins to 300mm above 189m.
Bedding: 75°/CA @ 192m; 42°/CA @ 199m; 12°/CA @ 199.5m (fold nose); 65°/CA @ 205.4m.
Badly broken with choppy shears, over 5cm, adjacent to upper + lower contacts. Basal contact sharp - irreg bedding & some shearing.
1% py+sp, mainly in qtz-carb veinlets + larger qtz veins (some alt?)

206·4 — 240·4m: MASSIVE FELSIC VOLCANICLASTIC (?)

Unidentified volcanic.
Greenish-grey. Med to coarse gr, uniform, structureless, hard. Text indistinct due to weak-mod sericite-chlorite alt. Patchy wk silic.
Abund fold xyls av 2-3mm, evenly-scattered euhedral. No qtz xyls. Matrix is qtz-sericite.
Rare lithics in uppermost few metres - to 10mm.
Minor qtz-carb veins.
Basal contact gradual over 50mm.
Rare trace disemin py (mostly none). V rare sp-gn in qtz veins (most barren).

240·4 — 249·2m: VARIABLE FINE VOLCANIC SEDIMENTS

Bedded felsic vitric tuffaceous sed, feldspar crystal tuff, and dk grey to black sl carbonaceous tuff-shale. Rare thin clayey zones below 245m.
Fawny-grey to dk greenish-grey, f gr.
Abund small felds + fold xyl fragm (<<1mm) in vitric (sericitic) matrix.
2m xyl tuff felds to 3mm.
Weak-mod sericitisation, wk chlor and bleaching. Carb veinlets.
V disrupted bedding - streaked alt + laminae & intraformational folding @ 248.8m. Bedding: 38°/CA @ 240.5m; 7°/CA @ 242.5m; 67°/CA @ 247.2m.
V minor py + rare sp-gn. Disem + fracture-fillings.
Bottom contact gradational.

249·2 — 318·0m: FELDSPAR CRYSTAL TUFF

Similar to unit above 240m, but apparently epiclastic.
Light to dk grey. Med gr. Hard, unbroken, & uniform texture - little variation in grainsize. Some finer gr zones & vague banding 265.1–267.8m.
Abund evenly-dispersed fold xyls 1-3mm, gen euhedral, in silicous matrix. Extremely rare qtz xyls (6-10 seen).
Wkly alt - sericite > chlorite, patchy silic & bleaching.
V minor lithics (felsic-vitric + f gr silic types) to 15mm. Angular to subangular.
Indistinct bedding (rare): 76°/CA @ 258.4m; 75°/CA @ 265.1m.
Minor qtz-carb veinlets.
V minor disem py. Rare sp.
Irreg basal contact.

482
960478

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK, TASMANIA	HOLE NAME	CS1
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	451.4m

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	Au	Cu	Pb	Zn	Ag	SAMPLE No	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
349·4	350·9	<0·01	50	105	990	1·0	TS21			BQ		
350·9	352·4	0·01	45	125	1450	1·0	TS22			BQ		

DESCRIPTIVE LOG

318·0 — 328·35m: VARIABLE VOLCANIC SEDIMENTS

Mostly felsic coarse sst, with grey chunky tuff-siltst, tuff-shale + chert, beds) 326m.
Creamy-grey, fi-med gr.
Folds av < 2mm, lithics to 4mm av < 2mm, except irreg (soft) dk grey tuff-shale clasts below 322m, to 50mm av < 10mm. Have ripped up from unit below 326m. Top of shale-siltst @ 326m is broken up and invaded by the overlying sst - suggests latter is a debris flow deposit. Clear grading finding cycle at 325m. Bedding 75°/cca @ 327·5m. Bedding in tuff shale-siltst gen broken + brecciated.
First appearance of significant content (3%) qtz xtls (av 1mm), since 162·4m.
Rock tied sericitised + bleached. Wk chlor in places.
Prominent siderotic carb ± chlor ± qtz veins at all angles.
V minor disseminated py.
Transitional basal contact.

328·35 — 349·35m: CRYSTAL-LITHIC EPICLASTIC

One debris flow pole? First truely qtz-phyric unit since 162·4m
Pale grey, Med-coarse gr, Massive, Moderate
Mainly fold + qtz xtls (subhedral ± some subrounded qtz. Fold to 4mm av 2-3mm, qtz to 5mm, av 1-2mm. Xtls coarsest below 338m. Have small lithics (< 5mm) at top, inc below 338m, abound 342-345m (rock is a lithic breccia ± clasts to 80mm - gen angular). Downhill inc in grainsize, abundance and size of lithics, with depth. Largest + most abund clast type is pale green qtz-amygdaloidal lava, f/by med silic tuffaceous wkly and dk grey siltst.
Strongly siltst (or chertified - some appears chalcedonic). Mod bleached, sericitised, wk chlor. Throughout thin qtz ± carb ± chlor veins.
No clear mineral lineation. Bedding (indistinct) seen in two places: 30°/LCA @ 347·15m, 85°/LCA @ 342·25 (50mm bed of silic siltst).
328·35 — 338m: V minor disseminated py. Trace sp in qtz veins.
338 — 349·35m: Minor disseminated py-sp-gn.

349·35 — 352·4m: VOLCANIC SANDSTONE + TUFF-SHALE

Pale, greenish-cream, felsic-lithic sst, dk grey tuff-siltstone + tuff-shale
Upper contact irreg (scoured), bedding 85°/LCA. Very regular bedding in siltst + shales: 0°/LCA @ 349·5m; 60°/LCA @ 351m. At 350·5m silt bed ± fining downhole; at 350·7m similar bed fining upholes.
Wk patchy silic or chertiness (some pale grey tuffaceous chert beds towards base).
Wk sericitisation + bleaching.
Minor disseminated py > sp-gn.
Basal contact at 30°/LCA.

352·4 — 389·0m: CRYSTAL-LITHIC TUFF (EPICLASTIC)

Inc reworked and bedded towards base.
Pale grey, med-coarse gr.
Abund fold > qtz xtls (qtz more abund than units above). Fold av 2-3mm subhedral. Qtz av 1mm, rarely to 4mm - some subrounded grains.
At top occ lithics to 10mm, usu < 5mm, angular to subrounded, mostly fine gr silic types. Lithics inc ± depth, still av 5mm or less except rare 30mm clasts.

SHEET ___ OF ___

48

960479

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK, TASMANIA	HOLE NAME	CS1
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	451.4m

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	Au	Cu	Pb	Zn	Ag	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
389.0	391.0	<0.01	10	10	60	0.5	TS23			BQ		
391.0	393.0	<0.01	15	15	65	0.5	TS24			BQ		
393.0	395.0	0.20	10	5	90	1.0	TS25			BQ		

DESCRIPTIVE LOG

5) dk grey-black cherty shale to 70mm below 384.5m. Those angular, ± rounded qtz xyls in matrix, to 5mm.
Matrix is siliceous due to invasion by fi qtz, almost chalcedonic silica - chertiness, or silif? Locally strong. Wk-mod sericitisation, bleaching, chloritisation. Sprog blind sprinkles of grey qtz. Some larger qtz ± chlorite veinlets.
Texture indistinct due to wk-mod schistosity and alteration.
Vague mineral lineation and subtle textural + cohesive changes, suggest epiclastic origin for unit - confirmed by 15mm chert bed 74°/CA @ 392.4m and black shale bed 73°/CA 387.6-387.8m (underlying bed fines uphole) other bedding: 68°/CA @ 385.85m.
Shears: 65°/CA @ 361.55m, 30°/CA @ 375.4m.
Rare dissem py-sp.
Basal contact bedding 68°/CA.

389.0 — 393.25m: BLACK TUFF-SHALE
(This unit looks most like the black shale in 71R of any in this hole)
Fi gr, mod carbonaceous + graphitic. Mostly massive with poorly developed bedding. Minor vfu sst interbeds. Bedding 72°/CA @ 391.9m.
Quartz by abund fine (<2mm) qtz ± dolomite veins s'ub/f bedding.
Dec gtz - mostly in qtz veins. No po or sp.
Some crinkling + recrystallisation at basal contact, due to movement (sliding).

393.25 — 396.4m: FINE VOLCANIC SANDSTONE/SILTSTONE
Clearly the fine-grained top on unit below - indicates facing uphole.
Creamy-grey. fi-med gr.
Vitric + lithicaus ± tiny folds, qtz + lithic grains (<1mm), inc in size towards base. Some intercalations of coarser material ± rounded qtz xyls to 6mm.
Finely bedded in places - 78°/CA @ 395.3m.
Moderately sericitised + bleached. Minor patchy silif or chertiness.
Rare dissem + vein py.
Gradational contact at base.

396.4 — 412.6m: QUARTZ-PHYRIC CRYSTAL TUFF
Massive epiclastic unit charact by abund and large, subangular to rounded qtz xyls to 10mm, av 3-4mm. Inc in size ± depth.
Pale green or creamy-grey.
Fold xyls av 3mm, dec angular lithics (rarely to 20mm) - mostly fi gr silic vole or grey-black shale - latter inc downward towards base and evidently soft when emplaced.
All in felsic + siliceous matrix which is 'washed'. No evidence of bedding.
Wk-mod sericitisation, bleaching. Minor patchy silif. Also chlor + pink alteration below 404m.
Rare dissem py.
Basal contact gradational.

412.6 — 421.3m: BLACK SHALE AND VOLCANIC SANDSTONE
Mainly black shale with intercalations at top and bottom // vfu sst and tuffaceous siltstone. Dec qtz xyls in latter rock types. Mica folds + lithics.

SHEET OF

484

960480

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK, TASMANIA	HOLE NAME	CS1
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	451.4m

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	Au	Cu	Pb	Zn	Ag	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
412.8	414.8	0.01	20	15	75	1.0	TS26			BQ		
414.8	416.8	0.04	95	25	915	1.0	TS27			BQ		
416.8	418.8	0.03	105	55	1400	1.0	TS28			BQ		
418.8	419.8	<0.01	145	25	1700	1.0	TS29			BQ		

DESCRIPTIVE LOG

All rock types have extensive disruption and brecciation of bedding. Mod sericitisation, wk chloritisation, in sst + siltst.
Bedding 75°/CA @ 414.65m.
412.6 – 416.3m: Minor dissem py (some in the v. common irreg carb ± qtz veins + patches). 416.3 – 419.8m: 5% py mostly in carb veinlets. Minor sp.
419.8 – 421.3m: Minor py.
Basal contact sharp 75°/CA

421.3 — 451.4m: QUARTZ AND FELDSPAR-PHYRIC VOLCANICLASTIC
Unidentifiable – epiclastic?
Green-grey ± creamy bleached zones.
1° probable lithological change at 432.75m, indistinct streaky and banded texture, with minor variations in grainsize and banded brecciated zones. M-med gr, with indistinct fold xyls + ladder qtz xyls av 1–2mm, and sparse lithics to 50mm, av <15mm (green M gr silic or chloritic vfrs). Some deformed (stff) black slaty stringers.
Bedding: 75°/CA @ 422.2m; 67°/CA @ 425.5m. Poss deformed bedding 75°/CA @ 431.6m (sandy bands).
Below 432.75m text more even, no banding. Evenly-dispersed fold xyls (some euhedral) to 5mm, av 2–3mm. Rare qtz xyls. Some banded grey pyritic chert clasts.
Overall: mod alt – sericite > chlor, ± patchy silic ± bleaching above 432.75, becoming strong below 440m. Rock is wk–mod schistose.
Strong clayey shear 63°/CA @ 450.05m.
421.3 – 432.75m: Rare dissem py.
432.75 – 451.4m: Minor dissem py, locally 1% Tr sp. Up to 1% ilmenite (?) + leucoxene.

END OF HOLE

485
9604481

960482

APPENDIX X

Cutty Sark Locality - Petrological Descriptions

960483

488

Geochempet Services

PETROLOGICAL and GEOCHEMICAL CONSULTANTS

REGISTERED IN QUEENSLAND
Principal : A.S. Joyce B.Sc. (Hons), Ph.D.
200 Chapel Hill Road
Chapel Hill, Qld. 4069

Telephone: (07) 375 5258
A/H 378 6467

PETROLOGICAL REPORT ON

FIVE SAMPLES FROM THE CUTTY SARK AREA, TASMANIA

prepared for

BILLITON AUSTRALIA

Order Code : 11509/L350/JGP/012

Ref: J.G. Purvis

Stan Joyce

A.S. Joyce B.Sc.(HONS) PhD

27th June, 1986.

GENERAL COMMENTS

1. All five samples are of distinctly dacitic derivation, carrying abundant phenoclasts of plagioclase and quartz. Most of the quartz clasts are less than about 3mm in size, but there are examples of coarser grains. Shapes are quite consistent with smoothly corroded and deeply embayed crystals with β form : some are broken. None of the quartz is recognisable as having been derived from other than a dacitic source.

2. Three of the sample (12946, 12947 and 12948) have recognisably reworked textures, involving some sorting and rounding of mineral grains and rock fragments derived from a welded dacitic ashflow source. The sample 12945 has slight indications of reworking of dacitic ashflow material : it carries some pumiceous clasts. The sample 12944 is an altered dacitic crystal tuff without any distinctly reworked textures : it features many phenoclasts in a finely sericitized matrix.

All of the samples appear to represent the same tuffaceous source material deposited with minor textural variations involving poor sorting and rounding by epiclastic processes.

3. All of the samples have been albitized, sericitized and carbonated by apparently hydrothermal processes and three are slightly chloritized. There are traces of pyrite and some fissure veins carrying quartz and carbonate, accompanied in some cases by chlorite. A later metamorphic event has produced mild foliation and strained the veins.

490

960485

Sample Number : 12944

Identification : Albitized, sericitized and carbonated dacitic crystal tuff.

Description :

The sample is a superficially weathered hand specimen which displays many equant clasts of light grey quartz and others of orange pink feldspar, both ranging up to about 4mm, set in a pale olive matrix.

A cobaltinitrite staining test revealed no K-feldspar.

In thin section the sample displays abundant smoothly corroded, subhedral and in some cases broken phenoclasts, about 0.2 to 4mm in size, dispersed through a finely sericitic matrix with two mildly developed foliations intersecting at about 45°.

The most abundant phenoclasts are tabular, twinned grains of plagioclase with smoothly corroded outlines, broken in a few cases : the mineral is optically positive, consistent with albite, and shows slight reddish clouding. Phenoclasts of quartz are prominent as smoothly corroded and deeply embayed grains with B form, ranging up to 4mm in size : a few have broken shapes, most are mildly strained and a few are partly recrystallized. There are no obvious mafic phenoclasts, but they may be represented by disseminated patches of fine secondary sphene and ankeritic carbonate. The sericitic matrix has grainsizes of about 0.01 to 0.02mm and carries some quartz and possibly untwinned albite.

There are a few disseminated, subhedral, multifaceted grains of pyrite (less than about 0.07mm) in the matrix and a few fissure veins (less than about 0.5mm) carry ankerite and strained quartz.

An approximate mode is :

30-35%	plagioclase phenoclasts
20-25%	quartz phenoclasts
2-3%	ankerite patches
0.2-0.3%	sphene
35-45%	sericite matrix with fine quartz and possibly albite
rare	disseminated pyrite
0.4-0.6%	veins of quartz-ankerite

Comments and Interpretations :

It seems that this rock originated from a dacite source. Since it consists of phenoclasts dispersed through a fine matrix (now sericitized) it qualifies for description as a crystal tuff ; it may well have been deposited by directly tuffaceous processes on land or into water, but it is possible that it has undergone brief aqueous transport without substantial sorting or rounding.

After deposition the plagioclase phenoclasts were albitized, the mafic clasts were converted to ankerite and sphene, a few grains of pyrite developed and the matrix was sericitized and subjected to incipient development of two foliations. A few fissure veins of quartz with ankerite preceded the deformation.

491

960486

Sample Number : 12945

Identification : Sericitized, albitized and carbonated dacitic lithic crystal pumice tuff or reworked tuff.

Description :

The sample is a virtually unweathered hand specimen of mildly foliated rock of tuffaceous appearance. Phenoclasts of light grey quartz (ranging up to 3mm) and orange pink feldspar are set in a light greenish grey and pinkish matrix with aligned olive grey wisps (ranging up to 10mm) of possibly pumiceous or vitric origin.

A cobaltinitrite staining test revealed no K-feldspar.

In thin section the sample displays unsorted to slightly sorted unwelded, tuffaceous textures. Quartz is prominent as embayed and corroded phenoclasts, about 0.2 to 3mm in size, many of them obviously broken. Smoothly corroded and broken phenoclasts of plagioclase, comparable in size to the quartz, consist of lightly clouded albite moderately to heavily replaced by sericite and minor ankerite. There are a few coarse sericite pseudomorphs of inferred biotite phenoclasts : they carry secondary rutile. Coarse sericite with minor ankerite pseudomorphs wispy lenticular clasts of inferred pumice, many of which contain small phenocrysts of quartz and sericitized carbonated, albitized feldspar. Much of the rock consists of equant to ovoid 0.5 to 5mm clasts of very finely quartzofeldspathic rock or devitrified glass and minor interstitial, foliated sericite.

There are some replacement patches and crude fissure veins of anhedral to subhedral ankerite with quartz and one 4mm wide, strained and disturbed fissure vein of quartz (originally about 1mm grainsize). Fine, subhedral to anhedral, multifaceted pyrite (finer than about 0.15mm) occurs very sparsely as disseminated grains and as aggregate replacements of several small clasts.

An approximate mode is :

40-45%	finely quartzofeldspathic lithic or formerly vitric clasts
20-25%	moderately to heavily sericitized, carbonated and albitized plagioclase phenoclasts
15-20%	sericitized porphyritic pumiceous clasts
8-10%	quartz phenoclasts
1-3%	sericite-rutile pseudomorphs of biotite clasts
4-6%	matrix sericite
rare	fine pyrite
1-2%	veins and patches of ankerite and quartz.

Comments and Interpretations :

This sample displays unwelded tuffaceous textures and appears to have been derived from a dacite source. The textures may be consistent with direct unwelded, ashflow deposition on land or into water, but there are hints of sorting which suggest brief or turbulent transportation in water.

Probable hydrothermal activity has intensely sericitized pumice clasts, fine matrix components (possibly vitric shards) and biotite and moderately to heavily sericitized all plagioclase clasts; minor carbonate seems to have accompanied the sericite and a few grains of the pyrite developed. Residual plagioclase is all albitized. A few fissure veins of quartz and ankerite formed and then the rock developed a mild metamorphic foliation

492

960487

Sample Number : 12946

Identification : Albitized, sericitized, chloritized, carbonated and reworked dacite crystal lithic tuff.

Description :

The sample is a slightly weathered and porous hand specimen of tuffaceous or volcaniclastic appearance. It displays fairly densely packed, poorly sorted clasts of light greenish grey and greyish pink feldspar (up to 3mm) and light grey quartz (up to 5mm), felsic rock fragments (about 3 to 15mm), olive grey pumiceous or vitric clasts and a minor greenish grey matrix. There are several thin veins carrying grey quartz and greyish yellow carbonate.

A cobaltinitrite staining test produced some diffuse reaction with sericite, but revealed no K-feldspar.

In thin section the sample displays poorly sorted volcaniclastic textures. Quartz is prominent as smoothly corroded and deeply embayed phenoclasts with β form : they range in size from about 0.2 to 5mm and are mildly strained. A few have broken shapes. The most abundant clasts are equant to tabular, twinned phenoclasts of plagioclase (optically positive, consistent with albite) with light flecking by sericite, carbonate and in a few cases chlorite. Aggregates of fine sphene with sericite, and in some cases chlorite, may reflect former mafic minerals. Several equant, subrounded lithic clasts (up to 4mm) are of altered andesitic or microdioritic appearance, with albitized twinned plagioclase (0.3mm grainsize) dominating over sericite and minor sphene. Many other subrounded lithic or formerly vitric clasts consist of very fine untwinned albite and quartz (0.01mm grainsize) . Foliated sericite with minor chlorite forms an interstitial matrix, some of it of vaguely pumiceous appearance.

There are a few subhedral, multifaceted grains of pyrite, the largest about 0.4mm. Mildly deformed fissure veins (less than about 2mm wide) carry strained quartz (up to 1mm), anhedral ankerite and chlorite.

An approximate mode is:

30-35%	plagioclase phenoclasts, slightly altered
25-30%	quartz phenoclasts
8-10%	finely quartzofeldspathic lithic or formerly vitric clasts
0.5-1%	andesitic or microdioritic clasts
0.2-0.3%	sphene
2-3%	chlorite
25-30%	matrix sericite
rare	pyrite
1-2%	veins of quartz-ankerite-chlorite

..../

12946 cont.

Comments and Interpretations :

It is clear that this rock is derived from dacite crystal tuffaceous material but there are enough indications of sorting and incipient rounding to warrant describing the sample as reworked tuff.

Hydrothermal alteration has involved intense alteration of the minor matrix to sericite and minor chlorite, intense alteration of mafics to sphene with sericite and chlorite and slight sericite-carbonate-chlorite flecking of plagioclase. All plagioclase has been albitized. There are rare specks of pyrite. Quartz-ankerite-chlorite formed thin fissure veins and the rock was subsequently mildly foliated.

960489

494

Sample Number : 12947

Identification : Albitized, sericitized, chloritized and carbonated reworked dacite crystal vitric ashflow tuff.

Description :

The sample is a superficially weathered hand specimen which displays volcaniclastic or tuffaceous textures. Densely packed subhedral phenoclasts of light grey quartz (ranging up to 6mm) and light greenish grey and pinkish grey feldspar, subrounded greenish grey and pinkish grey felsic lithic clasts and some dark greenish grey pumiceous or vitric wisps are set in a minor greenish grey matrix.

A staining test revealed no K-feldspar.

In thin section the sample displays poorly sorted volcaniclastic textures. Quartz occurs as smoothly corroded, deeply embayed, and in some cases, broken phenoclasts, about 0.2 to 6mm in size : they are mildly strained and one is recrystallized to an aggregate of smaller grains. Plagioclase clasts are equant to tabular, subangular and subhedral grains of twinned albite with moderate sericitization. Mafic clasts have been crudely pseudomorphed by sphene with chlorite and sericite. Subrounded finely crystalline quartzofeldspathic clasts, about 0.5 to 15mm in size, are probably devitrified fragments of welded tuff: a few have ghosted shard textures and small phenoclasts of plagioclase and quartz. They are finely albitized (generally less than 0.01mm grainsize) and lightly sericitized. There are some sericitic and mildly chloritic pumiceous wisps and some interstitial foliated sericite. There are some patches of subhedral and anhedral ankerite and rare small grains and aggregates of pyrite.

There are some thin, deformed fissure veins (0.05 to 0.5mm wide) carrying strained quartz and some rhombs of ankerite.

An approximate mode is :

40-45%	plagioclase phenoclasts, moderately sericitized
25-30%	finely quartzofeldspathic clasts of probable welded vitric tuff.
10-15%	quartz phenoclasts
0.1-0.2%	sphene
2-3%	chlorite
10-15%	sericite in pumiceous clasts and the matrix
rare	pyrite
1-2%	carbonate patches
0.2-0.3%	veins of quartz with ankerite

..../

12947 cont.

Comments and Interpretations :

It is clear that this rock is derived from a dacite tuffaceous source capable of contributing phenoclasts of quartz, plagioclase and minor mafics, some pumiceous clasts and some lithic clasts of welded vitric tuff. There is enough sorting and incipient rounding to suggest epiclastic deposition by mild reworking of ashflow tuff.

The rock has been albitized moderately sericitized, lightly chloritized and carbonated and fissure-veined by quartz-ankerite, then incipiently foliated.

960491

Sample Number : 12948

Identification : Albitized, sericitized, carbonated and chloritized, reworked dacite crystal vitric ashflow tuff.

Description :

The sample is superficially weathered hand specimen of volcaniclastic or tuffaceous appearance. Poorly sorted, subangular lithic fragments (about 2 to 20mm) and phenoclasts (a fraction of a millimetre to about 5mm) are fairly densely packed within a greenish grey to dark greenish grey matrix. The lithic clasts and feldspar clasts are moderate orange pink and light greenish grey and the quartz clasts are light grey (mainly less than about 2mm, but ranging up to 5mm).

A staining test revealed no K-feldspar.

In thin section the sample displays poorly sorted volcaniclastic textures. Quartz is prominent as strained, partly recrystallized smoothly corroded and deeply embayed phenoclasts, ranging up to 5mm ; the smallest grains tend to be broken. Plagioclase phenoclasts are equant to tabular, subhedral and subangular, slightly sericitized grains of twinned albite. Small mafic clasts are represented by sphene with carbonate, chlorite and sericite. Numerous finely quartzofeldspathic clasts, ranging from 0.5 to many millimetres in size, appear consistent with devitrified welded tuff : some carry phenoclasts of plagioclase and quartz set in ghosted welded vitric shards. Mildly foliated sericite with some chlorite forms a minor matrix and pseudomorphs some wispy, probably pumiceous clasts.

There are many irregular replacement patches of anhedral to subhedral ankerite carbonate and a few poikiloblastic grains of pyrite (maximum size 1mm). Mildly deformed fissure veins, about 0.1 to 2mm wide, display quartz with chlorite and minor ankerite or ankerite alone, some colourless in section and some yellowish.

An approximate mode is :

30-35%	plagioclase phenoclasts, slightly sericitized
30-35%	finely quartzofeldspathic clasts of probable welded vitric tuff
10-15%	quartz phenoclasts
0.2-0.3%	sphene
2-3%	chlorite
10-15%	sericite in pumiceous clasts and the matrix
tr	pyrite
3-4%	carbonate patches
2-3%	veins carrying quartz, chlorite and ankerite

Comments and Interpretations :

This sample is very similar to 12947 and is regarded as having originated by subtle sorting and incipient rounding of phenoclasts and fragments of welded vitric tuff derived from a dacite source.

The rock has been albitized, moderately sericitized and carbonated, lightly chloritized and impregnated with traces of pyrite. Fissure veins carrying quartz, chlorite and ankerite developed and then the rock was incipiently foliated.

497

960492

CUTTY SARK
+71R.

Geochempet Services

PETROLOGICAL and GEOCHEMICAL CONSULTANTS

REGISTERED IN QUEENSLAND
Principal : A.S. Joyce B.Sc.(Hons), Ph.D.
200 Chapel Hill Road
Chapel Hill, Qld. 4069

Telephone: (07) 375 5258
A/H 378 6467

PETROLOGICAL REPORT ON FIVE SAMPLES

prepared for

BILLITON AUSTRALIA

Ref : G. Purvis

Stan Joyce

A. S. Joyce, B.Sc.(Hons), Ph.D.

11th April, 1986.

960493

498

SUMMARY COMMENTS

1. The samples 7969, 7970 and 7988 are interpreted to represent, respectively, dacitic crystal tuff, slightly reworked rhyodacitic crystal tuff and a band of rhyodacitic volcaniclastic arenite hosted by slightly reworked rhyodacitic crystal tuff.

   All three samples show moderate sericitic alteration and some fissure veining. Accompanying secondary minerals imply an increasing temperature gradient from 7969 through 7970 to 7988.

   There is a possibility that the rhyodacitic compositions of 7970 and 7988 are illusory, resulting from possible potassic metasomatism of otherwise dacitic rocks. The presence of K-feldspar in fissure veins may support this suggestion.

2. The massive sulphide samples 7948 and 7949 are thought to be related specimens of vein or replacement material. They do not display any obvious syngenetic textures.

499

960494

CUTTY SARK DEBRIS FLOW DEPOSIT
- MASSIVE SULPHIDE BOULDER

Sample Number : 7948

Identification : Massive sulphide vein or replacement material

Description :

The sample is a very superficially weathered hand specimen which displays mainly 3 to 20mm patches of fine pyrite in a host of dark grey sphalerite and minor galena. There is a 10mm patch of light grey quartz and a few disseminated pores, the largest about 2mm.

In polished section the patches of pyrite resemble clasts of massive, fine-grained pyrite comparable to that in sample 7949. The pyrite grains are subhedral cubes, about 0.01 to 0.15mm in grainsize. Near the edges of the apparent clasts there are increasingly dense patterns of irregular microveining by sphalerite, culiminating in patterns where individual remnant pyrite crystals occur as islands in sphalerite.

Much of the sample consists of very dark sphalerite with coarse vein-like distribution patterns. It is devoid of chalcopyrite and intergrown with minor anhedral to subhedral grains of a silicate which seems to be quartz, about 0.05 to 0.15mmin grainsize.

Anhedral galena, about 0.5 to 1mm in grainsize forms some massive pods, about 5 to 15mm long, within the sphalerite regimes. Quartz is also intergrown with the galena.

There are a few small, irregular pores in the non-pyritic regimes.

An approximate mode is :

65-70%	sphalerite
20-25%	pyrite
3-4%	galena
3-4%	silicates (apparently quartz)
0.3-0.4%	pores

Comments and Interpretations :

This sample is considered to represent massive sulphide vein or replacement material. It displays large remnant clasts of massive fine-grained pyrite (comparable to sample 7949) veined and enveloped by sphalerite with accompanying minor galena and fine quartz. Minor pores in the sample may reflect carbonate removed by incipient weathering.

No gold was observed.

960495

500

CUTTY SARK DEBRIS FLOW DEPOSIT
– MASSIVE SULPHIDE BOULDER.

Sample Number : 7949

Identification : Massive, fine-grained pyrite disrupted by a dense pattern of silicate veinlets with minor sphalerite

Description :

The sample is a 30mm, very superficially weathered hand specimen which appears to consist of massive fine pyrite and fine, porous veinlets of light grey quartz.

In polished section the sample is seen to consist of massive, fine-grained pyrite cut by a fine, irregular network of silicate veinlets, thought to be quartz from binocular examination of the hand specimen.

The pyrite displays subhedral cubic grains, about 0.01 to 0.15mm in size, densely intergrown as massive aggregates. The siliceous veinlets delineate irregular cells of pyrite, a fractionof a millimetre to about 1mm in size. The widest veins are about 0.3mm wide, but many are much thinner. Anhedral sphalerite occurs sparsely within the siliceous veins; locally it is the dominant vein mineral. Rare grains of galena occur in the veins.

The significance of irregular small pores in many of the veins is obscure. Perhaps they reflect carbonate dissolved by incipient weathering. No carbonate was proven during binocular examination.

An approximate mode is :

80–85%	pyrite
12–18%	porous silicate veins
1–3%	sphalerite in silicate veins
rare	galena in silicate veins

Comments and Interpretations :

The sample is considered to represent massive fine-grained pyrite which has been disrupted by a dense, irregular pattern of silicate veinlets (apparently quartz) with minor sphalerite, rare grains of galena and many irregular pores (possibly representing dissolved carbonate).

There are no distinct syngenetic textures and the pyrite may well represent vein or replacement material.

No gold was observed.

APPENDIX XI

Cutty Sark Locality - Rock Chip Assays

SAMPLE RECORD

Sheet 1 of —

Shell METALS DIVISION

SAMPLE TYPE: ROCK CHIPS | LOCATION / PROJECT: CUTTY SARK, MT BLACK PROJECT | SAMPLER: J.G. PURVIS | DATE: MARCH 1986 | MAP / PHOTO REF: —

ASSAY LAB: AMDEL / CLASSIC COMLABS | SAMPLE DESPATCH ORDER NO: 08328, 11501, 11502, 11506; | ASSAY REPORT NOS: AC 3523/86, AC 3819/86, AC 3876/86, COM860571 | SAMPLE STORAGE: DEVONPORT, TASMANIA

SAMPLE No.	LOCATION (AMG) NORTH	LOCATION (AMG) EAST	INTER'L (m)	ANALYSES Au	Au (Rpt)	Cu	Pb	Zn	Ag	Ba	Sn	As	Co / Sb	Mo / Bi	Te / W	DESCRIPTION
8949			Grab	Tr		19	30	145	<1	480	<4	14				dc. Limonite-siderite-qtz veins in volcaniclastic
8950			Grab	ND		140	44	54	<1	110	10	7				dc. Banded limonite-qtz-siderite vein
51			Grab	Tr		36	12	60	<1	410	6	10				dc. 0.15m qtz vein ± limonite + trace pyrite
52			Grab	ND		21	44	54	<1	110	<4	12				dc. Limonitic joint fillings + qtz-siderite veins.
53			Grab	Tr		120	290	205	<1	340	<4	405				dc. 30mm crush zone ± limonite in shales
54			Grab	0.12		115	58	110	<1	1340	4	8				Float. Silif mafic andesite ± 2% py 3% mt
8955			Grab	Tr		210	38	110	<1	470	4	6				dc. Wkly silif vdlc (felsic) ± 1% pyrite
8967			Grab	Tr		54	84	460	<1	420						dc. Massive felsic vdlc ± limonite veins
68			Grab	Tr		8	250	32	<1	490						dc. Red weathered felsic vdlc
69			2m chip	Tr		7	18	10	<1	980						dc. grey tuff-shale ± minor cherty interbeds
8970			0.5m chip	Tr		10	18	24	<1	1560						dc. limonite-stained cherty tuff-shale + sst
71			1m chip	Tr		7	38	10	<1	610						dc. Grey cherty tuff-shale
72			Grab	Tr		12	120	68	<1	930						dc. Limonitic, silif feld-qtz-xyl tuff
8973			Grab	Tr		15	54	250	<1	1260						Sub dc. Strong limonite stains + boxworks in xyl tuff.
8987			11m chip	Tr		38	160	115	<1	1260						dc Limonite stains + boxworks in tuffaceous sedc
88			13m chip	ND		16	36	150	<1	780						dc. Limonitic feld-qtz xyl tuff
89			Grab	0.07		165	18	72	1	470						dc. Propylitised andesite ± 3-5% vein py
8990			Grab	Tr		120	12	26	<1	900						Sub dc. Propylitised andesite ± 1% dissem py.
91			Grab	0.23		1.18%	70	460	5	95						Dump float. Chloritic felsic vdlc ± 10% py
92			Grab	Tr		1460	66	205	1	480						Dump float. Chloritic felsic vdlc ± 3-5% py.
93			Grab	0.17		10	12	33	<1	990						dc. Bleached qtz-feld porphyry ± 5% py
94			Grab	Tr		7	16	12	<1	660						dc. Bleached qtz-porphyry ± 1-2% py.
8995			Grab	Tr		11	125	34	1	650						dc. Bleached qtz-feld porphyry: 5% py
7923			Grab	0.04		1200	195	1300	2	350	8	50	6 / 8	8 / 155	<10 / 10	dc. Silif grey argillite ± 1-2% py, minor sp
24			Grab	<0.01		470	42	120	1	550	4	<2	12 / <4	<2 / 44	<10 / <10	Dump float. Felsic ignimbrite (?) ± 1-2% py.
25			Grab	0.06		2850	55	350	2	135	<4	8	14 / 4	6 / 46	<10 / 20	Dump float. Chloritic felsic vdlc. 5% py, minor sp.
26			Grab	0.05		1100	50	440	2	40	<4	12	14 / 4	4 / 42	<10 / <10	Dump float. Chloritic felsic vdlc. 5% py, minor sp.
27			Grab	0.06		2400	75	470	2	30	<4	14	16 / <4	4 / 90	<10 / 10	Dump float. Chloritic felsic vdlc 5-7% py + sp.
28			Grab	0.04		470	36	410	1	45	4	14	70 / 14	5 / 12	<10 / <10	Dump float. Chloritic felsic vdlc 5-7% py.
29			Grab	0.01		120	32	400	1	70	<4	12	40 / 6	4 / 14	<10 / <10	Dump float. Chloritic felsic vdlc ± 7-10% py
7930			Grab	0.02		46	24	75	1	410	6	8	4 / <4	4 / 10	<10 / <10	dc. Sericitised felsic vdlc ± 1-2% dissem py

REMARKS: —

960497

SAMPLE RECORD

Shell METALS DIVISION

Sheet 2 of ___.

SAMPLE TYPE: ROCK CHIPS

LOCATION / PROJECT: CUTTY SARK, MT BLACK PROJECT

SAMPLER: J.G. PURVIS

DATE: MARCH 1986

MAP / PHOTO REF: ___

ASSAY LAB: COMLABS

SAMPLE DESPATCH ORDER NO: 11504, 11506, 11510,

ASSAY REPORT NOS: COM 860449, COM 860571, COM 860937

SAMPLE STORAGE: DEVONPORT, TASMANIA

504

SAMPLE No.	LOCATION (AMG) NORTH	LOCATION (AMG) EAST	INTER'L (m)	Au	Au (Rpt)	Cu	Pb	Zn	Ag	Ba	Sn	As	Co / Sb	Mo / Bi	Te / W	DESCRIPTION
7948 *			Grab	0·12	0·10	410	8050	35·5%	20	75	980	320	28 / 30	32 / 14	<10 / <0·01	g/c. Massive sphalerite > pyrite boulder in debris flow.
49 *			Grab	<0·01	0·25	200	2000	1·35%	10	80	6	700	230 / 26	20 / 70	<10 / <0·01	g/c. Massive f-gr pyrite boulder in debris flow.
7950			Grab	0·57	0·30	50	450	810	8	630	<4	9·60%	530 / 60	28 / 40	/	g/c. 15mm arseno > py vein in qtz-feld porphyry.
12916			Grab	<0·01		9	16	50	<1	700	<4	7	<4 / 10	3 / 10	<10 / <10	Float. Sericitised felsic volc ± limonite stains.
12933			Grab	<0·01		420	26	450	1	390	4	12	<4 / 4	6 / 18	<10 / 10	g/c. Felsic chloritic lava ± 1% py, trace cp.
34			Grab	0·04		55	50	250	1	200	<4	18	65 / 8	4 / 18	<10 / 15	g/c. Felsic chloritic lava ± 5-7% py.
35			Grab	0·33		2·70%	165	430	8	115	<4	38	16 / 16	7 / 260	<10 / 20	Dump float. Chloritised silif volc ± 10% py > cp
36			Grab	0·95		4·50%	2400	390	34	25	4	135	50 / 14	9 / 5300	<10 / <10	Dump float. Chloritised volc ± 30% py, 5% cp.
12937			Grab	0·63		3·50%	720	440	18	40	<4	50	22 / 6	12 / 1800	<10 / <10	Dump float. chloritised silif volc ± 15% py > cp.
12940			Grab	<0·01		410	20	1100	3	370		2100				o/c. Clasts of massive py ± trace sp, cp, in silif volc
41			Grab	0·12		44	120	85	4	1050		280				o/c. Deformed massive py band ± trace gn
42			Grab	0·36		150	580	105	46	710		2200				o/c. Deformed massive py band 60mm thick in qtz-porp
12943			Grab	<0·01		26	185	24	3	650		2650				o/c. Qtz-porphyry ± 1-2% py + minor arsenopy.
12950			160-150mE	<0·01		5	18	12	<1	700		32				o/c weakly alt qtz-phyric volcaniclastic. Minor lim
51			150-140mE	<0·01		7	8	16	<1	550		8				o/c Wkly alt qtz-phyric volcaniclastic. Trace py.
52			140-134mE	<0·01		5	18	75	<1	560		20				o/c Felsic xyl-lithic epiclastic ± minor py.
53			103-160mE	<0·01		10	55	26	<1	470		46				o/c. Deformed volcaniclastic ± massive py bands.
54			100-90mE	<0·01		12	400	70	2	480		100				o/c. Qtz-porphyry ± 2% py incl py bands.
12955			90-80mE	<0·01		7	980	20	1	410		460				o/c Qtz-porphyry ± 1-2% py, minor py bands.
56			80-70mE	<0·01		8	110	20	<1	420		38				o/c Qtz-porphyry ± 1-2% py.
57			70-60mE	<0·01		3	22	14	<1	400		16				o/c Qtz-porphyry ± 1-2% py.
58			60-50mE	<0·01		3	16	30	<1	500		7				o/c Qtz-porphyry ± 1-2% py.
59			50-40mE	<0·01		4	10	16	<1	620		18				o/c Qtz-porphyry ± 1-2% py
12960			40-30mE	<0·01		10	12	16	<1	670		20				o/c Qtz-phyric volc ± qtz-ankerite veins
61			30-20mE	<0·01		3	8	38	<1	910		3				o/c Qtz-phyric volcaniclastic, minor py.
62			20-10mE	<0·01		3	8	26	<1	710		9				o/c Qtz-phyric pervicous volcaniclastic. Minor py.
12963			10-00mE	<0·01		7	26	14	<1	530		970				o/c qtz-phyric volcaniclastic, mod silif.

* Additional Assays:	Cd	Hg
7948	840	22·0
7949	32	0·73

REMARKS: First gold analysis by 50gm fire assay. Repeat gold analyses by 30gm aqua regia.

960498

SAMPLE RECORD

Sheet 3 of ___.

METALS DIVISION

PLE TYPE: ROCK CHIPS | LOCATION / PROJECT: CUTTY SARK, MT BLACK PROJECT | SAMPLER: J.G. PURVIS | DATE: JUNE 1986 | MAP / PHOTO REF: ___

SSAY LAB: COMLABS | SAMPLE DESPATCH: 11510, 11511 | ASSAY REPORT NOS: COM 860937, COM 861205, COM 861641

ORDER NO: 11519 | SAMPLE STORAGE: DEVONPORT, TASMANIA

505

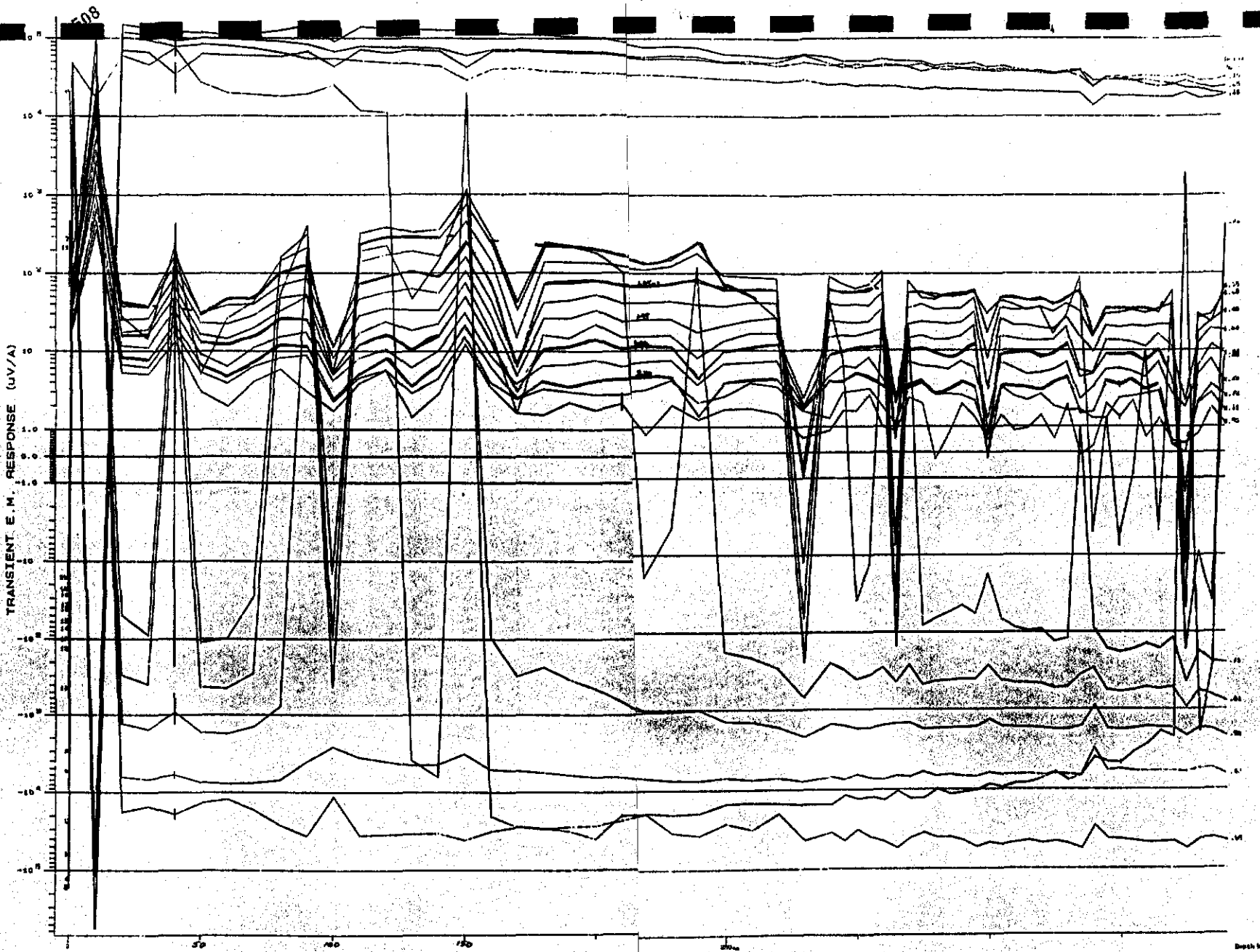
SAMPLE No.	LOCATION (AMG) NORTH	LOCATION (AMG) EAST	INTER'L (m)	ANALYSES Au	Au (Rpt)	Cu	Pb	Zn	Ag	Ba	As	DESCRIPTION
2964			00-10mW	<0.01		4	28	22	<1	680	5	dc. Qtz-xyl-lithic vdc, mod silif ± minor py
65			10-20mW	<0.01		2	8	22	<1	550	12	dc. " " " " " " "
66			20-30mW	<0.01		4	70	390	<1	560	24	dc. As above to 28.5m, then less if clarity sedc.
67			30-40mW	<0.01		32	310	310	1	770	105	dc. Tuff-shale to 32m, then silif vdc ± minor py.
68			40-50mW	<0.01		26	10	32	<1	610	3	dc. Qtz-phyric volcaniclastic. Silif ± minor py.
69			50-60mW	0.01		2	16	26	<1	590	4	dc. " " " " " " "
12970			60-70mW	<0.01		3	8	16	<1	560	4	dc. Silic vdc-tuffaceous. Minor py + qtz veins.
71			70-80mW	<0.01		<2	10	14	<1	750	<2	dc. " " " " " " "
72			80-90mW	<0.01		3	22	12	<1	960	12	dc. Fine silic volcaniclastic ± some tuff-sedst.
73			90-100mW	<0.01		4	30	34	<1	990	32	dc. Silic tuff-sedst and vdc sst. Sev % py.
74			100-110mW	<0.01		5	10	36	<1	720	16	dc. Silif qtz-phyric volcaniclastic. Sev % py.
12975			110-120mW	<0.01		3	8	14	<1	610	7	dc. " " " " " " "
76			120-127mW	<0.01		7	10	16	<1	750	8	dc. " " " " " " "
77			285-32mW	0.10		75	1450	640	5	750	340	dc. Tuffaceous argillite ± 2-3% py + minor sph
12978			Grab	0.04		7	80	55	<1	730	10	dc. Silic felsic vdc ± minor disseм py
12991			5m	<0.01		7	10	10	1	1000	4	dc. Tuffaceous chert + tuff-shale. Minor lim stains
12875			Grab	0.04		42	1200	145	<1		75	Sub dc. Highly limonite stained disrupted black shale.
12876			Grab	0.02		6	85	190	<1		10	dc. Felsic volcaniclastic ± lim stains + pits after py.

EMARKS: Gold analyses by 50 gm fire assay.

9604996

APPENDIX XII

SIROTEM Down Hole Survey CS1



SHELL COMPANY OF AUSTRALIA
TASMANIA
(JOB NO.632A) CUTTY SARK.
DH CS-1 EARLY TIMES 700X800 m
SIROTEM Survey by SOLO Geophysics & Co. 23/ 5/88
SOLO hole ref.701 Reading interval 1.0 m
SCALE 1 : 1000 Loop size : 700 m
LOOP configuration , Drill hole
Plotted : 4.01 PM 20/ 6/88

Loop diagram

SOLO

5 cm

960501

APPENDIX XIII

South Hercules - Drill Re-logs H1102, H1103

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

HEADING SHEET

511

COLLAR INFORMATION

DATA TYPE	COLLAR CO-ORDINATES EASTING	NORTHING	ELEVATION	COLLAR SURVEY AZIMUTH	DIP	HOLE NAME	TOTAL DEPTH	HOLE TYPE	DESC CODE	REMARKS
AMG	765811·7	6552273	962·3	279	-45	H1102	151·0			

PROJECT MT BLACK, TASMANIA	HOLE NAME H 1102
LOGGED BY J.G. PURVIS	TOTAL DEPTH 151·0m
CONTRACTOR	RIG
CREW	DATE STARTED 30·1·86 FINISHED 6·2·86
CORE STORAGE: Nº OF TRAYS / LOCATION: EZ, ROSEBERY	SAMPLE STORAGE
M&P LAB	ASSAY LAB COMLABS (SHELL SAMPLES)

SURVEY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	AZIMUTH	DIP	REMARKS
				FOR MAGNETIC BEARING SUBTRACT 12°
21·5	62·5	277°	-44°	READING TAKEN AT 43m.
62·5	101·0	274·5°	-38°	READING TAKEN AT 82m.
101·0	134·0	270°	-29·5°	READING TAKEN AT 120m.
134·0	151·0	266°	-23·5°	READING TAKEN AT 148m.

PLOTTING KEY

SYMBOL DES. CODE	SYMBOL G/LOG	INTERVAL FROM	INTERVAL TO	SYMBOL DES. CODE	SYMBOL G/LOG	INTERVAL FROM	INTERVAL TO

DESC.	SIZE	FROM	TO	TOTAL	REMARKS
NON CORE	HQ	0	3·0m	3·0m	
CORE	HQ	3·0	19·2m	15·2m	
	NQ	19·2	151·0m	132·8m	
	BQ				
CASING					
CASING LEFT					(S) steel (P) plastic

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE Nº	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG

DRILLING OBJECTIVES / SUMMARY: TO TEST SOUTHERN EXTENSION OF DUNNS SHAFT GOLD ZONE IN HERCULES HOST ROCKS

REPORT REFERENCE :

SHEET 1 OF 4

960503

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET
CONTINUATION SHEET

* SAMPLES PREFIXED 56 AND 66 TAKEN BY EZ, ANALYSED BY ANALABS

PROJECT	MT. BLACK, TASMANIA	HOLE NAME	H 1102
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	151.0m

512

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	Au	Cu	Pb	Zn	Ag	Ba	As	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
3.00	5.00	0.02	22	155	210	4	3450	125	13055			NQ		
5.00	7.00	<0.01	26	125	220	3	2350	510	13056			NQ		
7.00	9.00	<0.01	32	290	390	4	2350	220	13057			NQ		
9.00	11.00	<0.01	26	230	300	3	1350	160	13058			NQ		
11.00	13.00	<0.01	16	95	220	2	1350	110	13059			NQ		
13.00	15.00	<0.01	16	60	175	2	1000	105	13060			NQ		
15.00	17.00	<0.01	10	42	115	2	11100	80	13061			NQ		
17.00	18.20	<0.01	7	26	105	1	11150	18	13062			NQ		
18.20	20.00	<.008	15	40	85	1.0			56483*			NQ		
20.00	23.00	0.008	10	20	60	0.5			56484			NQ		
23.00	26.00	<.008	5	15	45	0.5			56485			NQ		
26.00	29.00	<.008	5	10	50	0.5			56486			NQ		
29.00	32.00	0.017	10	15	50	0.5			56487			NQ		
32.00	35.00	0.008	5	20	45	0.5			56488			NQ		
35.00	38.00	<.008	10	10	40	<0.5			56489			NQ		
38.00	41.00	0.008	10	15	40	<0.5			56490			NQ		
41.00	44.00	<.008	5	20	55	<0.5			66121			NQ		
44.00	47.00	<.008	10	10	50	<0.5			66122			NQ		
47.00	50.00	<.008	5	10	35	<0.5			66123			NQ		
50.00	52.00	<0.01	3	12	28	1	900	4	13063			NQ		
52.00	54.00	<0.01	2	10	32	1	1700	<2	13064			NQ		

DESCRIPTIVE LOG

0 – 3.0m: NO CORE

3.0 – 14.25m: FELDSPAR-CRYSTAL TUFF WITH BANDS OF TUFFACEOUS SHALE AND SILTSTONE

Grey, med gr, mod soft + broken, ± oxidation.
Felt xyls / gen ± rounded and cleanly resorbed, av 1-3mm, in Tuff-shale matrix which is highly sulphidic in places.
Tuff shale + siltstone occur as interbeds and at clasts within xyl-Tuff. These clasts have irreg margins + clearly were soft when incorp into xyl Tuff.
Bedding: 73°/LCA ⊃ 4.5m (tuning downhole). At 6m Bed in xyl Tuff ± bedding partly transgressed into schistosity.
Bedding / 20°/LCA ⊃ 6.7m; 80°/LCA ⊃ 12.8m.
Unit weakly sericitised, mod schistose: 50°/LCA ⊃ 4m; 57°/LCA ⊃ 10m.
5% fi gr ditrom py - conc into Tuff-shale matrix + interbeds, semi-massive in places. Trace sp-gn.
Transitional contact at base.

14.25 – 29.10m: FELDSPAR-CRYSTAL TUFF AND CHERTS

Light grey, med gr, similar to above except siliceous and more massive.
Minor interbeds of grey Tuff-siltstone and tuffaceous chert - latter common 19 - 22.5m, and gen irreg + disrupted.
Weakly sericitised and carbonatised (v. strong carb to 16m).
Matrix inc cherty or silif ± dedol.
Numerous small lithics and qdeo frags. Some well-rounded chert clasts above 16m.
Bedding: 63°/LCA ⊃ 22.4m.
14.25 – 22.5m: 2% py (patchy); 22.5 – 29.1m: 1% py.
Basal contact bedding 70°/LCA.

29.1 – 41.1m: DISRUPTED CHERTY TUFFACEOUS SEDIMENTS

Pale grey. Same feld-xyl Tuff as above, but shot through with a highly irreg confused mass of delicately-edged bands, pods + 'clasts' of grey cherty silica. Some show tuning, banding // to margins.
Strong sericitisation of xyl Tuff matrix ± patchy strong silif - chalc silica often banded and chalcedonic (different in appearance to the cherty silica).
Occ small fi gr lithics to 12mm below 35m.
Bedding: 70°/LCA ⊃ 37m. Strongly schistose (55°/LCA ⊃ 34m).
V minor fi gr disseminated py.
NB: No veining of any sort.
Basal contact a 100mm wide shear // schistosity ⊃ 65°/LCA.

41.1 – 57.15m: FINE GRAINED FELSIC VOLCANICLASTIC

Grey, fi - med gr, mod soft - not silic (except 43.1 – 43.4m where there is disrupted cherty Tuff as in above unit).
Uniform sandy text. Deformed carbonatised felt xyls, 1-3mm evenly dispersed in vitric Tuff matrix. Abund ± indistinct

960504

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

* SAMPLES PREFIXED 56 AND 66 TAKEN BY EZ, ANALYSED BY ANALABS

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK, TASMANIA	HOLE NAME	H 1102
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	151.0m

513

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	Au	Cu	Pb	Zn	Ag	Ba	As	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
54.00	56.00	<0.01	5	34	34	1	800	<2	13065			NQ		
56.00	58.00	<0.01	2	10	38	1	700	2	13066			NQ		
58.00	60.00	<0.01	2	6	26	1	770	<2	13067			NQ		
60.00	62.00	<0.01	20	48	195	1	720	9	13068			NQ		
62.00	64.00	<0.01	3	125	195	1	930	<2	13069			NQ		
64.00	66.00	<0.01	<2	135	70	<1	1200	10	13070			NQ		
66.00	69.00	0.017	465	3550	7550	9.0			56491			NQ		
69.00	72.00	0.008	130	1350	3200	5.0			56492			NQ		
72.00	75.00	0.040	150	2100	4300	11.0			56493			NQ		
75.00	78.00	0.137	250	4300	7100	14.0			56494			NQ		
78.00	81.00	0.025	100	1500	3500	7.0			56495			NQ		
81.00	84.00	0.032	290	1700	3900	6.5			56496			NQ		
84.00	87.00	0.246	205	2550	7000	7.0			56497			NQ		
87.00	90.00	0.008	50	375	725	<0.5			66124			NQ		

ASSAY INFORMATION

DESCRIPTIVE LOG

glass frags and rare lithics, av 2-4mm, max 10mm.
Mod-strongly sericitised and schistose. Minor chlor-some in veinlets. Mod carbonatisation, locally strong.
Schistosity: 50°/LCA @ 53.5m; 60°/LCA @ 57.15m.
Minor dissem py.

57.15 – 66.0m: TUFFACEOUS FELSIC VOLCANIC (EPICLASTIC?)
Pale greenish-grey, fi-med gr. Sim to above unit but finer gr and changes in grainsize and text suggest primary reworking and bedding.
Common carbonatised fold (finer and smaller than above).
Glass shards to 7mm
Mod-strongly sericitised and carbonatised. Common carb nodules 2-3mm, max 20mm. Mpo carb patches + veinlets. Minor chlor-some in veinlets
Qtz>carb veins to 50mm 58.5-60.5m, centered on shear 60.2-60.3m.
Strongly schistose: 53°/LCA @ 62m.
57.15-60.8m: Trace py; 60.8-62m: 1-2% dissem py.
62-66m: Minor to locally 1% py, trace sp.

66.0 – 67.55m: SHEARED ZONE
Creamy grey sheared, schistose and broken TUFF-SHALE, TUFFACEOUS VOLCANIC (as above), and partly recrystallised TUFFACEOUS CHERT
Strongly sericitised. Schistosity 62°/LCA.
2-3% py, 1% sp-gn-cp, dissem + in fluid qtz-carb stringers/silicified conc in chert bands which are up to 100mm.
Hng zone at base 20°/LCA. Sev puggy shears in basal 0.5m.

67.55 – 84.5m: QUARTZ SCHIST AND QUARTZ-SERICITE SCHIST AFTER ALTERED TUFFACEOUS SEDIMENTS
Creamy-grey, fi gr. Originally tuffaceous sediments, now very strongly sericitised, silicified, bleached and schistose.
Tne schistosity dips from 78-81m rock is a qtz schist with minor sericitic partings.
Common carb at top of unit - xylitic nodules (av < 3mm) some aggregating into patches up to 40mm. Occ veins of pale pink carb to 10mm. Carb def markedly below 75m where incipient qtz-augen text appears.
Schistosity: 50°/LCA @ 72m; 62°/LCA @ 80m.
67.55 – 68.4m: 3% sp-gn > cp, dissem, conc in carb. 5-7% py.
68.4 – 71m: 1-2% sp-gn > cp dissem. 5% py dissem.
71 – 84.5m: 2-3% sp-gn > cp (locally 5%), 2% py. Med-coarse gr, some sulph in aggregates to 30mm, some in stringers.
Basal contact rather arbitrary.

84.5 – 151.0m: AUGEN-TEXTURED QUARTZ-SERICITE SCHIST AFTER SILICIFIED TUFFACEOUS VOLCANIC SEDIMENTS (?)
Pale creamy-grey, hard, fi gr.

960505

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

* SAMPLES PREFIXED SG TAKEN BY EZ, ANALYSED BY ANALABS

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK, TASMANIA	HOLE NAME	H 1102
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	151.0m

514

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	Au	Cu	Pb	Zn	Ag	Ba	As	SAMPLE No	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
90.00	92.00	<0.01	18	70	42	<1	650	6	130711			NQ		
92.00	94.00	<0.01	8	42	40	<1	470	8	130712			NQ		
94.00	96.00	<0.01	14	95	105	1	570	8	130713			NQ		
96.00	98.00	<0.01	48	1300	440	2	430	<2	130714			NQ		
98.00	100.00	<0.01	30	860	1050	1	540	<2	130715			NQ		
100.00	102.00	<0.01	8	680	450	1	530	<2	130716			NQ		
102.00	104.00	<0.01	14	390	480	<1	480	<2	130717			NQ		
104.00	106.00	<0.01	80	650	1900	1	540	<2	130718			NQ		
106.00	109.00	0.008	150	2150	1800	2.0			564916			NQ		
109.00	112.00	0.008	20	1750	3250	2.0			564917			NQ		
112.00	114.00	<0.01	12	380	660	1	560	2	130719			NQ		
114.00	116.00	<0.01	6	160	290	1	660	4	130720			NQ		
116.00	118.00	<0.01	18	200	520	1	670	6	130811			NQ		
118.00	120.00	<0.01	140	300	910	1	520	2	130812			NQ		
120.00	122.00	<0.01	32	570	400	2	520	<2	130813			NQ		
122.00	124.00	<0.01	22	390	350	3	480	2	130814			NQ		
124.00	125.50	<0.01	70	900	820	2	490	<2	130815			NQ		
125.50	126.50	0.017	165	3200	5450	3.0			565001			NQ		
126.50	129.00	<0.01	105	1050	770	1	440	<2	130816			NQ		
129.00	131.00	<0.01	22	160	65	1	540	2	130817			NQ		
131.00	133.00	<0.01	10	75	48	1	550	7	130818			NQ		
133.00	135.00	<0.01	5	26	16	1	520	20	130819			NQ		
135.00	137.00	<0.01	5	65	24	1	640	12	130820			NQ		
137.00	139.00	<0.01	28	80	18	1	730	5	130911			NQ		
139.00	141.00	<0.01	8	60	160	1	700	34	130912			NQ		
141.00	143.00	<0.01	5	280	360	1	730	20	130913			NQ		
143.00	145.00	<0.01	14	370	880	2	730	9	130914			NQ		
145.00	147.00	<0.01	24	330	400	1	680	12	130915			NQ		
147.00	149.00	<0.01	2	50	30	1	810	8	130916			NQ		
149.00	151.00	<0.01	<2	6	22	1	810	6	130917			NQ		

DESCRIPTIVE LOG

Strongly altered and schistose. Alt: sericitisation, silic and bleaching. Silic intense below 140m.
Qtz augen to 10mm, in matrix gen more sericitic than silic.
Orig rock gen unidentifiable but from 120–135m rock is a fine ash appears volcaniclastic, sediment & small deformed lithics, fold xyls and layering bedding visible @ 131m (60°/LCA) and 133.2m (68°/LCA). Elsewhere rock is mod banded & small vitric streaks are <5mm (glass shards?)
Abund carb nodules are <10mm, max 20mm, esp above 99–117m. Sparse below 138m. Many pale pink (rhodocrosite?) often contain sp-gn. Some carbonatisation. Veinlets of carb ± qtz. Minor pale green fluorite in thin veinlets around 108.5m.
Below 140m silic intense and rock fabric inc disrupted and brecciated (approaching stockwork?). Common pink alb & xyls below 149.8m and trace chlorite.
Schistosity: 60°/LCA @ 91m; 65°/LCA @ 101.5m; 63°/LCA @ 118.2m); 70°/LCA @ 132m; 75°/LCA @ 146.2m.
92.5–92.8m: broken leached zone 35°/LCA sub // schistos.
84.5–88m: 2–3% sp-gn>cp. 1–2% py. Dissem.
88–96.75m: 1% py, minor sp-gn.
96.75–112m: 1% sp-gn>cp, 1% py Dissem & in carb veinlets.
112–128.5m: 1% py, minor sp-gn.
128.5–146.5m: 1% py
146.5–151m: V minor py.

END OF HOLE

SHEET 4 OF 4

960506

515

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

HEADING SHEET

COLLAR INFORMATION

DATA TYPE	COLLAR CO-ORDINATES EASTING	NORTHING	ELEVATION	COLLAR SURVEY AZIMUTH	DIP	HOLE NAME	TOTAL DEPTH	HOLE TYPE	DESC CODE	REMARKS
AMG	376426	5365 53	962	270°	-45°	H1103	142.0			

PROJECT MT BLACK, TASMANIA	HOLE NAME H 1103
LOGGED BY J.G. PURVIS	TOTAL DEPTH 142.0 m
CONTRACTOR	RIG
CREW	DATE STARTED 7.2.86 FINISHED 14.2.86
CORE STORAGE: Nº OF TRAYS / LOCATION: EZ, ROSEBERY	SAMPLE STORAGE
M & P LAB	ASSAY LAB COMLABS (SHELL SAMPLES)

DESC.	SIZE	FROM	TO	TOTAL	REMARKS
NON CORE	HW	0	3	3	
CORE	HQ	3	24	21	
	NQ	24	142	118	
	BQ				
CASING					
CASING LEFT					(S) steel (P) plastic

SURVEY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	AZIMUTH	DIP	REMARKS
				FOR MAGNETIC BEARING SUBTRACT 12°
15.0	50.0	268°	-44°	READING TAKEN AT 30m.
50.0	88.0	268.5°	-42.5°	READING TAKEN AT 70m.
88.0	123.0	268°	-40.7°	READING TAKEN AT 106m.
123.0	142.0	267°	-38.5°	READING TAKEN AT 140m.

PLOTTING KEY

SYMBOL DES. CODE	SYMBOL G/LOG	INTERVAL FROM	INTERVAL TO	SYMBOL DES. CODE	SYMBOL G/LOG	INTERVAL FROM	INTERVAL TO

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE Nº	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG

DRILLING OBJECTIVES / SUMMARY: TO TEST SOUTHERN EXTENSION OF DUNNS SHAFT GOD ZONE IN HERCULES HOST ROCKS.

REPORT REFERENCE :

SHEET 1 OF 4

960507

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

* SAMPLES PREFIXED 56 TAKEN BY EZ, ANALYSED BY ANALABS

PROJECT	NT BLACK, TASMANIA	HOLE NAME	H 1103
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	142·0m

516

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	Au	Cu	Pb	Zn	Ag	Ba	As	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
															0–3m: NO CORE
3·00	5·00	<0·01	24	290	100	1	570	65	13001			HQ			3–6·5m: TUFFACEOUS SILTSTONE
5·00	7·00	<0·01	22	510	160	1	980	125	13002			HQ			Grey, fi gr, uniform. Mod soft. Broken, mod oxidised. Bedding @ 5·5m 15°/CA. Trace dissem py. Limonite on fractures. Broken contact at base.
7·00	9·00	<0·01	6	100	75	1	1250	36	13003			HQ			6·5–19·4m: FELDSPAR CRYSTAL TUFF
9·00	11·00	<0·01	2	40	80	1	1300	14	13004			HQ			An epiclastic – cleanly reworked above 10m & several interbeds of tuffaceous siltstone. Bedding 90°/CA @ 9·4m.
11·00	13·50	<0·01	2	22	100	<1	940	14	13005			HQ			Grey & brown fe-ox stains. Med gr.
13·50	15·50	<0·01	<2	20	70	<1	1050	8	13006			HQ			Badly broken, oxidised, mod soft.
15·50	17·50	<0·01	<2	20	65	<1	1000	6	13007			HQ			Feld xyls av 2–3mm, some euhedral, in silty tuffaceous matrix mx; weakly sericitised. Some variation in feld xyl abundance.
17·50	19·70	<0·01	3	22	70	<1	1150	34	13008			HQ			Some lgk green qtz H shards to 4mm
															wk–mod schistosity (65°/CA @ 16·5m). Patchy wk silif.
															Minor py, trace sp
															Broken basal contact.
19·70	22·00	<·008	5	45	85	<0·5			56516*			HQ			19·4–53·9m: DISRUPTED CHERTY TUFFACEOUS SEDIMENTS
22·00	24·00	<·008	5	20	65	<0·5			56517			HQ			In places, esp below 30m, looks like Rosebery Host Rocks.
24·00	27·00	<·008	5	25	60	<0·5			56518			NQ			Grey, fi gr, hard.
27·00	30·00	<·008	5	25	55	<0·5			56519			NQ			Disrupted irreg delicate-edged bands, pods and clasts of grey tuffaceous chert and pale to feldspar xyl tuff. Occasional, finely-interpolated chert and xyl tuff that has been highly disturbed, distorted & much flowage and brecciation. Disruption prob soft-sed or diagenetic (pre-lithification).
30·00	33·00	<·008	5	95	70	<0·5			56520			NQ			
33·00	36·00	0·025	10	90	125	<0·5			56527			NQ			
36·00	38·00	<0·01	9	60	70	1	1550	7	13009			NQ			
38·00	40·00	<0·01	14	70	125	<1	1300	10	13010			NQ			
40·00	42·00	<0·01	7	110	125	1	1050	24	13011			NQ			
42·00	44·00	0·08	36	360	530	4	1150	22	13012			NQ			Strongly sericitised bleached strongly schistose (55°/CA @ 38·2m; 65°/CA @ 42m; 60°/CA @ 53m)
44·00	46·00	<0·01	95	1400	1800	7	880	40	13013			NQ			Nodules & carb to 8mm 30–42m, minor carb elsewhere.
46·00	48·00	0·03	24	310	370	3	900	44	13014			NQ			19·4–24m: Minor py. 24–36m: 1–2% v.fi gr dissem py
48·00	50·00	0·03	20	220	340	2	770	34	13015			NQ			36–39m: Trace py. 39–50m: 2% dissem py, 1% sp-gn,
50·00	52·00	0·17	14	160	195	3	620	32	13016			NQ			trace cp. 50–53·9m: 1% py, minor sp-gn-cp.
52·00	54·00	0·175	20	310	410	3·5			56521			NQ			Basal contact sharp, 75°/CA.
															SILICEOUS
54·00	56·00	0·220	30	400	510	3·5			56522			NQ			53·9–60·4m: STRONGLY ALTERED TUFFACEOUS SEDIMENT
56·00	58·00	0·100	20	1300	2100	12·5			56523			NQ			Pale creamy-khaki. V fi gr + uniform. Hard – a vitric and silicious rock now strongly schistose and sericitised.
58·00	60·00	0·008	20	600	360	4·0			56524			NQ			Abund carb 'spots', av 1+2mm, max 6mm, many & sp-gn conc in thyn. 56–58·7m: carb 'spots' totally replaced by silphidic; below 58·7m 'spots' largely replaced by chlorite.
															53·9–55·5m: 1% py, minor sp-gn; 55·5–58·7m: 2–3% py, minor sp-gn; 58·7–60·4m: Minor py, rare sp-gn.
															Transitional contact at base.
															60·4–75·2m: FINE FELSIC VOLCANICLASTIC
															Pale greenish-grey. fi–med gr. Mottled and 'flecked' rock.

ASSAY INFORMATION

SHEET 2 OF 4

960508

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

* SAMPLES PREFIXED 56 TAKEN BY EZ, ANALYSED BY ANALABS

PROJECT	MT BLACK, TASMANIA	HOLE NAME	H 1103
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	142.0m

517

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	Au	Cu	Pb	Zn	Ag	Ba	As	SAMPLE NO	CORE ANGLE	ROCK TYPE	CHAMP	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
60·00	62·00	0·03	2	65	75	2	780	14	130117			NQ			Looks similar to unit beneath but is leaser altered.
62·00	64·00	0·03	2	46	40	<1	830	22	130118			NQ			Flattened glass shards to 5mm + fi gr cherty lithics to 10mm
64·00	66·00	0·02	<2	38	55	1	740	6	130119			NQ			- mostly angular, all // schistosity in tuffaceous matrix.
66·00	68·00	0·01	<2	24	28	1	910	30	130120			NQ			Mod / strongly sericitised, weakly chloritised. Weakly
68·00	70·00	0·01	<2	24	36	1	790	30	130121			NQ			silif below 70m. Minor chlor + carb veinlets. Aft inc ē
70·00	72·00	0·01	<2	20	22	<1	670	14	130122			NQ			depth. Strongly schistose (60°/LCA @ 62·5m).
72·00	74·00	<0·01	2	12	18	<1	830	7	130123			NQ			Minor fi gr dissem py - locally 1%. Rare sp-gn.
74·00	76·00	0·02	4	14	22	<1	850	<2	130124			NQ			Transitional basal contact.
76·00	78·00	0·01	<2	10	12	<1	720	<2	130125			NQ			75·2 – 103·1m: AUGEN-TEXTURED QUARTZ > SERICITE SCHIST
78·00	80·00	0·02	<2	8	14	<1	790	2	130126			NQ			Pale creamy-grey.
80·00	82·00	0·01	2	12	12	1	760	3	130127			NQ			Strongly schistose, highly altered unidentifiable volc.
82·00	84·00	0·04	2	22	24	<1	730	6	130128			NQ			Intensely sericitised, strongly silif, bleached and
84·00	86·00	0·06	5	70	135	2	700	12	130129			NQ			carbonatised / common 'spots' and patches of carb to
86·00	89·00	0·167	15	65	40	1·5			565255*			NQ			20mm esp 80–88m + 98·5–103·1m. Deformed
89·00	92·00	0·040	30	100	45	1·0			565256			NQ			carbonatised feld xyls visible below 100m. Small green
92·00	94·00	0·15	46	250	420	1	770	10	130130			NQ			voids prob after glass.
94·00	96·00	0·73	34	170	140	2	740	22	130131			NQ			Oft augen to 25mm, rounded + gen ē indistinct margins.
96·00	98·00	0·16	12	85	32	1	860	10	130132			NQ			Schistosity: 65°/LCA @ 77m; 65°/LCA @ 94m.
98·00	100·00	0·08	8	55	24	1	840	14	130133			NQ			75·2 – 86m: Minor py; 86–97·5m: 1–2% py. Dissem ē some in
100·00	102·00	0·03	3	20	12	1	850	6	130134			NQ			thin veinlets or coat in gr augen. Minor sp-gn (assoc ē carb).
102·00	104·00	0·02	4	16	10	1	980	14	130135			NQ			97·5 – 103·1m: Minor py / Rare fichsite below 95m.
															Transitional basal contact.
104·00	106·00	0·07	120	150	40	3	990	18	130136			NQ			103·1 – 105m: SILICEOUS TUFFACEOUS SEDIMENT
															Pale creamy-grey. Fi gr.
															Strongly schistose and sericitised. Mod silif + bleached.
															Some small carb 'spots' - prob alt feld xyls. Minor qtz-carb
															veining.
															Some indistinct banding and textural changes suggestive
															of orig bedding (60°/LCA @ 103·7m). Basal contact bedding 64°/LCA.
															Minor dissem py.
106·00	108·00	0·05	7	40	8	1	840	8	130137			NQ			105 – 114·85m: QUARTZ-SERICITE SCHIST WITH SOME
108·00	110·00	<0·01	<2	16	14	<1	860	7	130138			NQ			QUARTZ-AUGEN TEXTURE
110·00	112·00	<0·01	2	12	18	1	1150	5	130139			NQ			Appears altered felsic tuffaceous volcaniclastic.
112·00	114·00	<0·01	<2	10	16	<1	1100	3	130140			NQ			Pale cream fi-med gr.
															Strongly sericitised, bleached + schistose. Mod silif and
															carbonatised. Abund carb 'spots' 1–3mm after deformed
															felds. Minor qtz-carb veinlets.
															Abund dk green streaks up to 50mm after glass / poss
															pumice. Incipient siliceous augen text. Occ indistinct
															poss R qr silic lithics.
															Rock strongly lineated ē vague banding // schistosity.
															Schistosity: 65°/LCA @ 107m.
															Minor to 1% dissem py.
															Transitional basal contact.
															114·85 – 126·5m: ALTERED FELSIC VOLCANICLASTIC
															Appears to be same rock type as above but alt to less and

SHEET 2 OF 4

960509

518

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	MT BLACK, TASMANIA	HOLE NAME	H 1103
LOGGED BY	J.G. PURVIS	TOTAL DEPTH	142·0m

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	Au	Cu	Pb	Zn	Ag	Ba	As	SAMPLE Nº	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
114·00	116·00	<0·01	<2	10	24	<1	1050	6	13041			NQ		
116·00	118·00	0·02	<2	12	32	<1	1050	4	13042			NQ		
118·00	120·00	0·02	<2	10	22	<1	1000	8	13043			NQ		
120·00	122·00	0·08	<2	10	16	<1	1100	3	13044			NQ		
122·00	124·00	0·34	<2	14	20	<1	1050	3	13045			NQ		
124·00	126·00	<0·01	<2	10	22	<1	1300	<2	13046			NQ		
126·00	128·00	<0·01	<2	12	24	<1	1000	<2	13047			NQ		
128·00	130·00	<0·01	<2	6	20	<1	770	5	13048			NQ		
130·00	132·00	<0·01	2	4	18	<1	650	5	13049			NQ		
132·00	134·00	<0·01	2	10	16	<1	640	<2	13050			NQ		
134·00	136·00	<0·01	3	8	16	<1	700	4	13051			NQ		
136·00	138·00	<0·01	<2	10	16	<1	770	2	13052			NQ		
138·00	140·00	<0·01	2	12	18	<1	820	2	13053			NQ		
140·00	142·00	<0·01	<2	10	24	<1	660	3	13054			NQ		

DESCRIPTIVE LOG

dec c depth.
Pale greenish-grey, fi-med gr.
Mod-strongly sericitised, mod silic, weak chlor + bleaching.
Vague gtz/augen text in places at top of unit.
Abund strongly carbonatised feld xyls 1-3mm deformed by schistosity at top of unit becoming euhedral below 121m where some/are pink (albite?)
Fgr siltic lithics av 5-10mm, max 30mm. Inc c depth -gen equant + subangular. Some pink (albitised lava?)
Numerous chloritic wisps after glass (pumice). These contain feld xyls. Below 121m some are fairly equant. Av < 30mm.
Schistosity 62°/LCA @ 122m. Minor chlor veinlets.
V (minor) dissem py.
Transitional basal contact.

126·5 - 142m: INTENSELY SILICIFIED AND DEFORMED PELSIC VOLCANICLASTIC.
Could be same rock type as above. Texture largely obliterated by intense silic + strong schistosity and some brecciation.
Greenish-grey. V hard, mgd gr.
Mod sericitisation, chloritisation and carbonatisation.
Weak pink albitisation in places.
Abund, gen deformed, feld xyls 2-5mm gen replaced by qtz. Some pink albite.
Dk lithics, some equant, to 50mm av < 20mm. Some glass frags.
Numerous veinlets chlor ± carb. Some chlor as matrix to breccia zones // schistosity and at Lt to schistosity.
Schistosity: 50°/LCA @ 130m; 52°/LCA @ 141·5m.
126·5 - 130m: No sulphides.
130 - 142m: Minor py - often core in lithics.

END OF HOLE

SHEET 4 OF 4

9960510

APPENDIX XIV

South Hercules - Rock Chip Sampling Results

960512

SAMPLE RECORD

METALS DIVISION

SAMPLE TYPE: ROCK CHIPS LOCATION / PROJECT: SOUTH HERCULES, MT BLACK PROJECT SAMPLER: J.G. PURVIS DATE: JULY 1986 MAP / PHOTO REF: 5921

ASSAY LAB: COMLABS SAMPLE DESPATCH ORDER NO: 11511, 11512, 11513, 11514, ASSAY REPORT NOS: COM 861205, COM 861240, COM 861384 SAMPLE STORAGE: DEVONPORT, TASMANIA

SAMPLE No.	LOCATION (AMG)		INTERVAL (m)	ANALYSES Au	Au (Rpt)	Cu	Pb	Zn	Ag	Ba	As	DESCRIPTION
12979	For locations		Grab	<0.01		12	18	12	1	180	230	Dump float. Alt felsic volc ± sulph stains.
12980	see plan		Grab	<0.01		10	1.43%	2.50%	26	570	5	Dump float. Gossanous limonite veins
81			Grab	0.02		70	3450	250	16	250	2400	Dump float. Silif felsic volc ± limonite veins
82			Grab	<0.01		16	880	30	9	440	1050	Dump float. Silif felsic volc ± sulph stains.
83			5m chip	<0.01		5	105	95	<1	710	26	Qfc. Altered tuff ± minor limonite stains
84			Grab	<0.01		3	34	48	<1	770	12	Qfc. Qtz-phyric volcaniclastic ± lim stains.
12985			Grab	<0.01		10	18	22	<1	50	14	Dump float. Weakly limonitic vein qtz.
86			Grab	<0.01		38	9200	1.05%	16	590	3	Dump float. Mod silif felsic volc ± sponge vein
87			Grab	0.06		1850	2550	930	680	390	2300	Dump float. Silif felsic volc ± dissem sp-gn
88			Grab	<0.01		70	4100	1.07%	4	110	60	Qfc. 30mm vein of qtz + massive Fe oxide
89			Grab	<0.01		480	1000	1350	2	35	20	Dump float. 250mm vein of qtz + Fe oxid
12990			Grab	<0.01		70	200	270	2	310	34	Qfc. 1-2.5m vein of qtz ± minor Fe oxide
12992			Grab	<0.01		24	220	210	2	540	28	Qfc. Fi or vitric volc ± lim after sulphides
93			Grab	<0.01		12	32	300	1	370	12	Qfc. Silty silif vitric volc ± lim after sulph.
94			4m chip	0.26		24	85	260	16	700	30	Qfc. Qtz-sericite schist ± patchy lim after sulph
12995			Grab	<0.01		24	150	220	3	2600	110	Qfc. Qtz schist ± minor limonite after sulphides
12996			Grab	<0.01		155	480	2200	2	810	20	Dump float. Altered tuffaceous volc ± 3-5% py
12997			Grab	0.09		195	1000	5600	5	180	16	Dump float. Qtz-sericite schist ± 3-5% py
12998			Grab	<0.01		65	860	440	2	220	14	Dump float. Altered tuffaceous volc ± 10% py
12999			Grab	<0.01		24	170	490	2	1500	10	Dump float. Highly silif clasty volc ± 1% py
13000			Grab	<0.01		12	90	85	<1	1650	4	Dump float. Mod silif volc ± minor limonite
12801			Grab	<0.01		12	95	120	2	590	14	Qfc. Qtz-ser schist ± patchy lim after sulph
12802			Grab	<0.01		6	220	14	<1	880	38	Qfc. Qtz-ser schist ± limonite after sulph.
12803			Grab	2.2		38	120	90	4	580	90	Qfc. Qtz-ser schist ± veinlet qtz + lim after sulp
12804			Grab	<0.01		2	6	4	<1	1550	4	Qfc. Sericite schist ± carb nodules + minor lim
12805			Grab	<0.01		2	6	28	1	1350	7	Qfc. Sericitised felsic volc ± limonite stains
12806			Grab	<0.01		10	195	32	2	230	220	Qfc. Limonitic chert, minor qtz-lim veins
12807			2m chip	<0.01		4	48	48	1	790	14	Qfc. Chert and feld-xtal tuff, likely limonitic
12808			2m chip	<0.01		12	110	42	1	1050	14	Qfc. Clasty vitric tuff, v.k limonite stains
12809			Grab	0.10		6	28	9	3	2100	70	Qfc. Qtz schist ± limonite stains after sulph.
12810			Grab	0.04		800	240	460	7	1050	165	Float. V silif volc ± 5% py + 1% cp-bn.
12811			Grab	<0.01		5	10	12	1	280	125	Qfc. Mod alt felsic volc ± limonite stains
12812			Grab	<0.01		3	8	10	1	380	26	Qfc. Mod alt felsic volc ± limonite stains.

REMARKS:

Shell METALS DIVISION

960513

SAMPLE RECORD

SAMPLE TYPE: ROCK CHIPS

LOCATION / PROJECT: SOUTH HERCULES MT BLACK PROJECT

SAMPLER: J.G. PURVIS

DATE: AUGUST 1986

MAP / PHOTO REF: 5522

ASSAY LAB: COMLABS

SAMPLE DESPATCH ORDER NO: 11514, 11516, 11515

ASSAY REPORT NOS: COM 861384, COM 861482, COM 861441

SAMPLE STORAGE: DEVONPORT, TASMANIA

SAMPLE No.	LOCATION (AMG)		INTER'L (m)	ANALYSES Au	Au (Rpt)	Cu	Pb	Zn	Ag	Ba	As	DESCRIPTION
12813	For locations		2m chip	<0.01		4	10	16	1	300	1150	o/c. Alt felsic volc ± FeOx veins + boxworks.
12814	see plan.		Grab	<0.01		2	24	22	1	310	910	o/c. Alt felsic volc ± veinlets of FeOx incl limon
12815			Grab	<0.01		2	12	14	1	330	410	Dump float. Alt felsic volc ± FeOx veins ± qtz
12816			Grab	<0.01		2	50	100	1	390	30	o/c. Silif alt felsic volc. Minor lim stain
12817			Grab	<0.01		2	42	105	<1	360	30	o/c. Strongly silif volc.
12818			Grab	<0.01		2	38	70	<1	390	16	o/c. Alt felsic volc ± minor lim staining
12819			Grab	0.04		48	780	1400	<1	185	24	Dump float. Silif and sericitised volc ± 3% py, sp
12820			1.5m chip	0.03		120	1250	2200	1	1000	22	o/c. Silif and sericitised volc. 3% py, 1-2% sp-
12821			2m chip	0.04		55	175	105	1	230	26	o/c. Alt tuffaceous volc ± lim after 2% py.
12822			Grab	0.03		24	155	24	<1	550	100	Dump float. Alt volc ± minor disseminated py.
12823			Grab	<0.01		3	10	20	<1	370	3	Dump float. Weakly lim-stained lava.
12824			Grab	<0.01		2	10	36	<1	470	3	o/c. Alt tuffaceous volc ± minor lim and trace
12825			Grab	<0.01		<2	8	34	<1	350	2	Dump float. Strongly silif tuffaceous volc. Trace
12826			Grab	<0.01		3	22	60	1	730	7	o/c. Alt tuffaceous volc ± 1% py.
12827			Grab	<0.01		8	10	85	<1	270	10	o/c. Strongly chloritic massive volc ± lim alter
12828			Grab	0.03		65	125	1600	6	70	65	Dump float. V strongly chloritic volc ± 10% py
12829			Grab	<0.01		7	46	145	1	350	22	o/c. Strongly chloritic ± silif volc ± 5-10% py.
12830			Grab	0.01		7	80	160	1	90	32	o/c. Strongly chloritic tuff-shale ± 1-2% py
12831			Grab	<0.01		26	240	14	2	420	16	o/c. Qtz-ser-chlor schist ± 2% py.
12832			Grab	<0.01		60	310	90	1	210	14	o/c. Chloritised cherty tuff-siltst ± lith alter, sil
12833			Grab	<0.01		6	115	410	1	380	26	o/c. Chloritised tuff-shale ± Mn + lim stain
12834			Grab	<0.01		7	55	55	1	120	3	o/c. Lim-stained chlor volcaniclastic alte
12835			Grab	<0.01		80	55	14	1	170	12	o/c. Chloritic qtzose volc ± lim after 1-2% py
12836			Grab	<0.01		14	26	120	1	230	14	o/c. Chloritic qtzose volc ± 1-2% py.
12837			Grab	<0.01		85	70	50	7	230	14	o/c. Alt cherty tuffaceous sed ± lim alte

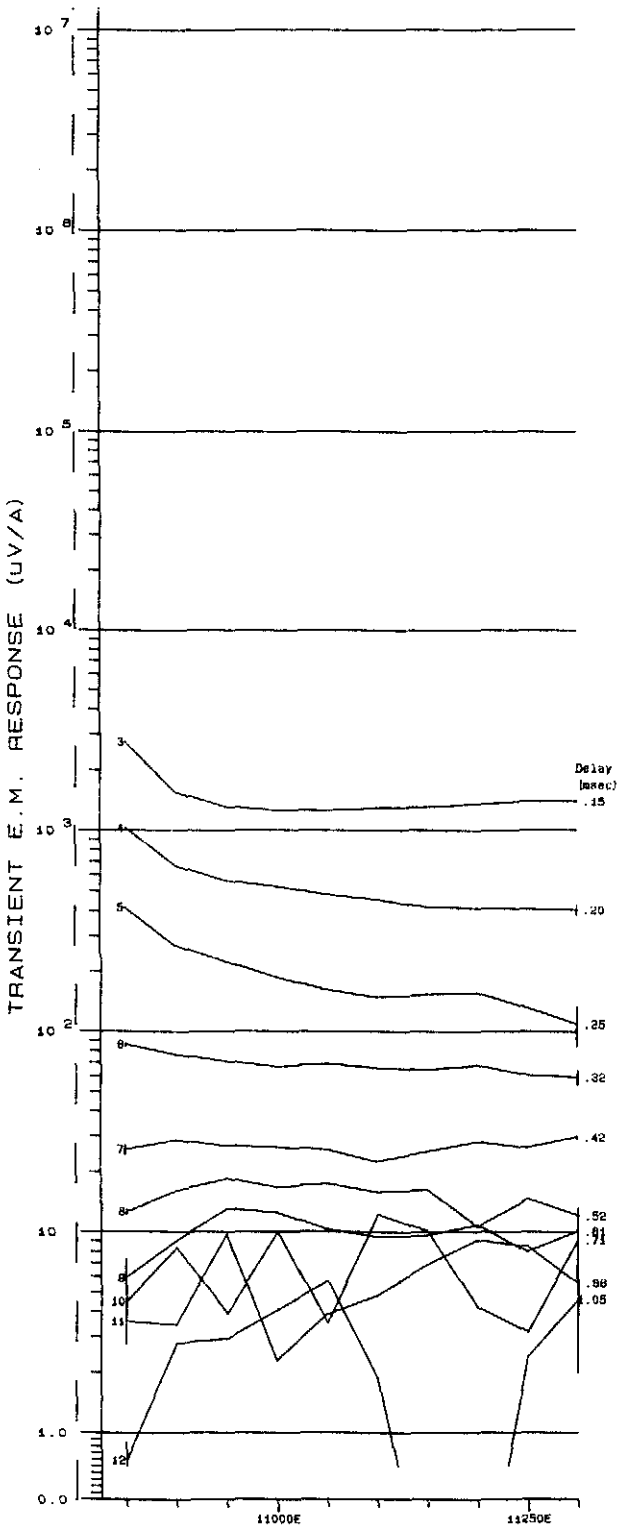
REMARKS:

APPENDIX XV

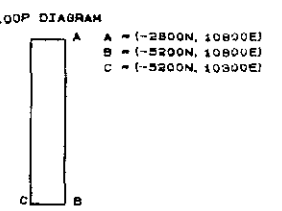
South Hercules - Sirotem Profiles

960515

525



BILLITON AUSTRALIA PTY. LTD.
ROSEBERY, TASMANIA (JOB 648E)
HERCULES MINE AREA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 2800 SOUTH Reading interval 50.0 m
SCALE 1 : 5000 Loop size : 600 x2400 m
LOOP configuration : Fixed loop (Z component)
Plotted : 12:22 PM 11/12/88

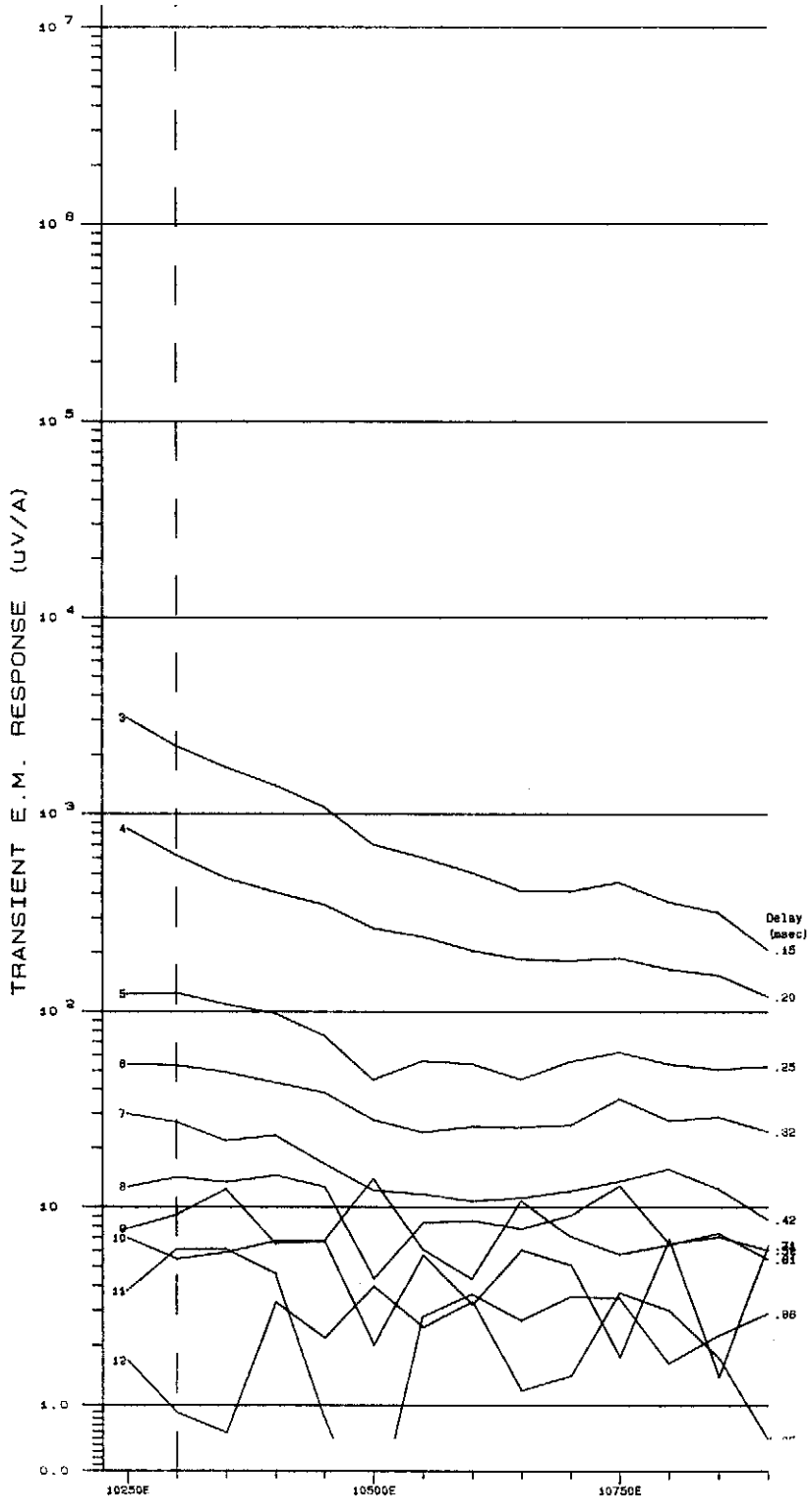


SOLO

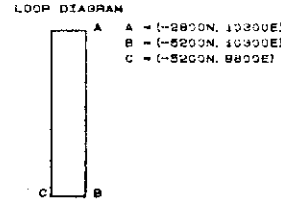
5 cm

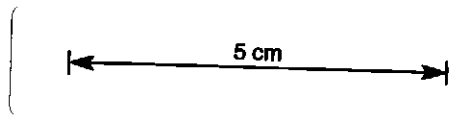
526

960516



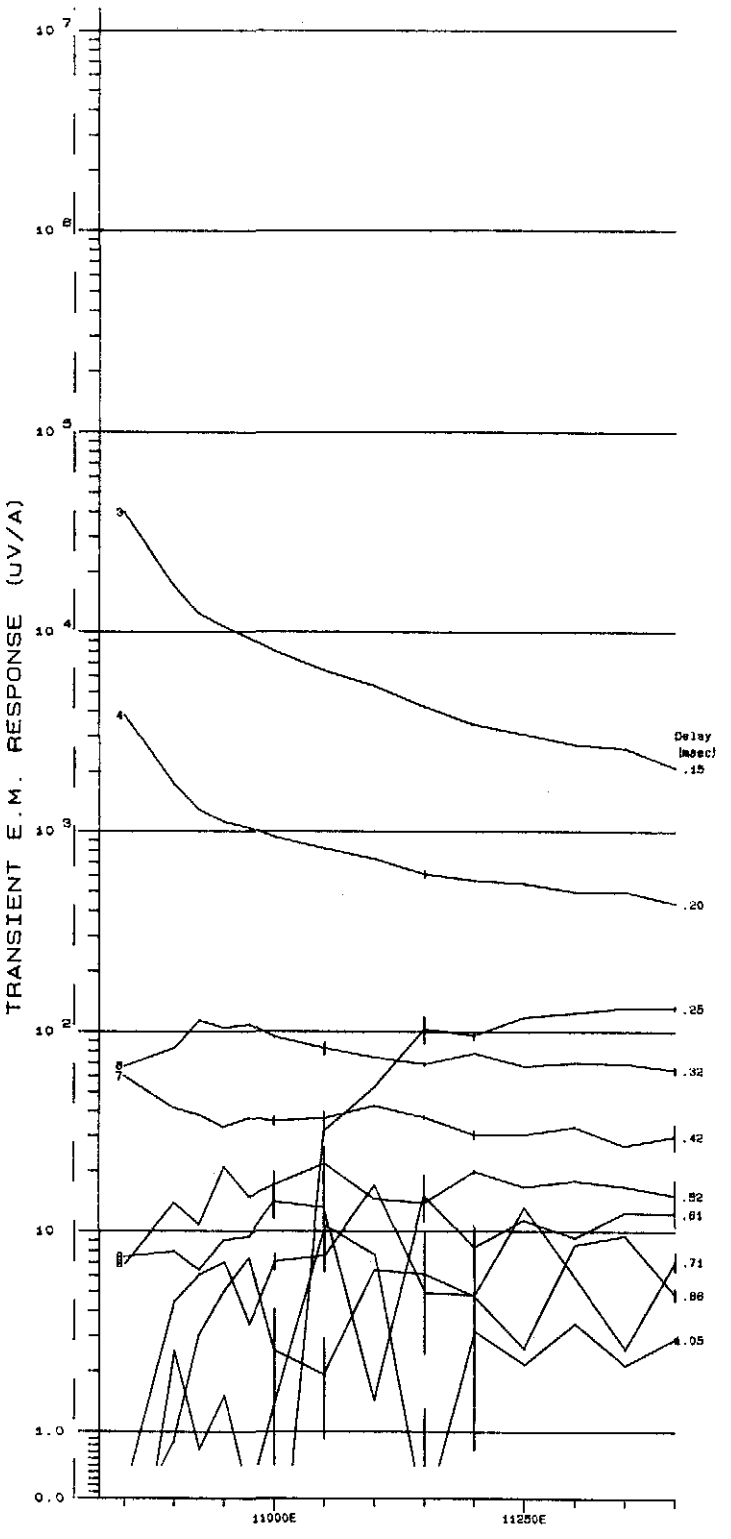
BILLITON AUSTRALIA
HERCULES MINE AREA (LOOP 1)
ROSEBERY, TASMANIA (JOB 648D)
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 2800 SOUTH Reading interval 50.0 m
SCALE 1 : 5000 Loop size : 500 x2400 m
LOOP configuration : Fixed loop (Z component)
Plotted : 1:20 PM 11/12/88



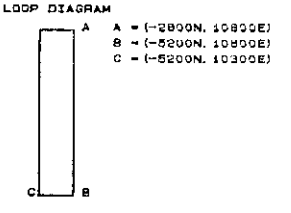


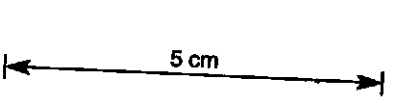
960517

527



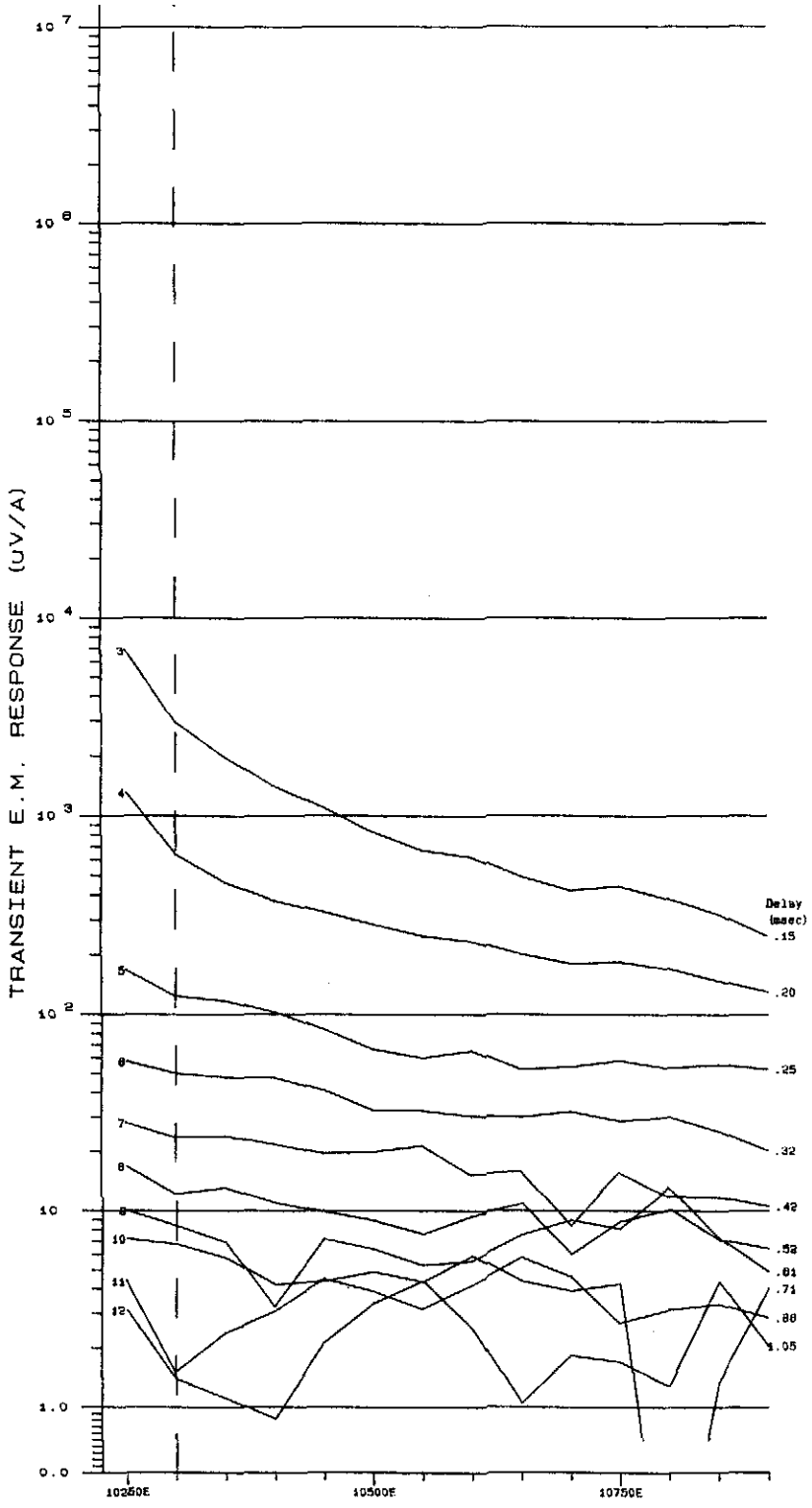
BILLITON AUSTRALIA PTY. LTD.
ROSEBERY. TASMANIA (JOB 648E)
HERCULES MINE AREA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 3200 SOUTH Reading interval 25.0 m
SCALE 1 : 5000 Loop size : 500 x2400 m
LOOP configuration : Fixed loop (Z component)
Plotted : 12:25 PM 11/12/86



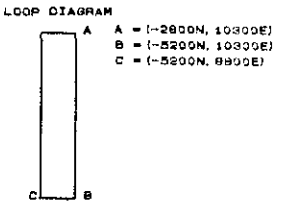


528

960518



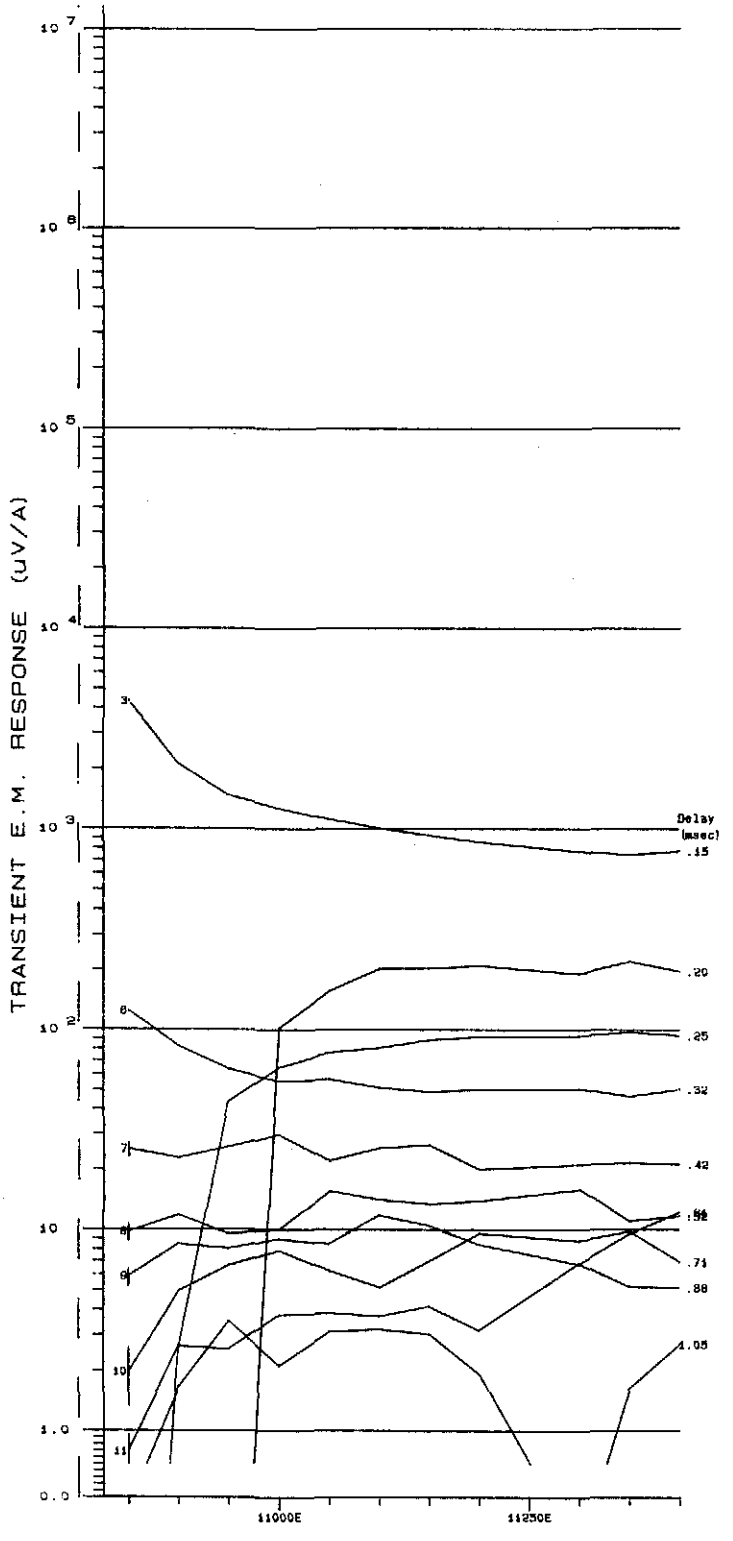
BILLITON AUSTRALIA
HERCULES MINE AREA (LOOP 1)
ROSEBERY, TASMANIA (JOB 848D)
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 3200 SOUTH Reading interval 50.0 m
SCALE 1 : 5000 Loop size : 500 x2400 m
LOOP configuration : Fixed loop (Z component)
Plotted : 1:23 PM 11/12/88



5 cm

960519

529



BILLITON AUSTRALIA PTY. LTD.
ROSEBERY. TASMANIA (JOB 648E)
HERCULES MINE AREA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 3600 SOUTH Reading interval 50.0 m
SCALE 1 : 5000 Loop size : 500 x2400 m
LOOP configuration : Fixed loop (Z component)
Plotted : 12:27 PM 11/12/86

LOOP DIAGRAM

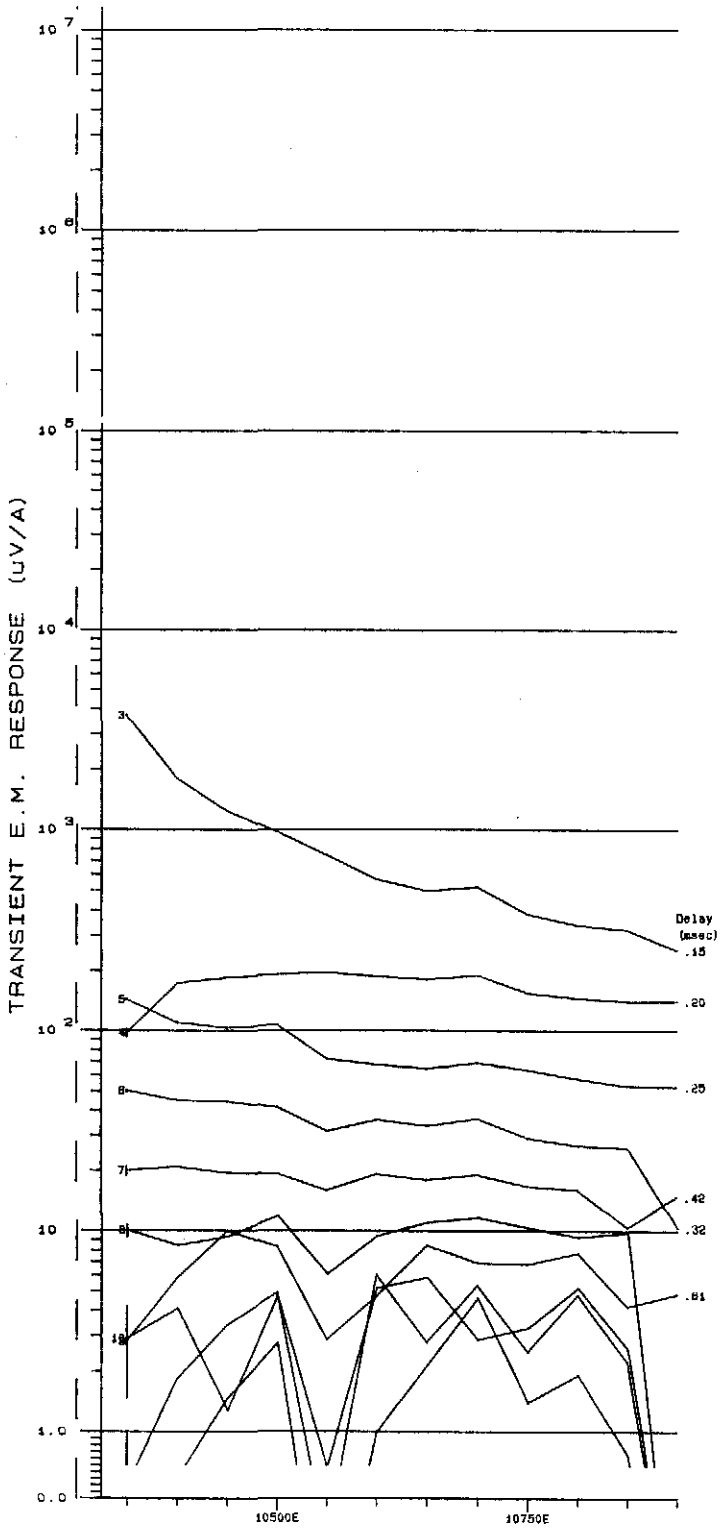
A = (-2800N, 10800E)
B = (-5200N, 10800E)
C = (-5200N, 10300E)

SOLO

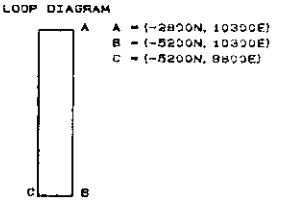
5 cm

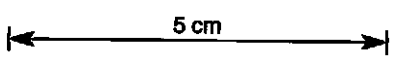
530

960520



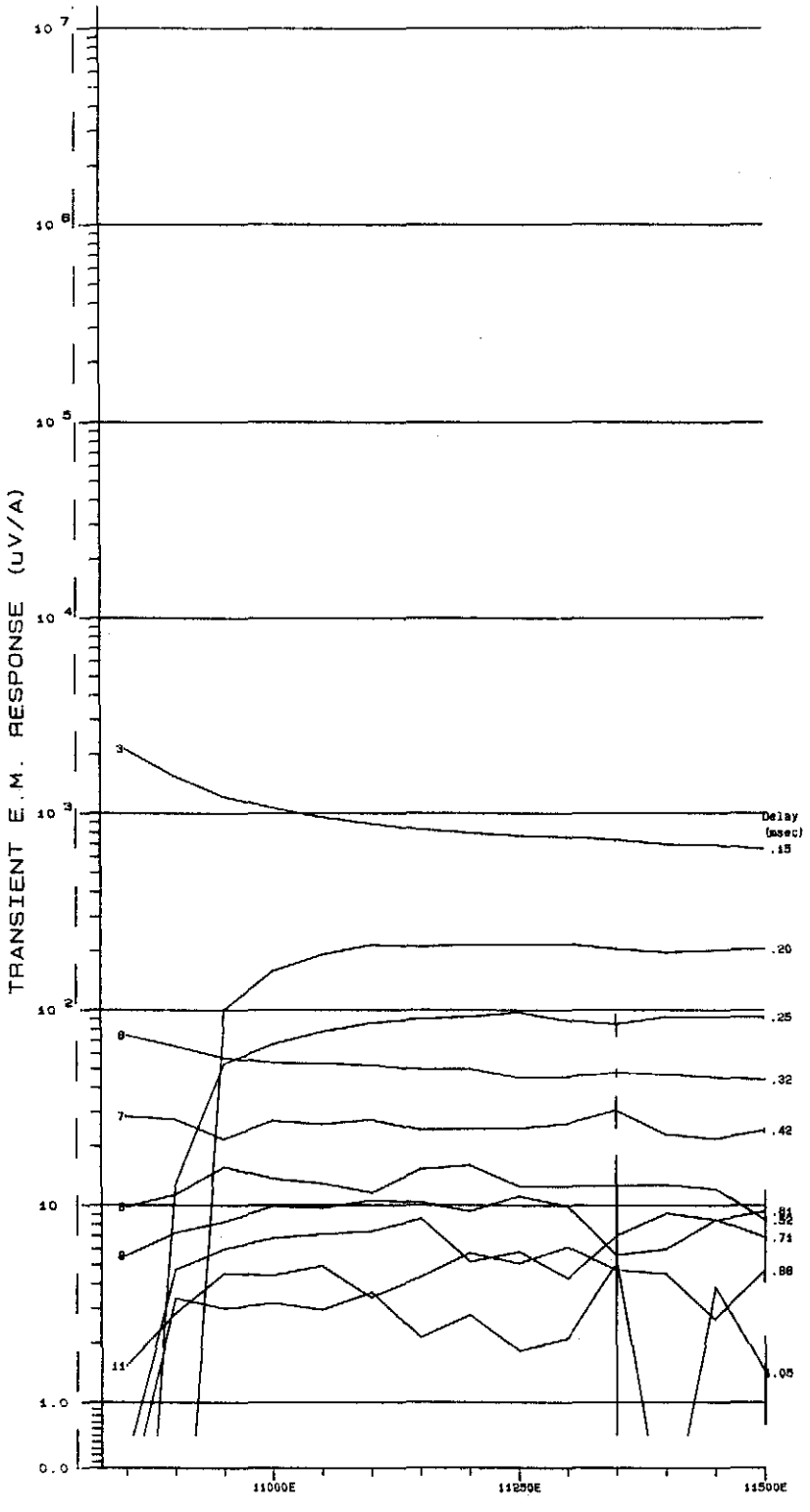
BILLITON AUSTRALIA
HERCULES MINE AREA (LOOP 1)
ROSEBERY, TASMANIA (JOB 648D)
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 3600 SOUTH Reading interval 50.0 m
SCALE 1 : 5000 Loop size : 500 x2400 m
LOOP configuration : Fixed loop (Z component)
Plotted : 1:25 PM 11/12/86





531

960521



BILLITON AUSTRALIA PTY. LTD.
ROSEBERY. TASMANIA (JOB 648E)
HERCULES MINE AREA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 4000 SOUTH Reading interval 50.0 m
SCALE 1 : 5000 Loop size : 500 x2400 m
LOOP configuration : Fixed loop (Z component)
Plotted : 12:30 PM 11/12/86

LOOP DIAGRAM

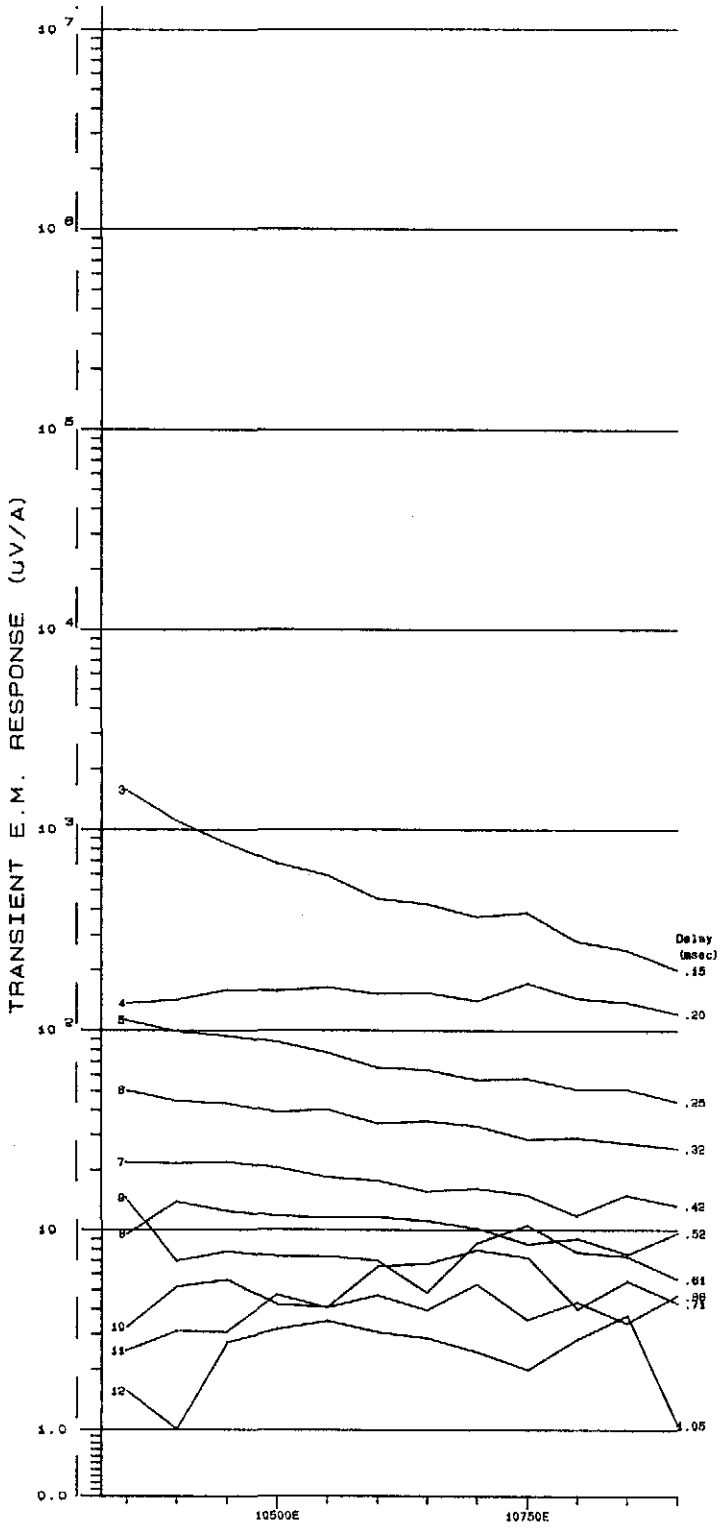
A = (-2800N, 10900E)
B = (-5200N, 10800E)
C = (-5200N, 10300E)

SOLO

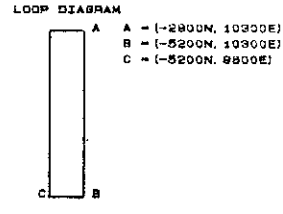
5 cm

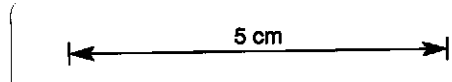
960522

532



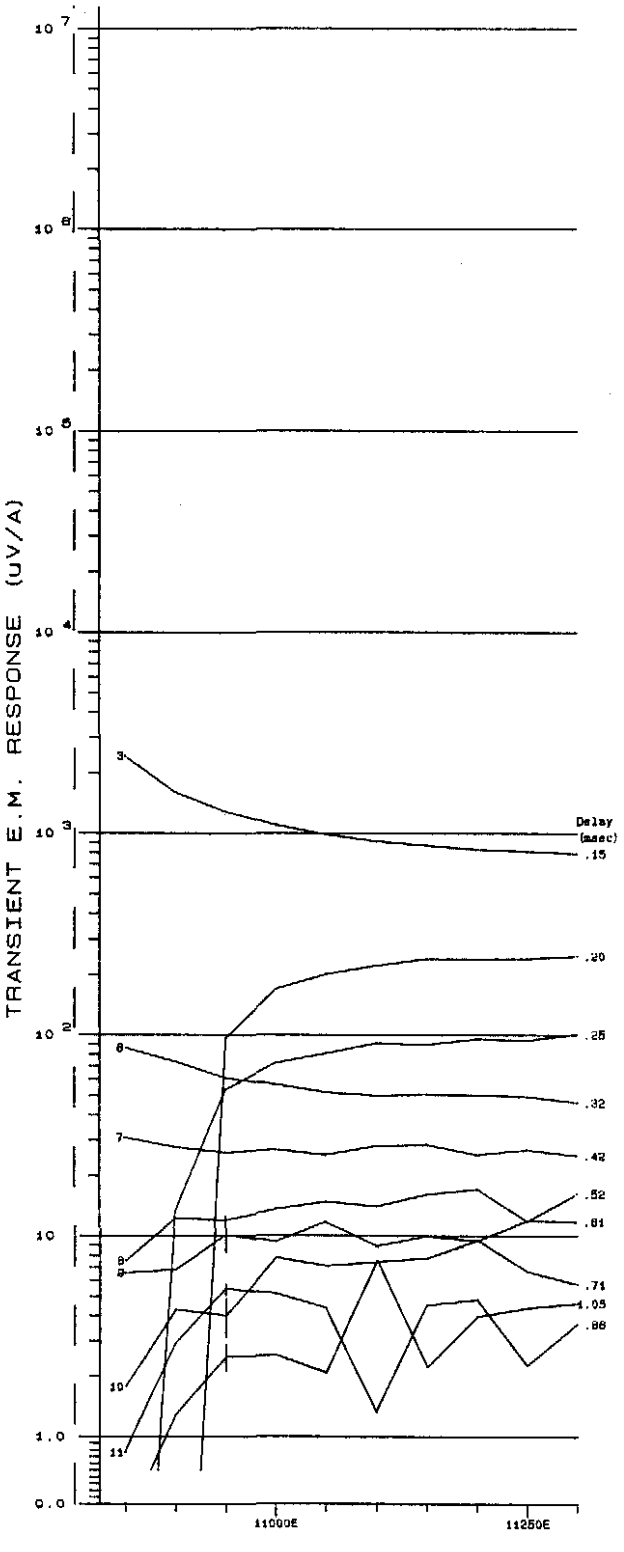
BILLITON AUSTRALIA
HERCULES MINE AREA (LOOP 1)
ROSEBERY, TASMANIA (JOB 648D)
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 4000 SOUTH Reading interval 50.0 m
SCALE 1 : 5000 Loop size : 500 x2400 m
LOOP configuration : Fixed loop (Z component)
Plotted : 1:28 PM 11/12/88





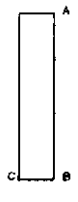
533

960523



BILLITON AUSTRALIA PTY. LTD.
ROSEBERY. TASMANIA (JOB 648E)
HERCULES MINE AREA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 4400 SOUTH Reading interval 50.0 m
SCALE 1 : 5000 Loop size : 500 x2400 m
LOOP configuration : Fixed loop (Z component)
Plotted : 12:33 PM 11/12/86

LOOP DIAGRAM



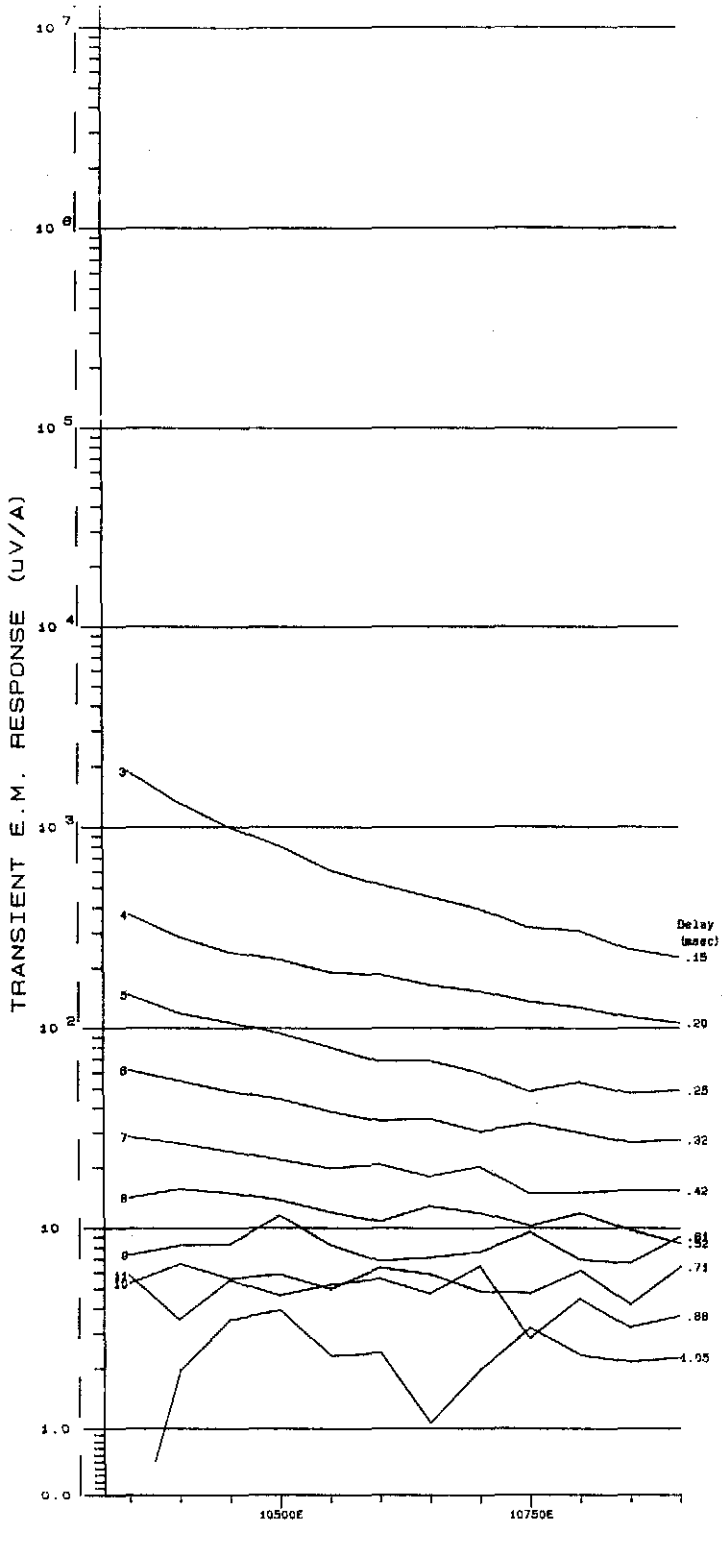
A = (-2800N, 10800E)
B = (-5200N, 10800E)
C = (-5200N, 10300E)

SOLO

5 cm

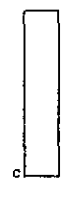
534

960524



BILLITON AUSTRALIA
HERCULES MINE AREA (LOOP 1)
ROSEBERY, TASMANIA (JOB 648D)
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 4400 SOUTH Reading interval 50.0 m
SCALE 1 : 5000 Loop size : 500 x2400 m
LOOP configuration : Fixed loop (Z component)
Plotted : 1:31 PM 11/12/86

LOOP DIAGRAM



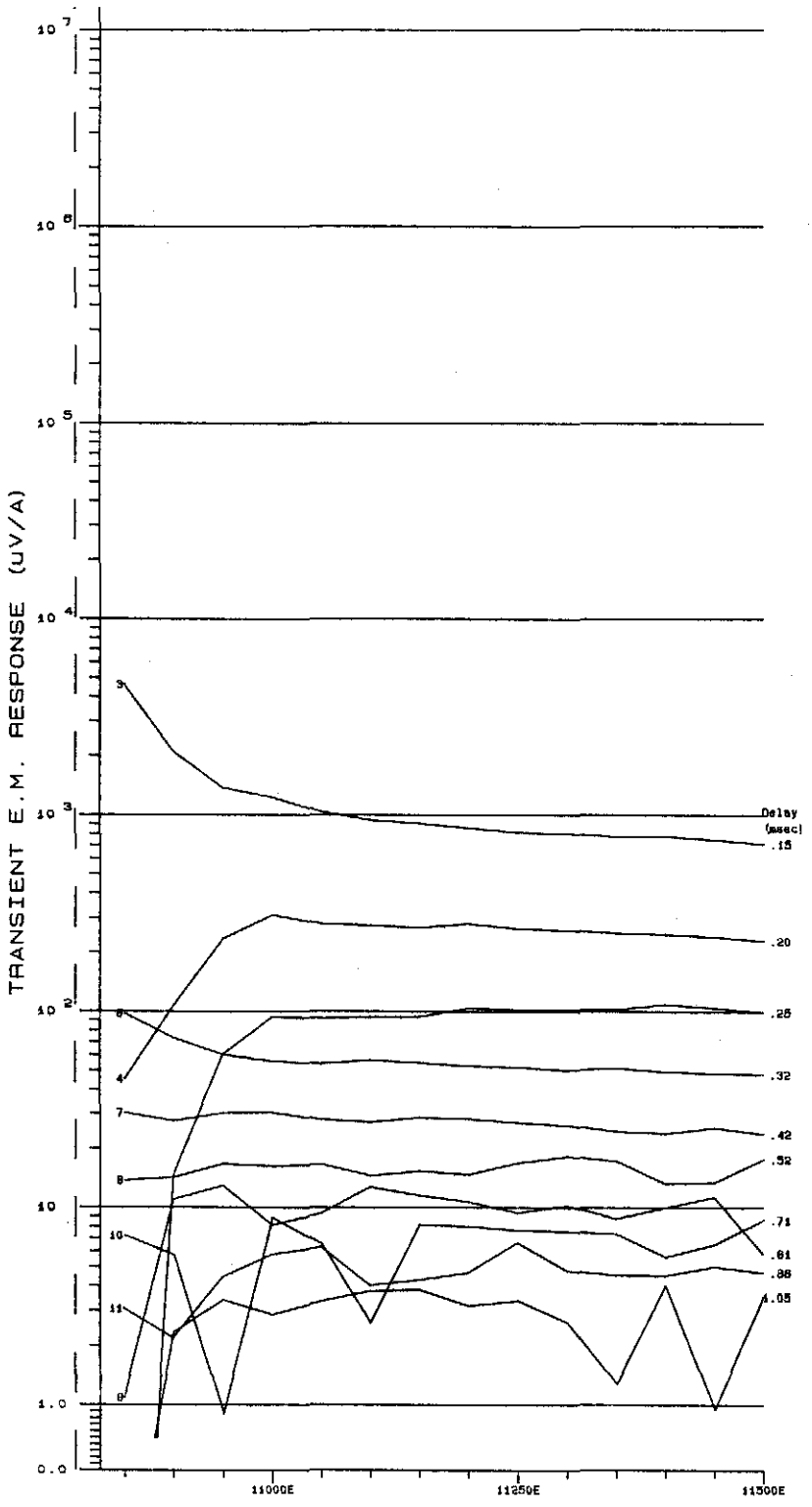
A = (-2800N, 10300E)
B = (-5200N, 10300E)
C = (-5200N, 9800E)

SOLO

5 cm

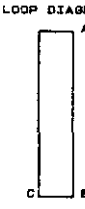
535

960525



BILLITON AUSTRALIA PTY. LTD.
ROSEBERY. TASMANIA (JOB 648E)
HERCULES MINE AREA
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 4800 SOUTH Reading interval 50.0 m
SCALE 1 : 5000 Loop size : 500 x2400 m
LOOP configuration : Fixed loop (Z component)
Plotted : 12:38 PM 11/12/86

LOOP DIAGRAM



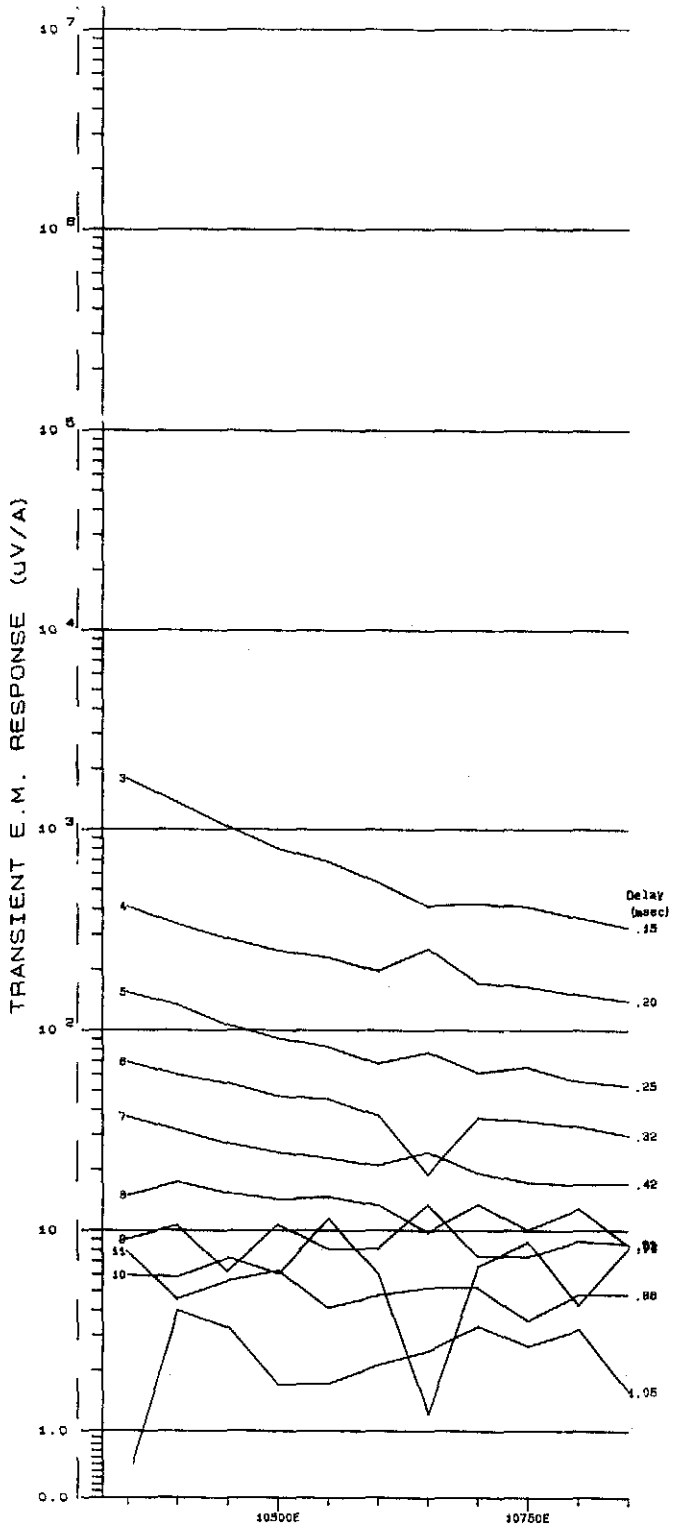
A = (-2800N. 10800E)
B = (-5200N. 10800E)
C = (-5200N. 10300E)

SOLO

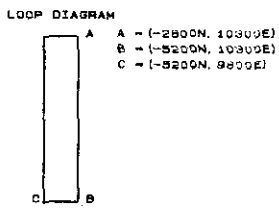
5 cm

536

960526



BILLITON AUSTRALIA
HERCULES MINE AREA (LOOP 1)
ROSEBERY, TASMANIA (JOB 648D)
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 4800 SOUTH Reading interval 50.0 m
SCALE 1 : 5000 Loop size : 500 x2400 m
LOOP configuration : Fixed loop (Z component)
Plotted : 1:33 PM 11/12/86

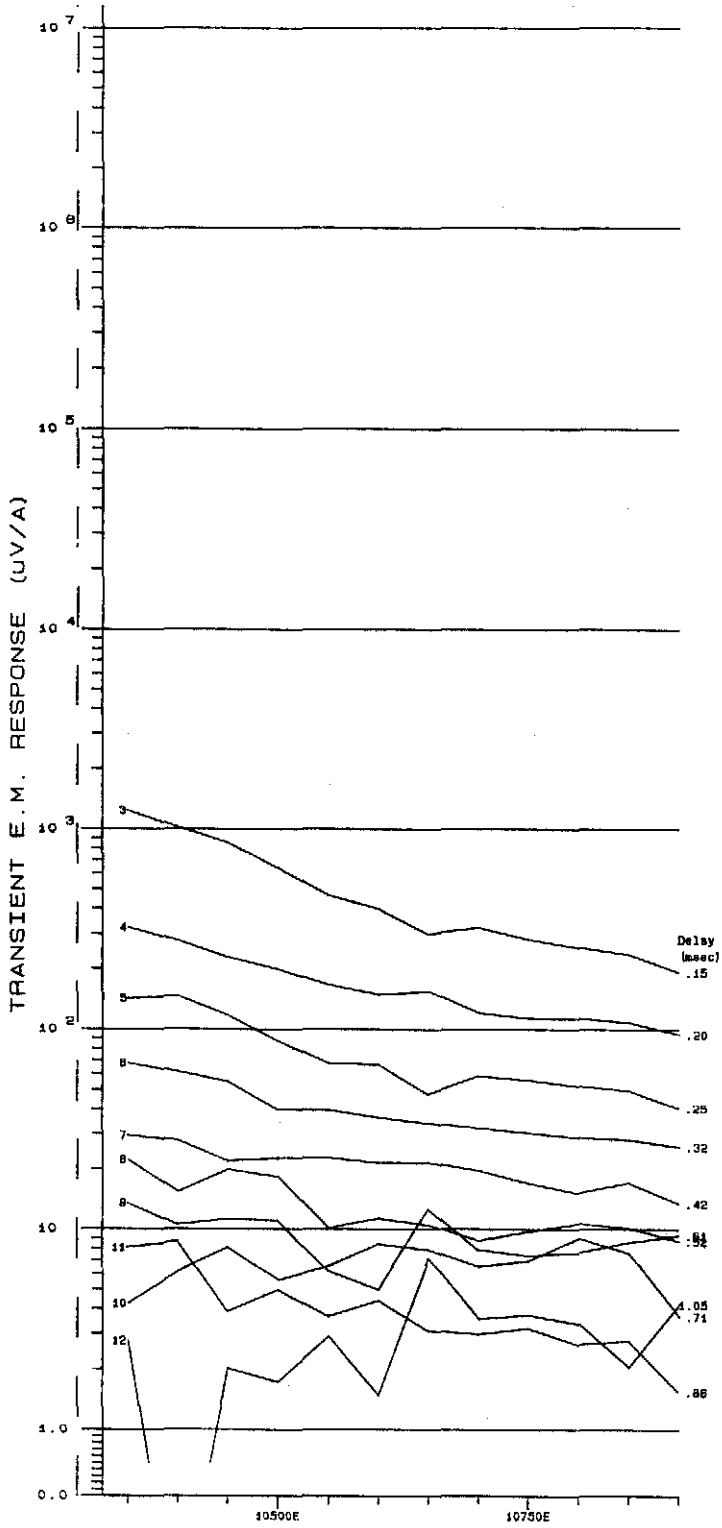


SOLO

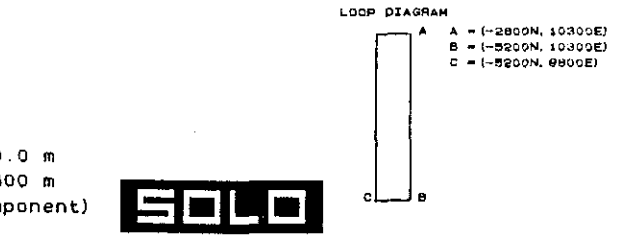
5 cm

537

960527



BILLITON AUSTRALIA
HERCULES MINE AREA (LOOP 1)
ROSEBERY, TASMANIA (JOB 848D)
EARLY TIMES
SIROTEM Survey by SOLO Geophysics & Co.
LINE : 5200 SOUTH Reading interval 50.0 m
SCALE 1 : 5000 Loop size : 500 x2400 m
LOOP configuration : Fixed loop (Z component)
Plotted : 1:38 PM 11/12/88



SOLO

5 cm

960528

539

APPENDIX XVI

South Stitt - Petrological Descriptions

960529

540 **Geochempet Services**

PETROLOGICAL and GEOCHEMICAL CONSULTANTS

REGISTERED IN QUEENSLAND
Principal : A.S. Joyce B.Sc. (Hons), Ph.D.
200 Chapel Hill Road
Chapel Hill, Qld. 4069

Telephone: (07) 375 5258
A/H 378 6467

PETROLOGICAL REPORT ON SIX SAMPLES FROM THE MOUNT READ VOLCANICS, TASMANIA

prepared for

BILLITON AUSTRALIA

Ref : G. Purvis

Stan Joyce

A. S. Joyce, B.Sc.(Hons), Ph.D.

29th April, 1986.

SUMMARY COMMENTS

A. South Stitt Area

Both of the samples 8963 and 8964 have finely crystalline igneous textures consistent with lava and both are thought to have originated as mafic andesite. Textural differences suggest that they belong to two different flows. One has been heavily epidotized and chloritized and the other has been mainly chloritized.

The sample 8966 is texturally quite different and regarded as chloritized andesitic crystal tuff. There are no recognisably epiclastic features.

B. Drill Hole 71R

The three samples 12908, 12910 and 12909 all display well preserved textures consistent with unwelded vitric crystal tuff, deposited probably by airfall processes. They lack evidence of epiclastic sorting or rounding. The original rocks were andesitic but they have been sericitized, albitized, foliated and veined.

960531

542

Sample Number : 8963

Identification : Mafic meta-andesite

Description :

The sample is a lightly weathered hand specimen of greenish grey, fine-grained rock. On the sawn surfaces part of the sample displays many small yellowish grey, altered phenocrysts, less than 1mm in size.

A cobaltinitrite staining test revealed no K-feldspar.

In thin section the sample displays porphyritic, hypidiomorphic volcanic textures, modified by incipient foliation and moderate mineralogical alteration. Phenocrysts were about 0.4 to 0.7mm in size and the groundmass is dominated by laths of plagioclase about 0.1 to 0.3mm long.

The phenocrysts are tabular, twinned, poorly zoned grains of plagioclase : the low refractive indices and optically positive sign are consistent with albite. In part of the section the phenocrysts have been heavily epidotized (the yellowish grey specks noticed in hand specimen).

The groundmass features twinned laths of sodic plagioclase, interstitial chlorite, streaks of a very fine epidote group mineral and many subhedral to euhedral grains of apparently primary magnetite (mainly 0.02 to 0.1mm). A few magnetic grains occur as microphenocrysts (0.2mm) partly rimmed by sphene.

There are a few lenses of strained quartz, probably representing amygdales, about 0.3mm in size.

An approximate mode is :

40-45%	plagioclase
25-30%	epidote group minerals (epidote or clinozoisite)
20-25%	chlorite
6-8%	magnetite and traces of secondary sphene
0.3-0.5%	quartz amygdales

Comments and Interpretations :

This sample has well preserved porphyritic igneous textures consistent with andesite or basalt lava, but its mineral assemblage has been modified by regional metamorphic processes to the greenschist assemblage albite-epidote-chlorite; apparently primary magnetite persists.

Because the plagioclase has had its composition albitized by metamorphism, the normal distinction between andesite and basalt (based on the arbitrary composition An_{50}) cannot be made. The alternative approach, based on basalt having a mafic index in excess of 35 is also complicated by the question of how much epidote represents former mafic minerals and how much reflects the calcic component of plagioclase.

I suspect that the original mafic index was about 30 and that the rock was a mafic andesite. I would expect to see some suggestion of former pyroxene or olivine phenocrysts if the rock originated as basalt.

543

Sample Number : 8964

Identification : Mafic meta-andesite

Description :

The sample is a water-worn and lightly weathered hand specimen of fine-grained, mildly foliated, greenish grey rock.

A staining test revealed no K-feldspar.

In thin section the sample displays a fairly even-grained hypidiomorphic, crystalline volcanic texture, modified by low grade metamorphism and incipient foliation. There are a few 1mm phenocrysts of plagioclase rendered inconspicuous by fracturing associated with the metamorphic foliation.

Plagioclase is prominent as twinned, laths-shaped to tabular grains, now fractured and with optical properties consistent with albite or oligoclase : primary grainsizes were about 0.2 to 0.5mm. Equant subhedral to anhedral grains of inferred ilmenite or titaniferous magnetite, about 0.1 to 0.3mm in size, have been pseudomorphed by leucoxene. The rest of the rock consists of patches, lenses and streaks of chlorite, accompanied by very minor, fine epidote group minerals.

There are a few deformed, discontinuous, fracture-controlled veins carrying chlorite, quartz and irregular pores.

An approximate mode is :

40-45%	plagioclase
50-55%	chlorite
3-4%	epidote group minerals
3-4%	leucoxene
0.2-0.3%	veins of chlorite and quartz with some weathering pores

Comments and Interpretations :

This sample has remnant textures consistent with sparsely porphyritic andesiteor basalt lava, but there has been significant textural and mineralogical adjustment attributable to greenschist facies metamorphism. The rock is broadly similar, but not identical to sample 8963.

It could be argued that the high abundance of chlorite is consistent with a formerly basic rock, but I favour interpreteation as a formerly mafic andesite because of the lack of any indications that the rock carried olivine or pyroxene phenocrysts.

960533

544

Sample Number : 8966

Identification : Mildly foliated, chloritized andesitic crystal tuff with veinlets of albite

Description :

The sample is a lightly weathered hand specimen of faintly foliated greenish grey rock with many indistinct feldspar phenoclasts.

A cobaltinitrite staining test revealed a 5mm patch of fine K-feldspar.

In thin section the sample displays many phenoclasts about 0.2 to 2mm in size and a few volcaniclithic clasts, up to 3mm, set in a mildly foliated chloritic matrix.

The phenoclasts are mainly tabular, lightly sericitized and chloritized, subhedral grains of plagioclase. Mafic phenoclasts are generally less than about 1mm and pseudomorphed by chlorite and sphene. There are also many leucoxene and sphene pseudomorphs of former ilmenite or titaniferous magnetite grains about 0.1 to 0.4mm in size. The lithic clasts are of andesitic type with feldspar laths about 0.2mm long and subordinate chlorite and sphene. Thematrix between the clasts consists of anhedral, untwinned feldspar (about 0.02mm grainsize), mildly foliated chlorite and specks of sphene.

The patch of K-feldspar is of replacement style with associated poorly twinned, fine albite. The rock is also cut by a few irregular, thin fissure veins of poorly twinned albite. Such veins are mainly about 0.1 to 0.4mm wide. There are a few disseminated, subhedral grains of partly oxidized pyrite.

An approximate mode is :

35-40%	plagioclase phenoclasts, lightly sericitized and chloritized
3-4%	chlorite-sphene pseudomorphs of mafic phenoclasts
1-2%	sphene-leucoxene pseudomorphs of titaniferous oxides
0.2-0.3%	lithic clasts of chloritized andesite
30-40%	matrix plagioclase
10-15%	matrix chlorite
0.3-0.4%	matrix sphene
0.2-0.3%	replacement orthoclase
2-3%	veins of albite
tr	disseminated, partly oxidized pyrite

Comments and Interpretations :

This sample is interpreted to represent andesitic crystal tuff. It is unsorted and may have been deposited on land or into water but it does not seem to have been reworked. The rock is distinctly chloritized, mildly foliated and cut by albite veins. There are traces of disseminated pyrite.

The rock is texturally quite different from 8964.

960534

545

Sample Number : 12908 (2164')

Identification : Moderately foliated, heavily sericitized andesitic vitric crystal tuff with thin veins of albite-chlorite-calcite

Description :

The sample is a drill core specimen of pale olive grey moderately foliated rock with indistinct feldspar phenoclasts ranging up to about 2mm. The foliation is approximately normal to the core axis.

A staining test revealed no K-feldspar.

In thin section the sample is seen to be heavily sericitized and moderately foliated but remnant textures are distinctly tuffaceous. Moderately abundant phenoclasts of twinned, lightly to heavily sericitized plagioclase, about 0.3 to 3mm in size, are set in a matrix which is mainly untwinned albite and foliated fine sericite. Under low illumination there are many examples of albite aggregates plainly pseudomorphing former cuspate, unwelded vitric shards about 0.1 to 0.4mm in size. There are no obvious mafic clasts but there are a few streaks and small lenses which carry fine brown biotite and in some cases minor chlorite. Opaque oxides also occur as vague streaks and disseminated small grains (0.02 to 0.03mm), some with minor secondary sphene. There are sparse disseminated grains of anhedral brassy sulphide.

Fissure veins about 0.2 to 1mm thick, carry untwinned and poorly twinned albite, fine chlorite and anhedral carbonate, apparently calcite. In the thickest vein the carbonate fills the core and the albite lines the vein. The thin veins are mainly albite.

An approximate mode is :

20-30%	phenoclasts of lightly to heavily sericitized plagioclase
30-40%	matrix albite, some of it distinctly pseudomorphous after vitric shards
20-30%	matrix sericite
3-4%	fine brown biotite
tr	chlorite
2-3%	opaque oxides and minor sphene
tr	brassy sulphide (?pyrite)
2-3%	veins of albite-chlorite-calcite

Comments and Interpretations :

This sample has remnant textures which are plainly consistent with unwelded vitric crystal tuff and the composition was apparently andesitic. There are no indications of epiclastic sorting. There are no quartz phenocrysts.

The rock has been albitized, heavily sericitized, moderately foliated and cut by veins of albite-chlorite-calcite. The sericitization was accompanied by the production of some fine brown biotite. In contrast the veins carry minor chlorite.

546

Sample Number : 12909 (2192')

Identification : Moderately foliated, heavily sericitized andesitic vitric crystal tuff with many albite-dominated veins

Description :

The sample is a drill core specimen of pale olive grey rock with moderate foliation approximately normal to the core axis and with vague concordant banding and lenticular structures.

A cobaltinitrite staining test revealed no K-feldspar.

In thin section the sample is seen to be quite sericitic and moderately foliated but at low illumination there are plainly visible, relatively undisturbed, remnant textures consistent with many unwelded, cuspate, vitric shards, about 0.1 to 0.5mm in size. The shards have been pseudomorphed by aggregates of untwinned to poorly twinned albite. There are also disseminated subhedral clasts of plagioclase, about 0.1 to 0.5mm in size, some pseudomorphed by mosaics of fine albite and others persisting as single sericitized grains. Fine equant to platy opaque oxides are disseminated as single grains and small clusters (0.01 to 0.1mm). There are also a few disseminated subhedral grains of pyrite, about 0.2mm in size.

Many fissure veins, about 0.2 to 1mm thick and generally acutely discordant to the sericite foliation are filled by sutured aggregates of fine anhedral albite (mainly untwinned) with minor strained quartz and calcite and traces of chlorite and platy opaque oxide.

An approximate mode is :

10-15%	plagioclase phenoclasts, variously sericitized and albitized
30-40%	matrix albite, pseudomorphing vitric shards
35-40%	matrix sericite
0.2-0.3%	opaque oxides
tr	pyrite
10-12%	veins of albite-quartz-calcite-chlorite-opaques

Comments and Interpretations :

This sample has plainly recognisable remnant textures consistent with unwelded vitric crystal tuff of andesitic composition. It is analogous to sample 12908, but carries fewer and generally smaller plagioclase phenoclasts.

The rock has been albitized, heavily sericitized, moderately foliated and cut by many fissure veins carrying albite with some quartz, calcite, chlorite and opaque oxides.

There are indistinct suggestions of layering, but no clear evidence of aqueous sorting or rounding. Airfall deposition on land or directly into water seems likely.

Sample Number : 12910 (2195'6")

Identification : Moderately foliated, heavily sericitized andesitic vitric crystal tuff with many albite-dominated veins

Description :

The sample is a drill core specimen of pale olive to medium light grey rock with moderate, lenticular foliation crudely normal to the core axis and with many indistinct feldspar phenoclasts ranging up to about 2mm in size.

A cobaltinitrite staining test revealed minor K-feldspar as small patches and subtle veinlets.

In thin section the sample is seen to consist mainly of fine secondary albite and moderately foliated sericite, but in many places there are distinct remnant textures consistent with former tuff. Phenoclasts about 0.3 to 3mm in size consist of moderately sericitized, twinned plagioclase or of albite mosaics after plagioclase. Fine albite pseudomorphs former cuspate, unwelded vitric shards, about 0.1 to 0.5mm in size and aggregates of albite and sericite replace clasts of pumice ranging up to several millimetres in size. Additional matrix sericite is foliated and lackingin remnant textures. Fine opaque oxides occur as small patches and streaks. There are a few disseminated, subhedral grains of pyrite (ranging up to 0.4mm).

Numerous discordant fissure veins, about 0.05 to 2mm wide, contain mainly fine anhedral, untwinned or poorly twinned albite with minor fine chlorite and carbonate (some of it apparently dolomitic and the rest resembling calcite). Trace components are opaque oxide and pyrite. Several of the veins carry some strained quartz.

An approximate mode is :

20-25%	plagioclase phenocrysts, variously sericitized and albitized
35-45%	matrix albite, some of it plainly pseudomorphing vitric shards and pumice
25-30%	matrix sericite
2-3%	K-feldspar
0.5-1%	matrix opaque oxides
tr	pyrite
6-8%	veins of albite-chlorite-carbonate-quartz-opaques

Comments and Interpretations :

This sample has remnant textures plainly consistent with an unwelded tuff composed of vitric shards, pumice and plagioclase phenoclasts. Its composition was apparently andesitic prior to pervasive alteration to albite and sericite. It is analogous to samples 12908 and 12909 in lacking evidence of epiclastic sorting or rounding. Airfall deposition seems likely.

APPENDIX XVII

South Stitt - Geochemical Rock Sample Ledger

SAMPLE RECORD

METALS DIVISION

MPLE TYPE: ROCK CHIPS | LOCATION / PROJECT: SOUTH STITT | SAMPLER: J.G. PURVIS | DATE: MARCH 1986 | MAP / PHOTO REF: 550

ASSAY LAB: AMDEL | SAMPLE DESPATCH ORDER NO: 08326/001, 11501, | ASSAY REPORT NOS: AC 3375/86, AC 3819/86

SAMPLE STORAGE: DEVONPORT, TAS

SAMPLE No.	LOCATION (AMG) NORTH	EAST	INTER'L (m)	Au	Au (Rpt)	Cu	Pb	Zn	Ag	Ba	As	Sn				DESCRIPTION
8927	370750	381935	Grab	Tr*		35	40	86	<1	55	7					olc. Qtz-chlorite veins in ignimbrite.
28	370750	381935	"	Tr		23	48	460	<1	550	7					Sub olc. Basic dyke ± limonite stains.
29	371000	382350	"	Tr		31	22	66	<1	410	10					olc. Silicified felsic volc ± qtz-carb veins.
8930	371000	382380	"	Tr		80	38	45	<1	1040	8					olc. Silicified felsic volc ± trace py > hem.
31	370250	381940	"	Tr		7	68	120	<1	630	16					olc. Cherty or silicified fi gr volc sediment.
32	370250	382140	"	ND		11	46	200	<1	90	26					olc. Lithic volc breccia ± minor limonite on fracs.
33	370250	382385	"	Tr		4	550	92	<1	890	78					Sub olc. Silic > felsic volc ± qtz veins.
34	370250	382755	"	ND		5	14	52	<1	190	8					Float. Sericitic xyl tuff ± limonite boxworks.
8935	370250	382755	"	Tr		4	18	115	<1	140	5					Float. Sericitic xyl tuff-shale ± limonite stains.
8937	370320	382705	3m chip	Tr		98	240	265	<1	780	42					olc. Chloritic felsic volc ± wk limonite stains.
38	370468	382660	Grab	0.08		22	315	175	<1	190	60					olc. Weakly silicified felsic volcaniclastic.
39	370493	382655	Grab	Tr		19	82	500	<1	260	27					olc. Chloritic volc siltst ± minor dissem py.
8940	370500	383060	"	0.06		5	26	27	<1	460	11					olc. Volc breccio-conglomerate ± minor limonite.
41	370500	383040	"	Tr		6	74	39	<1	490	50					Sub olc. Volc breccio-cong ± limonite stains.
42	370500	382695	"	Tr		7	6	345	<1	110	8					Sub olc. Chloritic volc breccia ± trace py.
43	370500	381980	"	Tr		9	50	100	<1	720	6					olc. Felsic volcaniclastic ± trace py.
44	370250	382020	"	Tr		10	145	58	<1	580	43					Float. Silicified felsic volc ± minor py.
45	370250	382045	"	Tr		8	180	70	<1	180	58					olc. Felsic volc ± py xyls to 7mm > qtz veins.
46	370250	382165	"	ND		9	78	125	<1	110	18					olc. Felsic volc ± 2-3% sooty py in lenses.
47	370890	381990	"	Tr		50	56	5	<1	20	20					olc. Limonitic qtz vein 0.3m wide.
8948	369500	381570	"	ND		45	54	110	<1	1300	10	< 4				Sub olc. Sl silicified rhyodacitic intrusive ± qtz veins.
8956	370500	382655	"	ND		60	110	410	2	1100						olc. Felsic epiclastic ± 5% py > 2% hem.
57	370520	382655	"	ND		130	18	370	<1	160						olc. Chloritic felsic volc ± minor cp > py.
58	370528	382655	"	0.50		860	280	66	11	130						olc. Qtz vein or chert band 0.2m. Minor cp-py-hem
59	370540	382650	"	Tr		165	10	2000	<1	170						olc. Basalt ± 1% dissem py > cp.
8960	370575	382655	"	0.07		2160	10	210	1	150						olc. Chloritic volc siltst ± 1% cp, minor py.
61	370620	382665	"	ND		25	74	215	<1	320						olc. Volc sst. Abundant limonite > Mn stains.
8962	370855	382755	"	Tr		13	34	13	<1	20						olc. 0.4m qtz vein ± minor limonite stains.
8974	368500	381765	"	Tr		18	32	64	<1	690						Sub olc. Silic sericitic volcaniclastic ± limonite.
75	368500	381760	"	Tr		14	6	64	<1	450						Sub olc. Cherty tuffaceous sediment ± rare py.
76	368500	381750	"	Tr		10	6	50	<1	770						Sub olc. Silic volcaniclastic ± minor dissem py.
8977	368500	381745	"	Tr		11	< 4	66	<1	480						olc. Felsic silic tuff ± 1% coarse gr py.

EMARKS: SOUTH STITT is part of MT BLACK EL 1/62, TASMANIA.

* Tr = trace (< 0.04 ppm Au) ND = Not detected.

9605358

SAMPLE RECORD

METALS DIVISION

SAMPLE TYPE: ROCK CHIPS LOCATION / PROJECT: SOUTH STITT SAMPLER: J.G. PURVIS DATE: MARCH 1986 MAP / PHOTO REF: _____

ASSAY LAB: AMDEL SAMPLE DESPATCH ORDER NO: D8328, 11501, 11502, ASSAY REPORT NOS: AC 3819/86, AC 3523/86

SAMPLE STORAGE: DEVONPORT, TAS.

SAMPLE No.	LOCATION (AMG) NORTH	EAST	INTER'L (m)	ANALYSES Au	Au (Rpt)	Cu	Pb	Zn	Ag	Ba	As	Sn				DESCRIPTION
8978	368500	381715	Grab	Tr		9	4	62	<1	620						o/c. 1m wide silic (flinty) tuff-siltst
79	368500	381705	"	Tr		125	6	49	<1	550						Float. Intensely silic (chalcedonic?) vdlc ± 1% py.
8980	368500	381595	"	Tr		86	4	82	<1	310						o/c. Sericite-chlorite schist ± minor limonite
81	368500	381565	"	Tr		18	<4	120	<1	210						o/c. Qtz-py vdlc ± chlorite-qtz veins.
82	368500	381420	"	Tr		110	18	72	<1	510						Float. Py-rare mafic vdlc ± magnetite + rare py
83	368500	381585	"	Tr		80	54	86	<1	420						Float. Tuff-shale + siltst ± 1% bedded py?
84	369000	381615	"	0.07		16	8	195	<1	490						o/c. Chloritic felsic volcaniclastic ± sl limonite stains.
8985	369000	381610	"	Tr	Tr	16	22	295	<1	540						o/c. Vdlc siltst + sst ± minor limonite stains.
8995A	369500	381520	"	Tr		16	32	88	<1	770						Float. Wk silicified felsic vdlc ± 1-2% py.
96	369500	381350	"	ND	Tr	15	6	135	<1	580						Float. Chloritic felsic vdlc ± limonite stains
97	369400	382490	"	Tr		8	<5	42	<1	310						Sub o/c. Qtz xyl-lithic grit ± limonite stains
98	370000	382045	"	Tr		29	<5	235	<1	90						Float. Vdlc sst or weath. basalt. Limonite stains.
8999	370000	382055	"	Tr		10	<5	195	<1	440						Float. Chloritic lithic breccia ± limonite stains.
9000	371000	383245	"	Tr		45	30	425	<1	650						o/c. Tuffaceous sediments ± rare limonite stains.
7908	370000	382800	"	Tr	Tr	11	20	64	<1	530						Float. Xyl-lithic grit ± minor limonite stains
09	370000	382845	"	ND		25	98	185	<1	360						o/c. Breccio-conglomerate ± limonite boxworks.
7910	369980	382895	"	Tr		4	<5	45	<1	270						o/c. Orange, soft limonite encrustation
11	369980	382895	"	Tr		12	10	50	<1	640						o/c. Vdlc breccio-cong ± minor limonite boxworks.
12	370010	382890	"	Tr		9	<5	30	<1	140						o/c. Soft gossanous limonite - Mn encrustation
13	370050	382900	"	Tr		12	6	185	<1	550						o/c. Vdlc sst + siltst ± minor py + limonite
14	370060	382880	"	ND	Tr	11	12	94	<1	790						o/c. Vdlc breccio-conglomerate ± limonite stains.
15	370085	382850	"	Tr		7	90	36	<1	410						o/c. Soft, gossanous limonite encrustation
16	370200	382775	"	Tr		7	<5	135	<1	210						o/c. Qtz-sericite schist ± mod limonite staining.
17	370205	382775	"	Tr		82	48	46	<1	180						o/c. Bleached qtz-sericite schist ± 2% py.
18	371000	383485	"	Tr		8	6	18	<1	580						o/c. Strongly schistose + bleached felsic vdlc.
19	371000	383500	"	Tr		21	<5	62	<1	580						o/c. Tuff-siltst + shale ± limonite boxworks.
7920	371000	383500	"	Tr	Tr	28	140	74	<1	780						o/c. Qtz-sericite schist after tuff shale ± limonite.
21	371000	383545	"	Tr		10	10	13	<1	380						o/c. Leached, bleached schistose vdlc breccio-cong.
7922	371000	383590	"	Tr		12	<5	32	<1	510						o/c. Qtz-sericite schist ± v. minor limonite boxworks.
-80 MESH STREAM SEDIMENT SAMPLE:																
8936	370250	382755		ND		5	150	33	<1	160	37	10				Upper Sterling River. Good boulder trap

REMARKS: SOUTH STITT IS PART OF MT BLACK EL 1/62, TASMANIA.

551

9605 39

960540

APPENDIX XVIII

Henty Fault Zone - Drill Hole Re-logs & Assays

554

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

HEADING SHEET

COLLAR INFORMATION

DATA TYPE	COLLAR CO-ORDINATES EASTING	NORTHING	ELEVATION	COLLAR SURVEY AZIMUTH	DIP	HOLE NAME	TOTAL DEPTH	HOLE TYPE	DESC CODE	REMARKS
	7481	19844 7		090	-44	MP30				

PROJECT HENTY FAULT ZONE	HOLE NAME MP 30
LOGGED BY J. RANDELL	TOTAL DEPTH 411 ft.
CONTRACTOR	RIG
CREW	DATE STARTED ..... FINISHED .....
CORE STORAGE: No OF TRAYS / LOCATION	SAMPLE STORAGE
M&P LAB	ASSAY LAB

DESC.	SIZE	FROM	TO	TOTAL	REMARKS
NON CORE					
CORE	HQ				
	NQ				
	BQ				
CASING					
CASING LEFT					(S) steel (P) plastic

SURVEY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	AZIMUTH	DIP	REMARKS

PLOTTING KEY

SYMBOL DES. CODE	G/LOG	INTERVAL FROM	TO	SYMBOL DES. CODE	G/LOG	INTERVAL FROM	TO

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE No	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
								12 - 167'6" // BLACK SILTSTONE Poorly laminated, bedding ~ 80°. 23'1" - 23'6" fine grained chloritic intermediate tuff, poorly layered. Minor disrupted interbedded tuff/siltstone 39'6" - 40' massive white quartz, contacts obscured. Better developed lamination down hole. Bedding 80-90°. 46'6" - 54'. Strong core loss. Moderate quartz veining. 131'6" 6" quartz vein 85° to core axis 138'5" 3" quartz vein, contact obscured. 158'4" 6" quartz vein. 167'6" - 184' // INTERBEDDED SILTSTONE/TUFF. Fine laminated and chloritic siltstone tuffaceous sediments. Thin quartz veins along bedding planes (85-90°). 184' - 202'9" // LAYERED FINE LITHIC TUFF. Minor coarse siltstone lithics, minor bedded quartz. 202'9" - 296'6" // INTERBEDDED SILTSTONE - TUFF. Black siltstone with coarse grey tuffaceous

DRILLING OBJECTIVES / SUMMARY

REPORT REFERENCE :

SHEET 1 OF .....

9605411

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	HENTY FAULT ZONE	HOLE NAME	MP 30
LOGGED BY		TOTAL DEPTH	

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
								sediment. Trace pyrite observed. Quartz veining, weak to moderate (85-90°) Core 4-5' becoming more siliceous, bleached with minor carbonate veinlets. Trace blebby py @ 295'.
								296'6" - 301' // SERICITIC SILICEOUS VOLCANICLASTIC Fine grained non layered siliceous unit Veins 297'8" 40° to core axis, 0·4cm quartz carbonate py 5% (sphgal) 298'6" 2" quartz carbonate py gal(sph) 300'3" 1" 40° to core axis, quartz pyrite 25-30%
								301' - 341'6" // INTERMEDIATE TUFF Medium to coarse feldspar phyric layered tuff weak chlorite veinlets. 301' - 312' Zone of carbonate spotting and veinlets and quartz veining. 307' 2" quartz - carbonate - chlorite vein 305' 3" quartz - siderite - hematite - pyrite 311' 3" quartz - carbonate veins, 50° to core axis 312' - 346" medium feldspar phyric tuff non altered, no carbonate - quartz veining.
								341'6" - 369' // BLACK SILTSTONE Fine poorly laminated, minor quartz veinlets.
								369' - 384' // PUMICE FELDSPAR LITHIC TUFF Well layered medium grained, minor silty laminae. Trace pyrite.
								384' - 411' // INTERBANDED SILTSTONE / TUFF Black finely laminated (80°-90°) siltstone and mottled green sericitic tuffaceous sediment.
								E.O.H.

SHEET 2 OF

555

9605 42

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

HEADING SHEET

536

COLLAR INFORMATION

DATA TYPE	COLLAR CO-ORDINATES EASTING	NORTHING	ELEVATION	COLLAR SURVEY AZIMUTH	DIP	HOLE NAME	TOTAL DEPTH	HOLE TYPE	DESC CODE	REMARKS
	7884	20259				MP32				

SURVEY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	AZIMUTH	DIP	REMARKS

PLOTTING KEY

SYMBOL DES. CODE	SYMBOL G/LOG	INTERVAL FROM	INTERVAL TO	SYMBOL DES. CODE	SYMBOL G/LOG	INTERVAL FROM	INTERVAL TO

PROJECT HENTY FAULT ZONE	HOLE NAME MP 32
LOGGED BY J. RANDELL.	TOTAL DEPTH 361ft
CONTRACTOR	RIG
CREW	DATE STARTED ..... FINISHED .....
CORE STORAGE — No OF TRAYS / LOCATION	SAMPLE STORAGE
M&P LAB	ASSAY LAB

DESC.	SIZE	FROM	TO	TOTAL	REMARKS
NON CORE					
CORE	HQ				
	NQ				
	BQ				
CASING					
CASING LEFT					(S) steel (P) plastic

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE No	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
								19'8" - 20'3" // QUARTZ VEIN White non ferruginous, contacts observed.
								20'3" - 25'9" // INTERMEDIATE LAVA Medium grained feldspar-quartz phyric, silicified, minor chlorite veining.
								25'9" - 35' // QUARTZ VEIN 65% vuggy white quartz, ferruginous stained, minor fibrous. Rare core at 65°. 35% Silicified intermediate feldspar quartz phyric lava, strongly bleached, chlorite veined.
								35' - 78' // FELDSPAR-QUARTZ PHYRIC INTERMEDIATE LAVA. Medium to coarse grained, minor blue very fine siliceous clots, minor strong chlorite development, rare quartz veins. 70'3" 0.5" ghost vein. 74'6" 2° vuggy ferruginous quartz vein
								78' - 78'11" // INTERMEDIATE VOLCANIC White quartz veined chloritic, carbonated with minor blebby galena/sphalerite. Trace pyrite smears.

DRILLING OBJECTIVES / SUMMARY

REPORT REFERENCE :

SHEET 1 OF .....

9605 43

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	HOLE NAME MP32
LOGGED BY	TOTAL DEPTH

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
								78'11" - 96'6" // INTERMEDIATE LAVA Feldspar phyric siliceous, foliated, minor chlorite veinlets.
								81'10" 3" quartz vein (65° contact) with 1" carbonate + gal, sph.
								94'6" 6" moderately carbonated siliceous quartz veined intermediate lava.
								96'6" - 101'10" // INTERMEDIATE LAVA Strongly siliceous feldspar phyric with chlorite veins and milky quartz. (0-10°)
								101'10" - 138'5" // SILICEOUS INTERMEDIATE LAVA Strongly siliceous with strongly chloritic zones + chlorite veins (10-15°). Minor quartz veins.
								138'5" - 137'2" // 1" quartz vein (65°) with carbonated siliceous contorted lava.
								137'2" - 144" // FELDSPAR PHYRIC INTERMEDIATE LAVA Crudely layered, defined by wispy chlorite veinlets. Minor quartz veins
								144' - 145'8" // CHLORITIC INTERMEDIATE VOLCANIC Siliceous with milky quartz veining
								145'8" - 193' // SILICEOUS INTERMEDIATE VOLCANIC Feldspar phyric massive ? lava with thin quartz veinlets. (35-90°)
								193' - 197'6" // AS ABOVE Coarse grained with 5-7% carbonate spotting, minor quartz veinlets @ 70°.
								197'6" - 198'3" // VEIN BRECCIA Carbonate - chlorite with coarse gal/sph 20%.
								198'3" - 203'6" // CARBONATED INTERMEDIATE VOLCANIC Rare thin carbonate veinlets. 203'2" 1" quartz vein 75°. 203'5" 1" " " 55°
								203'6" - 213'6" // FELDSPAR PHYRIC INTERMEDIATE LAVA Weak irregular quartz veining, 65-75°

SHEET 2 OF

551

9605544

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	HOLE NAME mp32.
LOGGED BY	TOTAL DEPTH

ASSAY INFORMATION

DISTANCE FROM COLLAR: TO TOP | TO BOTTOM

SAMPLE Nº | CORE ANGLE | ROCK TYPE | DIAM | DESC CODE | GRAPHIC LOG

DESCRIPTIVE LOG

213'6" - 252'6" // INTERMEDIATE ? LAVA
Rare quartz veinlets, feldspar phyric, minor carbonate veinlets
249' - 252'6" // Minor carbonate spotting

252'6" - 269'2" // INTERMEDIATE VOLCANIC
Feldspar phyric, very siliceous, intense quartz veining (70%).
261'6" - 264' Minor carbonate spotting.

269'2" - 272' // SILICEOUS VOLCANIC INTERMEDIATE
Moderate quartz veining 50-65°, weak carbonate spotting.

272' - 307'6" // RHYOLITE, Weak quartz vns.
297'6" - 298'2" chloritic and carbonate spotting

307'6" - 312'2" // BLEACHED CARBONATED INTERMEDIATE LAVA.
Weakly foliated, 35-40°.

312'2" - 318'6" // SILICIFIED INTERMEDIATE VOLCANIC.
Weakly quartz veined, minor carbonate patches.

318'6" - 319'9" // LAMINATED CHLORITIC SILICEOUS TUFF.

319'9" - 323'6" // CHLORITIC INTERMEDIATE VOLCANIC
Irregular carbonate spotting
323'5" 1" stony carbonate blebs with minor blebby galena 3-5%.

323'6" - 334' // BLACK SILICEOUS SILTSTONE
Massive with minor brecciated section thin quartz and carbonate veinlets. Moderate laminations. (45°)

334' - 361' // LAMINATED PYRITIC SILTSTONE
3-3% pyrite in finely laminated sediment. Bedding 25°, ripup clasts noted. Minor zones of siliceous black sediment.

E.O.H.

SHEET 3 OF

559

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

HEADING SHEET

COLLAR INFORMATION	DATA TYPE	COLLAR CO-ORDINATES EASTING	NORTHING	ELEVATION	COLLAR SURVEY AZIMUTH	DIP	HOLE NAME	TOTAL DEPTH	HOLE TYPE	DESC CODE	REMARKS
		5863	23994		10°	45	MPTO	546			

PROJECT	HENTY FAULT ZONE	HOLE NAME	MP 70
LOGGED BY	J.P. RANDELL	TOTAL DEPTH	546ft
CONTRACTOR	JUNE 1986	RIG	
CREW		DATE STARTED 1940 FINISHED	

CORE STORAGE		SAMPLE STORAGE
Nº OF TRAYS	LOCATION	
M & P LAB		ASSAY LAB

DESC.	SIZE	FROM	TO	TOTAL	REMARKS
NON CORE					
CORE	HQ				
	NQ				
	BQ				
CASING					
CASING LEFT					(S) steel (P) plastic

SURVEY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	AZIMUTH	DIP	REMARKS

PLOTTING KEY

SYMBOL DES. CODE	SYMBOL G/LOG	INTERVAL FROM	INTERVAL TO	SYMBOL DES. CODE	SYMBOL G/LOG	INTERVAL FROM	INTERVAL TO

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE Nº	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
C	0						
C	10						
C	17.5						
C	28.0						
C	35.5						
C	45.0						
S	51.5						
S	54.0						
S	57.5						
C	60.0						
C	70						
C	80						
C	91						
C	101						
C	112						
C	122						
C	132						
C	140						

DESCRIPTIVE LOG

0 – 17'6" Pink siliceous acid volcanic – massive. Rare ferruginous on fracture planes.

17'6" – 28' Dark green quartz veined massive intermediate lava.

– 35'6" Massive pink weakly quartz veined acid lava.

35'6" – 54' Mixed dark green quartz veined massive intermediate lava and pale pink slightly silicified quartz veined acid lavas. Banding intermittenly siliceous towards bottom.

54' – 57'6" Massive white quartz vein obscured. No

57'6" – 91' Mixed grad contacts massive pink quartz veined acid lava/green quartz veined intermediate lavas.

91' – 112' Predominantly pale pink silicified and quartz veined with minor thin carbonate veinlets massive lava. Strongly broken core.

112' – 148' Strongly quartz veined silicified green intermediate lava. Brecciated in places.

DRILLING OBJECTIVES / SUMMARY Duttons workings

REPORT REFERENCE :

SHEET ... OF ...

9605546

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	HOLE NAME MP 70
LOGGED BY	TOTAL DEPTH

	DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE Nº	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
S	148·00	156·50							148' - 160' Strong silicified massive acid lava with increasing fine brown carbonate veinlets down hole. May be some fine sulphide.
S		160							160' - 179'6" Very strong carbonated quartz zones of strong breccia and fine ferruginous veining. Strongly broken core. Some of graphitic material caught up in it.
S		170							179'6" - 240' Strongly broken core. Bedding variable in development. Angle 60-75° Defined by fine carbonate/folds laminae. Rock type varies from fine black siltstone to fine to medium grain banded wacke.
S		179·50							240' - 245' Pale yellow green layered siliceous and carbonated tuff with wispy chlorite and epidote.
S		185							245 - 265' Grey black laminated siltstone/volcaniclastic wacke with fine grained quartz veining. Minor 5-10cm white quartz veins contacts obscured.
C		185							265 - 339' Variable fine laminated siltstone poorly banded fine wacke to fine-medium grained volcaniclastic wacke. Minor irregular quartz veining.
C		205							339 - 349' Pale grey poorly bedded fine to medium grained wacke with 3-5% cross cutting sphalerite-carbonate veinlets.
C		215							Sph
C		225							349 - 429' Grey fine medium grained poorly layered and weakly carbonate veined volcaniclastic wacke. Some more silty sections.
C		235							429 - 450' Grey fine grained wacke with irregular weak sphalerite-carbonate veinlets. Some zones of white quartz siltstone breccia. Some fine siltstone bands. Generally 3-5% sphalerite veinlets.
S		240							450 - 485' Grey poorly laminated fine grained wacke.
S		245							485 - 508' Predominantly white quartz minor blebby pyrite, some zones breccias of black fine grained siltstone.
S		255							508 - 546' Fine laminated pyrite black siltstone with minor quartz veins. Bedding 70-75°
S		265							
C		275							
C		285							
C		295							
C		305							
C		315							
C		325							
C		335							
S		339							
S		344							
S		349							
C		360							
C		370							
C		380							
C		390							
C		400							
C		410							
C		420							
C		429							
C		435							
S		440							
S		445							
S		450							
C		460							
C		470							
C		480							
C		485							
S		495							
S		502							
S		508							
C		520							
C		530							
C		540							
C		546							

ASSAY INFORMATION

SHEET 2 OF

560

9605 47

561

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

HEADING SHEET

COLLAR INFORMATION	DATA TYPE	COLLAR CO-ORDINATES: EASTING	NORTHING	ELEVATION	COLLAR SURVEY: AZIMUTH	DIP	HOLE NAME	TOTAL DEPTH	HOLE TYPE	DESC CODE	REMARKS
							MP71	594			

PROJECT	HENTY FAULT ZONE	HOLE NAME	MP 71
LOGGED BY	J.R. RANDELL	TOTAL DEPTH	594 Ft
CONTRACTOR	JUNE 1986	RIG	
CREW		DATE STARTED	FINISHED .....

CORE STORAGE: No OF TRAYS	LOCATION	SAMPLE STORAGE

M&P LAB — ASSAY LAB

DESC.	SIZE	FROM	TO	TOTAL	REMARKS
NON CORE		0	52		
CORE	HQ				
	NQ				
	BQ				
CASING					
CASING LEFT					(S) steel (P) plastic

SURVEY INFORMATION

DISTANCE FROM COLLAR: TO TOP	TO BOTTOM	AZIMUTH	DIP	REMARKS

PLOTTING KEY

SYMBOL: DES. CODE	G/LOG	INTERVAL: FROM	TO	SYMBOL: DES. CODE	G/LOG	INTERVAL: FROM	TO

ASSAY INFORMATION

DISTANCE FROM COLLAR: TO TOP	TO BOTTOM	SAMPLE No	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
C 52	62.00						
C	72						
C	82						
C	96						
C	100						
C	105						
C	115						
C	124						
S 124	131						
S 131	140						
S 140	147						
S	153						
S	160						
S	169						
C	180						
C	190						
C	200						
C	210						
C	220						
C	230						
C	240						
C	250						
C	260						
C	270						
C	276						

DESCRIPTIVE LOG

52 - 82.5 Massive pink weakly quartz veined acid lava. Some green chlorite veinlets

82.5 - 105 Pale pink green siliceous acid lava with thin chlorite veinlets throughout.

105 - 131 Fractured pink - green quartz veined siliceous lava becoming more intense at bottom.

131 - 153 90% massive white to milky quartz. Minor carbonate veinlets

153 - 169 Strong broken core, graphitic brecciated. Some quartz veined volcaniclastic arenite

169 - 283 Grey black fine layered (blebby 80-90°) volcaniclastic arenite with Some lithic components, bedding variable from very good to poor. Becoming courser and sandier towards bottom.

DRILLING OBJECTIVES / SUMMARY

REPORT REFERENCE :

SHEET ... OF ...

960548

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	HOLE NAME MP 71
LOGGED BY	TOTAL DEPTH

562

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
283	288							283 - 288 Fine grained pale yellow green layered sericitic sediment with wispy apple green laminae + fine quartz veinlets containing minor fine sulphide.
	300							288 - 390 Black fine bedded sediment with some coarser arenaceous layers and minor zones of strong carbonate veining. Thick quartz vein (1") at 337' 60° Towards bottom becoming sandier Also more intense carbonate veining
	310							
	320							
	330							
	340							
	350							
	360							
	370							
	380							
	390							
	400							390 - 420 Moderately cleaved strongly broken sericitic sandy volcaniclastic arenite Grey carbonate bearing Gradation change down hole to more gr finer grained silty sediment
	410							
	420							
	430							
	440							420 - 453 Very fine grained massive silty carbonate sediment with fine brecciated carbonate veinlets.
	446							
	453							453 - 475 Strongly carbonate veined in places and graphitic numerous zones of brown sideritic carbonate + sphalerite
	460							
	465							
	470							
	475							475 - 594 Strongly broken core to 435' but only weak carbonate veining. Generally fine medium grained black silty to sandy volcaniclastic. Fine bedding usually 80-90° to core axis 562-567 Zone of strong quartz veining Becoming more silty from 565'
	485							
	495							
	505							
	515							
	525							
	535							
	545							
	555							
	565							
	575							
	585							
	594							E.O.H.

SHEET 2 OF 2

960549

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

HEADING SHEET

COLLAR INFORMATION	DATA TYPE	COLLAR CO-ORDINATES EASTING	NORTHING	ELEVATION	COLLAR SURVEY AZIMUTH	DIP	HOLE NAME	TOTAL DEPTH	HOLE TYPE	DESC CODE	REMARKS
		7878	3318	488	122	61	MP86	331	EX		

PROJECT	HENTY FAULT ZONE
LOGGED BY	J. RANDELL
CONTRACTOR	MAY 1986
CREW	
CORE STORAGE — No OF TRAYS	LOCATION
MAP LAB	
HOLE NAME	MP 86
TOTAL DEPTH	331 ft
RIG	
DATE STARTED 15/5/87 FINISHED	
SAMPLE STORAGE	
ASSAY LAB	

SURVEY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	AZIMUTH	DIP	REMARKS
0		122	61	
100			53.5	
200			44.5	
300			50	

PLOTTING KEY

SYMBOL DES. CODE	SYMBOL G/LOG	INTERVAL FROM	INTERVAL TO	SYMBOL DES. CODE	SYMBOL G/LOG	INTERVAL FROM	INTERVAL TO

DESC.	SIZE	FROM	TO	TOTAL	REMARKS
NON CORE		0	38	38	
CORE	HQ				
	NQ				
	BQ EX	38	331	293	
CASING					
CASING LEFT					(S) steel (P) plastic

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
38.00	48						
48	58						
58	68						
68	78						
78	88						
88	98						
98	108						
108	118						
118	128						
128	138						
138	148						
148	158						
158	168						
168	174						
174	180						
180	185						
185	190						
190	195						
195	205						
205	215						
215	225						
225	238.00						

DESCRIPTIVE LOG

38-76 Massive siliceous quartz phyric acid lava. Layering quartz porphyroblasts with some quartz veining. Minor fine ferruginous network veinlets.

76-78 Massive green quartz feldspar phyric dacitic/andesitic lava. Thining quartz veinlets & porphyroblasts, as above.

78-95 Massive siliceous acid lava. Quartz feldspar veining & porphyroblasts.

95-102 Green dacitic siliceous lava. Minor quartz carbonate blobs.

102-124 Massive siliceous acid lava. Minor quartz carbonate veining.

124-125.5 Green dacitic lava, contacts gradational or obscure.

125.5-180 Siliceous acid lava (rhyolite) with irregular quartz (carbonate) veinlets. More intense sil & veining towards bottom.

180-190 Fine bedded wacke (85°) with numerous (0.1-0.6') quartz veins.

190-238 Moderate well bedded (85°) grey feldspar wacke. Trace carbonate spotting.

DRILLING OBJECTIVES / SUMMARY: Test geophysical anomaly at 33400N 8300E

REPORT REFERENCE :

563

960550

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	HOLE NAME MP 86
LOGGED BY	TOTAL DEPTH

	DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE Nº	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
C	238	00							238-331 Fine grey/black/green finely & poorly laminated mudstone. Bedding where visible 80°
C	248								294-307 80% milky fragments
C	258								277' 05" massive pyrite
C	268								
C	278								
C	288								
S	294								
S	300								
C	307								
C	317								
C	325								

ASSAY INFORMATION

SHEET 2 OF

564

9960551

565

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

HEADING SHEET

COLLAR INFORMATION	DATA TYPE	COLLAR CO-ORDINATES EASTING	NORTHING	ELEVATION	COLLAR SURVEY AZIMUTH	DIP	HOLE NAME	TOTAL DEPTH	HOLE TYPE	DESC CODE	REMARKS
		8045	3239	622	90	49	MP87	576			

PROJECT HENTY FAULT ZONE	HOLE NAME MP87
LOGGED BY J. RANDELL	TOTAL DEPTH 576 Ft.
CONTRACTOR MAY 1986	RIG
CREW	DATE STARTED 26/6/87 FINISHED
CORE STORAGE: No OF TRAYS / LOCATION	SAMPLE STORAGE
MAP LAB	ASSAY LAB

DESC.	SIZE	FROM	TO	TOTAL	REMARKS
NON CORE		0	11		
CORE	HQ				
	NQ				
	BQ EX	11	576		
CASING					
CASING LEFT					(S) steel (P) plastic

SURVEY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	AZIMUTH	DIP	REMARKS
0		90	49	
100			44	
200			36	

PLOTTING KEY

SYMBOL DES. CODE	G/LOG	INTERVAL FROM	TO	SYMBOL DES. CODE	G/LOG	INTERVAL FROM	TO

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE No	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
C 11.00							
C 30							
C 50							
C 75							
C 100							
C 125							
C 150							
C 175							
C 200							
C 225							
C 250							
C 275							
C 300							
C 325							
C 350							
C 375							
C 400							
C 425							
C 450							
C 475							

DESCRIPTIVE LOG

11-125 Fine layered grey wacke/sediment.
107-110' 7° only massive quartz.

125- Black fine laminated siltstone quite strongly fissile.

NB 29-230' represented by only 32ft of core
i.e. 15ft missing, rest is core loss on drilling.

280-295 Predominantly quartz veins, minor black siltstone.
326-328 Predominantly quartz.

NB (1) 230-380ft (150ft) represented by only 41ft of core
9ft missing, rest is core loss.

(2) 380-506 (126ft) represented by 50ft core.

Generally black siltstone poorly laminated
40-45°

DRILLING OBJECTIVES / SUMMARY

REPORT REFERENCE :

SHEET ..... OF .....

960532

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	HOLE NAME MP 87
LOGGED BY	TOTAL DEPTH

566

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
C 500·00								?506-576 Fine layered wacke core quartz veinlets. Some coarser sections. Layering at 40° to core axes.
C 525								
C 550	586·00							

ASSAY INFORMATION

SHEET OF

9605553

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

HEADING SHEET

COLLAR INFORMATION	DATA TYPE	COLLAR CO-ORDINATES EASTING	NORTHING	ELEVATION	COLLAR SURVEY AZIMUTH	DIP	HOLE NAME	TOTAL DEPTH	HOLE TYPE	DESC CODE	REMARKS
		6039	23854	128	280	65	MP88	659			

PROJECT HENTY FAULT ZONE	HOLE NAME MP88
LOGGED BY J. RANDELL	TOTAL DEPTH 659ft
CONTRACTOR MAY 1986	RIG
CREW	DATE STARTED 22/10/51 FINISHED
CORE STORAGE: Nº OF TRAYS / LOCATION	SAMPLE STORAGE
M&P LAB	ASSAY LAB

DESC.	SIZE	FROM	TO	TOTAL	REMARKS
NON CORE		0	50		
CORE	HQ				
	NQ				
	~~NQ~~ EX	50	659		
CASING					
CASING LEFT					(S) steel (P) plastic

SURVEY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	AZIMUTH	DIP	REMARKS
0		280	65	
100			60	
200			54	
300			43	
400			31·6	
500			29·7	

PLOTTING KEY

SYMBOL DES. CODE	SYMBOL G/LOG	INTERVAL FROM	INTERVAL TO	SYMBOL DES. CODE	SYMBOL G/LOG	INTERVAL FROM	INTERVAL TO

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE Nº	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
C 50·00							
C T0							
S 100							
S 130							
C 150							
C 165							
S 182							
S 201							
S 210							
S 225							
S 240							
S 250							
S 259							

T.S. 211

DESCRIPTIVE LOG

50-138 Irregularly & poorly laminated siltstone with lesser wacke component. Bedding shallow 40° Some carbonate-quartz veining
100' 0·3ft massive quartz
125' 0·2ft massive quartz

138-182 Bedded fine wacke with some lithic clasts siltstone & quartz laminae. Moderate carbonate quartz veining
Increased carbonate layering down hole at 40-45°
Gradational contact

182-201 Strongly siliceous sediment. Poorly layered, chlorite + carbonate very strong in places

201-210 Weakly siliceous wacke. Minor lithics
Bedding 40-45°

210-240 Moderate-strong siliceous sediment, generally poorly laminated, sometimes wavy, moderate carbonate alteration.

240-259 Mixed siliceous sediment, black siltstone + minor wacke. Weak carbonate veining.

DRILLING OBJECTIVES / SUMMARY To test for mineralization intersected in MP 33, 35.
Result: Intersected Farrell Quartz + Daly's line of lode.

REPORT REFERENCE :

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	HOLE NAME MP 88
LOGGED BY	TOTAL DEPTH

568

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE Nº	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG		DESCRIPTIVE LOG
C	259								259-311 Fine poorly layered wacke. Weak-moderate carbonate veining.
C	270								270-290 Layering becomes better defined. 50° Weak carbonate veinlets throughout.
C	280								
C	290								
C	300								
S	311								311-324 Fine laminated black siltstone. Some chloritic mudstone. Bedding generally 50-55° although minor sections of disrupted beds at 20° 319' 0.7' Massive quartz vein, contents obscured trace ferruginous. Trace pyrite.
S	317								
C	324								324-351 Fine to medium grained tuff wacke increased grain size down hole. Minor layering 55° Minor quartz veinlets
C	335							TS 329	
S	345								
S	351								351-356 70% quartz 20% carbonate 10% chlorite siltstone gangue.
S	356								356-360 Fine black poorly laminated siltstone 60° bedding. Trace carbonate veinlets.
S	360								360-364 85% quartz 10% carbonate 5% gangue. Minor blebby pyrite
S	364								364-383 Predominantly bedded black siltstone (60-65°) with quartz veins at 377'378' (1"-2" wide?)
S	375								Vein contacts 381'-383' (1' obscured Trace coarse pyrite & trace
S	383								383-411 Fine bedded black siltstone. 65-70° Thin carbonate veinlets
S	400								391-392 Massive quartz, contacts 45°, 60°
C	411								
C	421								
C	431								
C	440								
C	450								
C	460								
C	470								
C	480								
C	490								
C	500								
C	510								
C	520								
C	530								
C	538								
C	550								
	4 Samples of composite mixed core.								
All Split	560 A							TS 415	411-538 Fine layered tuff/wacke with some green pale green chloritic mudstone. 411-480 Weak carbonate veining + broken core. → 480 → essentially fairly massive medium wacke/tuff.
	B								
	C								
	D								
									538->563 Massive weakly layered medium grained feldspar phyric lava/tuff
									N.B. 563-659 is all mixed up core pieces of feldspar phyric volcanic/tuff, quartz 20% black siltstone

SHEET 2 OF

9605553

569

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

HEADING SHEET

COLLAR INFORMATION

DATA TYPE	COLLAR CO-ORDINATES EASTING	NORTHING	ELEVATION	COLLAR SURVEY AZIMUTH	DIP	HOLE NAME	TOTAL DEPTH	HOLE TYPE	DESC CODE	REMARKS
	10702	11948		090	45	TP133	296			

PROJECT HENTY FAULT ZONE	HOLE NAME TP 133
LOGGED BY J RANDELL	TOTAL DEPTH 296 ft
CONTRACTOR JULY 1986	RIG
CREW	DATE STARTED 17/9/86 FINISHED

CORE STORAGE		SAMPLE STORAGE
No OF TRAYS	LOCATION	
M & P LAB		ASSAY LAB

DESC.	SIZE	FROM	TO	TOTAL	REMARKS
NON CORE		0	66		
CORE	HQ				
	NQ				
	BQ BX	66			
CASING					
CASING LEFT					(S) steel (P) plastic

SURVEY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	AZIMUTH	DIP	REMARKS
0		090°	45	
100			43	
200			44	
300			41.5	

PLOTTING KEY

SYMBOL DESC. CODE	SYMBOL Q/LOG	INTERVAL FROM	INTERVAL TO	SYMBOL DESC. CODE	SYMBOL Q/LOG	INTERVAL FROM	INTERVAL TO

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE No	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG
C 66.00	76						
C 76	86						
S 86	91						
S 91	93						
C 93	103						
C 103	113						
C 113	122						
C 122	132						
C 132	142						
C 142	152.00						

DESCRIPTIVE LOG

66-91 Pale grey-green layered dacitic pyroclastic. Minor quartz veins increasing down hole. Minor ferruginous + strong quartz at lower contact.

91-93 Strongly contorted with some brecciated bedding 0.1-0.3 inch laminae strong altered siliceous + black siltstone. Predominantly of quartz at bottom. Contact upper 45°.

93-122 Fine well laminated (50°) green grey mudstone in places, others show vague layering. 107-105' 30-40 quartz in breccia. All core strongly broken.

122-137 Fine grey siltstone bedding 40-45° increasing fissility down hole. Cleavage 35-40° Bedding 55-60°

137-140 Green highly fissile + in places brecciated shale

DRILLING OBJECTIVES / SUMMARY

REPORT REFERENCE :

SHEET ..... OF .....

9605556

570

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	HOLE NAME TP 133
LOGGED BY	TOTAL DEPTH

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG		DESCRIPTIVE LOG
C 152.00									140 - 153 Grey black well laminated siltstone with minor quartz carbonate laminae
C 162									153 - 172 Strongly fissile green mudstone well laminated 55°
C 172									167 4" quartz, carbonate, chlorite breccia.
C 182									172 - 196 Grey black fine laminae and strong fissile siltstone/shale.
C 192									176' 0.5ft quartz, carbonate breccia.
C 202									196 - 207 Fine laminated green mudstone 45-50° Strongly fissile.
C 212									207 - 213 Fine laminated grey black siltstone
S 222									213 - 218 Green highly fissile mudstone 55-60° bedding
S 224									218 - 234 Grey fine laminated siltstone minor carbonate veinlets
S 229									222 - 224 Strong quartz veining + breccia
S 236								TS 235	234 - 238 Medium grained feldspar phyric dacitic pyroclastic
S 238									238 - 243 Fractured quartz (-carbonate) + minor chlorite + siltstone. Trace. Contacts obscured.
S 243									243 - 245 Quartz - shale breccia. 30% 70%
S 245									245 - 255 Green fissile mudstone/shale.
S 250									255 - 259 Quartz 85%, 15% chlorite siltstone breccia
S 255									259 - 276 Fine laminated grey siltstone often contorted bedding irregular quartz veins and breccias. 15% quartz overall.
S 259									276 - 296 Fine grey laminated siltstone shale bedding wavy contorted, 65°
S 265									
S 270									
S 276									
C 286	296.00								

ASSAY INFORMATION

SHEET 2 OF

9605571

571

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

HEADING SHEET

COLLAR INFORMATION	DATA TYPE	COLLAR CO-ORDINATES: EASTING	NORTHING	ELEVATION	COLLAR SURVEY: AZIMUTH	DIP	HOLE NAME	TOTAL DEPTH	HOLE TYPE	DESC CODE	REMARKS
		11233	14275		270°	45	TP135	346	BA		

PROJECT	HENTY FAULT ZONE
LOGGED BY	J P RANDELL
CONTRACTOR	JULY 1986
CREW	
CORE STORAGE: Nº OF TRAYS	LOCATION
MAP LAB	

HOLE NAME	TP 135
TOTAL DEPTH	346 ft
RIG	
DATE STARTED 8/11/86 FINISHED	
SAMPLE STORAGE	
ASSAY LAB	

DESC.	SIZE	FROM	TO	TOTAL	REMARKS
NON CORE		0	13	13	
CORE	HQ				
	NQ				
	BQ	13	295	282	
CASING					
CASING LEFT					(S) steel (P) plastic

SURVEY INFORMATION

DISTANCE FROM COLLAR: TO TOP	TO BOTTOM	AZIMUTH	DIP	REMARKS
0		270°	45	
100		—	46·75	
200		—	42·50	

PLOTTING KEY

SYMBOL: DES. CODE	G/LOG	INTERVAL: FROM	TO	SYMBOL: DES. CODE	G/LOG	INTERVAL: FROM	TO

ASSAY INFORMATION

DISTANCE FROM COLLAR: TO TOP	TO BOTTOM	SAMPLE Nº	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG		DESCRIPTIVE LOG
13·00									13-14 Pale green weathered layered siliceous volcaniclastic.
14·00									14-17·8 Green chloritic weakly foliated feldspar phyric andesite (lava?) with rare quartz ho
17·80									17·8-37·8 Fine grained poorly laminated (65°) pervasively carbonated + quartz veined volcani- clastic. Chloritic in places with suggestion of epiclastic nature.
20·00									17·8-25·5 Intense carbonate alteration + minor pyrite.
25·50									35'-37·8' Fine laminations and staining suggest weak fine grain sulphide.
30·00									
35·00									
37·80									
42·30									
44·50									
49·50									
55·00								T.S.	37·8-42·3 Green feldspar phyric with chloritic
58·00								38·0	?amygdales andesitic lava. Moderate quartz veined.
63·25	65·20								42·3-45·5 Pervasive weak carbonation in fine grained volcanic.
									-49·5 Moderate quartz carbonate irregular veining with strong chlorite. Manganese band at 44·6
									49·5-55 Intense wavy carbonate alteration plus some silicification.
									-58 Decreasing carbonate altering imparted foliation 45-50°
									58-65·2 Decreasing carbonate + increasing chlorite. Fine network of manganese carbonate veinlets developing at bottom

DRILLING OBJECTIVES / SUMMARY

REPORT REFERENCE :

SHEET 1 OF

9605 58

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	HOLE NAME TP 135
LOGGED BY	TOTAL DEPTH

572

ASSAY INFORMATION

	DISTANCE FROM COLLAR TO TOP	TO BOTTOM
S	65.20	70.00
C	70.00	
C	80.00	
C	87.00	
C	94.00	
C	104.00	
C	114.00	
C	121.00	
C	128.30	
S	138.50	
S	143.50	
C	148.50	
C	158.00	
C	168.00	
C	178.00	
C	185.00	
C	195.00	
C	202.00	
C	212.00	
C	220.00	
C	230.00	
C	240.00	
C	250.00	
C	260.00	
S	269.00	
S	271.00	
S	275.00	
C	279.00	
C	285.00	
S	291.00	
S	293.00	

SAMPLE Nº | CORE ANGLE | ROCK TYPE | QUAN | DESC CODE | GRAPHIC LOG

DESCRIPTIVE LOG

65.2 - 94 Grey-green poorly and irregular laminated, contorted bedding. Appears to be fine wacke or volcanogenic sediment. Minor well laminated siltstone.
77-79 Moderate carbonate veining.
69-71 Moderate brecciation.
Bedding variable 40-85°

94 - 128.3 Generally well laminated black siltstone.
Bedding 70-80°. Minor carbonate veinlets.
Quartz filled breccia at 100'
100-105' Brecciated and weakly carbonate veined.
105-115' Bedding disrupted often wavy.
115-128.3' More regular bedding 75° fine laminations. Weak irregular carbonate veinlets throughout.

128.3 - 148.5 Generally well laminated grey fine medium grained wacke, weakly silicified thin carbonate veinlets.
138.5-148.5' Zone of strong quartz impregnation, milky, thin carbonate veinlets, contorted bedding.

148.5-163 Fine laminated black siltstone. weak crackle carbonate veining.

163 - 202 Gradual intermixing of above with olive green laminated chloritic mudstone. Very gradational and irregular change.
Bedding still 75°
Minor thin quartz veins. Weak crackle carbonate veinlets.
198 0.5' carbonate breccia.

202 - 220 Moderate well laminated black siltstone with ubiquitous thin carbonate veinlet network and minor quartz bandins.

220 - Fine laminated carbonated mixed green mudstone/siltstone.
222-223 Boudin bands milky quartz concordant with bedding.
224 - 0.5' brecciated carbonate matrix
Bedding constant at 65-70°
232-237 Very strong fissile shale.
269-271 Several thick quartz carbonate veins 50° to core less.
275-279 Several boudin quartz carbonate veins and crackle carbonate veining.
279-283 Strong carbonate crackle veining.
291.2-291.9 Siltstone breccia with quartz carbonate - hematite - sphalerite (30%)
292.8-292.9 Carbonate - hematite - sphalerite breccia.

SHEET 2 OF

9909559

SHLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	HOLE NAME TP135
LOGGED BY	TOTAL DEPTH

ASSAY INFORMATION

DISTANCE FROM COLLAR TO TOP	TO BOTTOM	SAMPLE Nº	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
S 297.00								301 - 303 Coarse quartz carbonate chlorite breccia.
S 301								304 - 312 Scattered quartz carbonate pyrite breccia zones + quartz carbonate veining.
S 303								312 - 314 Crumbly oxidised and completely degraded siltstone.
S 304								314 - 318 Quartz carbonate veins and breccia zones.
S 308								318 - 320 85% Quartz carbonate vein. Contacts obscured.
S 312								320 - 325 Quartz carbonate siltstone breccia zones.
S 318								325 - 330 Mainly degraded fissile siltstone with minor quartz carbonate breccia.
S 320								335 - 346 Fine laminated green mudstone. Bedding 75-80° to core axis.
S 325								
S 330								
C 335								
C 340	346.00							
EOH								

SHEET 3 OF

574

960561

COMLABS SERVICES PTY. LTD.

305 South Road, Mile End South, South Australia 5031 Telephone (08) 43 5722 Telex LABCOM AA89323 Facsimile No. (08) 234 0321

NATA REGISTERED No. 1526

OUR REF. COM861241

YOUR REF. 08341/LJ50/JPR/015

Mr. J. Randell
The Shell Co. of Aust. Ltd.
30 Mersey Main Rd
Spreyton
DEVONPORT
TAS 7310

August 7, 1986

Dear Jeff

RE: JOB COM861241

Enclosed are the assays for the samples delivered to our laboratory on July 31, 1986

Yours Sincerely,
COMLABS PTY LTD

per :

Report Length 6 pages

960562

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full

ANALYTICAL REPORT JOB COM861241
O/N : 08341/LJ50/JPR/015

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
MP70/ 0	120	42	1	<0.01	16	9	270
MP70/ 10	14	26	<1	<0.01	16	10	270
MP70/17.5	8	50	<1	<0.01	20	4	160
MP70/ 28	7	32	<1	<0.01	4	6	270
MP70/35.5	12	32	1	<0.01	18	4	160
MP70/ 45	5	42	<1	<0.01	14	4	80
MP70/51.5	6	20	<1	<0.01	4	4	35
MP70/ 54	5	14	1	<0.01	<4	<2	20
MP70/57.5	4	20	1	<0.01	<4	6	90
MP70/ 60	5	30	<1	<0.01	4	2	185
MP70/ 70	4	24	1	<0.01	<4	<2	175
MP70/ 80	5	44	<1	<0.01	8	6	115
MP70/ 91	4	42	<1	<0.01	<4	7	120
MP70/101	5	30	<1	<0.01	10	3	135
MP70/112	7	32	1	<0.01	8	8	105
MP70/122	6	55	1	<0.01	12	4	65
MP70/132	4	28	1	<0.01	4	<2	30
MP70/140	6	28	<1	<0.01	16	16	40
MP70/148	4	240	1	<0.01	210	8	45
MP70/156.5	24	185	8	<0.01	210	42	45
MP70/160	26	175	8	<0.01	220	42	70
MP70/170	44	125	10	<0.01	95	42	75
MP70/179.5	7	42	1	<0.01	14	34	135
MP70/185	5	60	1	<0.01	14	4	95
MP70/195	4	135	1	<0.01	70	26	105
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

576

960563

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT JOB COM861241

O/N : 08341/LJ50/JPR/015

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
MP70/205	4	210	1	<0.01	220	32	120
MP70/215	4	390	10	<0.01	60	22	105
MP70/225	5	46	1	<0.01	10	24	130
MP70/235	4	85	1	<0.01	26	40	150
MP70/240	6	32	1	<0.01	<4	46	175
MP70/245	14	700	1	<0.01	440	42	140
MP70/255	7	165	2	<0.01	135	42	130
MP70/265	5	60	1	<0.01	16	55	125
MP70/275	5	110	1	<0.01	70	30	135
MP70/285	6	520	2	<0.01	480	36	150
MP70/295	6	680	2	<0.01	830	75	170
MP70/305	7	910	2	<0.01	570	75	185
MP70/315	6	260	3	<0.01	1000	70	155
MP70/325	7	970	2	<0.01	400	95	185
MP70/335	6	1200	3	<0.01	1250	55	155
MP70/339	4	1400	3	<0.01	1200	160	120
MP70/344	5	790	4	<0.01	1600	80	125
MP70/349	4	320	1	<0.01	160	22	120
MP70/360	3	75	1	<0.01	210	7	90
MP70/370	4	730	2	<0.01	950	8	125
MP70/380	5	210	1	<0.01	240	16	135
MP70/390	3	175	1	<0.01	42	12	130
MP70/400	4	90	1	<0.01	70	18	140
MP70/410	4	185	1	<0.01	115	60	220
MP70/420	4	170	1	<0.01	400	110	190
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

577

960564

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT JOB COM861241

O/N : 08341/LJ50/JPR/015

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
MP70/429	7	740	5	<0.01	2150	580	200
MP70/435	12	1150	5	<0.01	2100	240	170
MP70/440	34	340	10	<0.01	3900	195	125
MP70/445	12	280	3	<0.01	280	20	155
MP70/450	16	80	1	<0.01	100	24	270
MP70/460	12	200	1	<0.01	230	12	180
MP70/470	7	270	1	<0.01	380	280	210
MP70/480	8	95	1	<0.01	360	430	230
MP70/485	18	70	2	<0.01	155	180	100
MP70/495	65	50	1	<0.01	44	38	270
MP70/502	55	50	2	<0.01	100	38	185
MP70/508	70	110	1	<0.01	55	50	430
MP70/520	65	105	1	<0.01	55	42	610
MP70/530	65	260	2	<0.01	290	85	540
MP70/540	70	600	2	<0.01	300	115	480
MP70/546	LNR	LNR	LNR	LNR	LNR	LNR	LNR
MP71/ 52	10	55	1	<0.01	16	10	350
MP71/ 62	5	32	<1	<0.01	6	6	370
MP71/ 72	3	65	<1	<0.01	16	4	290
MP71/ 82	3	40	1	<0.01	12	5	350
MP71/ 90	2	26	3	<0.01	12	<2	300
MP71/100	3	30	1	<0.01	4	5	210
MP71/105	4	32	1	<0.01	4	10	170
MP71/115	4	46	<1	<0.01	8	9	110
MP71/124	3	16	<1	<0.01	<4	4	75
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

578

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full

ANALYTICAL REPORT JOB COM861241

O/N : 08341/LJ50/JPR/015

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
MP71/131	2	18	1	<0.01	<4	4	50
MP71/140	3	18	<1	<0.01	6	8	55
MP71/147	3	195	1	<0.01	55	14	35
MP71/153	5	40	1	<0.01	38	14	55
MP71/160	5	330	2	<0.01	75	36	105
MP71/169	3	22	1	<0.01	16	14	70
MP71/180	4	140	1	<0.01	150	32	80
MP71/190	3	26	1	<0.01	105	55	155
MP71/200	3	28	1	<0.01	65	24	120
MP71/210	3	40	1	<0.01	36	16	95
MP71/220	3	28	1	<0.01	24	22	130
MP71/230	4	75	1	<0.01	28	30	130
MP71/240	3	70	1	<0.01	30	28	105
MP71/250	3	1600	1	<0.01	200	26	120
MP71/260	2	135	2	<0.01	580	42	145
MP71/270	4	250	2	<0.01	660	290	200
MP71/276	4	34	1	<0.01	160	16	120
MP71/283	10	42	1	<0.01	20	60	200
MP71/288	2	34	1	<0.01	12	34	170
MP71/300	3	30	1	<0.01	40	18	155
MP71/310	10	2200	2	<0.01	360	42	190
MP71/320	4	65	1	<0.01	24	55	160
MP71/330	4	75	1	<0.01	195	34	180
MP71/340	26	1100	9	<0.01	2900	125	190
MP71/350	12	450	6	<0.01	2200	250	145
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

579

960566

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full

ANALYTICAL REPORT

JOB COM861241
O/N : 08341/LJ50/JPR/015

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
MP71/360	85	195	4	0.01	970	125	200
MP71/370	14	950	2	<0.01	1300	65	180
MP71/380	3	280	2	<0.01	680	75	145
MP71/390	4	220	2	<0.01	770	7	110
MP71/400	2	50	<1	<0.01	22	12	125
MP71/410	4	60	1	<0.01	110	9	130
MP71/420	3	55	1	<0.01	26	14	155
MP71/430	10	200	1	<0.01	44	10	140
MP71/440	4	75	1	<0.01	110	5	210
MP71/446	4	130	2	<0.01	690	18	160
MP71/453	4	100	1	<0.01	210	55	140
MP71/460	4	220	1	<0.01	380	230	125
MP71/465	5	32	1	<0.01	14	165	150
MP71/470	5	40	1	<0.01	65	38	130
MP71/475	9	46	1	<0.01	120	90	280
MP71/485	90	160	2	<0.01	135	34	290
MP71/495	60	480	2	<0.01	165	40	440
MP71/505	60	220	1	<0.01	90	50	640
MP71/515	75	160	2	<0.01	50	55	560
MP71/525	75	150	9	<0.01	100	75	760
MP71/535	100	210	2	<0.01	125	30	640
MP71/545	85	110	1	<0.01	24	30	450
MP71/555	100	290	1	<0.01	130	20	590
MP71/565	95	400	2	<0.01	125	22	490
MP71/575	85	560	2	<0.01	460	60	470
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

580

COMLABS SERVICES PTY. LTD.

960567

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT JOB COM861241

O/N : 08341/LJ50/JPR/015

SAMPLE	Cu	Zn	Ag	Au	Pb	As	Ba
MP71/585	75	160	1	<0.01	80	46	850
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm
SCHEME	AAS1	AAS1	AAS3	FAS1	XRF1	XRF1	XRF1

581

960568

COMLABS SERVICES PTY. LTD.

305 South Road, Mile End South, South Australia 5031 Telephone (08) 43 5722 Telex LABCOM AA89323 Facsimile No. (08) 234 0321

NATA REGISTERED No. 1526

OUR REF: COM861484

YOUR REF: 08344/LJ50/60/JPR

Mr. J. Randell
The Shell Co. of Aust. Ltd.
30 Mersey Main Rd
Spreyton
DEVONPORT
TAS 7310

September 8, 1986

Dear Jeff

RE: JOB COM861484

Enclosed are the assays for the samples delivered to our laboratory on September 3, 1986

Yours Sincerely,
COMLABS PTY LTD

per :

Report Length 18 pages

582

960569

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full

ANALYTICAL REPORT

JOB COM861484
O/N : 08344/LJ50/60/JPR

SAMPLE		Sn	W
MP32	19.8	8	<10
MP32	25.9	4	15
MP32	30	<4	<10
MP32	35	6	<10
MP32	45	8	<10
MP32	55	8	15
MP32	65	10	<10
MP32	78	160	<10
MP32	78.11	6	10
MP32	88	12	10
MP32	96.6	10	10
MP32	101.1	12	<10
MP32	110	8	<10
MP32	120	8	<10
MP32	128	4	<10
MP32	136.5	<4	<10
MP32	137.2	6	<10
MP32	144	4	<10
MP32	145.8	8	<10
MP32	155	<4	10
MP32	165	8	<10
MP32	175	4	<10
MP32	185	10	<10
MP32	193	26	<10
MP32	197.6	LNR	LNR
	UNITS	ppm	ppm
	SCHEME	XRF1	XRF1

583

960570

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT JOB COM861484

O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
MP32 198.3	22	<10
MP32 203.6	<4	10
MP32 208	4	10
MP32 213.6	18	<10
MP32 225	4	10
MP32 235	4	<10
MP32 245	42	10
MP32 252.6	4	<10
MP32 262	<4	<10
MP32 269.2	100	<10
MP32 272	<4	<10
MP32 282	6	<10
MP32 292	14	<10
MP32 300	<4	<10
MP32 307.6	<4	<10
MP32 312.2	8	<10
MP32 318.6	10	10
MP32 319.9	8	<10
MP32 323.6	6	<10
MP32 328	10	10
MP32 334	10	<10
MP32 340	10	10
MP32 345	4	<10
MP32 350	6	<10
MP32 355	<4	<10
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

584

960571

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM861484
O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
MP32 361	LNR	LNR
MP30 12	<4	<10
MP30 20	8	<10
MP30 30	<4	<10
MP30 40	4	<10
MP30 50	<4	<10
MP30 60	4	<10
MP30 70	8	15
MP30 80	<4	<10
MP30 90	4	<10
MP30 100	4	<10
MP30 110	4	<10
MP30 120	6	<10
MP30 130	<4	10
MP30 140	8	<10
MP30 150	<4	<10
MP30 160	8	<10
MP30 170	<4	<10
MP30 180	<4	<10
MP30 190	8	<10
MP30 200	<4	<10
MP30 210	12	<10
MP30 220	10	<10
MP30 230	<4	<10
MP30 240	6	<10
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

960572

585

COMLABS SERVICES PTY. LTD.

- 4 -

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full

ANALYTICAL REPORT

JOB COM861484
O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
MP30 250	8	<10
MP30 260	12	<10
MP30 270	<4	10
MP30 280	<4	<10
MP30 292	8	<10
MP30 296.6	28	<10
MP30 301	40	10
MP30 305.3	75	10
MP30 312	12	<10
MP30 317	4	10
MP30 322	<4	<10
MP30 327	6	<10
MP30 332	8	<10
MP30 341.6	8	<10
MP30 350	<4	<10
MP30 360	8	<10
MP30 369	4	<10
MP30 375	4	<10
MP30 384	10	15
MP30 395	12	<10
MP86/ 48	6	<10
MP86/ 58	10	<10
MP86/ 68	4	10
MP86/ 78	6	15
MP86/ 88	4	<10
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM861484
O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
MP86/ 98	<4	<10
MP86/108	6	<10
MP86/118	6	<10
MP86/128	6	<10
MP86/138	4	<10
MP86/148	<4	<10
MP86/158	<4	<10
MP86/168	6	<10
MP86/174	8	10
MP86/180	<4	<10
MP86/185	6	<10
MP86/190	4	<10
MP86/195	<4	10
MP86/205	4	10
MP86/215	6	10
MP86/225	<4	10
MP86/238	4	<10
MP86/248	<4	<10
MP86/258	<4	<10
MP86/268	<4	<10
MP86/278	10	<10
MP86/288	<4	<10
MP86/294	8	15
MP86/300	6	<10
MP86/307	<4	10
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

587

960574

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full

ANALYTICAL REPORT JOB COM861484
O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
MP86/317	4	<10
MP86/325	<4	<10
MP86/331	8	<10
MP87/ 11	8	<10
MP87/ 30	<4	<10
MP87/ 50	4	<10
MP87/ 75	4	<10
MP87/100	4	15
MP87/125	<4	10
MP87/150	12	<10
MP87/175	<4	<10
MP87/200	<4	10
MP87/225	8	<10
MP87/250	8	<10
MP87/275	6	<10
MP87/300	<4	<10
MP87/325	10	10
MP87/350	4	<10
MP87/375	<4	15
MP87/400	8	<10
MP87/425	6	<10
MP87/450	6	15
MP87/475	8	10
MP87/500	4	<10
MP87/525	<4	<10
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

960575

588

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT JOB COM861484

O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
MP87/550	<4	<10
MP88/ 50	4	<10
MP88/ 70	4	<10
MP88/100	<4	10
MP88/130	4	<10
MP88/150	<4	<10
MP88/165	12	<10
MP88/182	8	<10,
MP88/201	12	15
MP88/210	10	<10
MP88/225	6	<10
MP88/240	6	<10
MP88/250	6	<10
MP88/259	4	<10
MP88/270	16	<10
MP88/280	14	<10
MP88/290	12	<10
MP88/300	20	<10
MP88/311	6	<10
MP88/317	12	10
MP88/324	8	<10
MP88/335	<4	<10
MP88/345	<4	<10
MP88/351	10	10
MP88/356	10	10
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

960576

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT JOB COM861484
O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
MP88/360	<4	10
MP88/364	6	10
MP88/375	6	<10
MP88/383	10	<10
MP88/400	8	10
MP88/411	<4	<10
MP88/421	6	<10
MP88/431	8	10
MP88/440	8	<10
MP88/450	8	<10
MP88/460	6	<10
MP88/470	<4	<10
MP88/480	6	<10
MP88/490	<4	<10
MP88/500	8	<10
MP88/510	<4	<10
MP88/520	16	10
MP88/530	16	25
MP88/538	6	<10
MP88/550	4	<10
MP88/560A	6	<10
MP88/560B	14	15
MP88/560C	14	<10
MP88/560D	14	<10
TP133/ 66	4	<10
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

590

960577

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM861484
O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
TP133/ 76	<4	<10
TP133/ 86	4	<10
TP133/ 91	12	15
TP133/ 93	6	<10
TP133/103	6	10
TP133/113	6	10
TP133/122	<4	<10
TP133/132	8	10
TP133/142	10	<10
TP133/152	8	<10
TP133/162	<4	10
TP133/172	8	25
TP133/182	<4	<10
TP133/192	8	10
TP133/202	10	<10
TP133/212	6	<10
TP133/222	6	<10
TP133/224	<4	25
TP133/229	16	10
TP133/234	6	<10
TP133/238	4	10
TP133/243	4	<10
TP133/245	6	<10
TP133/250	6	<10
TP133/255	6	15
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

591

960578

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full

ANALYTICAL REPORT

JOB COM861484
O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
TP133/259	8	<10
TP133/265	<4	10
TP133/270	4	<10
TP133/276	4	<10
TP133/286	6	<10
TP135/ 13	8	10
TP135/ 14	8	<10
TP135/17.8	10	<10
TP135/ 20	4	<10
TP135/25.5	6	15
TP135/ 30	12	<10
TP135/ 35	4	10
TP135/37.8	<4	<10
TP135/42.3	10	<10
TP135/44.5	<4	<10
TP135/49.5	<4	<10
TP135/ 55	12	<10
TP135/ 58	8	15
TP135/63.25	6	<10
TP135/65.2	8	<10
TP135/ 70	6	10
TP135/ 80	16	<10
TP135/ 87	<4	10
TP135/ 94	8	<10
TP135/104	6	<10
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

592

960579

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM861484

O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
TP135/114	8	<10
TP135/121	<4	<10
TP135/128.3	<4	<10
TP135/138.5	14	<10
TP135/143.5	10	<10
TP135/148.5	<4	<10
TP135/158	10	<10
TP135/168	6	<10
TP135/178	4	<10
TP135/185	4	<10
TP135/195	10	10
TP135/202	6	<10
TP135/212	<4	15
TP135/220	8	15
TP135/230	<4	<10
TP135/240	6	<10
TP135/250	10	<10
TP135/260	<4	<10
TP135/269	6	<10
TP135/271	4	<10
TP135/275	<4	<10
TP135/279	8	15
TP135/285	10	<10
TP135/291	4	<10
TP135/293	<4	15
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

593

960580

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM861484
O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
TP135/297	12	<10
TP135/301	16	10
TP135/303	8	<10
TP135/304	6	15
TP135/308	4	<10
TP135/312	6	10
TP135/318	4	<10
TP135/320	8	<10
TP135/325	8	15
TP135/330	6	<10
TP135/335	<4	<10
TP135/340	<4	10
MP70/ 0	6	<10
MP70/ 10	<4	<10
MP70/17.5	<4	<10
MP70/ 28	<4	<10
MP70/35.5	<4	<10
MP70/ 45	<4	<10
MP70/51.5	4	<10
MP70/ 54	4	<10
MP70/57.5	<4	<10
MP70/ 60	4	<10
MP70/ 70	10	<10
MP70/ 80	<4	<10
MP70/ 91	8	10
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

594
COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM861484
O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
MP70/101	<4	<10
MP70/112	6	<10
MP70/122	26	<10
MP70/132	<4	<10
MP70/140	<4	<10
MP70/148	<4	<10
MP70/156.5	4	<10
MP70/160	4	<10
MP70/170	4	<10
MP70/179.5	<4	<10
MP70/185	8	<10
MP70/195	8	<10
MP70/205	12	<10
MP70/215	4	<10
MP70/225	8	<10
MP70/235	<4	<10
MP70/240	8	<10
MP70/245	10	<10
MP70/255	<4	<10
MP70/265	6	<10
MP70/275	6	<10
MP70/285	6	<10
MP70/295	8	20
MP70/305	8	15
MP70/315	8	<10
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

595

960582

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT JOB COM861484

O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
MP70/325	4	<10
MP70/335	6	15
MP70/339	6	<10
MP70/344	8	<10
MP70/349	4	<10
MP70/360	8	<10
MP70/370	16	<10
MP70/380	10	<10
MP70/390	4	<10
MP70/400	<4	<10
MP70/410	4	<10
MP70/420	<4	<10
MP70/429	12	10
MP70/435	16	<10
MP70/440	8	<10
MP70/445	4	15
MP70/450	10	<10
MP70/460	10	15
MP70/470	8	<10
MP70/480	<4	<10
MP70/485	8	20
MP70/495	6	<10
MP70/502	4	<10
MP70/508	<4	<10
MP70/520	6	10
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

596

960583

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT JOB COM861484

O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
MP70/530	6	<10
MP70/540	12	10
MP70/546	LNR	LNR
MP71/ 52	8	<10
MP71/ 62	8	<10
MP71/ 72	10	<10
MP71/ 82	10	<10
MP71/ 90	6	<10
MP71/100	4	<10
MP71/105	<4	<10
MP71/115	6	<10
MP71/124	<4	<10
MP71/131	<4	<10
MP71/140	4	<10
MP71/147	8	<10
MP71/153	4	<10
MP71/160	4	<10
MP71/169	<4	<10
MP71/180	6	<10
MP71/190	6	<10
MP71/200	6	<10
MP71/210	<4	<10
MP71/220	6	15
MP71/230	10	<10
MP71/240	4	<10
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

597

960584

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT

JOB COM861484
O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
MP71/250	6	<10
MP71/260	8	<10
MP71/270	8	20
MP71/276	8	10
MP71/283	10	<10
MP71/288	<4	<10
MP71/300	10	<10
MP71/310	4	20
MP71/320	6	<10
MP71/330	6	15
MP71/340	8	15
MP71/350	16	<10
MP71/360	12	<10
MP71/370	8	<10
MP71/380	8	<10
MP71/390	<4	<10
MP71/400	8	<10
MP71/410	8	10
MP71/420	10	<10
MP71/430	10	<10
MP71/440	10	<10
MP71/446	6	10
MP71/453	8	10
MP71/460	10	<10
MP71/465	14	15
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full

ANALYTICAL REPORT JOB COM861484
O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
MP71/470	16	20
MP71/475	12	<10
MP71/485	<4	<10
MP71/495	8	10
MP71/505	<4	<10
MP71/515	4	10
MP71/525	4	<10
MP71/535	<4	<10
MP71/545	4	<10
MP71/555	<4	10
MP71/565	12	10
MP71/575	6	15
MP71/585	6	<10
MP28/ 0	6	<10
MP28/ 10	<4	10
MP28/ 20	6	<10
MP28/ 30	16	<10
MP28/ 45	6	<10
MP28/ 56	<4	<10
MP28/ 66	10	15
MP28/ 74	4	<10
MP28/ 84	4	<10
MP28/ 94	6	<10
MP28/104	<4	<10
MP28/114	4	<10
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

599

960586

COMLABS SERVICES PTY. LTD.

This Laboratory is registered by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of registration. This document shall not be reproduced except in full.

ANALYTICAL REPORT JOB COM861484

O/N : 08344/LJ50/60/JPR

SAMPLE	Sn	W
MP28/123	<4	10
MP28/129	6	10
MP28/139	4	<10
MP28/149	<4	<10
MP28/170	<4	<10
MP28/182	8	<10
MP28/190	4	<10
MP28/200	10	10
MP28/210	6	15
MP28/220	4	<10
UNITS	ppm	ppm
SCHEME	XRF1	XRF1

601

APPENDIX XIX

Henty Fault Zone - Murchison Grid Geophysics

602

960588

M E M O R A N D U M

DATE : 24 September, 1986

FROM : BXN:NH:AJD

TO : BXH/DEVONPORT (DH & GP)

cc :

MURCHISON BRIDGE GRID

A small grid (100 m line spacing, 25 m pegs) was put in north-west of the Murchison Bridge using AMG co-ordinates. The grid was designed to cover the northern end of a prominent Dighem conductor and magnetic anomaly (Fig. 1). These strike N-S over 2 kms and appear to be coincident from the airborne survey. They occur in the Farrell sequence of volcanics and sediments about 350 metres east of the Henty Fault zone, but their sources are obscured by recent glacial cover. However, south of the Murchison River the conductor has previously been defined by a Max-Min survey and was drilled by EZ (MR-1 and MR-2). The results of this drilling are discussed in the Rosebery East Exploration Progress Report August 1983-June 1984. Both intersected "a seven metre downhole interval of intense quartz-carbonate-?flourite stockwork, ... within a wide black shale unit of the Farrell Slates", at the positions of the Max-min conductors. Best Au assay of 1.5 m @ 0.70 g/t occurs within 12.9 m interval of 0.31 g/t Au, 0.25% As. Only selected portions of core were sampled.

The present grid indicates a continuation of the same sequence of Farrell Slates (and stockwork?) continuing to the north of the Murchison River. At least 12 m of glacials occur on this grid (known from the Que River pit nearby) and no bedrock outcrop occurs. An EZ hole MP-1, about 1 km to the north drilled through 88 metres of glacials but never reached bedrock (drilled to test Henty Fault Zone?).

Surveys

A ground magnetic survey was carried out on 10 metre stations, using a G856 digital magnetometer. Data were corrected for diurnal drift using a similar base station magnetometer. Stacked magnetic profiles are shown in Fig. 2. A Max-Min (horizontal loop EM) survey was subsequently completed using 100 metre coil spacing and 1777, 888 and 222 Hz frequences (444 Hz not working).

Results

The ground magnetic profiles revealed two separate sources, 100 to 150 metres apart, each at a depth of about 50 metres. Between the two magnetic sources lies the conductor (Fig. 3, 4, 5). The conductor is interpreted to lie at a depth of about 40 metres. It is thus assumed that the thickness of glacials here is about 40 metres, probably shallower to the south as expected from previous EZ drilling. Note that the glacials are not greatly conductive (about 400 ohm-metres from the Dighem). The conductivity-thickness of the Max-Min anomaly on this grid is somewhat greater than that of the anomaly south of the river tested by MR-1 and MR-2. This implies that the conductor is either thicker or more conductive or both, and thus may contain more total sulphides than intersected in MR-1 and MR-2.

603

The EM and magnetic anomalies have been quantitatively interpreted on line 75800N (Figs. 4, 8). Dips and depths agree very well for both EM and magnetic sources, despite the magnetic source being difficult to model due to a strong underlying gradient possibly caused by an adjacent intensely mangetic Cambrian granite.

Recommendation

Fig. shows a possible location for a drill hole at 84950E on 75800N which should intersect EM and magnetic sources. Drilling problems will include about 50 metres of glacials, and the location will probably be boggy, although not to any great depth judging from tracks in the area.

The EM source will probably be as in MR-1 and 2 i.e. a conductive black and pyritic shale. The cause of the magnetic anomaly is uncertain not having been tested elsewhere. It is a somewhat unusual feature however, occurring as it does in predominantly sedimentary units of the Farrell sequence. It may outcrop on the Murchison Highway south of the river, and thus mapping with magnetic susceptibility measurements could elucidate the source. It has been attributed in the past by EZ to a rhyolite unit containing magnetite.

960590

SHELL COMPANY OF AUSTRALIA

METALS DIVISION

R.O.C.S. - PROTEM

N.W.TASMANIA
ROSEBERY EAST J.V.
MURCHISON BRIDGE
GROUND MAGNETICS

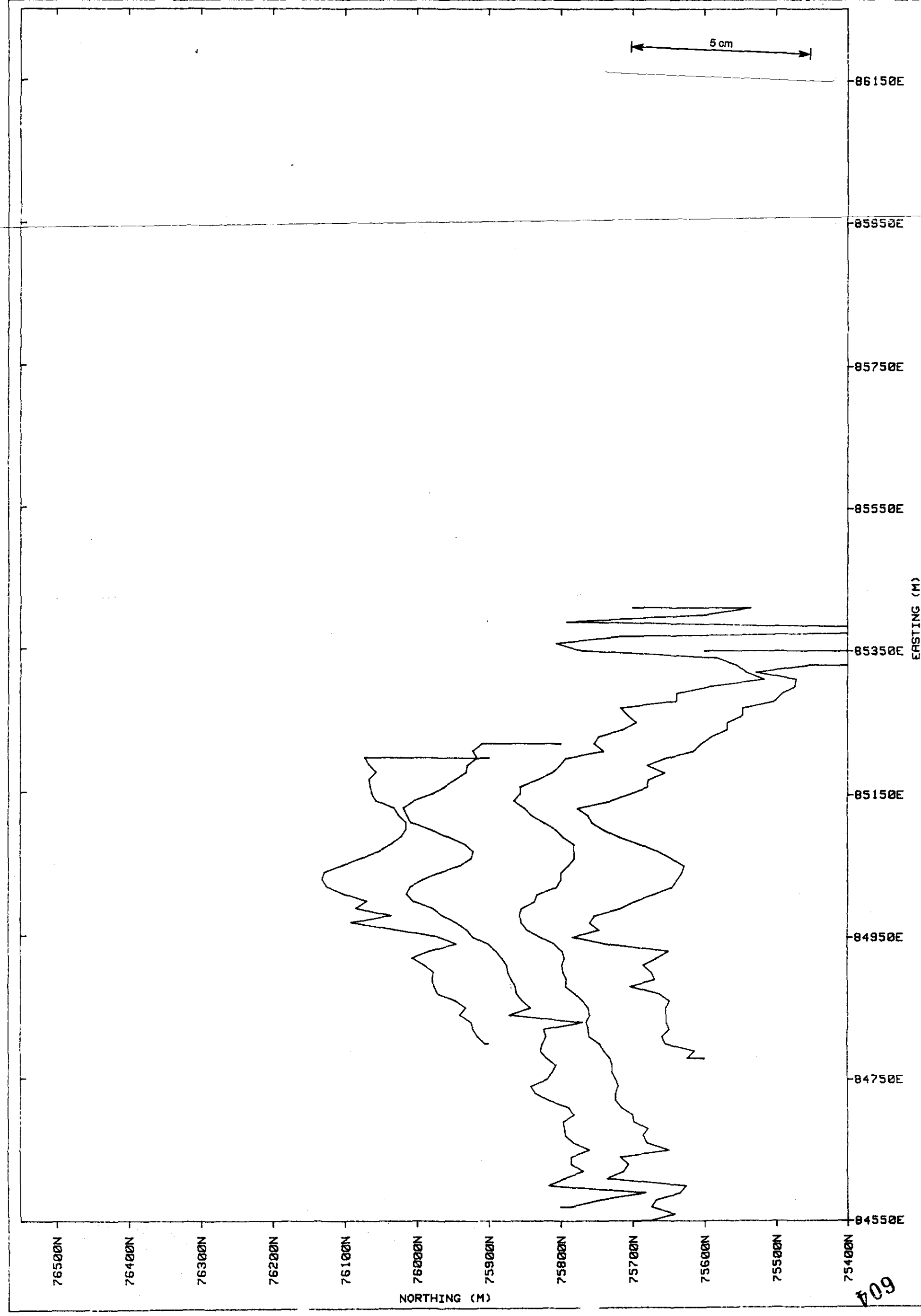
SCALE 1 : 5000

FIG No :	2
DATE :	9/86
AUTHOR :	
OFFICE :	AHO
DRAWN :	

LEGEND

BASE LEVEL : 62240nT

SCALE : 30nT/cm



604

960591

605

LAKE EDGE (CHAINING ERRORS)

POWER LINE

MURCHISON RIVER & HIGHWAY

222 Hz

10%

0

-10%

-20%

Q P

I P

+20%

+10%

886 Hz

0

-10%

-20%

COIL SPACING 100m.
Tx to WEST

1777 Hz

10%

0

-10%

-20%

Q P

I P

GROUND MAGNETICS

SCALE 200nT/cm

West dipping conductor @ approx 40m depth

609

5 cm

200 metres

84 500E | 84 700E | 84 900E | 85 100E | 85 300E | 85 500E | 85 700E | 85 900E

In Phase

Out of Phase

The Shell Company of Australia Limited
METALS DIVISION

STATE TASMANIA
PROSPECT ROSEBERY EAST A.V.
(MURCHISON BRIDGE)
LINE 75 700N

MAX-MIN E.M.

SCALE 1:5000	DATE 8/85
AUTHOR N.H.	DRAWN N.M.R.
OFFICE AKD	REP No.
DRG NO LJ50/1041	FIG.No. 3

960592

606

LAKE EDGE (CHAINING ERRORS)

POWER LINE

+20%
0%
222 Hz
0
-10%
0%
10%
+20%
1777 Hz
0
-20%
-40%

D P

P

D P

P

COIL SPACING 100m
Tx to EAST

+20%
+10%
888 Hz
0
-10%
-20%

GROUND MAGNETICS

2300
2270
52240
2210
2180
0

B4950 E
PROPOSED D.H.

Highway

Lake surface

60°

80m

MAG

MAG.

E.M. CONDUCTOR

250m

Parallel Sequence (volcanics, shales)

909

5 cm

400 -60
200 -40
b.s.l. a.s.l

84 500E
84 700E
84 900E
85 300E
85 500E
85 700E
85 900E

200 metres

In Phase

Out of Phase

The Shell Company of Australia Limited METALS DIVISION	
STATE TASMANIA	
PROSPECT ROSEBERY EAST J.V. (MURCHISON BRIDGE)	
LINE 75 SOON	
MAX-MIN E.M.	
SCALE 1:5000	DATE 9/66
AUTHOR N.H.	DRAWN N.M.R.
OFFICE AHO	REP. No
DRG NO LJ50/1042	FIG No 4

960593

607

POWER LINE

+10%
12 Hz
0
-10%
-20%

OP
IP

OP
IP

+20%
+10%
888 Hz
0
-10%
-20%

+40%
+20%
177 Hz
0
-20%
-40%

COIL SPACING 100m
Tx to WEST

OP
IP

nT
52300
52270
52240
52210
52180
0
100
200

GROUND MAGNETICS

West dipping conductor
@ approx 55m depth

5 cm

109

84 500E
84 700E
84 900E
85 100E
85 300E
85 500E
85 700E
85 900E

200 metres

In Phase
Out of Phase

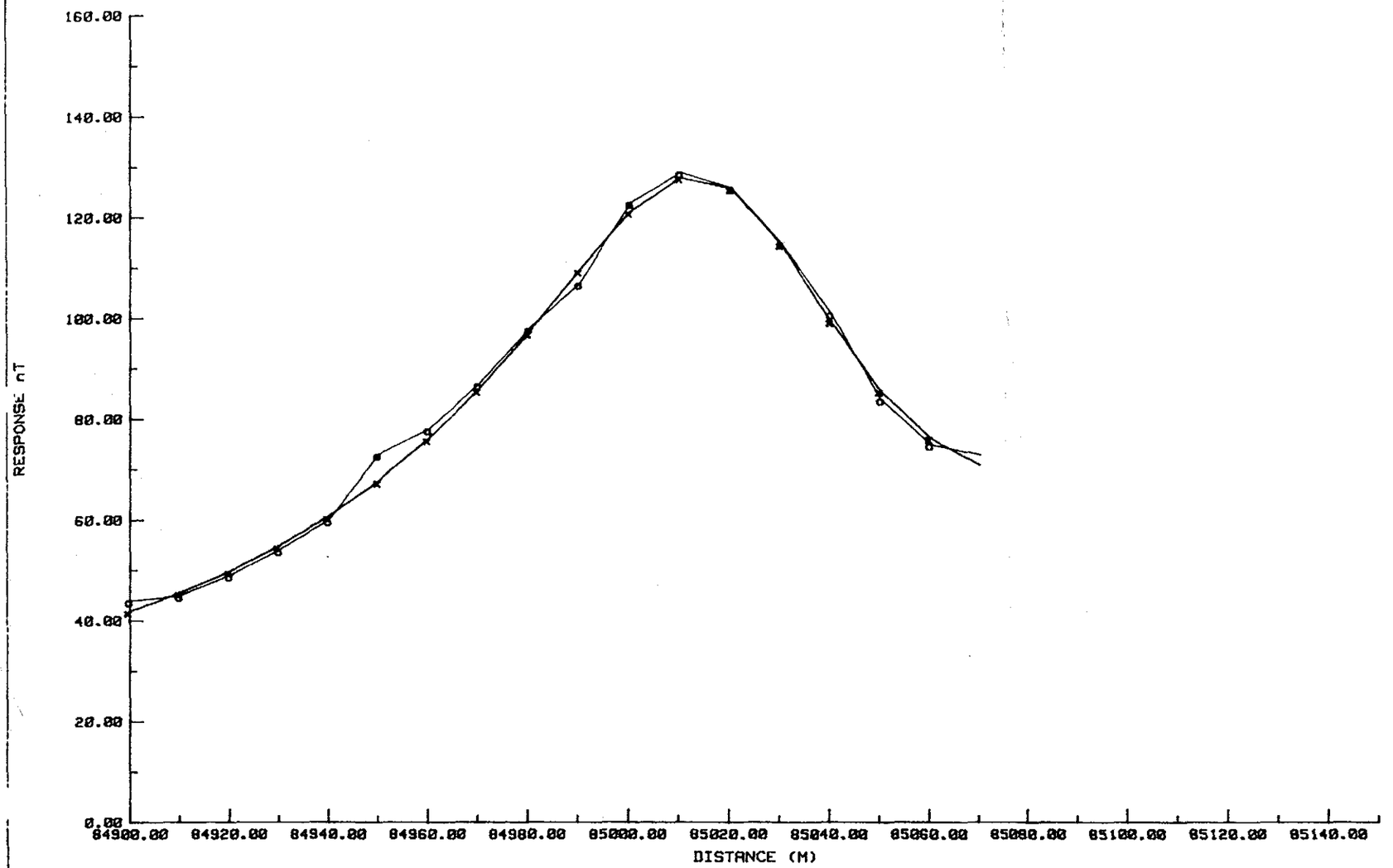
The Shell Company of Australia Limited
METALS DIVISION

STATE TASMANIA
PROSPECT ROSEBERY EAST J.V.
(MURCHISON BRIDGE)
LINE 75 900N

MAX-MIN E.M.

SCALE 1:5000	DATE 9/86
AUTHOR N.H.	DRAWN H.M.R.
OFFICE AHO	REF.No
DRG. NO L/50/1043	FIG.No. 5

960594



809

5 cm

R.O.C.S.

GEOPHYSICS SYSTEM - MAGMOD

MODEL : TAB 2

CALCULATED RESPONSE	: x	
OBSERVED DATA	: o	KEY
MAGNETIZN	88.9479	1
DIP	131.5088	1
BASE LEVEL	62.4690	1
BASE SLOPE	.1500	2
POSITION	85022.0363	1
HALF WIDTH	13.0137	1
HALF LNGTH	500.0000	0
DEPTH	36.0431	1
THICKNESS	95.8119	1
INCLINATN	-71.0000	0
DECLINATN	78.0000	0
FIELD	0.0000	0
ORIENTATN	354.0000	0

SCALE

DISTANCE	:	10.00	M/CM
FIELD	:	10.00	nT/CM
DEPTH	:	10.00	M/CM

SHELL COMPANY OF AUSTRALIA
METALS DIVISION

ROSEBERY EAST J.V.
MURCHISON BRIDGE

LINE 75800N
GROUND MAGNETICS

FIG.NO: 6	REPT.NO:
ENCL.NO:	DRG.NO:
DATE: 9/86	AUTHOR: NH
DRAWN:	OFFICE: AHO

80 000mE

85 000mE

80 000mN

75 000mN

70 000mN

CHESTER

DACITIC–IGNIMBRITIC LAVAS

DACITIC–ANDESITIC LAVAS

LAKE ROSEBERY

LAKE MACKINTOSH

TULLAH

CUTTY SARK

LANGDONS

MT. SALE

ANDESITIC LAVAS

ROBBIES CREEK

MT. BLACK

MT. △ BLACK

DUNDAS GROUP

FELSIC IGNIMBRITE

DACITIC–ANDESITIC LAVAS

ROSEBERY

MURCHISON HIGHWAY

FAULT

ZONE

FELSIC VOLCANICS

STERLING VALLEY

DUNDAS GROUP

FELSIC PYROCLASTICS

ALTERATION ZONE

ROSEBERY

FAULT

SOUTH STITT

CENTRAL VOLCANICS

DACITIC LAVAS

ORDOVICIAN

OWEN CONGLOMERATE

HERCULES

MT. READ

HENTY

RHYOLITIC – DACITIC VOLCANICS

SOUTH HERCULES

HENTY PROSPECT

960595

5 cm

86-2622

0 1 2 3 km

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project: TASMANIA
ROSEBERY EAST J.V.

Title:

REGIONAL GEOLOGY

Author J.P.R.	Date 12/86	Scale 1:50 000	
Drawn H.M.R.	Office AHO	Revised	Date
Drawing No. LJ50/1055			Fig. No. 3

5981

75 000 E

80 000 E

85 000E

80 000 N

75 000 N

70 000 N

LAKE ROSEBERY

PIEMAN

MURCHISON F

HWY

>64 000nT

63000 – 64 000nT

62 600 – 63000nT

Aeromag (Dighem)

Ground mag

5 cm

Billiton Australia

The Metals Division of the Shell Company of Australia Limited

Project

ROSEBERY EAST J.V.

Title

DIGHEM
ENHANCED MAGNETICS

Author	Date 4 / 86	Scale	1:50 000
Drawn	Office AHO	Revised	Date
Drawing No.	LJ50 / 1023		Fig. No. 4

96059

8622

- 5982

MURCHISON HWY

MACKINTOSH RIVER

Dam

PIEMAN CREEK

MACKINTOSH

80 000 N

Pb, graphite

Tullah

FARRELL

RIVER

MURCHISON

△ MT SALT 1804

MURCHISON VALLEY

?

Robbies Ck.

? ? mg

MT BLACK alteration zone

mg

△ MT BLACK 1277

mg

po+Pb?

75 000 N

Pb, py

Rosebery

po

Pb, graphite

△ MT MACKINTOSH 1275m

70 000 N

glacials?

SOUTH STITT

WHITE SPUR

graphite?

Known altered (magnetite, mg) or mineralised (pyrrhotite, po) zones (from aeromag)

Alteration zones with pyrite and clays (from resistivity)

Other major (shallow) conductive trends

960597

5 cm

86-2622

Billiton Australia

TASMANIA

ROSEBERY EAST J.V.

DIGHEM MAGNETIC AND CONDUCTIVE TRENDS

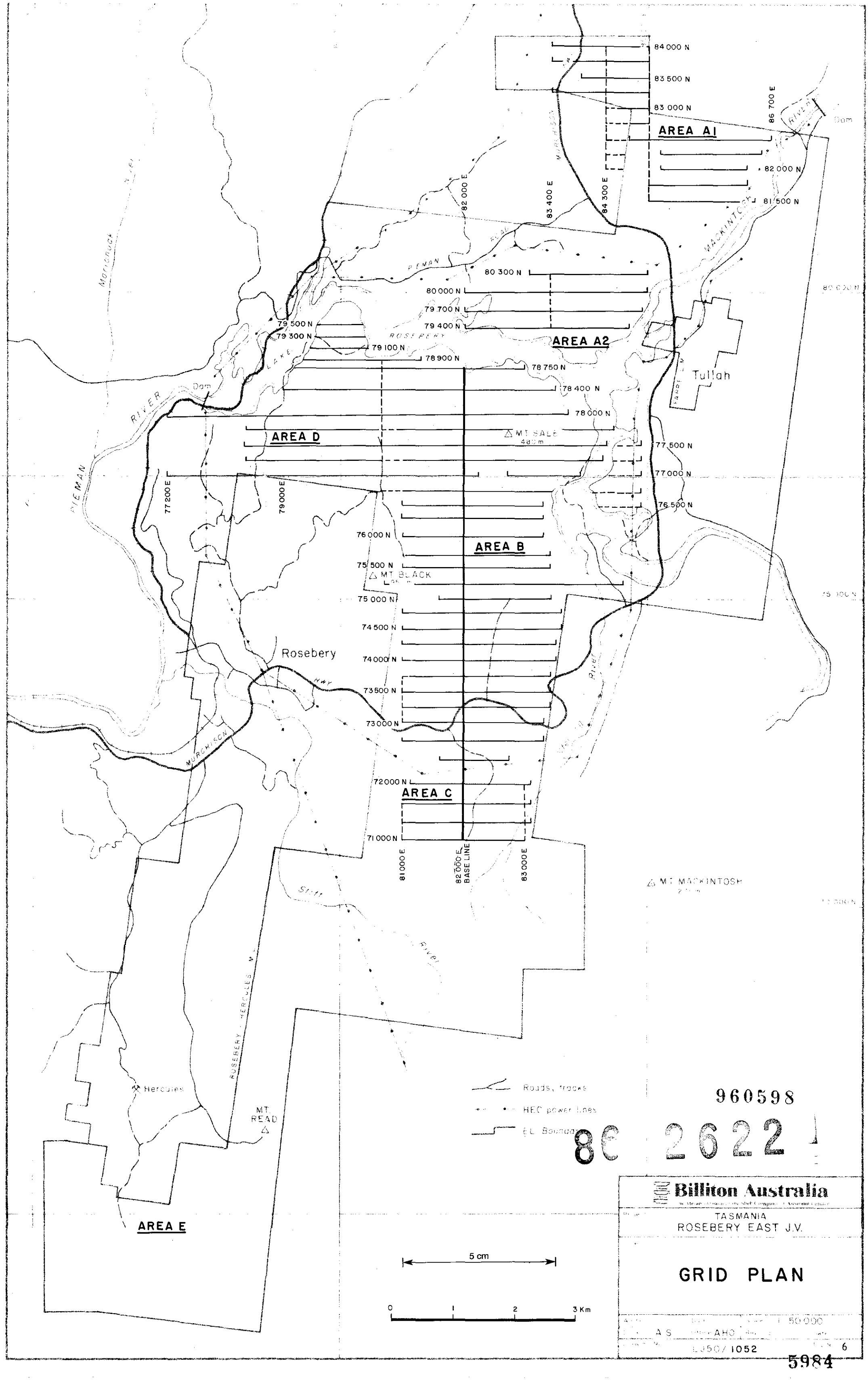
12/86

A.S./H.R.

L050/1051

5

5983



960598

8€ 2622

Billiton Australia

TASMANIA
ROSEBERY EAST J.V.

GRID PLAN

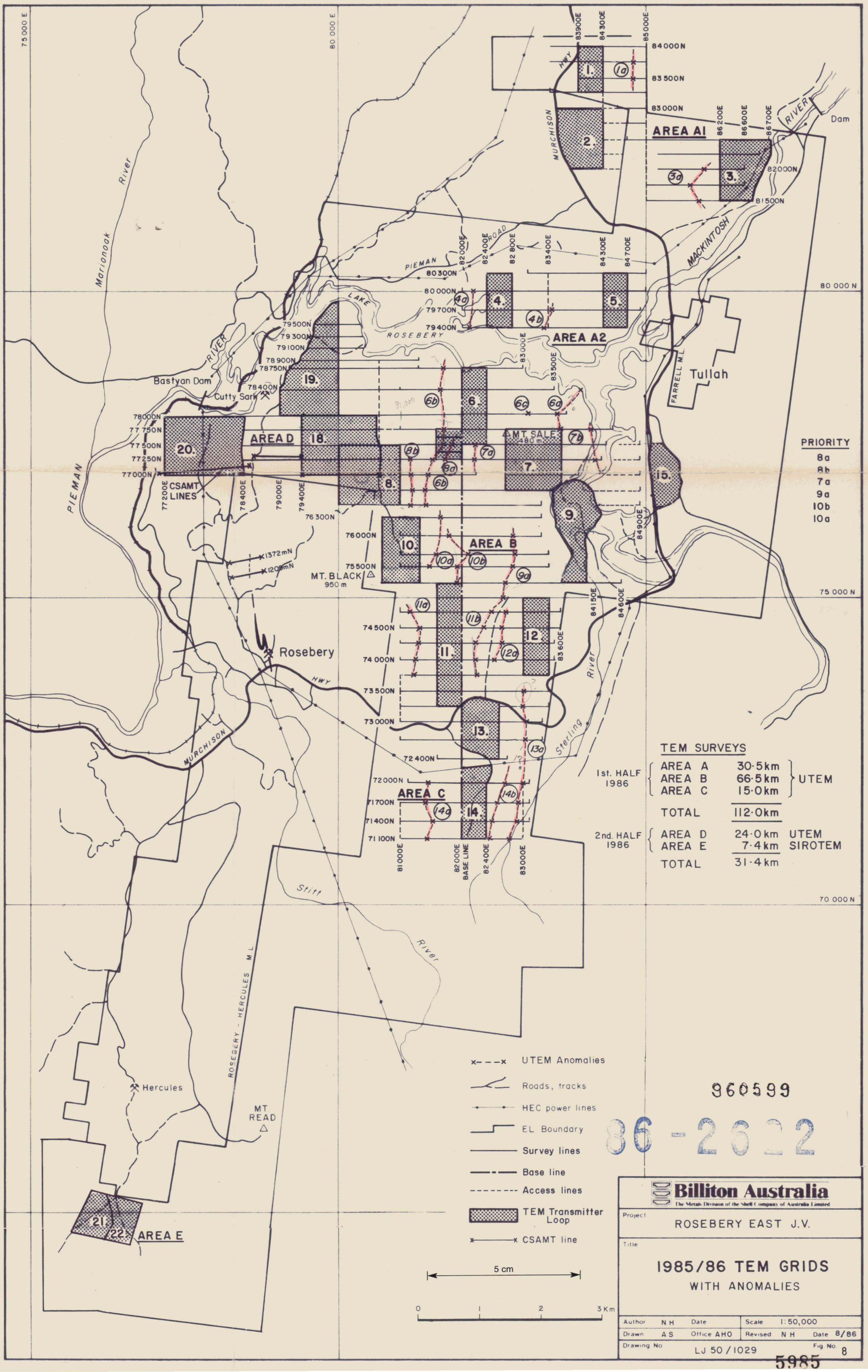
1 : 50 000

A S AHO

EJ50/1052

6

5984



960599

86-2602

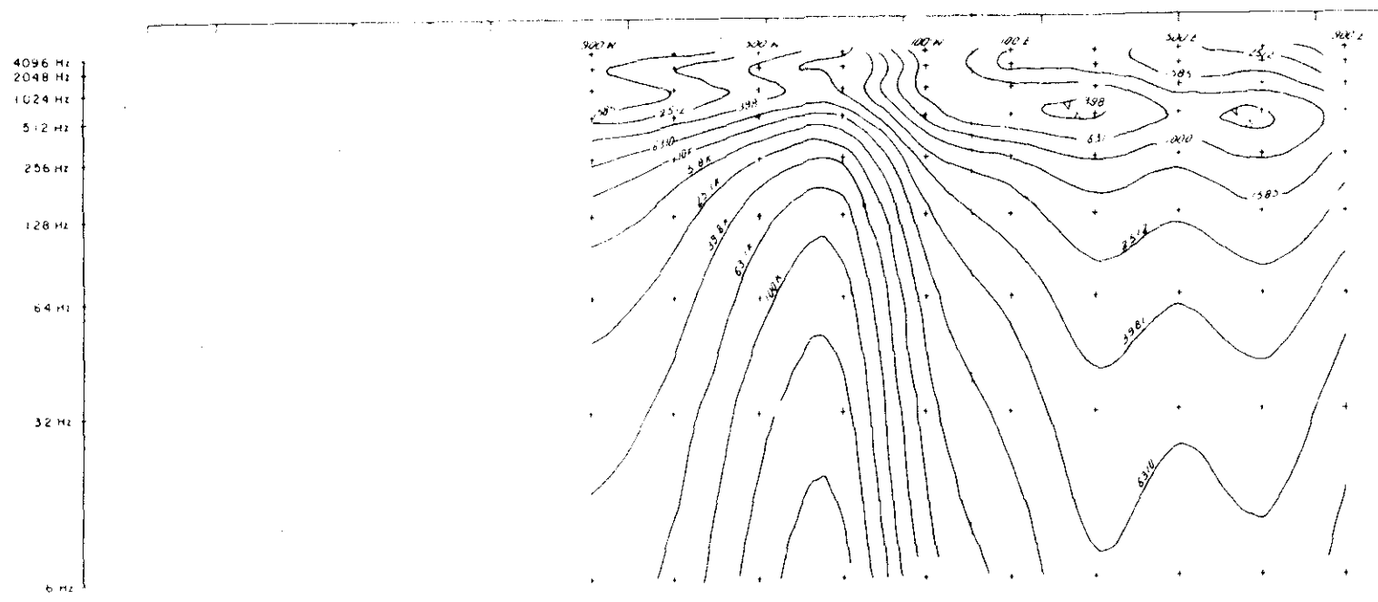
Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project: ROSEBERY EAST J.V.

Title: 1985/86 TEM GRIDS WITH ANOMALIES

Author	N H	Date	Scale	1:50,000	
Drawn	A S	Office AHO	Revised	N H	Date 8/86
Drawing No.	LJ 50/1029				Fig No. 8

5985



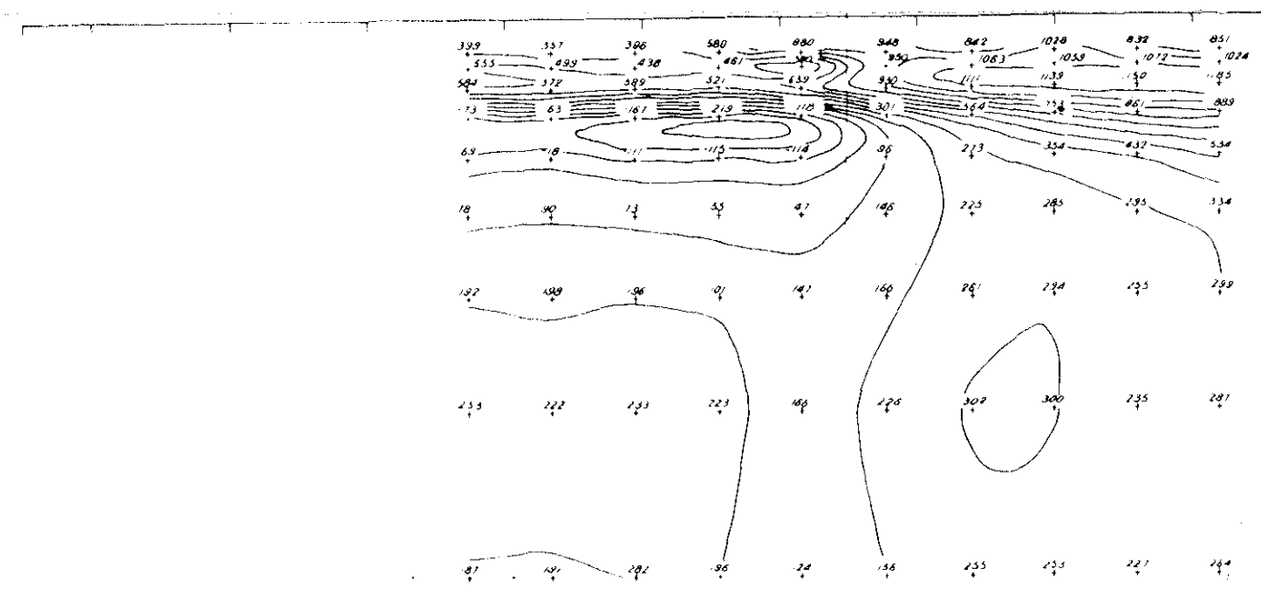
CSAMT
LINE 3900N
CAGNIARD RESISTIVITY

ohm - metres

Rx length = 200 m (1 km)
Tx length = 2.3 km
Tx position = 4km to South
Tx orientation N78°E
Bx Zonge for Bfield: Z 86

PHASE DIFFERENCE

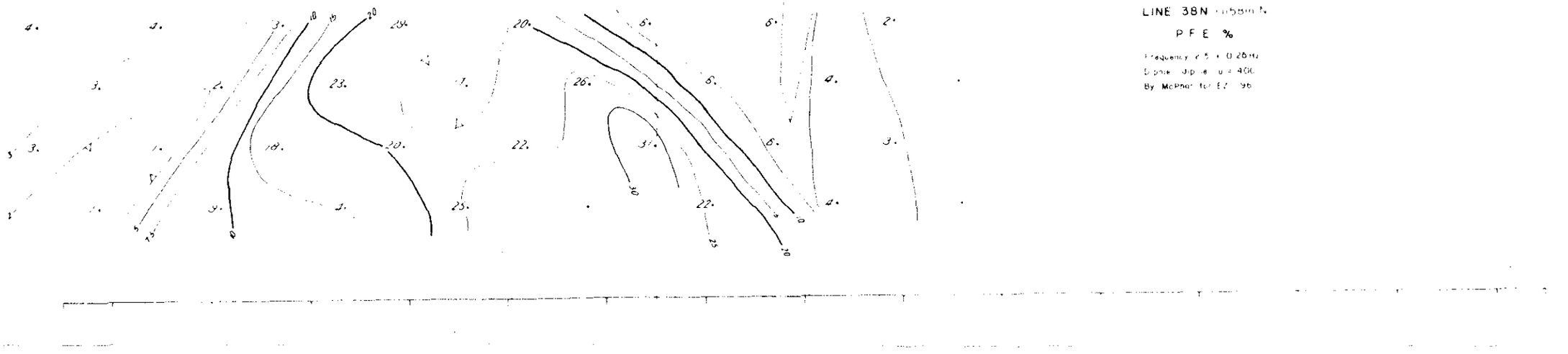
in milliradians



GROUND MAGNETICS
1 cm = 25 nT
Base Level 62 300 nT
By EZ 1985
(position of profile with base level uncertain)
LINE 3900 N

LINE 38N (1658m N)
P F E %
Frequency = 0.5 + 0.25Hz
Dipole Dipole a = 400
By McPhar for EZ '86

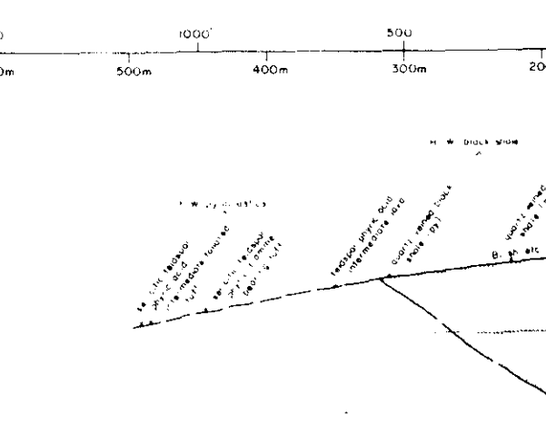
LINE 38N (1658m N)
RESISTIVITY
ohm metres



N B
BLACK SHALE APPROX 100 m
ORE APPROX 1 A m
(MINE MEASUREMENTS)

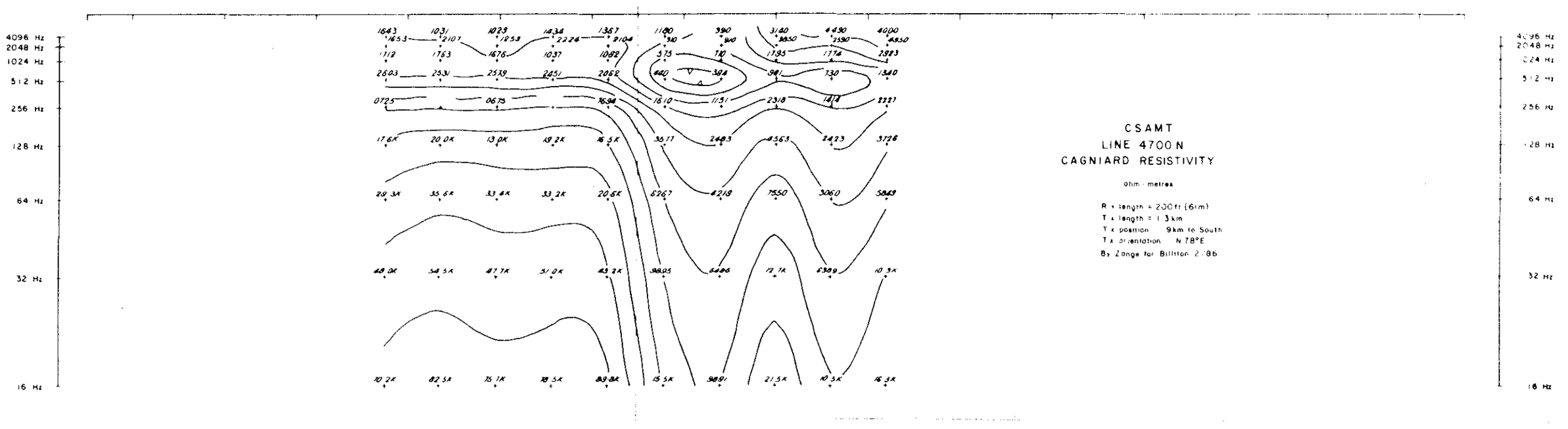
5 cm

960600



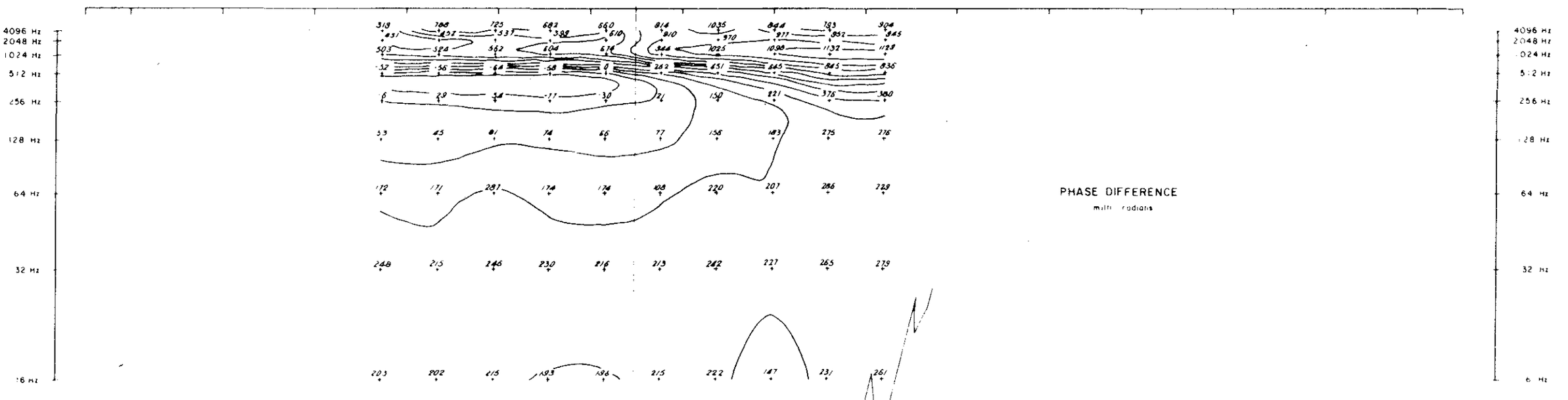
Billiton Australia	
Project: ROSEBERY EAST JV, TAS	
CROSS-SECTION ON 1209m N (3966 N) (ROSEBERY MINE GRID) WITH IP & CSAMT	
Author: N.H. Dept:	Scale: 1:5000
Drawn: S.L.P. Date: 7/86	Revised: Date:
Checked: Date:	Standard: Date:
Sheet No: 9	Drawing No: EJ58/7/0153

5986

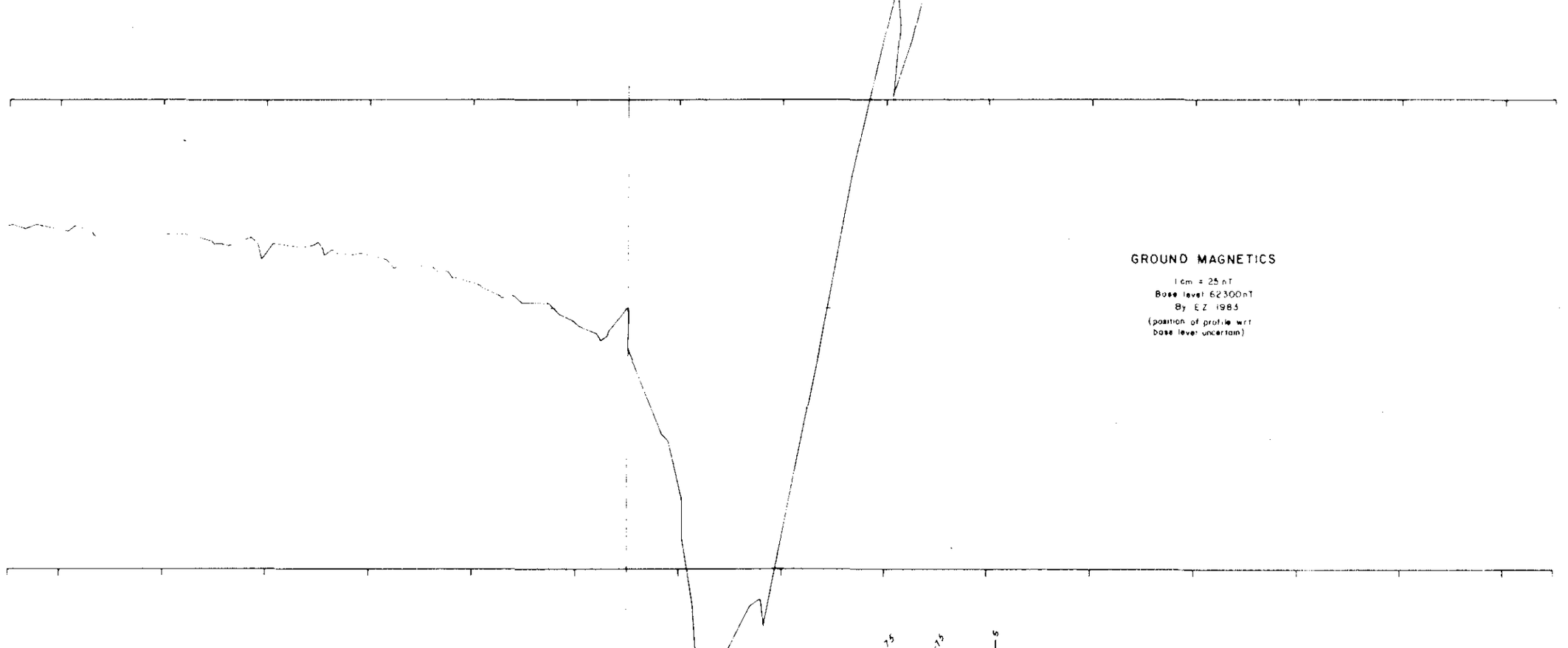


CSAMT
LINE 4700 N
CAGNIARD RESISTIVITY
ohm metres

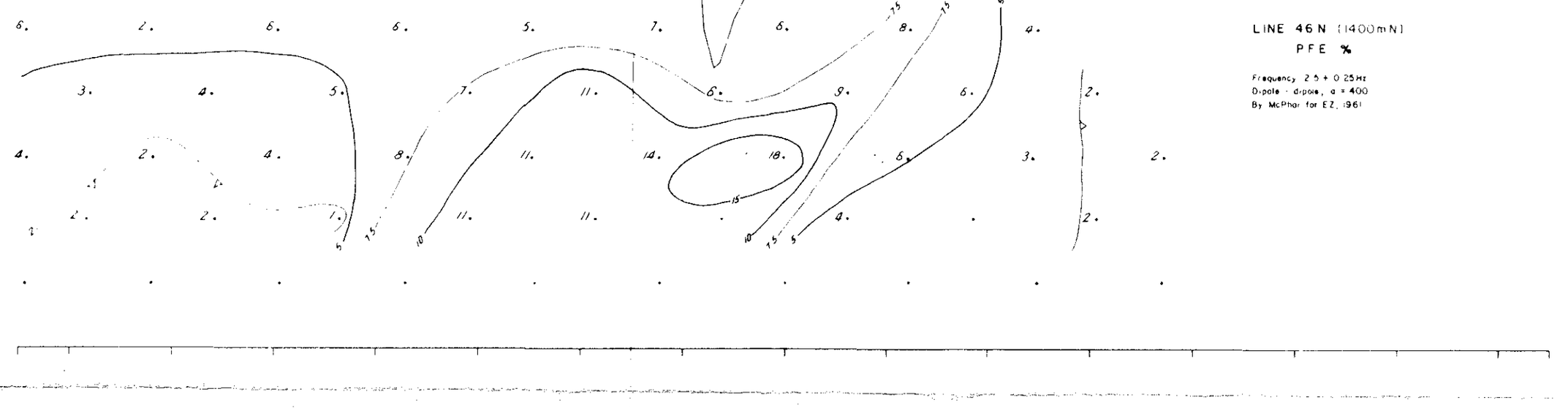
R = length = 200m (6Hz)
T = length = 1.3km
T = position 9km to South
T = orientation N 78°E
By Zonge for Billiton 2/86



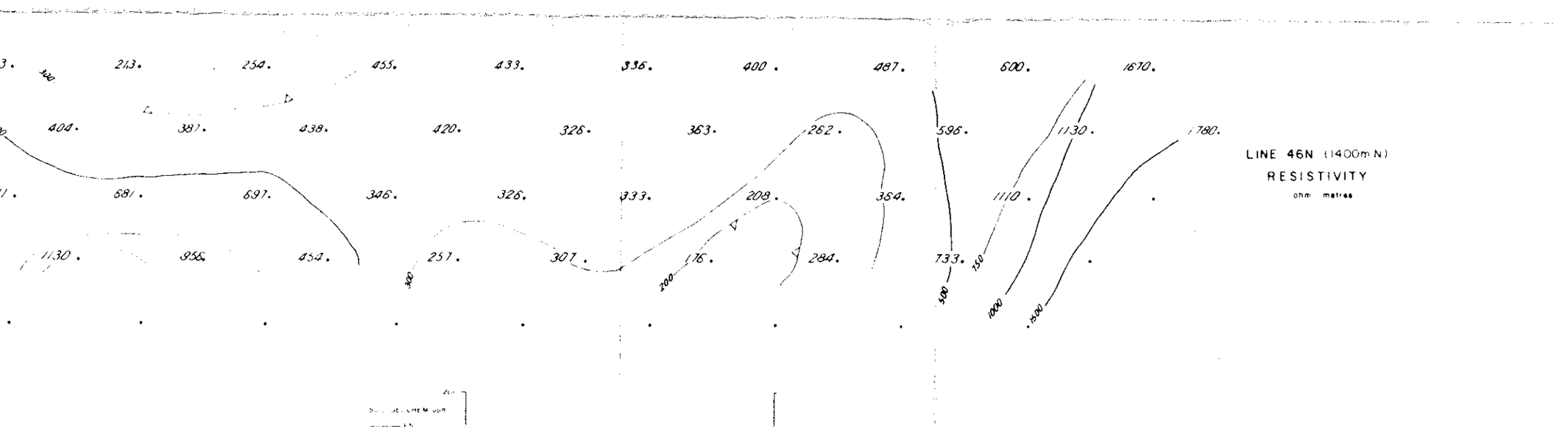
PHASE DIFFERENCE
milli radians



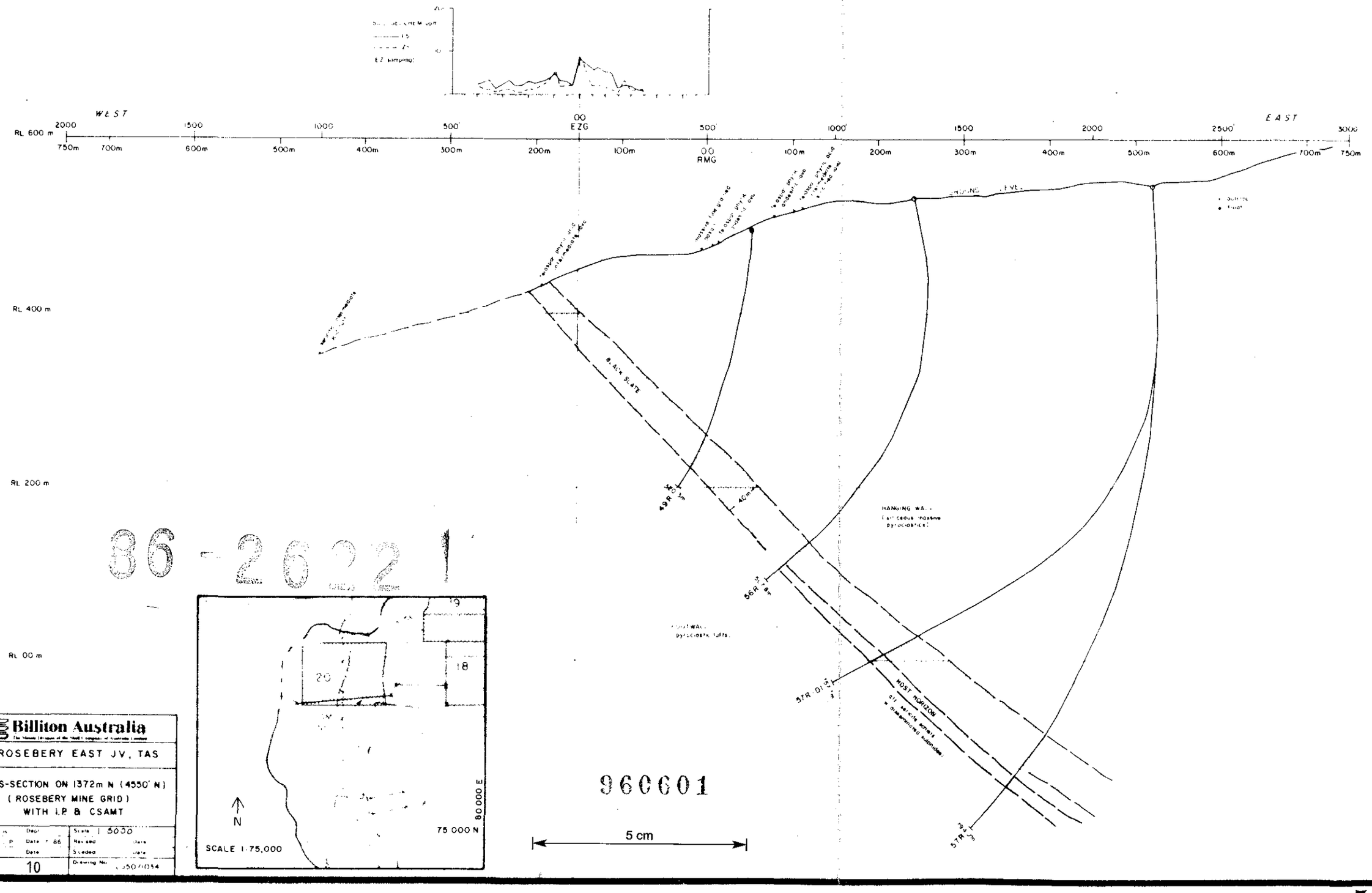
GROUND MAGNETICS
14m x 25 nT
Base level 62300nT
By EZ 1983
(position of profile wrt
base level uncertain)



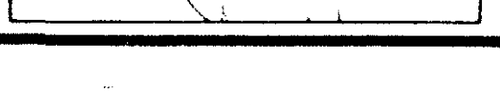
LINE 46 N (1400m N)
PFE %
Frequency 2.5 + 0.25Hz
Dipole - dipole, a = 400
By McPhar for EZ, 1981



LINE 46N (1400m N)
RESISTIVITY
ohm metres



86-26221



960601

5 cm

Billiton Australia
The Minerals Division of The Shell Company of Australia Limited

ROSEBERY EAST JV, TAS

CROSS-SECTION ON 1372m N (4550' N)
(ROSEBERY MINE GRID)
WITH I.P. & CSAMT

Author		Drawn	Scale 1:5000
Checked	S. P.	Date 7 - 86	Revised
Approved		Date	Scaled
Sheet No.	10		Drawing No. 1250/1114

5988

LAKE ROSEBERY

FARRELL LEASES

NEW NORTH MT FARRELL
CENTRAL MACKINTOSH
SOUTH MACKINTOSH
NORTH MT FARRELL
MT FARRELL
MT FARRELL SOUTH
DUTTONS
CENTRAL FARRELL
NORTH MURCHISON (MURCHISON EXTENDED)
MURCHISON RIVER
SOUTH MURCHISON
GREEN & KINGS
THOMAS WORKINGS
TULLAH WORKINGS
MIDSONS PROSPECT
MACES PROSPECT
TURLEYS (FINNS)
LAKE MACKINTOSH

Cu 200
Pb 3·15%
Zn 1950
Ag 150
As 580
W 70

Pb 4000
Zn 7700
Ag 10
(Cu 48)
(As 95)

LANGDONS
BASTYAN DAM
CUTTY SARK
MACES No 2 LODE
Sn 36
Sn 65
Au 0·12
HAWKSBURY
BOBADIL
ROSEBERY FAULT
MT SALE
MT BLACK
ROSEBERY
BLACK P.A.
DALMENY
ROSEBERY LODES
SALISBURY
CHAMBERLAIN
KOONYA
JUPITER
RING P.A.
HERCULES
MT READ
STERLING VALLEY
HENTY FAULT

(Cu 18)
(Zn 190)

Au 0·08

36/051 36/052 36/053 36/054
37/108 37/109 37/110 37/111 37/112 37/113
38/060 38/079 38/080 38/081 38/082 38/083
39/058 39/059
40/013 40/014 40/015
41/051 41/053

1 (3·8)
2 (3·3)
3 (0·6)
4
5
6
7
8 Au 0·08
9 (0·2)
10 (0·1)
11 Au 0·08
12
13 (0·2)
14 (1·7) Sn 36
15 (0·9)
16 (0·2)
17
18
19
20
21
22
23 (0·3)
24 Sn 65 Au 0·12
25 (0·6)
26 (0·1)
27
30 (0·1)
31 (0·2)
32
33 (5·3)
34 (0·2)
35 (0·3)
36
37
38
39
40
41 (0·3)
42
43 (0·4)
44
45
46
47 (0·4)
48 (0·1)
49

Sample number
(0·2) Sample point,
BCL Gold Value (ppm) (< = Below detection limit)
(Pb 3000 Zn 250) Marginally anomalous
Associated base metal and indicator values (ppm)
Shale or Sediment Horizon
Alteration Zone
Base Metal Workings
Significant Fault
Photo Centre
Trend of Topographic High

960602

86 2622

5 cm

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project	TASMANIA ROSEBERY EAST JOINT VENTURE		
Title	BULK CYANIDE LEACH SURVEY SAMPLE LOCATION AND SIGNIFICANT RESULTS		
Author J.P.R.	Dept.	Scale 1:20,000	
Drawn A.S.	Date 11/86	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. Fig. No. 12		Drawing No. LJ50/1058	

5989

ANALYTICAL REPORT

SAMPLE	Cu	Zn	Ag	Au	As	Pb	Ba	Sn	W
UNITS	ppm	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm
21901	2	6	<1	7	4	<4	900	10	<10
21902	4	2	<1	<5	5	<4	15	8	<10
21903	4	10	<1	10	5	4	630	<4	<10
21904	3	6	<1	10	<2	6	400	<4	<10
21905	3	9	<1	<5	4	<4	15	4	10
21906	3	32	<1	9	6	<4	50	<4	<10
21907	3	220	<1	<5	6	<4	10	<4	25
21908	3	125	<1	6	2	<4	10	4	<10
21909	3	16	<1	<5	6	<4	10	4	<10
21910	3	22	<1	8	3	<4	10	6	<10
21911	115	150	<1	6	38	145	330	<4	<10
21912	12	50	<1	<5	18	16	920	8	<10
21913	46	105	<1	<5	115	65	80	<4	<10
21914	5	18	<1	<5	6	4	40	4	50
21915	4	38	<1	<5	5	4	85	<4	15
21916	3	6	<1	<5	5	<4	20	8	<10
21917	3	8	<1	<5	5	<4	10	4	<10
SCHEME	AAS1	AAS1	AAS3	AAS5C	XRF1	XRF1	XRF1	XRF1	XRF1

381 000 E · 382 000 E · 383 000 E

378 000 N · 377 500 N · 377 000 N · 376 500 N · 376 000 N · 375 500 N · 375 000 N

LOOP 6 · LOOP 7 · LOOP 8 · LOOP 10 · LOOP 12

ANOMALY 6B · ANOMALY 8A · ANOMALY 7A · ANOMALY 8B · ANOMALY 10B · ANOMALY 10A · ANOMALY 9A

EL 1/62 BOUNDARY

MT. BLACK

2.5m silty/sandy tuff & Sct interbeds + boudins (wk py) f.m. chl alter ?

Epidotized-chloritized porphyritic andesitic flow breccia

Feldsp. sandy & silty sericitic pelite (poorly sorted sandy mud)

Brecc. interm. lava & epid. chl ± py, poss hydroth. brecciation & propylitic alteration

Chl. epid. seric andesite & qtz amyg. + K-felds

Port epid. + chl tuffac. pelite + pelitic trachy andes. reworked lithic tuff minor py

Ser. intermed pumice tuff & fiamme

Chl. porph. andes & amyg + qtz

Ser. py. silic f.g. volc. ash

Tuff. ser. chl epiclastic, wispy baudins (Zn chl rock above & below)

Trachyandes. volc-clastic arenite & graded bedding. Port. epid. well sorted

Gridded not cut

No outcrop

Not cut or gridded

very difficult access

V. old line, difficult access Feb 86

old access line not located

LEGEND

Geological mapping
- BAUS
- GETTY
- EZ

Andesitic lavas

Chloritic siliceous brecciated lavas

Coarse ash flows and andesitic lavas

27901 BAUS sample number

1059 Getty " "

Soil contour Cu Pb or Zn

Dighem conductor

Dighem resistivity low

Dipole - dipole I.P. line

Gradient array I.P. line

I.P. anomaly (gradient)

I.P. anomaly (dipole)

UTEM loop corner

Dighem magnetic anomaly

UTEM anomaly and trend

f.	fine grained	Ar	acid volcanic
m.	medium grained	I	intermediate volcanic
c.	coarse grained	t	tuffaceous
f	feldspar	Sh	shaley sediment
q	quartz	ves	vesicular
V	volcanic (lava)	amyg	amygdaloidal
Vi	intermediate (volcanic lavas)	cb	carbonate
Va	acid (volcanic lavas)	chl	chlorite
Via	acid-intermediate (volcanic lavas)	agg	agglomerate
ser	sericite	sil	siliceous
E	epiclastic (volcanic derived)	alb	albite
Sct	cherty exhalite	pum	pumice
Ssh	black shale	fiam	fiamme
hem	hematite	*	limonite
mag	magnetite		

- Auger sample
- × Rock chip sample
- 100 Pb Anomalous auger or rock chip sample
- Anomalous soils (Getty)

SCALE 1:5000

0 100 200 300 400 500 m.

5 cm

960603

80-2622

Billiton Australia — The Metals Division of the Shell Company of Australia Limited	
Project: ROSEBERY EAST J.V.	
Title: MT. BLACK LOCALITY — GEOLOCICAL, GEOCHEMICAL, AND GEOPHYSICAL COMPILATION	
Author J R	Dept.
Drawn A S	Date 3/86
Checked	Date
Sheet No. Fig. No. 14	
Scale 1:5000	
Revised J R	Date 9/86
S'ceded	Date
Drawing No. LJ 50/1010	

5990

378 000 N

375 000 E

375 000 N

SILTY/SANDY TUFF CHERTY BEDS

55

FIAMME

CHERT

PUMIC TUFF (FIAMME)

30-45

SILTY ASH

FIAMME

SILTY ARENITE

CHERTS

CHERT

TUFFAC. PELITE

SILTY TUFFAC. SEDS.

MT. BLACK

Chert

t Tuffaceous

Silty, sandy sediments

Andesite

Rhyolite

Dacite

Alteration

Chlorite

Sericite

Magnetite

Silica

SCALE 1:5000

0 100 200 300 400 500 m

5 cm

960604

86-2622

Billiton Australia

The Metals Division of The Shell Company of Australia Limited

Project: ROSEBERY EAST J.V.

Title: MT. BLACK LOCALITY

GEOLOGICAL INTERPRETATION

Author J R	Dept.	Scale	
Drawn A S	Date 4/86	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. Fig. No. 15		Drawing No. LJ 50 / 1017	

5991

38 1000mE

38 2000mE

38 3000mE

37 7000mN

37 6000mN

37 5000mN

A

B

D

E

F?

H?

5 cm

A.E.

86-2622

960605

Billiton Australia

The Metals Division of the Shell Company of Australia Limited

Project: ROSEBERY EAST J.V.

Title:

MT BLACK LOCALITY

DIGHEM AEROMAGNETIC MAP (ENHANCED)

Author	Dept.	Scale	1:5000
Drawn	Date 4/86	Revised	Date
Checked	Date	S'ceded	Date
Sheet No.	Fig. No. 16	Drawing No.	LJ50/1022

ANALYTICAL REPORT

SAMPLE	Cu	Zn	Ag	Au	As	Pb	Ba	Sn	W
UNITS	ppm	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm
21901	2	6	<1	7	4	<4	900	10	<10
21902	4	2	<1	<5	5	<4	15	8	<10
21903	4	10	<1	10	5	4	630	<4	<10
21904	3	6	<1	10	<2	6	400	<4	<10
21905	3	9	<1	<5	4	<4	15	4	10
21906	3	32	<1	9	6	<4	50	<4	<10
21907	3	220	<1	<5	6	<4	10	<4	25
21908	3	125	<1	6	2	<4	10	4	<10
21909	3	16	<1	<5	6	<4	10	4	<10
21910	3	22	<1	8	3	<4	10	6	<10
21911	115	150	<1	6	38	145	330	<4	<10
21912	12	50	<1	<5	18	16	920	8	<10
21913	46	105	<1	<5	115	65	80	<4	<10
21914	5	18	<1	<5	6	4	40	4	50
21915	4	38	<1	<5	5	4	85	<4	15
21916	3	6	<1	<5	5	<4	20	8	<10
21917	3	8	<1	<5	5	<4	10	4	<10
SCHEME	AAS1	AAS1	AAS3	AAS5C	XRF1	XRF1	XRF1	XRF1	XRF1

5992

381 000 E · 382 000 E · 383 000 E

378 000 N · 377 500 N · 377 000 N · 376 500 N · 376 000 N · 375 500 N · 375 000 N

LOOP 6 · LOOP 7 · LOOP 8 · LOOP 10 · LOOP 12

6b · 8a · 8b (Coincident VLF anomaly) · 10a (Coincident VLF anomaly)

2.5m silty/sandy tuff & Sct interbeds + boudins (wk py) 1m chl. alter. ?

21903,04 · 21902 · 21901

1996 Ser. intermed pumice tuff & fiamme

1995 Chl. porph. andes. & amyg + qtz

1994 · 1996 · 1395 · 1386 · 1389 · 1376 · 1371 · 1098 · 1381 · 1362 · 1399 · 1355 · 1433 · 1346 · 1324

No outcrop

Gridded not cut

graded bedding

Ser. py. silic f.g. volc. ash

lam. ser. chl epiclastic, wispy boudins (Zn chl rock above & below)

(Misplaced in flight-path recovery?) (1)

Not cut or gridded

very difficult access

old line, difficult access Feb '86

? old access line

Epidotized-chloritized porphyritic andesitic flow breccia

massive silty sed. & felds phenes.

Felds.p. sandy & silty sericitic pelite (poorly sorted sandy mud)

Epidotized chloritized andesitic tuff/lava

Chl. epid. seric. andesite & qtz amyg. + K-felds

Brecc. interm. lava & epid chl ± py, pass hydroth. brecciation & propylitic alteration

Part epid. + chl tuffac pelite ± pelitic trachy andes. reworked lithic tuff, minor py

Chl. + bd qz hem

mag hem. Sct + sil. chl. m.f.Vi + qz mag veins

Felds. m.f.Vi chl

Felds? Via ser

Felds. m.f.Vi

Sh not located

100 Cu · 100 Pb · 120 Zn (40) s. sed.

MT. BLACK

ROSEBERY MINE LEASE

F

LEGEND

Geological mapping
- BAUS
- GETTY
- EZ

Andesitic lavas

Chloritic siliceous brecciated lavas

Coarse ash flows and andesitic lavas

27901 BAUS sample number

1059 Getty " "

Soil contour Cu Pb or Zn

Dighem conductor

Dighem resistivity low

dip I.P. Dipole - dipole I.P. line

grad I.P. Gradient array I.P. line

I.P. anomaly (gradient)

I.P. anomaly (dipole)

UTEM loop corner

UTEM anomaly

Magnetic trends (Dighem)

Dips from EZ ground magnetic profiles

f.	fine grained	Ar	acid volcanic
m.	medium grained	I	intermediate volcanic
c.	coarse grained	t	tuffaceous
f	feldspar	Sh	shaley sediment
q	quartz	ves	vesicular
V	volcanic (lava)	amyg	amyg daloidal
Vi	intermediate (volcanic lavas)	cb	carbonate
Va	acid (volcanic lavas)	chl	chlorite
Via	acid-intermediate (volcanic lavas)	agg	agglomerate
ser	sericite	sil	siliceous
E	epiclastic (volcanic derived)	alb	albite
Sct	cherty exhalite	pum	pumice
Ssh	black shale	fiam	fiamme
hem	hematite	*	limonite
mag	magnetite		

SCALE 1:5000

0 100 200 300 400 500 m.

960606

5 cm

96-2622

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project	ROSEBERY EAST J.V.		
Title	MT. BLACK LOCALITY GEOPHYSICAL TREND MAP		
Author	J R /NH Dept. AH.O.	Scale	1:5000
Drawn	A S Date 3/86	Revised	Date
Checked	Date	S'ceded	Date
Sheet No.	Fig. No. 17	Drawing No.	LJ 50/1019

382 000m E | 383 000m E | 384 000m E | 385 000m E

5 379 000m N

378 750 N

LOOP 6

LAKE ROSEBERY

5 378 000 m N

MT. SALE

ANOMALY 6C

ANOMALY 6A

ANOMALY 7B

383 500 E

378 400 N

no O/C

* Petrological work (samples 21964,65) suggests that the gold anomalous rocks are subvolcanic intrusives of trachyandesitic composition. More anomalous gold values are probably due to local remobilization from within the intrusion into late stage drusy quartz veins.
* Note that all follow up rock chips and auger samples contain no detectable gold

NB In this area there is a ±200m discrepency between E.Z and Shell coordinates. On this map, Shell coords have been taken as correct and E.Z grid and geology superimposed relative to Shell. Furthermore, inaccuracies render the Shell grid not true AMG.

Track overgrown – no Sch located

Not located

5 377 000 m N

377 500 N

SCALE 1:5000

0 100 200 300 400 500 Metres

IP line and anomaly (E.Z.)
UTEM anomaly (Shell)
Dighem resistivity anomaly (Getty)
Aeromagnetic anomaly (Getty)
Dighem anomaly (Getty)
UTEM loop corner

x Outcrop
• Float
f. Fine grained
m. Medium grained
c. Coarse grained
f Feldspar phyric
A or Va Acid volcanic lava
I or Vi Intermediate volcanic lava
Via Acid-intermediate volcanic lava
Ssh Shale
Sch Chert
mag Magnetite
t Tuffaceous
fiam Fiamme
100 Cu Soil geochem
◎ Auger sample

5cm

960607 86-2621

Billiton Australia
The Minerals Division of The Shell Company of Australia Limited

Project: ROSEBERY EAST JV

Title: MT. SALE LOCALITY GEOLOGICAL, GEOPHYSICAL AND GEOCHEMICAL PLAN

Author	J.P.R	Dept.		Scale	1:5000
Drawn	A.S	Date	8/86	Revised	Date
Checked		Date		S'ceded	Date
Sheet No.	Fig. No. 18			Drawing No.	LJ 50/1039

5993

379 000 E

380 000 E

381 000 E

5 380 000m N

5 379 000 m N

PIEMAN ROAD

LAKE ROSEBERY

TRACK

LAKE ROSEBERY

LANGDONS MINE DUMPS AND ADIT

Adit

stope

dumps

Va

Vi

Im

Ssh

Va lith

sil Va

sil Va lith

Sct and rew tuff

Mapping beneath the lake interpreted from E.Z mapping

N.B. E-facing (cross-bedding) 80° E dip

Sbs

vein Sph gal

Interbedded Sst,Sct layers & frags in m.f Va matrix weath. Va

21930 T.S. & assay

21931 T.S. & assay

21932 TS & assay

21933

21934

21935

21936

21937 T.S. & assay

21938

21939

21940

21941

21942

21943 T.S.

21944

21945

21946 T.S.

21947-49

21950

21951,52

21953

21954

21955

21956

21957

21958

21960

21961

21962

21963

NB. Detailed petrological work (samples 21934, 37, 46, 70-72) has indicated that intensive silicification has altered the original andesitic composition. This is a local alteration that is evident to the south towards Mt Black and is expressed at the surface as a well defined geobotanical anomaly.

Additional rock chip sampling carried out has failed to produce anomalous results. All samples of interest originate from the Langdons workings (see below)

LIMITED ROCK CHIP SAMPLING – LANGDONS MINE

	SAMPLE	Cu	Zn	Ag	Au	Au1	Au2	Au3	Pb	As	Sn	W	Ba
Massive cherty sideritic hematitic + galena, sphalerite veins.	21919	24	3700	18	0.14	-	-	-	1.32%	3300	<4	<10	230
Massive Chloritic cherty with blebby galena + veinlets sph, hem, gal.	21920	40	4200	16	4.8	5.0	4.3	4.4	1.37%	2500	<4	15	260
Strongly ferruginous vuggy + cherty oxidised ore, 2° qtz + siderite.	21921	300	2.20%	530	<0.01	-	-	-	24.0%	<0.01%	<4	<10	55
Dense black coarse hematite with cherty frags + siderite, galena.	21922	28	4600	34	<0.01	-	-	-	2.35%	470	<4	<10	105
Weakly chloritic siliceous network veined gal, hem, siderite.	21923	40	1.49%	85	<0.01	-	-	-	6.80%	1200	<4	15	350
Siliceous weakly chloritic massive, rare qtz veins, siderite.	21924	9	1900	10	<0.01	-	-	-	6100	270	<4	<10	290
Strongly silicified feldspar phyric acid lava, network qtz veinlets.	21925	5	360	4	<0.01	-	-	-	2800	110	4	15	230
	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	SCHEME	AAS1	AAS1 AAS1A	AAS3 AAS4	FAS1	FAS1	FAS1	FAS1	XRF1 XRF2	XRF1	XRF1	XRF1	XRF1

Im	Mafic intrusive
Va	Siliceous andesitic lava
Vi	Andesitic lava
Via	Dacitic-andesitic lava
Sct	Chert
Sbs	Black shale
Sst	Sandstone
m.	Medium grained
f.	Feldspar phyric
sil	Silicified
chl	Chloritic
Δ Δ	Breccia (pyroclastic ?)
fiam	Fiamme
TS	Thin section
	Strike / Dip bedding
cb	Carbonate
q	Quartz

5 cm

SCALE 1:5000

0 100 200 300 400 500 Metres

960608

5994

86 2022

Billiton Australia

The Metals Division of The Shell Company of Australia Limited

Project	ROSEBERY EAST J V
Title	LANGDONS LOCALITY GEOLOGICAL MAPPING AND GEOCHEMICAL COMPILATION

Author	JPR	Dept.		Scale	1:5000
Drawn	AS	Date	8/86	Revised	Date
Checked		Date		S'ceded	Date
Sheet No.	Fig. No. 19			Drawing No.	LJ 50/1040

379 000 E

380 000 E

381 000 E

5 380 000 N

5 379 000 N

FIAM

ROSEBERY LAKE

BLACK SHALE

FIAM

FIAM

FIAM

FIAM

FIAM

CHERT

LANGDONS
ADIT 10m
DRIVE 15m
STOPE 10m

FIAM

BLACK SHALE

CHERT

SANDY SILT CHERT

FIAM

SANDS CHERT

CHERT

CHERT

ROSEBERY LAKE

Quartz vein stockwork

Strong silicification

Strong chloritization

Strong sericitization, carbonation

Epiclastic / sediment horizon
– often disrupted sandy-cherty beds

Δ Δ Δ Zone of strong coarse volcanic breccia.
Blocks up to 30 cm pumiceous regions, fiamme

v v v Massive fine grained basalts / dolerites.
Presumably dyke like intrusions.
Attitude unknown but possibly conformable

SCALE 1: 5000

0 100 200 300 400 500 Metres

5 cm

Billiton Australia
The Metals Division of BHP Minerals Australia Limited

Project: ROSEBERY EAST JV

Title: LANGDONS LOCALITY
GEOLOGICAL INTERPRETATION

Author	JPR	Dept.		Scale	1: 5000
Drawn	AS	Date	8/86	Revised	Date
Checked		Date		S'ceded	Date
Sheet No.	Fig. No. 20			Drawing No.	LJ 50/ 1041

960609

5995

"INSET"

× 12943 Rock grab sample
× 12947(P) Petrological rock sample
12976 Rock chip sample (over interval shown)
0 50m

slumped and disrupted grey shale raft
Excellent west facing in turbidite unit
clasts of semi-massive pyrite to 25mm in volcanic breccia
12977: 0·1g/tAu
INTERPRETED ANTICLINAL AXIS
LAKE ROSEBERY
12948(P)
py,sp,cp
8993: 0·17g/tAu
7950: 0·57g/tAu
12942: 0·36g/tAu, 46g/tAu
12941: 0·12g/tAu
fuchsite stains
Mod silicification throughout. Numerous quartz-ankerite veins.
qtz veins
12947(P)
12945(P)
Deformed massive pyrite sulphide bands up to 60mm wide in volcaniclastics and margin of quartz-porphyry lava
massive pyrite clasts to 40mm in volcanic breccia-conglomerate

E.L. 1762
Piaman River
Bastyan Dam
FOR ROCK SAMPLE LOCATIONS IN THIS AREA SEE "INSET"
Position of 8.5m x 1m lens of basemetal massive sulphide exposed by HEC during dam construction. At least four smaller massive sulphide lenses also exist in this vicinity.
py,sp,gn,cp
Section 1876 (now underwater) Reported py, mal, sp, gn, disseminated in chlorite-sericite schist
Reported trend of mineralisation
LAKE ROSEBERY

INTERPRETED ANTICLINAL AXIS
slumped and disrupted grey shale raft
Excellent west facing in turbidite unit
clasts of semi-massive pyrite to 25mm in volcanic breccia
Deformed massive pyritic sulphide bands up to 60mm wide in volcaniclastics and margin of quartz-porphyry lava
massive pyrite clasts to 40mm in volcanic breccio-conglomerate
fuchsite stains
Mod silicification throughout. Numerous quartz-ankerite veins.
qtz veins
clasts of tuffaceous chert
Clasts of massive sulphide up to 2m in a mass debris flow deposit.
7948: 0.12g/tAu, 35.5%Zn, 0.8%Pb, 20g/tAg, 0.1%Sn
7949: 0.25g/tAu, 1.3%Zn, 0.2%Pb, 10g/tAg
py,sp,gn
Clasts of massive pyrite and sphalerite in quartz-crystal-lithic breccia.
Old prospecting pits
Section 1841 (ROBBIE BURNS) Reported vein py,gn,sp.
clasts of tuff-shale to 300mm
12991
cherty tuffaceous sediments
quartz veins
7923: py,sp
minor fuchsitic clasts
12978
coarse volcanic breccia with fuchsitic clasts and clasts of tuff-siltstone to 300mm
C.S.1
C.S.2

AREA VESTED IN THE H.E.C.

BOBADIL AREA
TO BE EVALUATED

B.D.1
B.D.269

12935: 2.7%Cu, 0.33g/tAu, 8g/tAg, 0.03%Bi
12936: 4.5%Cu, 0.95g/tAu, 34g/tAg, 0.53%Bi
12937: 3.5%Cu, 0.63g/tAu, 18g/tAg, 0.18%Bi
Zones of strong chlorite ± silica alteration with disseminated and vein pyrite-chalcopyrite.
Cutty Sark
7924 - 30
7931 (P)
Sub Basin
12933
12934
Zone of strong chlorite alteration with disseminated pyrite
LINE 9900N SURVEYED WITH CSAMT, 1986
8991: 1.2%Cu, 0.23g/tAu
8992
Hawksbury
Zone of strong chlorite-sericite alteration with pyrite and chalcopyrite.
Rosebery Mine Lease Boundary (approx)
8700 N Lease Boundary (approx)
12875
12876
quartz-ankerite veins
8967
8953
INTERPRETED HOST HORIZON SEDIMENTS
SECTION LINE 7150N
600mW
500mE
7IR
8968
8969
8970
12916
8971
8972
8973
8987
8988
8989
8990
minor cherty bands in bedded grey tuff-shale
1m band of tuff-shale
numerous large clasts of black shale in feldspar quartz-crystal-tuff matrix
Zone of weak propylitic alteration with pyrite

QUATERNARY

GLACIAL DEPOSITS

CAMBRIAN – MT READ VOLCANICS

ROSEBERY MINE HANGINGWALL SEQUENCE

WELDED FELDSPAR - PHYRIC IGNIMBRITES
Large spectacular flamme' in places.

MASSIVE ANDESITIC LAVAS
Feldspar-porphyritic. Commonly chloritised. Magnetic in places. Mapped zones of alteration and mineralisation shown cross-hatched.

REWORKED VOLCANICLASTICS
Quartz and feldspar-crystal-lithic reworked poorly-bedded volcaniclastics; ranging from coarse volcanic breccias to crystal tuffs. Characterised by coarse volcanic quartz crystals in matrix; or by feldspar crystal matrix with minor small quartz crystals. Crystal tuffs shown ... or ::::. Interbedded lenses of tuff-shale, siltstone or sandstone shown ////. Unit contains lenses (rafts?) and large clasts of massive sulphide in vicinity of Bastyan Dam.

ROSEBERY MINE HOST HORIZON SEQUENCE

MASSIVE QUARTZ - PORPHYRY LAVA
Large bi-pyramidal quartz crystals in white siliceous matrix. Smaller porphyritic feldspars.

VOLCANICLASTIC SEDIMENTS
Reworked fine feldspar-crystal-lithic volcaniclastics with minor small rounded quartz crystals. Includes unit of grey tuff-shale with cherty bands.

ROSEBERY MINE FOOTWALL SEQUENCE

FELDSPAR - PHYRIC LAVAS & PROBABLE IGNIMBRITES
Massive feldspar-porphyritic volcanics. Some volcaniclastics with small lithics, flattened pumice(?), and very rare small quartz crystals.

SYMBOLS
BEDDING
FACING
SCHISTOSITY
× 8994 ROCK SAMPLE
× 1294(P) PETROLOGY SAMPLE
ABBREVIATIONS
li LIMONITE/ LIMONITIC
silif SILIFICATION

OUTCROP AND CONTACT (Mapped by J.G.P.)
INFERRED CONTACT
MAPPED FAULT
INFERRED FAULT
MAPPED THRUST FAULT WITH DIP

A.M.G. M.N. 2°
5 cm

960610
5996

Billiton Australia
The Metals Division of the Shell Companies of Australia Limited

Project: TASMANIA ROSEBERY EAST JOINT VENTURE
Title: MT. BLACK E.L. 1/62 CUTTY SARK – BOBADIL
INTERPRETED GEOLOGY

Author J.G.P.	Dept TAS.	Scale 1:2500	
Drawn H.M.R.	Date II/86	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. Fig. No. 21		Drawing No. LJ50/1050	

WEST

EAST

800 W
INNES' TRACK
FELSIC VOLCANIC
Unidentifiable Rare small quartz crystals
700 W
600 W
500 W
400 W
QUARTZ-FELDSPAR CRYSTAL TUFF (?)
Rounded quartz crystals to 6mm
300 W
200 W
100 W
Creek
DARK GREY SHALE AND SILTSTONE
00
100 E
200 E
Creek
300 E
400 E
500 E
Creek
600 E
700 E
800 E
CS I
900 E
1000 E
1100 E
1200 E
1300 E
1400 E
1500 E

200 m RL

ANDESITIC LAVA
(Fitz.Gerald 1984)

DACITIC PYROCLASTICS
(Fitz.Gerald 1984)

100m

QUARTZ-FELDSPAR-CRYSTAL-LITHIC VOLCANICLASTIC
Epiclastic Subrounded qtz crystals to 7mm
Lithics av <10mm

100 m RL

GREY SHALE AND SILTSTONE
Highly disrupted bedding
FELDSPAR-CRYSTAL TUFF
? 6m QUARTZ VEIN IN MAJOR FAULT ZONE
DARK GREY SHALE AND SILTONE
Disrupted bedding, minimal Carbonaceous content
Possible fold axis
MASSIVE FELSIC VOLCANICLASTIC (?)
Unidentifiable
Possible fold axis
VARIABLE FINE VOLCANIC SEDIMENTS
Disrupted bedding
FELDSPAR-CRYSTAL TUFF
Epiclastic. Similar to unit above 240m
Rare quartz crystals
VARIABLE VOLCANIC SEDIMENTS
Some chert and charty tuff-siltstone
QUARTZ-FELDSPAR-CRYSTAL-LITHIC VOLCANICLASTIC
Epiclastic, mass debris flow
Largest and most abundant clast type is quartz-amygdaloidal lava
VOLCANIC SANDSTONE & TUFF-SHALE
QUARTZ-FELDSPAR-CRYSTAL-LITHIC VOLCANICLASTIC
Epiclastic Charty matrix Lithics av. <5mm
BLACK SHALE
QUARTZ-CRYSTAL TUFF
Epiclastic Rounded quartz crystals to 10 mm
BLACK SHALE AND VOLCANIC SANDSTONE
Disrupted bedding
FELDSPAR AND QUARTZ-PHYRIC VOLCANICLASTIC
Unidentifiable Quartz crystals rare at base
Sparse lithics

196 m PYRR
200m
300m
400m
5% PYR
EOH 451.4 m

00

-100 m RL

ROSEBERY MINE GRID
Bearing 258° AMG (270° RMG)

LEGEND

- Geological contact
- Bedding
- Bedding facing
- Shear or fault

960611

5 cm

5997

86-2622

Billiton Australia
The Metals Division of The Shell Companies of Australia Limited

Project	ROSEBERY EAST JV
Title	MT BLACK PROJECT - CUTTY SARK AREA GEOLOGICAL SECTION DRILLHOLE CS I SECTION 11500'N
Author JGP Dept.	Scale 1:1000
Drawn AS Date 6/86	Revised Date
Checked Date	S'ceded Date
Sheet No. Fig. No. 22	Drawing No. LJ 50/1028

500m W | 400m W | 200 W | 00 | 200m E | 400m E | 500m E

RL 500 m

Track to Cutty Sark

Feldspar - phyric ignimbrite and lava

Felsic Volcaniclastic (epiclastic)

Volcanic Sandstone and Bedded grey Tuff, Shale

Basaltic Volcaniclastic (epiclastic)

Feldspar Crystal Tuff (minor quartz-crystals and lithics)

Feldspar Crystal Tuff with lithic clasts and shale clasts (minor quartz crystals)

Feldspar Crystal Tuff (minor quartz crystals)

Finely bedded Sediments (siltstone, sandstone, tuff) minor seaweed

Feldspar - quartz Crystal Tuff with lithic clasts (minor quartz crystals, phyric units to west)

Felsic porphyritic ignimbrite

Andesitic to Dacitic Lava Non-magnetic

Track to Cutty Sark

Zone of phyllitic alteration with pyrite

Drillsite access track

Drillsite access track

RL 500 m

400 m

300 m

200 m

100 m

RL 00

-100m

-200m

71R
-90°
Proj. 168 N

200'

400'

600'

800'

1000'

1200'

1400'

1600'

ANDESITIC TO DACITIC LAVA

FELSIC IGNIMBRITE (?)

DACITIC LAVA (Lees, 1982)

QUARTZ CRYSTAL TUFF TUFFACEOUS SEDIMENTS

HOST HORIZON CHERTY SEDIMENTS

FELDSPAR - PHYRIC IGNIMBRITE AND LAVA (FOOTWALL SEQUENCE)

Semi-massive pyrite-magnetite breccia zones

5%py 5-10%mt
3-5%py 2-5%mt
10%py

FELSIC LAVA

SILICIFIED VOLCANIC Unidentifiable

Major fault zone

FELDSPAR - QUARTZ CRYSTAL - LITHIC TUFF (Epiclastic)

LINEATED FELSIC VOLCANICLASTIC (IGNIMBRITE?) strongly carbonatised

TUFFACEOUS CHERT

FELSIC VOLCANICLASTIC Mod-strongly sericitised, bleached, silicified and carbonatised

FELSIC CRYSTAL-LITHIC VOLCANICLASTIC Common clasts of amygdaloidal lava

LITHIC-RICH VOLCANIC BRECCIA Abundant clasts of amygdaloidal lava

FELSIC VOLCANICLASTIC (Epiclastic?) Clasts of amygdaloidal lava Mod-strongly silicified, bleached, sericitised

COARSE VOLCANIC SANDSTONE feldspar & quartz crystals and fine lithics

COARSE CRYSTAL-LITHIC EPICLASTIC Highly quartz-phyric

TUFF-SHALE AND CHERT

VARIABLE SCHISTOSE EPICLASTICS Interbeds of tuff-siltstone, some smeared-out lithic clasts

CRYSTAL-LITHIC TUFF (EPICLASTIC) WITH GREY SHALE CLASTS Mod-strong sericitisation

BLACK SHALE

Petrological sample 7969

Petrological sample 7970

QUARTZ-FELDSPAR CRYSTAL TUFF (Epiclastic) Abundant strongly rounded quartz crystals Mod-strongly silicified

Petrological sample 7988

VOLCANIC BRECCIA - CONGLOMERATE Mod-strong sericite - silica-carbonate alteration

COARSE VOLCANIC SANDSTONE Quartz crystal and lithic clasts strongly schistose

QUARTZ-FELDSPAR PORPHYRY (INTRUSIVE OR FLOW) Mod-strongly silicified

TUFFACEOUS CHERTY SILTSTONES & SHALES

QUARTZ - CRYSTAL TUFF/SILTSTONE & CHERTY SILTSTONE

TUFFACEOUS CHERT & CHERTY SILTSTONE

BANDED TUFFACEOUS FELDSPAR-PHYRIC VOLCANIC After felsic pyroclastic

FELDSPAR - AUGEN SCHIST After felsic pyroclastic

Petrological sample 7990

EOH Proj 25.5 m

HOST ROCK SEQUENCE (200ft / 61m) (30m)

Mod-strongly schistose and sericitised

FOOTWALL SEQUENCE Strongly schistose Mod-strong sericite - silica - chlorite alteration

LEGEND

- Geological contact
- Bedding
- Primary lineation (ie flow banding etc)
- Schistosity
- Bedding facing
- Shear or fault

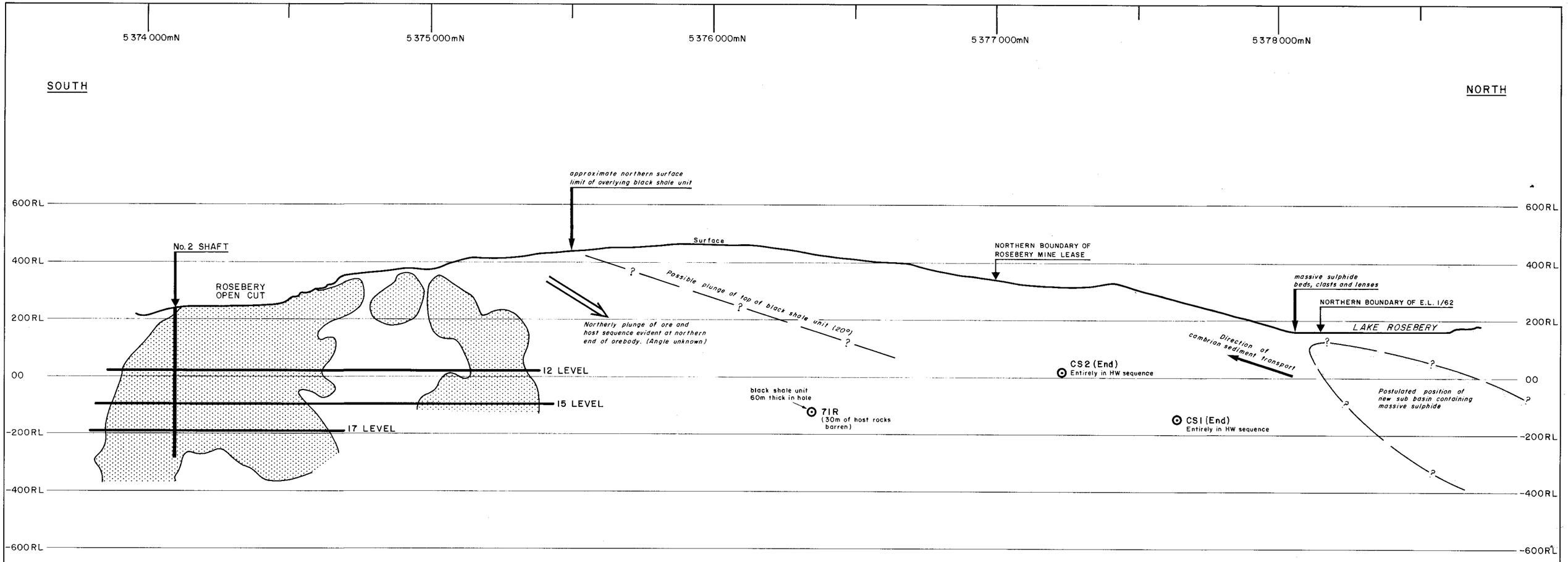
86-2622

Billiton Australia
The Minerals Division of The Shell Company of Australia Limited

Project: Mt. BLACK PROJECT - TASMANIA
CUTTY SARK AREA

Title: GEOLOGICAL SECTION
DRILLHOLE 71R
SECTION 7150'N, ROSEBERY MINE GRID
Bearing 258° AMG (270° RMG)

960612



36-2622

960613

5 cm

5999

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project: TASMANIA
ROSEBERY EAST J.V.

Title:
LONGITUDINAL PROJECTION OF ROSEBERY MINE HOST HORIZON
LOOKING WEST

Author J.G.P.	Date 11/86	Scale 1:10 000	
Drawn H.M.R.	Office AHO	Revised	Date
Drawing No. LJ50/1049			Fig. No. 26

6000

LAKE ROSEBERY

EL 1762

378 400 N

SHELL 19

379 400 E

380 000 E

378 000 N

GETTY 1.

GETTY 2.

GETTY 3.

DH SIROTEM

CS-1

DH SIROTEM BD-1 by GETTY

SARK ROAD

CUTTY

377 750 N

377 500 N

377 300 N

377 250 N

HEC ROAD

SHELL 20

SHELL 24 (Approx 1600 x 900m)

9900'N

3,000E

100

1000'W

2000'W

SHELL 23 (Approx 800 x 800m) south of 9900'N

SHELL 18

377 000 N

9 900'N

376 800 N

376 600 N

SHELL 1020 (800 x 500m)

376 500 N

CUTTY SARK ROAD

BOUNDARY

LEASE

ROSEBERY MINE

1000'E

4700 N

1000'W

3 900 N

EL 1762

CSAMT line

TEM transmitter loops

Shell UTEM lines

N.B. Positions of lines and loops are as AMG coords. These are not necessarily correct on the ground.

960614

5 cm

86-2622 1

Billiton Australia

Project	ROSEBERY EAST J.V.
Title	CUTTY SARK - N. ROSEBERY TEM LOOP POSITIONS & GEOPHYSICAL GRID LINES (1986)
Author N.H.	Date Nov. 86 / Scale 1:5000
Drawn A.M.	Office A.H.O. / Revised / Date
Drawing No. LJ50/1047	Fig. No. 28

6001

377 000 m E

380 000 m E

5 378 000 m N

5 374 000 m N

BASTYAN DAMA

PLANT

DENSE

MEDIUM

CLEAR

EML 606

EZ 152

Quarry

Airstrip

KARLOWS HUT

E.L. 1762

SCALE 1:5000

0 100 200 300 400 metres

5 cm

86-2622

Mean Sensor Height=53m

960615

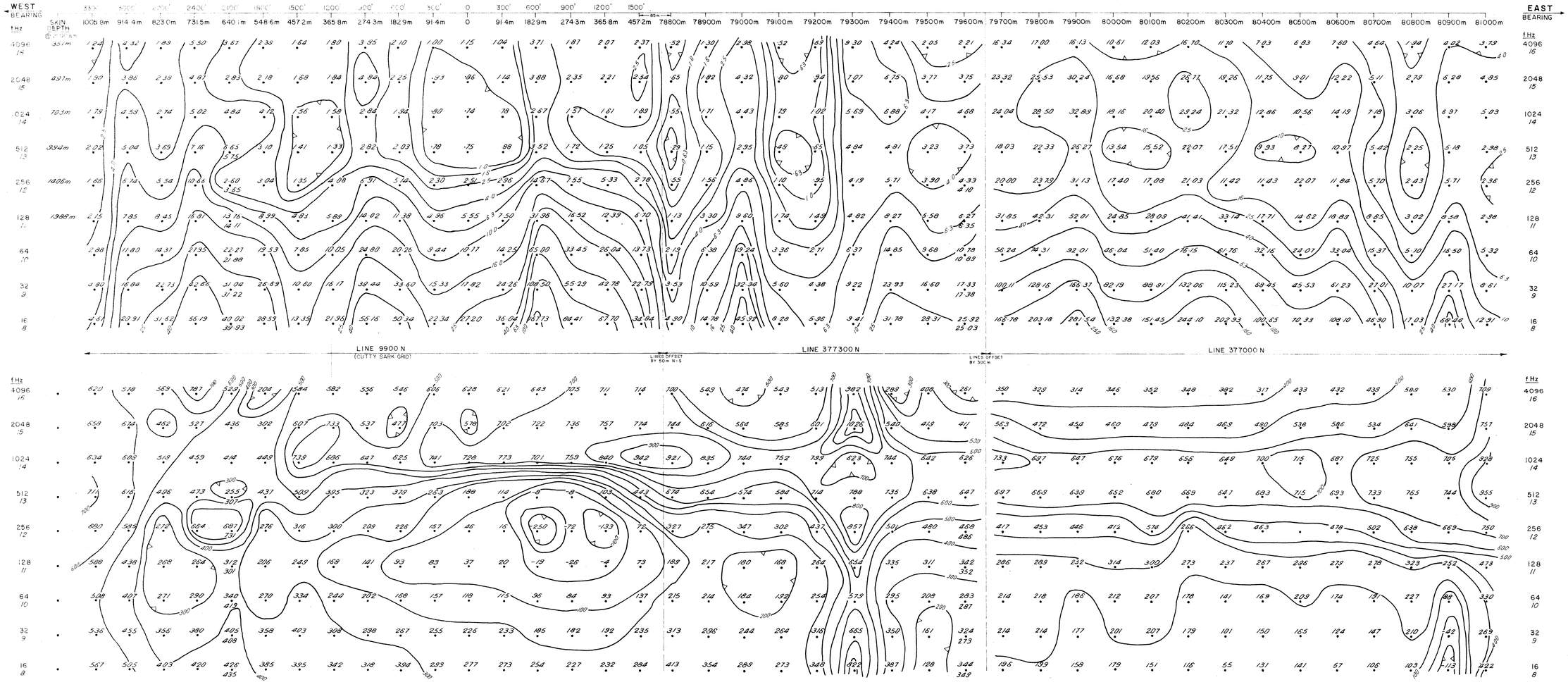
Billiton Australia

The Metals Division of the Shell Companies in Australia Limited

Project: ROSEBERY EAST J.V.

Title: **CUTTY SARK**
NORTH ROSEBERY AREA
DIGHEM ENHANCED AEROMAGNETICS

Author:	Dept:	Scale:	
Drawn:	Date:	Revised:	Date:
Checked:	Date:	Supplied:	Date:
Sheet No:	Fig No 29	Drawing No:	SJ 507



LINE 377 300 N

CSAMT
CAGNIARD RESISTIVITY

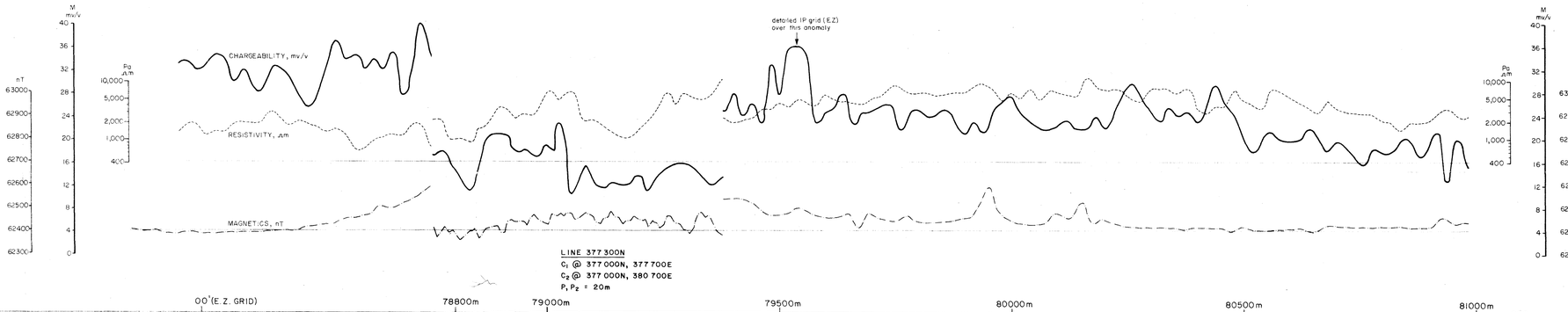
Km

R x length = 100m (300ft Line 9900N)
T x length = 1·1 km
T x position : 6·0km to South
T x orientation : N 85°E
By Zonge for Billiton 2/86

LINE 377 300 N

CSAMT
PHASE DIFFERENCE

milli - radians

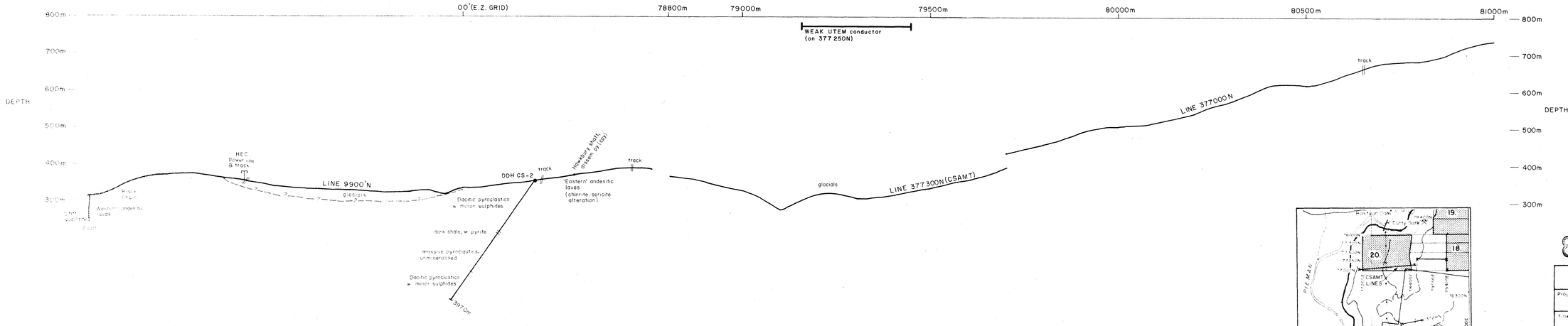


LINE 377000N
I.P. & MAGNETIC SURVEYS

By Scintrex for E.Z. 12/78 & 1/79
Gradient array : C_1C_2 = 6500m
P_1P_2 = 20m
Rx = IPR-8
Timing = 2 sec on-off
M_3 plotted

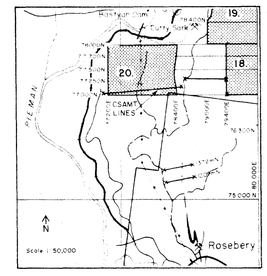
LINE 377 300 N
C_1 @ 377 000N, 377 700E
C_2 @ 377 000N, 380 700E
P_1P_2 = 20m

WEAK UTEM conductor (on 377 250N)



TOPOGRAPHY

from 1:10,000 topo maps (EZ)



960616
86-2622

Billiton Australia
The Metals Division of the Shell Companies of Australia Limited

Project	ROSEBERY EAST J.V., TAS
Title	CUTTY SARK AREA GEOLOGICAL CROSS-SECTION WITH IP, CSAMT & MAGNETICS

Author N.H.	Dept AHO	Scale 1:5000	
Drawn S.L.P	Date 8/86	Revised	Date
Checked	Date	Sceded	Date
Sheet No.	Fig No 30	Drawing No.	LJ 50/1035

L-6003

375500mE
376000mE
376500mE
377000mE

DUNN'S SHAFT STRATIFORM GOLD BODY: 290,000t @ 2·6g/t Au; 120g/t Ag 1·6% Pb; 2·6% Zn

FOOTWALL SEQUENCE — Altered silicified tuffaceous sediments and ignimbrite(?)

HOST ROCKS

H880, 881
H1107
H1108, 1109
H951
H1098, 1099
H1106
H1104, 1105
H1101
H953
H1102
H954

ALTERED SILICIFIED PUMICEOUS VOLCANICLASTIC

QUARTZ-FELDSPAR-PHYRIC VOLCANICLASTIC

TUFFACEOUS SEDIMENTS

365 500mN

WHITE SPUR FORMATION
(VOLCANO-SEDIMENTARY SEQUENCE)

TUFF
SHALE

QUARTZ-FELDSPAR CRYSTAL TUFF

MINE LEASE

365 000mN

CHLORITE-PYRITE ALTERATION ZONE
(Part of East Hercules line of mineralisation)

QUARTZ-AUGEN SCHIST ZONES WITH PYRITE

FELDSPAR-PHYRIC LAVAS AND INTRUSIVES

CRYSTAL TUFF

Zone of quartz-sericite alteration with sulphides

strong silicification along contact

MASSIVE FELDSPAR-PHYRIC VOLCANICLASTIC OR LAVA

364 500mN

UNCONFORMITY

ANGULAR

TUFFACEOUS SEDIMENT

FELDSPAR-CRYSTAL-LITHIC VOLCANICLASTIC
(Reworked in places)

QUARTZ-FELDSPAR PORPHYRY INTRUSIVE

364 000mN

363 500mN

E.L. 1/62
E.L. 11/85

6002

960617

5 cm

× 816 SHELL ROCK SAMPLE 1986
(All samples prefixed 12___)

86-2622

0 100 200 300 400m

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project: TASMANIA
ROSEBERY EAST JOINT VENTURE

Title: MT. BLACK E.L. 1/62

SOUTH HERCULES INTERPRETED GEOLOGY

(BASED ON LEES 1985, WITH MODIFICATIONS)

Author J.G.P.	Dept. TAS.	Scale 1: 5000	
Drawn H.M.R.	Date 12/86	Revised	Date
Checked	Date	S'ceded	Date
Figure No. 31		Drawing No. LJ50/1056	

140 W | 120 W | 100 W | 80 W | 60 W | 40 W | 20 W | 00 | 20 E | 40 E

PLAN 270° AMG

H 1103

WEST — EAST

EOH 142 m

SECTION

H 1103 ~45°

Road

minor lim after sulphides 12803 — 2·2 g/t Au

12802 minor lim after sulphides

12801

12995 minor lim after sulphides

0·26 g/t Au, 16 g/t Ag

12994 minor lim after sulphides

12993 minor lim after sulphides

x 12992

12805 lim after sulphides

12804 lim after sulphides

Altered felsic volcaniclastic

Quartz-augen schist

no O/C

Tuffaceous siltstone, sandstone and shale

Felsic & bands volcaniclastic of tuffaceous sediments

Altered tuffaceous sediment

Felsic pumiceous volcaniclastic (ignimbrite?)

WHITE SPUR FORMATION

ANGULAR UNCONFORMITY

50 – 58 m: 8 m @ 0·17 g/t Au, 6·0 g/t Ag

86 – 98 m: 12 m @ 0·22 g/t Au

122 – 124 m: 2 m @ 0·34 g/t Au

1-2% py

carb nodules

2% py 1% sp, gn

1% py

2-3% py

TUFFACEOUS SILTSTONE Ox

FELDSPAR CRYSTAL TUFF Ox, lim

DISRUPTED CHERTY TUFFACEOUS SEDIMENTS Ser, ble, schist

ALTERED SILICEOUS TUFFACEOUS SEDIMENT Ser, schist, carb nodules

FINE FELSIC VOLCANICLASTIC ser, schist

AUGEN-TEXTURED QUARTZ-SERICITE SCHIST Unidentifiable volcanic. ser, silif, ble, carb, schist

SILICEOUS TUFFACEOUS SEDIMENT Ser, schist

QUARTZ-SERICITE SCHIST (Altered felsic tuffaceous volcaniclastic) Ser, ble, schist.

ALTERED FELSIC VOLCANICLASTIC Ser, carb, schist

INTENSELY SILICIFIED AND DEFORMED FELSIC VOLCANICLASTIC Silif.

EOH 142m

20 | 40 | 60 | 80 | 100 | 120 | 140

5 cm

LEGEND

- Geological contact with attitude measured
- Geological contact with attitude inferred
- Bedding
- Schistosity
- x 12993 — Rock sample
- Ox — Oxidation
- lim — Limonite

Alteration Types (Only noted where strong)

- ser — Sericitisation
- silif — Silicification
- ble — Bleaching
- carb — Carbonatisation/carbonate
- schist — Strongly schistose

960618

Billiton Australia

The Metals Division of The Shell Companies in Australia

Project: ROSEBERY EAST J.V. EL 1/62
MT. BLACK, TASMANIA

Title:
SOUTH HERCULES AREA
GEOLOGICAL SECTION
DRILLHOLE H1103
SECTION BEARS 270° AMG

Author	JGP	Date	8/86	Scale	1:500
Drawn	AS	Office	AHO	Revised	JGP Date 12/86
Drawing No.	LJ 50 / 1036			Fig. No.	32

6004

CRA EXPLORATION PTY LTD

Approximate position of Rosebery Mine Lease

EZ BASE LINE 00
SHELL BASE LINE 10,000mE

LOOP 21
Approx 500 x 700m

LOOP 22
Approx 450 x 700m

5365000m N

376000mE

376750mE

5 cm

960619

2622

6005

Billiton Australia
The Metals Division of The Shell Company of Australia Limited

Project: ROSEBERY EAST J.V.

Title: SOUTH HERCULES AREA
SIROTEM GRIDS
2nd half '86

Author N.H	Date 11.86	Scale 1:5000	
Drawn A.J.M	Office AHO	Revised	Date
Drawing No.			Fig No. 33

RECENT, QUATERNARY — Glacial moraine and scree

UPPER CAMBRIAN — Owen Conglomerate. Massive quartz and quartzite pebble conglomerate

MIDDLE CAMBRIAN — Volcanomict breccio-conglomerate and quartz-crystal-lithic tuff. Intercalations of volcanic sandstone, siltstone and shale

MT. READ VOLCANICS

West of the Henty Fault Zone

LOWER CAMBRIAN

- Feldspar phyric (dacitic) lava and ignimbrite. Subvolcanic felsic intrusive
- Basalt — flows and dykes
- Chloritic volcanic sandstone, siltstone and shale. Volcanic lithic breccia. Feldspar and quartz-crystal tuff.

East of the Henty Fault Zone

- Siliceous volcanic sandstone, siltstone and chert. Quartz and feldspar-crystal - lithic breccia. Crystal tuff. Carbonaceous tuff-shale.
- Quartz-porphyritic rhyolite lava.

Fault - observed

Fault - inferred

Dyke or vein

Geological contact

Inferred geological contact

Areas of examined outcrop

Bedding

Primary lineation (flow bedding etc)

Schistosity

x 8934 Rock outcrop or float sample

8936 Stream sediment sample

silif Silicification

py Pyrite

cp Chalcopyrite

li Limonite

381 500 mE · 382 000 mE · 382 500 mE · 383 000 mE

5 371 500 m N · 5 370 500 m N · 5 369 500 m N · 5 369 000 m N · 5 368 500 m N

71 000 m N · 70 500 m N · 70 250 m N · 70 000 m N · 69 750 m N · 69 500 m N · 69 250 m N · 69 000 m N · 68 500 m N

E.L. 1/62 · E.L. 4/73

Sterling River

Primary lineation in welded dacitic ignimbrite

0.3m qtz vein

qtz veins

Basalt dykes

qtz veins with py

Basalt dyke or flow

fine grained cherty sediment

volcanic lithic breccia

crenulated qtz-sericite schist zone

limonite seeps

Samples 7921 @ 545E, 7922 @ 590E off plan

2 x 3m granite erratic

10m moraine wall

30m moraine wall

Glacial Moraine Ridge

walking track

GODC pit

EZ pit

Sub-surface geology beneath glacials from drill holes

welded ignimbrite

volcanic lithic breccia

1m chert band

HENTY FAULT ZONE

STITT RIVER

G.N. (AMG) M.N. 12°

100 50 0 100 200 Metres

960620

5 cm

MT. LYELL GRID LINE 68 N

5100' W · 4000' W · 3000' W · 2000' W

E.L. 1/62

E.L. 9/66

9009

Billiton Australia

The Metals Division of The Shell Company of Australia Limited

Project	ROSEBERY EAST J.V. TASMANIA
Title	MT BLACK EL 1/62 SOUTH STITT GEOLOGY
Author J.G.P. Dept. D'PORT	Scale 1:5000
Drawn A.S. Date 4/86	Revised Date
Checked J.G.P. Date 5/86	S'ceded Date
Sheet No. Fig No 34	Drawing No. LJ 50/1016

3632

GEOLOGY AFTER J.G. PURVIS, 1986

Geological interpretation of Henty Fault position

Dighem Anomaly

Chargeability contours n = 1

Mag highs (Dighem)

VLF Conductor

72 000 m N

71 500 m N

100m Dipole-Dipole I.P

100m Pole - Dipole I.P

UTEM T_X LOOP 14
400m x 1100m

72 000N (UTEM)

71 700N (UTEM)

71 500N (UTEM)

71 400N (UTEM)

71 000N (UTEM)

UTEM CONDUCTOR 13a – WEAK

UTEM CONDUCTOR 14b – WEAK

Anomalous Soil Pb/Zn (no anomalous soil Pb/Zn)

Weak UTEM anomaly

Sterling River

IP/Res anomaly (EZ Sterling Valley)

LINE 1050N

Decreasing res with depth no VLF

Anomalous Soil Pb/Zn

SS1

SS2

211.4 m

145.6m

Fault ?

HENTY FAULT

Samples
7921/@ 5455
7922/@ 5905
off plan

9000

8964

8962

8965

8960

8955

8950

8945

8940

8935

8930

8925

8920

8915

8910

8905

8900

8895

8890

8885

8880

8875

8870

8865

8860

8855

8850

8845

8840

8835

8830

8825

8820

8815

8810

8805

8800

8795

8790

8785

8780

8775

8770

8765

8760

8755

8750

8745

8740

8735

8730

8725

8720

8715

8710

8705

8700

8695

8690

8685

8680

8675

8670

8665

8660

8655

8650

8645

8640

8635

8630

8625

8620

8615

8610

8605

8600

8595

8590

8585

8580

8575

8570

8565

8560

8555

8550

8545

8540

8535

8530

8525

8520

8515

8510

8505

8500

8495

8490

8485

8480

8475

8470

8465

8460

8455

8450

8445

8440

8435

8430

8425

8420

8415

8410

8405

8400

8395

8390

8385

8380

8375

8370

8365

8360

8355

8350

8345

8340

8335

8330

8325

8320

8315

8310

8305

8300

8295

8290

8285

8280

8275

8270

8265

8260

8255

8250

8245

8240

8235

8230

8225

8220

8215

8210

8205

8200

8195

8190

8185

8180

8175

8170

8165

8160

8155

8150

8145

8140

8135

8130

8125

8120

8115

8110

8105

8100

8095

8090

8085

8080

8075

8070

8065

8060

8055

8050

8045

8040

8035

8030

8025

8020

8015

8010

8005

8000

7995

7990

7985

7980

7975

7970

7965

7960

7955

7950

7945

7940

7935

7930

7925

7920

7915

7910

7905

7900

7895

7890

7885

7880

7875

7870

7865

7860

7855

7850

7845

7840

7835

7830

7825

7820

7815

7810

7805

7800

7795

7790

7785

7780

7775

7770

7765

7760

7755

7750

7745

7740

7735

7730

7725

7720

7715

7710

7705

7700

7695

7690

7685

7680

7675

7670

7665

7660

7655

7650

7645

7640

7635

7630

7625

7620

7615

7610

7605

7600

7595

7590

7585

7580

7575

7570

7565

7560

7555

7550

7545

7540

7535

7530

7525

7520

7515

7510

7505

7500

7495

7490

7485

7480

7475

7470

7465

7460

7455

7450

7445

7440

7435

7430

7425

7420

7415

7410

7405

7400

7395

7390

7385

7380

7375

7370

7365

7360

7355

7350

7345

7340

7335

7330

7325

7320

7315

7310

7305

7300

7295

7290

7285

7280

7275

7270

7265

7260

7255

7250

7245

7240

7235

7230

7225

7220

7215

7210

7205

7200

7195

7190

7185

7180

7175

7170

7165

7160

7155

7150

7145

7140

7135

7130

7125

7120

7115

7110

7105

7100

7095

7090

7085

7080

7075

7070

7065

7060

7055

7050

7045

7040

7035

7030

7025

7020

7015

7010

7005

7000

6995

6990

6985

6980

6975

6970

6965

6960

6955

6950

6945

6940

6935

6930

6925

6920

6915

6910

6905

6900

6895

6890

6885

6880

6875

6870

6865

6860

6855

6850

6845

6840

6835

6830

6825

6820

6815

6810

6805

6800

6795

6790

6785

6780

6775

6770

6765

6760

6755

6750

6745

6740

6735

6730

6725

6720

6715

6710

6705

6700

6695

6690

6685

6680

6675

6670

6665

6660

6655

6650

6645

6640

6635

6630

6625

6620

6615

6610

6605

6600

6595

6590

6585

6580

6575

6570

6565

6560

6555

6550

6545

6540

6535

6530

6525

6520

6515

6510

6505

6500

6495

6490

6485

6480

6475

6470

6465

6460

6455

6450

6445

6440

6435

6430

6425

6420

6415

6410

6405

6400

6395

6390

6385

6380

6375

6370

6365

6360

6355

6350

6345

6340

6335

6330

6325

6320

6315

6310

6305

6300

6295

6290

6285

6280

6275

6270

6265

6260

6255

6250

6245

6240

6235

6230

6225

6220

6215

6210

6205

6200

6195

6190

6185

6180

6175

6170

6165

6160

6155

6150

6145

6140

6135

6130

6125

6120

6115

6110

6105

6100

6095

6090

6085

6080

6075

6070

6065

6060

6055

6050

6045

6040

6035

6030

6025

6020

6015

6010

6005

6000

5995

5990

5985

5980

5975

5970

5965

5960

5955

5950

5945

5940

5935

5930

5925

5920

5915

5910

5905

5900

5895

5890

5885

5880

5875

5870

5865

5860

5855

5850

5845

5840

5835

5830

5825

5820

5815

5810

5805

5800

5795

5790

5785

5780

5775

5770

5765

5760

5755

5750

5745

5740

5735

5730

5725

5720

5715

5710

5705

5700

5695

5690

5685

5680

5675

5670

5665

5660

5655

5650

5645

5640

5635

5630

5625

5620

5615

5610

5605

5600

5595

5590

5585

5580

5575

5570

5565

5560

5555

5550

5545

5540

5535

5530

5525

5520

5515

5510

5505

5500

5495

5490

5485

5480

5475

5470

5465

5460

5455

5450

5445

5440

5435

5430

5425

5420

5415

5410

5405

5400

5395

5390

5385

5380

5375

5370

5365

5360

5355

5350

5345

5340

5335

5330

5325

5320

5315

5310

5305

5300

5295

5290

5285

5280

5275

5270

5265

5260

5255

5250

5245

5240

5235

5230

5225

5220

5215

5210

5205

5200

5195

5190

5185

5180

5175

5170

5165

5160

5155

5150

5145

5140

5135

5130

5125

5120

5115

5110

5105

5100

5095

5090

5085

5080

5075

5070

5065

5060

5055

5050

5045

5040

5035

5030

5025

5020

5015

5010

5005

5000

4995

4990

4985

4980

4975

4970

4965

4960

4955

4950

4945

4940

4935

4930

4925

4920

4915

4910

4905

4900

4895

4890

4885

4880

4875

4870

4865

4860

4855

4850

4845

4840

4835

4830

4825

4820

4815

4810

4805

4800

4795

4790

4785

4780

4775

4770

4765

4760

4755

4750

4745

4740

4735

4730

4725

4720

4715

4710

4705

4700

4695

4690

4685

4680

4675

4670

4665

4660

4655

4650

4645

4640

4635

4630

4625

4620

4615

4610

4605

4600

4595

4590

4585

4580

4575

4570

4565

4560

4555

4550

4545

4540

4535

4530

4525

4520

4515

4510

4505

4500

4495

4490

4485

4480

4475

4470

4465

4460

4455

4450

4445

4440

4435

4430

4425

4420

4415

4410

4405

4400

4395

4390

4385

4380

4375

4370

4365

4360

4355

4350

4345

4340

4335

4330

4325

4320

4315

4310

4305

4300

4295

4290

4285

4280

4275

4270

4265

4260

4255

4250

4245

4240

4235

4230

4225

4220

4215

4210

4205

4200

4195

4190

4185

4180

4175

4170

4165

4160

4155

4150

4145

4140

4135

4130

4125

4120

4115

4110

4105

4100

4095

4090

4085

4080

4075

4070

4065

4060

4055

4050

4045

4040

4035

4030

4025

4020

4015

4010

4005

4000

3995

3990

3985

3980

3975

3970

3965

3960

3955

3950

3945

3940

3935

3930

3925

3920

3915

3910

3905

3900

3895

3890

3885

3880

3875

3870

3865

3860

3855

3850

3845

3840

3835

3830

3825

3820

3815

3810

3805

3800

3795

3790

3785

3780

3775

3770

3765

3760

3755

3750

3745

3740

3735

3730

3725

3720

3715

3710

3705

3700

3695

3690

3685

3680

3675

3670

3665

3660

3655

3650

3645

3640

3635

3630

3625

3620

3615

3610

3605

3600

3595

3590

3585

3580

3575

3570

3565

3560

3555

3550

3545

3540

3535

3530

3525

3520

3515

3510

3505

3500

3495

3490

3485

3480

3475

3470

3465

3460

3455

3450

3445

3440

3435

3430

3425

3420

3415

3410

3405

3400

3395

3390

3385

3380

3375

3370

3365

3360

3355

3350

3345

3340

3335

3330

3325

3320

3315

3310

3305

3300

3295

3290

3285

3280

3275

3270

3265

3260

3255

3250

3245

3240

3235

3230

3225

3220

3215

3210

3205

3200

3195

3190

3185

3180

3175

3170

3165

3160

3155

3150

3145

3140

3135

3130

3125

3120

3115

3110

3105

3100

3095

3090

3085

3080

3075

3070

3065

3060

3055

3050

3045

3040

3035

3030

3025

3020

3015

3010

3005

3000

2995

2990

2985

2980

2975

2970

2965

2960

2955

2950

2945

2940

2935

2930

2925

2920

2915

2910

2905

2900

2895

2890

2885

2880

2875

2870

2865

2860

2855

2850

2845

2840

2835

2830

2825

2820

2815

2810

2805

2800

2795

2790

2785

2780

2775

2770

2765

2760

2755

2750

2745

2740

2735

2730

2725

2720

2715

2710

2705

2700

2695

2690

2685

2680

2675

2670

2665

2660

2655

2650

2645

2640

2635

2630

2625

2620

2615

2610

2605

2600

2595

2590

2585

2580

2575

2570

2565

2560

2555

2550

2545

2540

2535

2530

2525

2520

2515

2510

2505

2500

2495

2490

2485

2480

2475

2470

2465

2460

2455

2450

2445

2440

2435

2430

2425

2420

2415

2410

2405

2400

2395

2390

2385

2380

2375

2370

2365

2360

2355

2350

2345

2340

2335

2330

2325

2320

2315

2310

2305

2300

2295

2290

2285

2280

2275

2270

2265

2260

2255

2250

2245

2240

2235

2230

2225

2220

2215

2210

2205

2200

2195

2190

2185

2180

2175

2170

2165

2160

2155

2150

2145

2140

2135

2130

2125

2120

2115

2110

2105

2100

2095

2090

2085

2080

2075

2070

2065

2060

2055

2050

2045

2040

2035

2030

2025

2020

2015

2010

2005

2000

1995

1990

1985

1980

1975

1970

1965

1960

1955

1950

1945

1940

1935

1930

1925

1920

1915

1910

1905

1900

1895

1890

1885

1880

1875

1870

1865

1860

1855

1850

1845

1840

1835

1830

1825

1820

1815

1810

1805

1800

1795

1790

1785

1780

1775

1770

1765

1760

1755

1750

1745

1740

1735

1730

1725

1720

1715

1710

1705

1700

1695

1690

1685

1680

1675

1670

1665

1660

1655

1650

1645

1640

1635

1630

1625

1620

1615

1610

1605

1600

1595

1590

1585

1580

1575

1570

1565

1560

1555

1550

1545

1540

1535

1530

1525

1520

1515

1510

1505

1500

1495

1490

1485

1480

1475

1470

1465

1460

1455

1450

1445

1440

1435

1430

1425

1420

1415

1410

1405

1400

1395

1390

1385

1380

1375

1370

1365

1360

1355

1350

1345

1340

1335

1330

1325

1320

1315

1310

1305

1300

1295

1290

1285

1280

1275

1270

1265

1260

1255

1250

1245

1240

1235

1230

1225

1220

1215

1210

1205

1200

1195

1190

1185

1180

1175

1170

1165

1160

1155

1150

1145

1140

1135

1130

1125

1120

1115

1110

1105

1100

1095

1090

1085

1080

1075

1070

1065

1060

1055

1050

1045

1040

1035

1030

1025

1020

1015

1010

1005

1000

995

990

985

980

975

970

965

960

955

950

945

940

935

930

925

920

915

910

905

900

895

890

885

880

875

870

865

860

855

850

845

840

835

830

825

820

815

810

805

800

795

790

785

780

775

770

765

760

755

750

745

740

735

730

725

720

715

710

705

700

695

690

685

680

675

670

665

660

655

650

645

640

635

630

625

620

615

610

605

600

595

590

585

580

575

570

565

560

555

550

545

540

535

530

525

520

515

510

505

500

495

490

485

480

475

470

465

460

455

450

445

440

435

430

425

420

415

410

405

400

395

390

385

380

375

370

365

360

355

350

345

340

335

330

325

320

315

310

305

300

295

290

285

280

275

270

265

260

255

250

245

240

235

230

225

220

215

210

205

200

195

190

185

180

175

170

165

160

155

150

145

140

135

130

125

120

115

110

105

100

95

90

85

80

75

70

65

60

55

50

45

40

35

30

25

20

15

10

5

0

5 cm

Billiton Australia

ROSEBERY EAST J.V.
TASMANIA

MT BLACK EL 1/62

SOUTH STITT
GEOPHYSICAL COMPILATION

Surveyed N.H.	A.H.O.	1:5000	
Drawn A.S./S.L.P.	Date 8/86	Revised	Date
Checked	Date	Extended	Date
Sheet No. Fig No 35		Drawing No. LJ50/1037	

86-2622

960621

381 000mE
382 000mE
383 000mE
371 000mN
370 000mN
369 000mN
MEDIUM SCRUB
5 cm

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project	ROSEBERY EAST J.V. TASMANIA
Title	MT BLACK EL 1/62 SOUTH STITT ENHANCED MAGNETICS
Author / Dept.	AHO
Drawn / Date	7/86
Checked / Date	
Scale	1:5000
Revised / Date	
S'ceded / Date	
Sheet No.	Fig No 36
Drawing No.	LJ50/1032

960622

96-2622

381 000mE

382 000mE

383 000mE

371 000mN

370 000mN

369 000mN

MEDIUM SCRUB

5 cm

Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project	ROSEBERY EAST J.V. TASMANIA
Title	MT BLACK EL 1/62 SOUTH STITT RESISTIVITY

Author	Dept. AHO	Scale	1:5000
Drawn	Date 7/86	Revised	Date
Checked	Date	S'ceded	Date
Sheet No. Fig No 37		Drawing No.	LJ50/1031

960623 86-2622

HENTY FAULT ZONE

OWEN CONGLOMERATE

FARRELL SLATES

ALTERED TUFFS

MT BLACK VOLCANICS
(Feldspar-phyric)

MURCHISON VOLCANICS
(Quartz-phyric)

MURCHISON GRANITE

FARRELL MLs

Pb Ag

Pb Ag

Pb Ag

3 F
8.5m
0.37g/t Au

5 cm

5 378 000 N

MP 28
0.8m
1.2g/t Au

MT BLACK EL 1/62
(Shell - EZ JV)

MURCHISON MINE
Ore averaged
2.1g/t Au,
40% Pb,
1700g/t Ag

Pb Ag Au

MRP 233
4m 3.3g/t Au

ZONE

SHELL HOLE
RED 86-1
In progress

STP 234
0.6m 5.0g/t Au
2.5m 2.34g/tAu
1.55m 2.0g/t Au

MR 2
13.9m 0.31g/t Au

STP 221 2.1g/t Au

STP 217 1.2g/t Au

BODY OF SULPHIDE
480,000 t 5% As,
0.84g/t Au

FAULT

STP 283
0.85m 1.2g/t Au

STERLING VALLEY MINE ML

STERLING VALLEY EL 4/73
(Shell - EZ JV)

Pb Ag Au

STP 98
0.9m 3.1g/t Au
653g/t Ag

HENTY

SOUTH
STITT
AREA

385 000 E

5 370 000 N

0 1 2 3 4 Km

SCALE : 1:50 000

Drg.No.
LJ50/1054

6010

Fig No 38

960624

86-2622

384000mE

385000mE

DUTTON'S WORKINGS

MP 70

MP 71

MURCHISON

28N

12N

ON

8S

12S

28S

40S

48N

377000mN

376000mN

375000mN

DIGHEM RESISTIVITY LOW

MP 89 OP

62350

62400

62300

62380

HIGHWAY

H (very strong)

MRP 227

LAKE ROSEBERY

? diss magnetite in Mt Black volcanics adjacent to HFZ

75900N

75800N

75700N

75600N

MRP 233

MRP 212

py, sph & gal in HFZ (IP anomaly)

MR 2

MR 1

MRP 219

SCINTREX I.P. GRID

conductor = stockwork in Farrell slates

STP 218

STP 232 A1

STP 234

STP 221

STP 217

STP 284

STP 231

STP 220

py, po in Mt Black volcanics & Farrell slates adjacent to HFZ

SV1

960625

MAX – MIN CONDUCTOR

DIGHEM AEROMAG CONTOURS

MRP 219 DRILL HOLES

HENTY FAULT ZONE

I.P. ANOMALY (McPHAR, 1961)

5 cm

Billiton Australia

The Metals Division of the Shell Company of Australia Limited

Project: TASMANIA
ROSEBERY EAST J.V.

Title: MURCHISON AREA
GEOPHYSICAL MAP

Author N.H.	Date 9/86	Scale 1:10000	
Drawn H.M.R.	Office A.H.O.	Revised	Date 12/86
Drawing No. LJ50/1045			Fig. No. 39

86-2622

6011