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Authors : D.B. Hall
C.J. Creagh
N. Hungerford

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4. Billiton Aust., Melbourne
5. Billiton Aust., Devonport

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SUMMARY

Exploration for economic gold mineralization associated with the Henty Fault has continued in 1988.

Three diamond drill holes were completed in the Lakeside deposit, and one hole drilled to test the Fault zone south of the old Duttons workings.

A drill indicated resource of 750,000 tonnes @ 2.1g/t Au is present at Lakeside.

A grid based geological, geochemical and geophysical programme has been completed around the Murchison Mine. This has indicated a favourable target horizon for further mineralization.

A Max-Min EM survey along the Tullah Flats, covering the glacial obscured Farrell Sequence east of the Henty Fault has defined a single anomaly that requires drill testing. Ground exploration is still in progress, to better define targets prior to undertaking a drilling programme.

Drilling of geophysical anomalies, and at Lakeside, is proposed for 1989.

An application for renewal of 9km² will be made to the Department.

The remaining 12km², at South Stitt and Mackintosh, is to be relinquished.

CONCLUSIONS & RECOMMENDATIONS

Diamond drilling at Lakeside has confirmed the presence of gold-bearing vein style sulphide mineralization. Further drilling is required to prove up further tonnage, and test for higher grade portions.

Exploration at Tullah Flats and Murchison has indicated geological and geophysical targets that require drilling. The target in these areas are structurally emplaced base metal plus gold deposits similar to the Farrell and Murchison deposits. The Max-Min surveys completed have produced weak to moderate conductors that possibly indicate sulphides. Drilling is required to test these anomalies.

No further exploration has been done at South Stitt or in the Mackintosh area north of the Farrell mining leases. A detailed assessment of previous results indicates little potential for the presence of economic sulphide deposits.

It is recommended that the 9km² area around Lakeside, Murchison and the Arsenic Zone be retained. The remaining areas are recommended for relinquishment.

1.0 INTRODUCTION

EL 1/62 consists of 21km², in two parts, located north and south of Tullah (Fig. 1). The area is the subject of the Rosebery East Joint Venture between Billiton Australia, Norgold and Little River Resources. An area of 3km², south of Lake Rosebery was originally part of EL 4/73, and is the subject of the Sterling Valley Joint Venture between Billiton Australia and Norgold. Billiton Australia is the Manager/Operator of the Joint Ventures.

The tenement was due for expiry on 22nd January 1988, and the present area was renewed, at the discretion of the Department of Mines, for a further 1 year, to allow further testing of the Lakeside gold prospect, and exploration of other defined target areas on, or close to, the Henty Fault.

This report presents the exploration completed in the tenement during 1988, the results obtained, and proposals for exploration in 1989.

It is intended to apply for renewal of 9km² only, surrounding the Lakeside-Duttons-Murchison-Arsenic Zone prospects. The remaining areas, South Stitt and Mackintosh, will be relinquished.

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2.0 PREVIOUS EXPLORATION

Details of all exploration in the area prior to 1988 are given in Billiton Report No. 08.2498, Annual Report to the Mines Department on Work Completed 23/1/87 to 22/1/88.

This report, together with previous reports submitted by Billiton, presents a summary of the Regional Geology, the Henty Fault Zone, and associated mineralization.

Exploration by Billiton was successful in discovering a gold deposit at Lakeside. Previous drilling had intersected the sulphides, but the assaying techniques used at the time failed to detect the gold. Reassaying, using Fire Assay techniques, indicated significant gold values. Seven diamond drill holes were completed in 1987, confirming the mineralization.

Various geophysical techniques were utilized to gauge the response of the mineralization. It does in fact respond equally well to IP and EM methods.

Several geophysical techniques have been utilised by different generations of explorers. These are summarized in Figures 2 and 3.

3.0 WORK COMPLETED

3.1 LAKESIDE

Drilling: Three diamond drill holes were completed at this prospect (Fig. 4), for a total of 936.3m, as detailed below:

<u>Hole No</u>	<u>N(AMG)</u>	<u>E(AMG)</u>	<u>RL</u>	<u>AZ(AMG)</u>	<u>DIP</u>	<u>DEPTH</u>
RED 88-1	375551.1	384411.1	162.9	106°	60°	322m
RED 88-2	375249.5	384375.8	173.7	090°	50°	289.3m
RED 88-4	375352.1	384386	167.9	090°	65°	325m

RED 88-1 was designed to test down-dip from RED 87-7 at the northern limit of the mineralization.

RED 88-2 was designed to test for southerly plunging mineralization below RED 87-6.

RED 88-4 was designed to test an off-hole EM anomaly detected in a down-hole survey in RED 88-2.

All holes were collared with a casing-advancer through the glacials, which was cased with HQ casing. The weathered bedrock was drilled HQ, and the remainder of the hole drilled NQ.

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All holes were cased with slotted PVC piping to enable down-hole geophysics to be done.

All holes have been geologically logged and comprehensively sampled. (Appendix 1).

Geochemistry: Assaying was done on half-core samples of either 1m or 2m length, depending on the nature of the rock unit.

Details are as follows:

<u>No. of Samples</u>	<u>Element</u>	<u>Method</u>
188	Au	Fire Assay (50g)
188	Cu Zn Ag	AAS
188	Pb As Ba Sn W Sb	XRF

All assaying was carried out by Classic Comlabs, Adelaide. A total of 13 samples from drill core were submitted for petrological examination to Dr. A.S. Joyce of Geochempet Services (Appendix 2).

Five samples of mineralized drill core were examined by the CSIRO for their Pb Isotope Compositions (Appendix 3).

Resource Estimate: A preliminary drill indicated resource has been calculated.

Geophysics: A trial UTEM survey across the Lakeside mineralization was completed in December 1987, on lines 375100N, 375200N, 375300N. The objective was to test the response from the known mineralization, and to test for any deeper massive sulphides that may be present.

A down-hole SIROTEM survey was conducted on RED 88-2, to test the response from the intersected mineralization, and to test for any off-hole conductors.

A surface SIROTEM survey was conducted over 6 lines at 100m spacing, south of the Lakeside mineralization, designed to test for conductors along the Henty Fault. A large fixed loop was used as the transmitter source, and an RVR with a MkII receiver recorded standard and early channel times. The fixed loop was set up to the east of the survey area, because of the presence of the Murchison Highway and steep terrain to the west. The 22KV HEC power line crossing the loop is not grounded, and did not affect the survey. Reading interval on all six lines was 40m, except across the expected position of the Henty Fault where a 20m interval was used.

A suite of samples of drill core and outcrop material was despatched to Prof. D. Emerson, University of Sydney, for Petrophysical examination (Appendix 4). The study was designed to assist in the interpretation of IP, magnetic and EM surveys in areas of poor or zero outcrop, and to discriminate between sulphide and non-sulphide sources (eg graphite).

A single line Max-Min EM survey was done on line 375300N, to test the response from the known mineralization, and to compare it to IP and UTEM responses.

3.2 NORTH LAKESIDE - DUTTONS

Drilling: A single diamond drill hole, RED 88-3, was drilled as a spatial test of the Henty Fault Zone (Fig. 5). The hole was sited to the south of the old Duttons Workings at 377454N, 385098E, azimuth 110°AMG, Dip 60°, total depth 178.5m. Slotted PVC casing was put in the hole in case down hole geophysics was required.

Geochemistry: A total of 11 samples from RED 88-3 were submitted to Classic Comlabs for assaying for the same elements as at Lakeside.

Two samples were submitted to Geochempet Services for petrological description.

3.3 TULLAH FLATS

This area covers the glacially-covered part of the Farrell Sequence between the Henty Fault in the west, and the Murchison volcanoclastics to the east, between Lake Rosebery and Tullah. A previous grid was resurveyed prior to the geophysical survey. (Fig. 6).

Geophysics: A total of 18 lines were surveyed with a Scintrex G856 Proton Precession magnetometer, for a total of 8.52 line km. Data was computer plotted and reproduced as a contour plan.

Eleven lines were surveyed with Max-Min EM, for a total of 4.16 line km, coil spacing was 100m, and reading interval 20m. This survey did not give complete coverage, as no readings were taken across the Murchison Highway.

3.4 MURCHISON MINE AREA

A 500m wide grid was erected, at 100m spacing, north and south of the Murchison Mine, covering 2 km strike length of favourable stratigraphy. The grid was surveyed with tape and clinometer, and pegged at 25m intervals (Fig. 6).

Geological Mapping: A grid based mapping programme was completed, together with more detailed mapping of the Murchison Mine (at surface and underground). Aerial photography was used to outline broader geological units east of the grid.

Geochemistry: A 'C' horizon auger soil sampling survey was carried out within the Murchison Mine Line (Fig.36), area covering the lithological units associated with the known mineralization along strike to the north and south of the Murchison Mine. The survey also tested the weak EM anomalies along strike from the mine. No geochemistry was possible over the Tullah Flats area due to the thick glacial cover. A total of 217 samples were collected and analysed for Au Ag Cu Pb Zn Ba and As by Classic Comlabs Ltd. (Appendix 5).

Geophysics: A ground magnetometer survey was carried out on the grid, from 376200N to 378000N.

A 5 line dipole-dipole IP survey over the Murchison Mine, was carried out and reported on in 1987.

An eight-line Max Min EM survey was carried out from 376500N to 377200N, for a total of 3.4 line km. Coil spacing was 100m, and reading interval 25m. Steep and variable slopes over much of the eastern part of the grid in particular seriously affected the in-phase data, which has prevented quantitative estimates of depth and dip being calculated.

3.5 OTHER AREAS

No detailed surveys have been done at South Stitt or Mackintosh. All previous data has been reviewed in the light of results achieved at Lakeside etc. No further exploration was deemed to be warranted.

4. RESULTS ACHIEVED4.1 LAKESIDE4.1.1 Drilling

Three diamond drill holes have been completed at the Lakeside prospect. The drill programme was designed to test for strike and plunge extensions to the known gold bearing stratiform sulphide mineralization associated with the Henty Fault, as previously reported in BAUS report 08.2498. Locations of the three holes are shown in Fig. 4. A brief description of each hole follows, with more detailed logs and assay results contained in Appendix 1. The relative positions of the intersections to the Henty Fault are shown in the longitudinal projection (Figure 26).

<u>RED 88-1:</u>	Collar Co-ords.	384411E	375550N (Fig. 4)
	Azimuth	106°	AMG
	Dip	-60°	
	Depth	322m	

Drilled to test a possible northerly plunge to the known mineralization at the Lakeside prospect. The Henty Fault was intersected at 252.3m, with weak mineralization within black shales, sandstones and siltstones from 256-262m averaging 0.39g/t Au. Further mineralization from 289-294m contained 3 metres averaging 0.97% Sn.

A summary log is as follows:

0	-252.3m	Steep westerly dipping feldspar phyric andesites and basalts. Groundmass strongly altered to chlorite with silicification becoming more intense towards the Henty Fault. Minor disseminated pyrite throughout with minor arsenopyrite near the Henty Fault.
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- 252.3-254.5m Henty Fault Zone. Intense brittle deformation forming a cataclasite consisting of fragments of intermediate volcanics and black shales. Strong chloritic and silicic alteration. Minor disseminated pyrite, galena, chalcopyrite, arsenopyrite and sphalerite throughout.
- 254.5-262.2m Black shales, partly graphitic, interbedded with lesser fine grained siltstones and sandstones. Moderate to intense chloritic and silicic alteration. 5cm of massive pyrite-arsenopyrite-chalcopyrite at 258.8m. Best intersection (ppm) from 258 to 259.1m of 0.74 Au, 2200 Cu, 98 Zn, 190 Pb, 4 Ag, 2.8% As, 200 Sn.
- 262.2-294m Sandstones and siltstones with lesser interbedded black shales. Silicic and chloritic alteration prominent throughout. Narrow fissure fill veins and disseminated pyrite-arsenopyrite-pyrrhotite from 289-294m. Best intersection (ppm) from 290-291m of 0.34 Au, 1200 Cu, 320 Zn, 1620 Pb, 30 Ag, 1.33% As, 9400 Sn.
- 294 -313.5m Black shale. Minor disseminated sulphides.
- 313.5-322 m Sandstones and siltstones with lesser interbedded black shales.

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RED 88-2: Collar Co-ords. 384375E 375250N (Fig. 8)
 Azimuth 090° AMG
 Dip -50°
 Depth 289.3m

Designed to test a possible southerly plunge to the known mineralization at Lakeside. The Henty Fault Zone was intersected at 209.1m sulphide mineralization over 11m from 214-225m averaged 1.22 g/t Au.

A summary log is as follows:

- 0 - 33 m Fluvio-glacial sediments.
- 33 -209.1m Steep westerly dipping sequence of intermediate andesites, basalts and epiclastics. Groundmass largely replaced by chlorite. Strong silicification associated with zones of weak sulphide mineralization.

- 209.1-211.7m Henty Fault Zone. Multiply deformed, strongly altered intermediate volcanics, black shales and quartzose sandstones.
- 211.7-213.6m Black shale, partly graphitic, with lesser interbedded quartzose sandstones. Minor disseminated sulphides.
- 213.6-227.24m Mineralized Zone. Predominantly light grey quartzose sandstones with lesser interbedded black shales and siltstones. Strong silicic and chloritic alteration throughout. Semi-massive, massive and disseminated sulphides throughout. Average of 1.22g/t Au from 214-225m with a best intersection (ppm) from 223-224m of 4.9 Au, 910 Cu, 160 Zn, 190 Pb, 7 Ag, 3.7% As, 660 Sn.
- 227.24-289.3m Interbedded sandstones, siltstones and shales. Moderate silicic and chloritic alteration throughout. Minor disseminated sulphides.

EOH

A down hole EM survey was carried out on RED 88-2. Results from this survey indicate an off-hole narrow conductor below and to the north from RED 88-2.

RED 88-4: Collar Co-ords. 384385E 37535N (Fig. 9)
 Azimuth 090° AMG
 Dip -65°
 Depth 325m

Drilled to test a significant DHEM conductor below and to the north of RED 88-2. The Henty Fault Zone was intersected from 242.2-246m. Mineralization within the Farrell Sequence east of the fault averaged 1.3g/t Au from 268-273m.

A summary log is as follows:

- 0 - 32.5m Fluvio-glacial sediments.
- 32.5 -242.2m Steep westerly dipping sequence of predominantly feldspar phyric andesitic volcanoclastics with lesser fine grained lenses of basaltic volcanoclastics. The groundmass is strongly altered to chlorite with later strong to intense silicification becoming dominant from 104m to the Henty Fault.

- 242.2-246.4m Henty Fault Zone. Multiply deformed fragmented intermediate volcanoclastics, sandstones and black shales. Strong chloritic and silicic alteration. Minor carbonate alteration. Minor disseminated pyrite, arsenopyrite, sphalerite and chalcopyrite throughout.
- 246.4-276.18m Interbedded steep westerly dipping quartzose/volcanoclastic sandstones and siltstones with lesser interbedded black shales. Strong silicic and chloritic alteration. Mineralized zone from 254.77-276.18m. The mineralization is largely confined to the sandstone/siltstone units consisting predominantly of 5-10% disseminated and fissure filled pyrite-arsenopyrite>pyrrhotite>chalcopyrite. An average of 1.3g/t Au occurs from 268-273m with a best intersection (ppm) from 271-272m of 1.9 Au, 2600 Cu, 550 Zn, 6400 Pb, 84 Ag, 7.0% As and 2450 Sn.
- 276.18-325m Steep westerly dipping sandstones, siltstones and shales. Moderate to strong chloritic and silicic alteration. Minor carbonate alteration. Approximately 1% disseminated pyrite>pyrrhotite>sphalerite-galena throughout

EOH

As a result of the drill lifting, the drill target of RED 88-4 was not fully tested at the depth originally indicated by the DHEM on RED 88-2.

4.1.2 Petrology

Petrological samples were taken at selected intervals on all three drill holes. Sample locations are annotated in the drill logs in Appendix with descriptions in Appendix 2. Thin section 15703 is of particular interest, containing fissure veins rich in medium to coarse grained cassiterite and pyrite, suggestive of a granitoid source.

4.1.3 Isotope Studies

Sulphur isotope studies on the mineralization with the drill core from the Lakeside prospect, carried out by the Tasmanian Mines Department, indicate a possible magmatic source for the sulphur.

Pb isotope studies by CSIRO on the same mineralization suggest a Devonian thermal event being responsible for the mineralization at Lakeside. (Appendix 3).

It would appear from this work, and from the petrological studies, that the mineralization at Lakeside may be associated with the intrusion of a Devonian granitoid, which is thought to be located 1 to 1.5km beneath Lakeside.

4.1.4 Resource Estimate

To attempt to define a drill indicated resource an "envelope" estimate of tonnage and grade has been made. (Fig. 10).

The outer boundary of the envelope is placed either at mid-intersection at 50m or estimated base of glacials. All intercepts within the envelope are included in the estimate, with each "width x grade" calculated and accumulated. The cumulative "width x grade" was divided by cumulative "width" to give average grade; and the cumulative "width" divided by number of intercepts to give average "width".

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Hole No.	Width(m)	Grade(g/t)	g.metres
	(a)	(b)	(c=a x b)
RED 87-2	4	2.3	9.2
RED 87-3	4.65	5.9	27.4
RED 87-5	1.7	1.74	3.0
RED 87-6	8.9	1.59	14.2
RED 87-7	3.45	2.61	9.0
RED 88-2	11.0	1.22	13.4
RED 88-4	5.0	1.3	6.5
MRP 212	3.4	0.35	1.2
MRP 233	4.0	3.3	13.2

<u>Intercepts</u>	<u>Width</u>	<u>Au Grade</u>	<u>g.metres</u>
9	46.1	2.1 g/t	97.1

Au Width : 5.1m

Total Area : 43250m²

Total Volume: 220,000m³

Assume SG 3.4g/cc

Estimated indicated tonnage: 750,000t

Indicated Resource : 750,000t @ 2.1 g/t Au

4.1.5 Geophysics

The UTEM survey successfully delineated the known mineralization at Lakeside (Fig. 11), with better definition than the IP. However, there is no indication of a deeper source that could reflect more massive mineralization.

On line 375300N (Figs. 12,13,14) the anomaly occurs exactly where the sulphide mineralization is projected to subcrop beneath the glacial overburden. A glacial thickness of about 40 metres is indicated, compared with an interpreted depth of 50 metres from the UTEM response. Conductivity x thickness is interpreted to be about 1.3 siemens, which is rather low given the thickness of mineralization. The decay time-constant of 0.4 msec is rather short for a large amount of sulphide mineralization. Computer modelling indicates a depth extent of less than 200m.

Line 375200N (Figs. 15,16,17) extends further east than 375300N. The anomaly over the Lakeside mineralization is similar to that on line 375300N, with a similar interpreted depth. The conductivity x thickness product is lower, indicating less sulphide mineralization. At the eastern end of the line at 385000E, a strong anomaly is present. This is presumably reflecting a line of thin, vein style mineralization, hosted by graphitic shales, and intersected in previous diamond drilling (MR 1, MR 2, RED 86-1).

There is a markedly weaker response from the Lakeside mineralization on line 375100N (Figs. 18,19,20) indicating much less sulphide. The point-normalised Z component does not indicate any increase in source depth, and appears to preclude a southerly plunge to the mineralization. An important factor of the anomaly on this line is the significant weakening of response only 100m south of known significant mineralization. The strong conductor at 385000E is recorded on this line, and coincides with a strong 100m Max Min EM anomaly detected by Getty. Using Fraser filtered data, there is a deep conductor at 384820E, that does not show up on the raw data.

Down hole Sirotem Logging was carried out in drill holes RED 87-2, RED 87-6 and RED 88-2. A Sirotem MkII machine was used, using the transmitter loop shown in Figure 11. Data was digitally recorded, and plotted in-house on both log-linear, and linear-linear response form. Probe polarity was positive down within the loop.

In hole RED 87-2, the log-linear plot (Fig. 21) clearly indicates the anomaly due to mineralization. The semimassive sulphides between 216.3m and 218.3m produce the response, rather than the disseminated sulphides closer to the Henty Fault. The decay constant of 2.6 msec is larger than recorded on the surface and is more indicative of a larger sulphide body. It may also reflect the location of the intersection in the most strongly developed part of the mineralization.

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The shape of the anomaly is indicative of mineralization intersected at its edge, with the mineralization extending down dip beneath the hole. Due to the proximity of Lake Rosebery to the North, no surface UTEM can be done to confirm this premise.

The mineralization in hole RED 87-6 produced a considerably reduced response than in RED 87-2, with a decay similar to the surface UTEM response (Fig. 22). The anomaly profile is also less indicative of a down-dip extension to the mineralization. There appears to be a weak off-hole anomaly on the later channels at about 100m downhole, but it is uncertain in which direction the source is. The main anomaly is quite symmetric and could be caused by the mineralization to the north.

Drill hole RED 88-2 was logged using two loops, one north of the hole and one to south. The survey using the south loop did not produce a significant response (Fig. 23) indicating that no conductor is present south of the hole. The response from the survey using the northern loop (Fig. 24) indicates a significant conductor to the north of the hole, and probably deeper. The major conductor is at 240m depth, 20m below the mineralization in the hole; a weak off-hole conductor is present at 160m, within the andesitic volcanics east of the Henty Fault, and probably reflects minor, weak mineralization

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Modelling of the response using different source sizes and attitudes, produces a best fit (Fig. 25) from the observed response from a conductive body of 200m strike length, depth extent of 100m and width up to 10m. This implies a relatively small conductor of up to 200 000m³, lying north of the hole and extending down-dip.

TEM soundings were carried out in the centre of each of the DHEM transmitter loops, and indicate resistivities decreasing with depth. The soundings are probably reflecting the conductive lithologies east of the Henty Fault dipping westwards under the TEM loops.

The DHEM response was drill tested by drill hole RED 88-4.

The Sirotem survey south of Lakeside (Fig. 11) did not produce any significant response east of the Henty Fault. None of the profiles show a clear Lakeside-type response, although the position of the transmitter loop over the Farrell Sequence may have a detrimental effect. No clear drill targets were defined.

On all the lines, a strong response is present due to the conductive Farrell Sequence sediments east of the Henty Fault. The position of the Fault itself is not clear, indicating a somewhat gradual change in conductivity across the fault, indicating the possibility of weak sulphide mineralization west of the Fault.

For each line, profiles are presented for the standard-times (lin-lin plots), (Figs. 27-32). The Henty Fault is indicated on each profile as interpreted from the chargeability profiles and drillhole logs. Very weak TEM anomalies are indicated on the ST lin-lin profiles; these are Fraser-filtered anomalies, and all lie west of the Fault. None have any strong correlatable IP response, so they are probably due to a variation in conductivity in the volcanics, perhaps due to minor sulphides.

The petrophysical testwork on several samples of mineralized and unmineralized rock types from the area, was included in a broader test programme involving material from several other mineralized areas of the Mt. Read Volcanics (Appendix 4). It appears that the black shales within the Farrell Sequence are not graphitic and therefore should only be conductive if sulphides are present. This significantly upgrades various EM and IP anomalies detected in the Farrell Sequence in previous and present surveys.

The Max-Min survey on line 5375300N produced a positive response from the known mineralization (Figure 33). The anomaly is coincident with the UTEM and IP anomalies, with an interpreted depth of 40m to the top of the conductor, similar to the UTEM. Assuming a mineralized thickness of 3m (as intersected in RED 87-6), the conductivity is about 2 mhos, similar to that from the UTEM as a moderate to good conductor most massive sulphide orebodies are likely to have conduct-

-ivities an order of magnitude greater. Since the anomaly was not completely covered, there may be some errors in the quantitative interpretation.

There is a weak in-phase anomaly at the western end of the line, and the lack of a coincident out-of phase response suggests a coil-spacing problem due to gridding or terrain. Fig. 60 indicates the positions of the various anomalies in relation to the Henty Fault Zone.

4.2 NORTH LAKESIDE - DUTTONS

4.2.1 Drilling

Spatial testing along the Henty Fault for additional gold bearing sulphide mineralization was carried out north of the Lakeside prospect by drilling one diamond drill hole, RED 88-3. Due to thick glacial cover over the Henty Fault there was very little geological control upon the siting of the hole. Previous IP surveys had aided in the location of the Henty Fault combined with information gained from the work at the Lakeside prospect. (Fig. 5). A brief description of RED 88-3 follows, with a more detailed log in Appendix 1.

<u>RED 88-3:</u>	Collar Co-ords.	385098E	377454N (Fig. 34)
	Azimuth	110°	AMG
	Dip	-60°	
	Depth	178.5m	

027

- 0 - 36.3m Fluvio-glacial sediments.
- 36.3- 82.1m Steep westerly dipping sequence of intermediate andesites and basalts. Strong chloritic replacement of the groundmass. Silicification intense in parts. Minor disseminated pyrite throughout.
- 82.1- 91.3m Henty Fault Zone. Strongly silicified brecciated rock, original textures absent. Minor disseminated pyrite throughout.
- 91.3- 97.9m Black graphitic shale. Strong silicic and chloritic alteration. Minor disseminated pyrite.
- 97.9-178.5m Interbedded light grey quartzose sandstones, siltstones, black shales and minor epiclastics. Strong silicic alteration. Large quartz veins infill fissures from 128-131m. Weak disseminated sulphide mineralization from 152-155m. Best intersection (ppm) from 153-154m of <0.01Au, 320 Cu, 770 Zn, 3.05% Pb, 80 Ag, 190 As, <4 Sn.

EOH

The results from the drilling were dissappointing and no further work is envisaged in this area.

4.3.1 Mineralization

The Murchison Mine Line contains several small old workings, South Murchison, Murchison, Murchison Extended and Central Farrell. The Murchison Mine is the largest of the workings with recorded production of 300 tons @ 40% Pb, 53 oz/t Ag, 2.1g/t Au.

The mineralization occurs as a series of fissure fill en echelon lensoidal bodies occupying tension sigmoids within a narrow dacitic epiclastic host. The mineralization has a southerly plunge of 50-60°. The sigmoidal structures have been recognised by the author in the hanging wall shales and sandstones (Fig. 35), and would appear to have developed as a result of normal movement on thrust planes, which had been developed at an earlier time by reverse thrusting. The more brittle nature of the dacitic host rock probably aided in the formation of large fissures, compared to the softer shales and sandstones in the hanging wall and footwall where mineralization is largely absent. The steep southerly plunge of the mineralization suggests a possible additional horizontal thrust component.

The results of Pb isotope studies carried out on ore from the Murchison Mine strongly suggests a Devonian thermal event for the formation (Appendix 3).

4.3.2 Local Geology

The Tullah Flats region is completely obscured by glacial cover inhibiting any chance of detailed mapping within this area. It is known from drilling (RED 88-3), that the sequence immediately east of the Henty Fault consists of a steep westerly dipping sequence of interbedded black shales, siltstones, sandstones and quartz-feldspar phyric epiclastics of the Farrell Sequence. This sequence extends into the Murchison Mine Line where detailed mapping has been successful in differentiating several distinct lithologies across strike, and along strike to the north.

Outcrop within the Murchison Mine Line grid is poor with the majority of the mapping being interpreted from float samples. The topography is steep, situated on the western flank of Mt. Farrell and covered in thick vegetation. Good exposures are available along the Murchison Dam Road and within the adits of the several abandoned workings within the grid.

The sequence is strongly cleaved, with a distinct north northwest lineation, dipping west between 60 and 70°, parallel to the dip on the Henty Fault to the west. Striations on the cleavage planes indicate a west-blockup

movement. Bedding within the Farrell Sequence has a similar strike to the cleavage in the southern part of the grid, but with a shallower dip of 55-65°. The bedding swings around to strike north - northeast in the northern half of the area. No definitive structures were observed within the Farrell Sequence which could be used to determine facing. Within the Murchison Mine Line the Farrell Sequence lies upon the Murchison Volcanics to the east, the nature of the contact unknown.

The geology within the grid moving up sequence from east to west consists of: (Fig.36).

Murchison Volcanics a) A sequence of intensely sericitized, mildly chloritic, fine grained, ?rhyolitic, probably pumiceous tuffaceous rocks of unknown thickness. (Appendix 2 Sample 15713). b) Strongly sericitized, fine grained, quartz-feldspar phyric epiclastic of ?rhyolitic composition. The phenocrysts are predominantly feldspars with an average grain size of less than 1mm. Phenocryst content is less than 5%. Thickness is variable, ranging up to approximately 130.

Farrell Sequence c) Rhyodacitic volcanoclastic containing two distinct quartz phenocryst sizes (<2mm and <4mm), also contains feldspar phenocrysts and rhyodacitic rock fragments. Partly chloritic and sericitic. This sequence becomes thicker to the north, suggesting a possible palaeo-basin to

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the north. d) Finely laminated strongly sericitized ash tuffs and crystal rich dacitic tuffs. Individual lenses 1-6cm in width. The entire sequence is up to 65m thick.

e) Fine to medium grained dacitic epiclastic, containing abundant clasts chloritised dacite and phenocrysts of quartz (<2mm). The thickness of this unit is variable, up to 45m thick in parts. (Appendix 2 Sample 15712). f) Interbedded, finely laminated in parts, graphitic black shales and sandstones. The sequence forms the footwall lithology to the Murchison Mine ore body and has a variable thickness, steadily increasing to the north of up to approximately 50m.

g) Medium to coarse grained mildly chloritic dacitic epiclastic. This formation is the host horizon for the Murchison Mine ore body and contains abundant clasts of dacitic ?welded tuff and associated coarse phenocrysts of quartz and feldspar (5mm). The thickness of this unit varies along strike, up to a maximum of approximately 80m (Appendix 2, sample 15711). h) Interbedded sequence extending west to the Henty Fault of black shales, siltstones, sandstones and quartz-feldspar phyric epiclastics. The sandstones are known to contain lithic clasts of carbonaceous shales, rhyolitic volcanics, quartzites and granites. (Appendix 2, Sample 15714).

Alteration within the Murchison Mine Line consists of a strong regional development of sericite, particularly within the rocks derived from felsic volcanics, (Units a, b, c, d, e and g), with lesser regional development of chlorite. Strong silicification and disseminated pyrite alteration with lesser carbonate alteration accompanies the Murchison Mine ore bodies within the host rock (Unit g). This alteration halo is limited to a few metres which makes the detection of similar alteration within the rest of the area difficult due to the poor outcrop. There are small patches of strongly developed silicification and disseminated pyrite within the exposure along the Murchison Mine Road at approximately 385850E. These small alteration zones are accompanied by strong potassic alteration and may be associated with the intrusion of the nearby Cambrian Murchison Granite.

The contact between the host horizon (Unit g) and the footwall rocks (Unit f) is accompanied by the development of weak to moderate disseminated pyrite. This feature is evident along strike to the north of the Murchison Mine. Shallow workings accompany good exposures of this contact.

4.3.3 GEOPHYSICS

Ground Magnetics: Ground magnetic surveys were carried out separately over the Tullah Flats and Murchison Mine Line areas (Figs. 37,38). The Tullah Flats survey produced a line of relatively weak anomalies which strike north - northeast from RED 86-1 (Fig.39). This signature may be attributed to minor pyrrhotites observed in RED 86-1, which may be primary since the anomalies are conformable to the known strike of the Farrell Sequence. The magnetics clearly depict an east-west fault at line 376200N, which was also apparent during mapping on the Murchison Mine grid. Two magnetic trends are apparent on the Murchison Mine Line survey (Fig. 40). Both are believed to be from a shallow source. The eastern, north-northeast trending anomaly can be attributed to a magnetite bearing rhyodacitic volcanoclastic, with the magnetic trend following strike. There is no readily available explanation for the western anomaly, however, examination of the core from EZ drillholes MP28 and 29 may indicate the source. There is no direct magnetic signature to the mineralization at the mine, suggesting that the pyrrhotite remaining in the footwall of the mine is of limited size.

Max-Min EM: A Max-Min EM survey was carried out by BAUS personnel over the Tullah Flats and Murchison Mine Line areas. The results from the Tullah Flats area (Figs. 41-51) show a series of moderate EM anomalies trending north from DDH RED 86-1. These anomalies essentially coincide with Dighem EM anomalies. The source for these anomalies lies under approximately 40m of glacial sediments. The EM anomaly has a moderate conductivity, similar to that of the Lakeside anomaly, and that intersected by RED 86-1, both of which have failed to produce significant mineralization. The line of EM anomalies has a strike extent of over 1km and appears to diverge, to the north, from the westernmost trend of magnetic anomalies indicating either a disconformity within the Farrell Sequence or cross-cutting sulphide veins. The cause of the EM anomalies is most probably sulphide mineralization with possible contributions by host black shales and associated disseminated and stringer pyrite and pyrrhotite as observed in RED 86-1. As the Murchison Mine mineralization cross-cuts the regional foliation by 15-20°, it is quite feasible to suggest a cross-cutting vein system to the west.

An irregular array of weak EM anomalies is also present (Fig. 39). These weak anomalies may be caused by narrow lenses of black conductive shales with disseminated sulphides beneath the glacial cover.

Due to the steep and variable slopes over the Murchison Mine Line area only the out-of-phase component has been interpreted. Without the in-phase component quantitative estimates of depth and dip of a conductor cannot be made. A line of weak EM anomalies (Fig.40, and 52-59) trend north from the Murchison Mine with a weak anomaly corresponding to the mineralization at the mine or to the black shales within the footwall. The response indicates a deep or poorly conductive source. The line of anomalies roughly coincides with the contact between the host horizon and footwall black shales delineated during mapping. The presence of weakly disseminated pyrite along this contact may contribute to the EM response.

4.3.4 GEOCHEMISTRY

The results of the 'C' horizon auger sampling survey were very dissappointing (Appendix 5). Distinctly anomalous values occur on lines 376000N and 376700N, where the results are probably attributed to rubble and stream sediments derived from the Murchison Mine. The higher base metal values associated with the shales and sandstones of Unit (h) would appear to be a regional feature and not associated with possible mineralization. The weak EM anomaly on line 377000N is coincident with poorly outcropping Unit (e) with minor disseminated pyrite and silicification, associated with

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weakly anomalous Au Pb Zn As and Ba. The lack of anomalous Ag throughout the survey area indicates that there are no obvious targets within the area, as the known occurrences of mineralization are rich in Ag.

4.3.5 TARGETS

The combined Dighem EM and Max-Min EM anomalies along the western boundary of the Tullah Flats area presents a possible target for drilling, with the collar being located west of the Murchison Highway (Fig.39). Drilling could test a possible extension to the mineralization intersected in RED 86-1 viz: 0.85m @ 31% Pb, 3% Zn, 670g/t Ag.

Drilling of the Max-Min anomalies north of Murchison Mine is recommended to test for the source of the anomalies.

APPENDIX 1

DRILL LOG SHEETS RED 88-1, RED 88-2, RED 88-3, RED 88-4.

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SILMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The BHP Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

HEADING SHEET

DATA TYPE	COLLAR CO-ORDINATES			COLLAR SURVEY		HOLE NAME	TOTAL DEPTH	HOLE TYPE	DESC CODE	REMARKS
	EASTING	NORTHING	ELEVATION	AZIMUTH	DIP					
0 HOLE	394911.1	1325551.1	162.9	106	60	RED 88-1	322			

SURVEY INFORMATION	DISTANCE FROM COLLAR		AZIMUTH	DIP	REMARKS
	TO TOP	TO BOTTOM			
0	51.00		106	60	AZIMUTH IN ANG (MAG N12)
	103.00		105	59	
	201.00		104	57.5	
	250.00		104	57	
	300.00		107	56	

PLOTTING KEY					
SYMBOL	INTERVAL		SYMBOL	INTERVAL	
	DES. COM	G/LOG		DES. COM	G/LOG
	FROM	TO		FROM	TO

PROJECT	ROSEBERRY EAST J.V.	HOLE NAME	RED 88-1		
LOGGED BY	C. J. CREAGH	TOTAL DEPTH	322m		
CONTRACTOR	DIAMOND DRILLING-TAL	RIG	LONGYEAR 33		
CREW	K. HOW J. DUNSTAN	DATE STARTED	21/04/88		
		FINISHED	21/04/88		
NO OF TRAYS		CORE STORAGE			
58		DEVONPORT			
M&P LAB		ASSAY LAB CLASSIC COM LABS			
		DEVONPORT			
		CLASSIC COM LABS			
DESC.	SIZE	FROM	TO	TOTAL	REMARKS
NON CORE	HW	0	3	3	0m HQ CARINE AS
CORE	HQ	3	63.8	60.9	COLLAR AND CARINE
	NO	63.8	322	258.2	MFG TURNER CARINE
	SO				OUTER MFG
CASING	HR	0	6	6	
CASING LEFT					(S) steel (P) plastic

ABBAY INFORMATION	DISTANCE FROM COLLAR		AZIMUTH	DIP	REMARKS	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
	TO TOP	TO BOTTOM										

DRILLING OBJECTIVES / SUMMARY TEST NORTHERLY PLUNGE OF MINERALISATION WEST OF THE HANTY FAULT.
STEEP WESTERLY DIPPING ANOCHITOR/BREASTS TO HANTY FAULT AT 352.3m. WEAK MINERALISATION IN BLACK SHALES, SANDSTONES and SILTSTONES FROM 258-282m AND 289-298m.

REPORT REFERENCE:

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SMLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	ROSEBERRY EAST	HOLE NAME	RED 88-1
LOGGED BY	C. CREAGH	TOTAL DEPTH	322m

DISTANCE FROM COLLAR	TO TOP		TO BOTTOM		SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
	1	2	3	4							
	1	2	3	4							<p>0-3.0m No Core</p> <p>HQ CORE</p> <p>3.0-25.8m FELDSPAR PORPHYRITIC ANDESITIC LAVAS</p> <p>Massive dark grey/green intermediate porphyritic lava. Feldspar phenocrysts subhedral to mostly anhedral, 2-4mm in size. Groundmass aphanitic, intensely chloritised. Patchy light green zones below 21.9m due to increased silicification. Minor calcareate and pyrite development in groundmass.</p> <p>Alteration chlorite >> silicification > calcareate > pyrite</p> <p>Hydrothermal alteration masks lower Greenschist facies metamorphism.</p> <p>Jointing between 50° and 57° LCA, limonite & flow developed on joint planes.</p> <p>2cm qtz vein at 8.7m</p> <p>1cm qtz vein at 10.5m at 50° LCA</p> <p>1cm qtz vein at 24.9m & 26.3m</p>
											<p>25.8 - 28.5m BASALT LAVA</p> <p>Fine grained dark green basalt. Feldspar phenocrysts ~1mm in size. Irregularly oriented siderite-qtz veins from 25.8 - 26.3m. Below 26.3m predominantly light pine green colour with randomly located relict feldspar phenocrysts, completely replaced by chlorite.</p> <p>Upper basalt contact sharp at 31° LCA lower contact also 36° LCA.</p> <p>Jointing irregularly oriented, limonite staining common on joint planes.</p>
											<p>28.5 - 63.8m FELDSPAR PORPHYRITIC ANDESITIC LAVAS</p> <p>Massive green intermediate porphyritic lava. Feldspar phenocrysts subhedral to anhedral, 2-4mm in size. Alteration varies in intensity from pale green moderate chloritisation to dark green strong chloritic alteration of the groundmass down hole. More intense chlorite alt especially associated with qtz-calcareate veining. Feldspar pink colour below 58.5m due to Fe enrichment.</p> <p>Puggy zone 3cm wide at 41.7m indicating possible fault plane, infilled by qtz.</p> <p>Jointing at 55° LCA with limonite staining common on joint planes.</p> <p>Minor qtz and qtz calcareate veins, < 5mm, occur sporadically throughout.</p> <p>1cm qtz vein at 31.6m, 37.9m, 41.7m, 57.9m and 58.2m</p> <p>Kinky qtz veins in fill brown zone from 44.7m - 45.0m and 45.35 - 45.44</p> <p>2cm qtz-chlorite vein at 49.65m</p> <p>1.5cm qtz vein at 58.9m</p> <p>1cm qtz-calc veins at 62.25m and 61.85m</p>

ASSAY INFORMATION

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SINMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	ROSEBERY EAST	HOLE NAME	RED 88-1
LOGGED BY	C. CREAGH	TOTAL DEPTH	322m

DISTANCE FROM COLLAR	TO TOP		TO BOTTOM		SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
	1	2	3	4							
											strong chl. alteration with 1-2% disseminated pyrite closely associated. Disseminated pyrite, <1%, associated with pink feldspar from 63-63.8m
											NG CORE
											<p>63.8 - 92.1m <u>FELDSPAR PORPHYRITIC ANDESITIC LAVA</u> Massive mottled dark/light green feldspar porphyritic intermediate lava. Mottled colour due to varying degrees of hydrothermal alteration. Intense silicification occurs from 76.95-76.55m and 81-81.2m resulting in a pinky grey aphanitic texture. Ck to rsh feldspar fluctuate in intensity down-hole.</p> <p>1-3% disseminated pyrite accompanies increased chlorite carbonate alt in distinct zones from 74.16-76.4m, 85.7-85.9m and 86.2-86.5m. Otherwise minor, <1% disseminated pyrite throughout.</p> <p>Alteration chlorite-silica-carbonate > pyrite</p> <p>Foliation between 37° LCA and 47° LCA</p> <p>2cm qtz veins at 64.9m, 79.9m and 78.8m</p> <p>3cm qtz vein at 87.85m and 83.15m</p> <p>2cm qtz vein at 89.74m</p> <p>30cm qtz vein with minor chlorite infilling breccia zone at 90.7m</p> <p>Minor, elong, irregularly oriented qtz veins throughout.</p> <p>PETROLOGICAL SAMPLE 15701 FROM 65.1m</p> <p>92.1-109.95m <u>BASALT</u></p> <p>Fine grained massive dark green basalt. Feldspar phenocrysts, ~1mm, occur in a strongly chloritized aphanitic groundmass. Calcite clasts, ~5mm, probably representing relict feldspar occur sporadically throughout. Medium grained feldspar porphyritic andesitic volcaniclastic occurs between 95.8-98.1m</p> <p>Upper contact at 92.1m is 56° LCA</p> <p>Intense chlorite/pyrite alteration from 99-99.5m associated with narrow, ~5mm qtz carbonate veins. Pyrite is disseminated and on cleavage planes in amounts up to 10% in parts</p> <p>2cm qtz vein at 95.35m</p> <p>3cm qtz-Ksp carbonate veins at 105.85m, 105.9m, 106.5m and 106.75m. Narrow qtz-chlorite-Ksp veins occur at 101.15m</p> <p>Foliation 45° LCA</p> <p>55cm qtz-calcite vein from 109.9-109.95m</p> <p>PETROLOGICAL SAMPLE 15702 FROM 93m</p>

ASSAY INFORMATION

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SILMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION
DRILL LOG SHEET
CONTINUATION SHEET

PROJECT ROSEBERRY EAST
LOGGED BY C. CRAIG

HOLE NAME REQ 89-1
TOTAL DEPTH 322m

DISTANCE FROM COLLAR	TO TOP		TO BOTTOM		SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
	m	ft	m	ft							
											<p><u>109.95 - 132.66m FINE TO MEDIUM GRAINED ANDRESITES</u></p> <p>Massive dark green intermediate porphyritic lava containing feldspar phenocrysts from 2-9mm in size. Fining down hole to a fine grained andesite feldspar <1mm in size from 119.95 to 119.8m then gradationally coarsening to a medium grained andesite at 125.8m.</p> <p>Strong silicification occurs in zones between 127.15 and 125.9m with ~10% disseminated pyrite bordering silicified zones. Silicification imparts cherty, pale grey texture and colour to the rock.</p> <p>20cm qtz-calcite vein from 110.65-110.85m</p> <p>40cm qtz-calcite vein infill breccia zone from 112.4-112.9m</p> <p>Minor disseminated pyrite occurs throughout</p>
											<p><u>132.66 - 195.15m BASALT</u></p> <p>Fine grained massive dark green basalt predominantly aphanitic with occasional feldspar phenocrysts <1mm.</p> <p>Gradational contact with ^{intermediate volcanic} feldspar porphyritic intermediate volcanic from 132.86-135.26m. Alternating bands of fine grained basalt with lesser medium grained basalt with gradational contacts from 136.26-144.85m.</p> <p>Intense silicification associated with increased chlorite-pyrite alteration occurs in zones at 138.5m, 139.7-139.9m, 140.1-140.2m, 142.55-142.8m.</p> <p>Chalcedonic quartz occurs in some veins</p> <p>1-2% disseminated pyrite associated with silicified zones. <1% disseminated pyrite elsewhere</p> <p>Foliation 80° LCA</p> <p>Breccia zones infilled by qtz from 136.9-136.9m and 142.35-142.45m</p>
											<p><u>195.15 - 189.9m ANDRESITE</u></p> <p>Large medium grained massive feldspar porphyritic intermediate volcanic with some zones of fine grained feldspar porphyritic intermediate volcanic. Contacts are gradational.</p> <p>Alteration predominantly chlorite > siliceous carbonate > pyrite</p> <p>Irregularly oriented qtz veins, also, occur sporadically throughout</p> <p>Breccia zones infilled by qtz from 152.9-158.3m, 175.25-175.35m and 178.25-178.35m.</p> <p>Zone of intense silicification from 168.25-169.7m accompanied by <5% disseminated pyrite - aphanitic</p>

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SMLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

PROJECT	ROSEBERY EAST	HOLE NAME	REO 88-1
LOGGED BY	C. CREGG	TOTAL DEPTH	322m

CONTINUATION SHEET

DISTANCE FROM COLLAR	TO TOP		TO BOTTOM		Au	Cu	Zn	Pb	Ag	As	Sn	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
	TO TOP	TO BOTTOM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM							
	255.00	256.00	0.21	50	92	64	1	230	98	153110								interbedded with minor fine grained light to dark grey siltstones and sandstones.
	256.00	257.00	0.36	1680	96	1170	3	2300	310	153111								Multiaxially deformed, irregularly oriented qtz veins, 5mm, brown. Moderate to intense silicification and chloritisation accompanied by disseminated pyrite throughout, largely forming on fracture planes.
	257.00	258.00	0.17	96	62	56	<1	430	92	153112								10cm - 25% pyrite - arsenopyrite - chalcocite at 256.7m
	258.00	259.10	0.74	2200	98	1190	4	2700	200	153113								5cm of 5% arsenopyrite - pyrite - pyrrhotite at 258.1m
	259.10	259.60	0.11	92	105	66	<1	2000	130	153114								5cm of massive pyrite - arsenopyrite - chalcocite at 258.8m - zone of aspx - chalcocite - aspx.
	259.60	261.80	0.43	180	58	68	1	990	125	153115								Foliation of 46° LCA
	261.80	262.10	0.54	570	62	195	2	1690	370	153116								25cm of 5% pyrite - arsenopyrite - chalcocite from 258.8m mainly as stringers on cleavage planes
																		2cm of 80% arsenopyrite - pyrite at 261.9m
	262.20	263.00	0.16	210	38	160	1	1660	300	153117								<u>262.2 - 299m SANDSTONES AND SILTSTONES</u>
	263.00	264.00	0.03	14	60	70	<1	145	44	153118								<u>WITH LESSER INTERBEDDED BLACK SHALE</u>
	264.00	265.00	0.02	26	260	160	1	125	18	153119								Fine grained light grey to dark grey interbedded quartzose siltstones and sandstones. Sandstones contain clasts of mudstone, <2mm, aligned parallel to foliation at ~43° LCA. Black shales partly graphitic, from lower units. Bedding 38° LCA
	265.00	266.00	0.01	13	350	200	<1	46	16	153120								Silicic - chloritic alteration prominent throughout. Disseminated pyrite, <1%, throughout.
	266.00	267.00	0.09	34	54	42	<1	92	54	153121								Strongly cleaved throughout with black shales susceptible to multiple deformations.
	267.00	268.00	0.03	17	44	10	<1	42	22	153122								1cm of 5% pyrite - pyrrhotite at 262.3m
	268.00	269.00	0.24	76	180	84	<1	2350	200	153123								1-2% disseminated pyrite from 261.9 - 266.8m
	269.00	270.00	0.07	24	175	52	<1	78	66	153124								<5% disseminated pyrite - arsenopyrite from 268.5 - 269.2m
	270.00	271.00	0.05	28	185	76	<1	830	98	153125								<1% disseminated pyrite - arsenopyrite from 269.6 - 270.3m
	271.00	272.00	<0.01	15	145	44	<1	48	12	153126								10cm of 10% pyrrhotite from 278.7m
	272.00	273.00	<0.01	13	92	72	1	135	22	153127								1% disseminated pyrite - arsenopyrite - pyrrhotite mainly on cleavage planes from 278.8 - 280.2m
	273.00	274.00	<0.01	7	96	36	<1	48	10	153128								2cm vein of 10% pyrite at 284.2m in qtz gangue
	274.00	275.00	0.01	22	66	62	<1	48	40	153129								5-10% disseminated pyrite - pyrrhotite mainly on cleavage planes from 289.2 - 289.36m
	275.00	276.00	<0.01	11	250	70	<1	26	18	153130								2cm of 50% pyrite - arsenopyrite at 289.9m, 290.1m and 290.3m.
	276.00	277.00	<0.01	28	110	76	<1	17	6	153131								1% pyrite - pyrrhotite disseminated mainly on cleavage planes from 290.4 - 292.1m
	277.00	278.00	<0.01	10	54	34	<1	9	4	153132								2-5% veins of pyrite - arsenopyrite - pyrrhotite in qtz gangue from 291.1 - 292.4m and 292.5 - 292.8m
	278.00	279.00	0.02	98	135	220	1	420	320	153133								10cm of 30% pyrite - arsenopyrite at 292.4m
	279.00	280.00	0.02	340	210	185	5	920	390	153134								Minor carbonate alteration throughout.
	280.00	281.00	0.02	38	42	64	1	380	22	153135								Quartz veins, <5mm, throughout, parallel to cleavage, unmineralized.
	281.00	282.00	<0.01	30	54	28	<1	52	12	153136								
	282.00	283.00	<0.01	36	80	96	<1	96	18	153137								
	283.00	284.00	<0.01	52	64	14	<1	50	44	153138								
	284.00	285.00	<0.01	115	92	50	3	110	36	153139								
	285.00	286.00	0.18	72	155	92	1	100	44	153140								
	286.00	287.00	0.13	96	105	76	1	180	185	153141								
	287.00	288.00	<0.01	60	110	110	<1	140	300	153142								
	288.00	289.00	<0.01	120	340	260	4	160	105	153143								
	289.00	290.00	0.02	400	1600	1560	15	3450	620	153144								
	290.00	291.00	0.34	1200	320	1620	30	1330	940	153145								
	291.00	292.00	<0.01	220	140	120	3	400	1060	153146								
	292.00	293.00	0.06	530	180	320	11	2100	1078	153147								
	293.00	294.00	0.02	950	115	125	4	450	190	153148								

043

PETROLOGICAL SAMPLE 15703 FROM 291.9m

701045

SHELL MET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION
DRILL LOG SHEET

PROJECT ROSEBERRY EAST HOLE NAME R80 88-1
LOGGED BY C. CREAGH TOTAL DEPTH 322m

DRILL LOG SHEET

CONTINUATION SHEET

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	Au	Cu	Zn	Pb	Ag	As	Sn	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
294.00	295.00	0.12	96	54	410	<1	230	890	15344						
295.00	296.00	0.18	68	56	230	<1	1920	480	15350						
296.00	297.00	0.03	92	42	145	<1	110	220	15351						
297.00	298.00	0.02	240	740	115	1	610	130	15352						
298.00	299.00	0.02	180	1160	125	1	340	170	15353						
299.00	300.00	0.04	98	2500	540	1	110	22	15354						
300.00	301.00	0.03	115	5700	3300	6	76	54	15355						
301.00	302.00	<0.01	54	2250	1380	3	24	30	15356						
302.00	303.00	0.01	56	2250	430	2	16	12	15357						
303.00	304.00	0.02	70	3700	310	2	26	10	15358						
304.00	305.00	0.01	86	1440	290	1	9	12	15359						
305.00	306.00	<0.01	66	2150	580	2	13	12	15360						
306.00	307.00	<0.01	105	8100	1960	6	140	22	15361						
307.00	308.00	<0.01	68	220	110	1	7	9	15362						
308.00	309.00	0.02	84	1340	190	3	110	16	15363						
309.00	310.00	0.02	64	740	200	1	2	10	15364						
310.00	311.00	0.01	92	2500	350	1	5	10	15365						
311.00	312.00	0.02	70	820	140	1	12	6	15366						
312.00	313.00	0.05	68	640	135	<1	113	6	15367						
313.00	314.00	0.01	42	230	74	<1	32	12	15368						
314.00	315.00	<0.01	24	120	28	<1	46	8	15369						
315.00	316.00	0.01	24	125	44	<1	42	6	15370						
316.00	317.00	<0.01	20	62	36	<1	52	10	15371						
317.00	318.00	0.03	20	94	56	<1	52	4	15372						
318.00	319.00	0.02	32	330	74	<1	52	4	15373						
319.00	320.00	<0.01	26	94	110	<1	46	<4	15374						
320.00	321.00	0.02	22	145	155	<1	52	6	15375						
321.00	322.00	0.03	15	110	66	<1	54	4	15376						

294 - 313.5m BLACK SHALE
Black shales, strongly cleaved at 60° SCA
Pervasive silica-carbonate-chlorite-pyrite alteration
at 1% disseminated pyrite throughout - predominantly
located on cleavage planes
5mm vein of galena and sphalerite at 304m
3cm sphalerite in calcite gangue at 306.7m

313.5 - 322m SANDSTONES AND SILTSTONES
WITH LASSA INTERBEDDED SHALES
Gray, fine grained quartzose sandstones and
siltstones interbedded with lassa units of
black shale.
Bedding parallel to cleavage at 50° SCA
Irregularly oriented qtz veins, 2cm, common throughout
at 1% disseminated pyrite throughout.

E. O. H. 322m

ASSAY INFORMATION

044

701047

SILMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

All samples also analysed for Ba, Sb and W.

* Average of 2 analyses

** Average of 3 analyses

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT ROSEBERY EAST

HOLE NAME RED 88-2

LOGGED BY C. CREAGH

TOTAL DEPTH 289.3m

DISTANCE FROM COLLAR	TO TOP		TO BOTTOM		Au	Cu	Zn	Pb	Ag	As	Sn	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
	TO TOP	TO BOTTOM	TO TOP	TO BOTTOM														
																		0 - 33m No CORE Fluvio-glacial sediments - tri-cone drilling, no recovery.
																		33.0 - 75.9m FRAGMENTAL AMPHIBOLITE MUDROCK 'LAVAS' Matrix dark grey/green porphyritic intermediate ? bas. Fe-type phenocrysts 2-9mm in size, subhedral to mostly anhedral, randomly accreted. Groundmass aphanitic and strongly chloritised. Fine ground mass. Basaltic lenses occur from 42.5-49, 42.9-49.3m and 51.0-51.05m. Alteration is predominantly chloritic with lesser associated siliceous and carbonate alteration. Silicification more intense from 52-53.3m, 55.9-66.2m and 75.7-75.85m. Minor qtz-carbonate veining occurs throughout, mainly oriented parallel to foliation between 46-56° SCA. 15cm of 7-8% pyrite at 75.2m PETROLOGICAL SAMPLE 15705 FROM 75.55m PETROLOGICAL SAMPLE 15704 FROM 76m 75.9-93.6m BASALT 'LAVAS' Basal greenish dark green basalt 'lava' largely strongly chloritised aphanitic groundmass with occasional visible feldspar phenocrysts, slow in size, and chloritised fragments, a few in size. Core badly broken in parts. Foliation, largely, chloritic with minor apatite developed (some greenish-brown spines), overprinted by siliceous/basaltic chloritic alteration associated with mineralisation. Strong silica-chlorite alteration developed around fractures parallel to foliation 80° SCA. No core from 84.5-84.7m Fluorite disseminated pyrite throughout 2cm of 15% pyrite-sphalerite-chalcopyrite at 75.9m in qtz/calc gangue 15cm of 90% pyrite-galena-chalcopyrite-sphalerite at 78.0m 1cm of 20% pyrite-sphalerite at 76.25m 10cm of 5% pyrite-sphalerite at 76.75m 1cm of 50% pyrite at 78.2m 5cm of 90% pyrite at 78.75m 2cm of 50% pyrite at 84.3m in qtz/chlorite gangue 3cm of 40% pyrite at 84.8m 3cm of 2.5% pyrite-chalcopyrite-sphalerite-galena at 85.1m 6cm of brominated bent (1.5m) at 82.3m containing 90-95% disseminated pyrite-chalcopyrite-galena + sphalerite 1.5cm of 50% pyrite-chalcopyrite-galena-sphalerite at 87.5m
75.00	76.00	0.00	0.27	7.2	640	180	<1	2.8	52	155246								
76.00	77.00	40.01	8.80	27.0	43	<1	2.70	115	155247									
77.00	78.00	40.01	1.2	175	36	<1	2.8	10	155248									
83.00	84.00	40.01	2.4	185	82	<1	4.00	125	155249									
84.00	85.00	40.01	7.00	185	116	<1	11.00	340	155250									
85.00	86.00	40.01	1.05	135	60	<1	7.0	510	155251									
86.00	87.00	40.01	7.80	350	111.5	<1	2.75	500	155252									
87.00	88.00	40.01	3.3	125	37	<1	7.0	250	155253									
88.00	89.00	40.01	2.4	800	145	<1	12.60	200	155254									
89.00	90.00	40.01	1.7	5700	680	<1	4.0	52	155255									
90.00	91.00	40.01	11.0	2300	370	<1	2.70	175	155256									
91.00	92.00	40.01	4	1270	210	<1	5.8	180	155257									
92.00	93.00	40.01	1.4	780	810	<1	3.0	640	155258									

ANALYSIS INFORMATION

046

701048

047

SHLNET SYSTEM METRIC DECIMAL POINTS AS REQUIRED										The Shell Company of Australia Limited METALS DIVISION DRILL LOG SHEET CONTINUATION SHEET										PROJECT <i>ROSEMARY EST</i>		HOLE NAME <i>RED 88-2</i>	
										LOGGED BY <i>C CREAM</i>		TOTAL DEPTH <i>289.3m</i>											
DISTANCE FROM COLLAR										SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG							
TO TOP					TO BOTTOM																		
																<p>4m of 10-15% pyrite-chalcopyrite-galena & sphalerite of 87.75m</p> <p>+5% disseminated pyrite & sphalerite & chalcopyrite on fracture planes from 87.0-92.2m. Foliation 40° LCA.</p>							
																<p>93.6 - 106.3m ANDRESITE</p> <p>Massive porphyritic intermediate volcanic feldspar phenocrysts 2-3mm in size, euhedral, randomly distributed. Groundmass aphanitic, dk. green, strongly chloritic. Silicification increases down hole, accompanied by lesser chloritization, resulting in a relict feldspars replaced by chlorite in a fine green silicified groundmass. Foliation strong at 50° LCA.</p> <p>Quartz-chlorite veins irregularly oriented earlier silicification. Upper contact irregular.</p>							
																<p>106.3 - 122.05m EPICLASTIC</p> <p>Epiclastic containing fragments of chloritic shale up to 2cm across in a matrix derived largely from feldspar porphyritic intermediate volcanic. From 116.0m consists largely of interbedded lenses of possible basaltic derivation containing large clasts of coarser andesitic material. Intense brecciation accompanied by silicification from 114.3-115.4m, 116-116.3m, 116.9-117.1m, 117.4-117.5m, and 119.3-119.1m.</p> <p>Very minor disseminated pyrite throughout. Irregularly oriented qtz veins, also, common throughout.</p>							
																<p>PETROLOGICAL SAMPLE 15706 FROM 106.5m</p> <p>122.05 - 125.7m FINE TO MEDIUM GRAINED ANDRESITE</p> <p>Andesite ground feldspar porphyritic intermediate volcanic, gradually becoming finer grained down hole.</p> <p>Foliation 54° LCA</p> <p>Intense silicification from 122.75 to 123.95m</p> <p>Irregularly oriented qtz veins, also, common throughout.</p>							
																<p>135.7 - 170.4m ANDRESITE</p> <p>Massive porphyritic intermediate volcanic. Feldspar phenocrysts 2-4mm in size, euhedral to subhedral, randomly distributed. Dark green aphanitic groundmass resulting from lower greenschist facies regional metamorphism largely overprinted by silicification.</p>							

ASSAY INFORMATION

701049

048

SILMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONFIRMATION SHEET

PROJECT ROSEBARY EAST

HOLE NAME RED 88-2

LOGGED BY C. CREGAN

TOTAL DEPTH 289.3m

DISTANCE FROM COLLAR	TO TOP	TO BOTTOM	Au	Cu	Zn	Pb	Ag	As	Sn	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG	
																	1
132.00	132.00	132.00	0.02	7	110	50	<1	48	14	15515						and lesser carbonatation - chloritization associated with the formation of occasional zones of brecciation. Brecciation occurs intermittently from 138 - 169m, largely infilled by quartz with lesser carbonate. From 127.9 - 138.2m and 149.1 - 151.0m K. Feldspar alteration accompanies silicification. Qtz >>> carbonate mine occur up to 20cm wide, irregularly oriented throughout, mostly S.E. sum.	
133.00	135.00	135.00	0.19	70	72	110	<1	60%	88	15516					30cm of 1% disseminated pyrite arsenopyrite at 128.9m		
134.00	135.00	135.00	0.04	54	74	72	<1	770	98	15517					20cm of 25% pyrite-arsenopyrite at 138.9m		
135.00	136.00	136.00	<0.01	22	125	64		185	34	15518					30cm of 5% arsenopyrite-pyrite at 131.25m		
155.50	160.00	160.00	0.01	46	72	113	<1	230	42	15519					1.5cm of 25% pyrite at 139.3m		
160.00	161.00	161.00	0.11	220	60	100	2	3700	42	15520					2cm of 2% pyrite at 139.8m		
161.00	162.00	162.00	0.15	72	60	92	2	2750	24	15521					2cm of 2% pyrite at 135.9m		
162.00	163.00	163.00	<0.01	26	100	38	<1	360	12	15522					20cm of 90% pyrite at 160.5m		
															2cm of 80% pyrite at 160.9m		
															5cm of 50% pyrite at 161.05m		
															25cm of 7.5% pyrite at 161.4m		
															Minor disseminated pyrite throughout remainder. Chalcocite and enargite quartz developed at 169.2 and 162m.		
																170.4 - 176.37m BASALT	
																Fine grained massive dark green basalt. Silicification strong in parts resulting in a pine green colour. Alteration predominantly chloritic > silicic > carbonate > pyrite. Minor disseminated pyrite throughout.	
																176.37 - 209.1m ANDSITZ	
																Massive dark green porphyritic intermediate volcanic feldspar phenocrysts 2-9mm in size, euhedral to largely anhedral. Groundmass aphanitic - strongly chloritized. Gradually becomes fine grained towards 209.1m. Silicification increases downhole from 192m. Alteration is chloritic - silicic > carbonate > pyrite. Silicification accompanies breccia zones and fractures. Irregularly oriented qtz veins common. Disseminated pyrite throughout. 1cm of 90% galena - sphalerite-chalcopyrite at 185.83m. 1cm of 90% chalcopyrite - sphalerite + galena at 185.93m. <1% galena in qtz-carbonate min at 187.1m.	

ASSAY INFORMATION

1171 314 410 516 622 728 834 940 1046 1152 1258 1364 1470 1576 1682 1788 1894 1900 2006 2112 2218 2324 2430 2536 2642 2748 2854 2960 3066 3172 3278 3384 3490 3596 3702 3808 3914 4020 4126 4232 4338 4444 4550 4656 4762 4868 4974 5080 5186 5292 5398 5504 5610 5716 5822 5928 6034 6140 6246 6352 6458 6564 6670 6776 6882 6988 7094 7200 7306 7412 7518 7624 7730 7836 7942 8048 8154 8260 8366 8472 8578 8684 8790 8896 8902 9008 9114 9220 9326 9432 9538 9644 9750 9856 9962 10068 10174 10280 10386 10492 10598 10704 10810 10916 11022 11128 11234 11340 11446 11552 11658 11764 11870 11976 12082 12188 12294 12400 12506 12612 12718 12824 12930 13036 13142 13248 13354 13460 13566 13672 13778 13884 13990 14096 14202 14308 14414 14520 14626 14732 14838 14944 15050 15156 15262 15368 15474 15580 15686 15792 15898 16004 16110 16216 16322 16428 16534 16640 16746 16852 16958 17064 17170 17276 17382 17488 17594 17700 17806 17912 18018 18124 18230 18336 18442 18548 18654 18760 18866 18972 19078 19184 19290 19396 19502 19608 19714 19820 19926 20032 20138 20244 20350 20456 20562 20668 20774 20880 20986 21092 21198 21304 21410 21516 21622 21728 21834 21940 22046 22152 22258 22364 22470 22576 22682 22788 22894 23000 23106 23212 23318 23424 23530 23636 23742 23848 23954 24060 24166 24272 24378 24484 24590 24696 24802 24908 25014 25120 25226 25332 25438 25544 25650 25756 25862 25968 26074 26180 26286 26392 26498 26604 26710 26816 26922 27028 27134 27240 27346 27452 27558 27664 27770 27876 27982 28088 28194 28300 28406 28512 28618 28724 28830 28936 29042 29148 29254 29360 29466 29572 29678 29784 29890 29996 30102 30208 30314 30420 30526 30632 30738 30844 30950 31056 31162 31268 31374 31480 31586 31692 31798 31904 32010 32116 32222 32328 32434 32540 32646 32752 32858 32964 33070 33176 33282 33388 33494 33600 33706 33812 33918 34024 34130 34236 34342 34448 34554 34660 34766 34872 34978 35084 35190 35296 35402 35508 35614 35720 35826 35932 36038 36144 36250 36356 36462 36568 36674 36780 36886 36992 37098 37204 37310 37416 37522 37628 37734 37840 37946 38052 38158 38264 38370 38476 38582 38688 38794 38900 39006 39112 39218 39324 39430 39536 39642 39748 39854 39960 40066 40172 40278 40384 40490 40596 40702 40808 40914 41020 41126 41232 41338 41444 41550 41656 41762 41868 41974 42080 42186 42292 42398 42504 42610 42716 42822 42928 43034 43140 43246 43352 43458 43564 43670 43776 43882 43988 44094 44200 44306 44412 44518 44624 44730 44836 44942 45048 45154 45260 45366 45472 45578 45684 45790 45896 46002 46108 46214 46320 46426 46532 46638 46744 46850 46956 47062 47168 47274 47380 47486 47592 47698 47804 47910 48016 48122 48228 48334 48440 48546 48652 48758 48864 48970 49076 49182 49288 49394 49500 49606 49712 49818 49924 50030 50136 50242 50348 50454 50560 50666 50772 50878 50984 51090 51196 51302 51408 51514 51620 51726 51832 51938 52044 52150 52256 52362 52468 52574 52680 52786 52892 52998 53104 53210 53316 53422 53528 53634 53740 53846 53952 54058 54164 54270 54376 54482 54588 54694 54800 54906 55012 55118 55224 55330 55436 55542 55648 55754 55860 55966 56072 56178 56284 56390 56496 56602 56708 56814 56920 57026 57132 57238 57344 57450 57556 57662 57768 57874 57980 58086 58192 58298 58404 58510 58616 58722 58828 58934 59040 59146 59252 59358 59464 59570 59676 59782 59888 59994 60100 60206 60312 60418 60524 60630 60736 60842 60948 61054 61160 61266 61372 61478 61584 61690 61796 61902 62008 62114 62220 62326 62432 62538 62644 62750 62856 62962 63068 63174 63280 63386 63492 63598 63704 63810 63916 64022 64128 64234 64340 64446 64552 64658 64764 64870 64976 65082 65188 65294 65400 65506 65612 65718 65824 65930 66036 66142 66248 66354 66460 66566 66672 66778 66884 66990 67096 67202 67308 67414 67520 67626 67732 67838 67944 68050 68156 68262 68368 68474 68580 68686 68792 68898 69004 69110 69216 69322 69428 69534 69640 69746 69852 69958 70064 70170 70276 70382 70488 70594 70700 70806 70912 71018 71124 71230 71336 71442 71548 71654 71760 71866 71972 72078 72184 72290 72396 72502 72608 72714 72820 72926 73032 73138 73244 73350 73456 73562 73668 73774 73880 73986 74092 74198 74304 74410 74516 74622 74728 74834 74940 75046 75152 75258 75364 75470 75576 75682 75788 75894 76000 76106 76212 76318 76424 76530 76636 76742 76848 76954 77060 77166 77272 77378 77484 77590 77696 77802 77908 78014 78120 78226 78332 78438 78544 78650 78756 78862 78968 79074 79180 79286 79392 79498 79604 79710 79816 79922 80028 80134 80240 80346 80452 80558 80664 80770 80876 80982 81088 81194 81300 81406 81512 81618 81724 81830 81936 82042 82148 82254 82360 82466 82572 82678 82784 82890 82996 83102 83208 83314 83420 83526 83632 83738 83844 83950 84056 84162 84268 84374 84480 84586 84692 84798 84904 85010 85116 85222 85328 85434 85540 85646 85752 85858 85964 86070 86176 86282 86388 86494 86600 86706 86812 86918 87024 87130 87236 87342 87448 87554 87660 87766 87872 87978 88084 88190 88296 88402 88508 88614 88720 88826 88932 89038 89144 89250 89356 89462 89568 89674 89780 89886 89992 90098 90204 90310 90416 90522 90628 90734 90840 90946 91052 91158 91264 91370 91476 91582 91688 91794 91900 92006 92112 92218 92324 92430 92536 92642 92748 92854 92960 93066 93172 93278 93384 93490 93596 93702 93808 93914 94020 94126 94232 94338 94444 94550 94656 94762 94868 94974 95080 95186 95292 95398 95504 95610 95716 95822 95928 96034 96140 96246 96352 96458 96564 96670 96776 96882 96988 97094 97200 97306 97412 97518 97624 97730 97836 97942 98048 98154 98260 98366 98472 98578 98684 98790 98896 99002 99108 99214 99320 99426 99532 99638 99744 99850 99956 100062 100168 100274 100380 100486 100592 100698 100804 100910 101016 101122 101228 101334 101440 101546 101652 101758 101864 101970 102076 102182 102288 102394 102500 102606 102712 102818 102924 103030 103136 103242 103348 103454 103560 103666 103772 103878 103984 104090 104196 104302 104408 104514 104620 104726 104832 104938 105044 105150 105256 105362 105468 105574 105680 105786 105892 106000 106106 106212 106318 106424 106530 106636 106742 106848 106954 107060 107166 107272 107378 107484 107590 107696 107802 107908 108014 108120 108226 108332 108438 108544 108650 108756 108862 108968 109074 109180 109286 109392 109498 109604 109710 109816 109922 110028 110134 110240 110346 110452 110558 110664 110770 110876 110982 111088 111194 111300 111406 111512 111618 111724 111830 111936 112042 112148 112254 112360 112466 112572 112678 112784 112890 112996 113102 113208 113314 113420 113526 113632 113738 113844 113950 114056 114162 114268 114374 114480 114586 114692 114798 114904 115010 115116 115222 115328 115434 115540 115646 115752 115858 115964 116070 116176 116282 116388 116494 116600 116706 116812 116918 117024 117130 117236 117342 117448 117554 117660 117766 117872 117978 118084 118190 118296 118402 118508 118614 118720 118826 118932 119038 119144 119250 119356 119462 119568 119674 119780 119886 119992 120098 120204 120310 120416 120522 120628 120734 120840 120946 121052 121158 121264 121370 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701050

SILMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

PROJECT	ROSEBERY EAST	HOLE NAME	RED 88-2
LOGGED BY	C. CREAUGH	TOTAL DEPTH	289.3m

CONTINUATION SHEET

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	Au	Cu	Zn	Pb	Ag	As	Sn	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
209.00	210.00	0.03	17	650	290	41	9	28	15272						209.1 - 211.7m <u>HEAVY FAULT ZONE</u> Medium grained porphyritic intermediate volcanics to 210.0m. From 210.0m finely interbedded black shales and light grey quartzite sandstone. Contact diffuse due to strongly developed silicic-chloritic alteration. Multiply deformed with predominant foliation at 50° LCA. Cataclastic features developed at 210.6, 210.9 and 211.7m. 1-2% disseminated pyrite developed mainly on fracture surfaces.
210.00	211.00	0.60	2300	160	350	6	2.10%	3850	15273						
211.00	212.00	0.35	155	700	1750	9	1.03%	60	15274						211.7 - 213.6m <u>BLACK SHALE</u> Black shale, partly graphitic, interbedded with minor light grey quartzite sandstone. Strong foliation developed at 60° LCA. Silicic-chloritic alteration developed throughout. 2cm of 10% pyrite - pyrrhotite at 213.05m. 1-2% disseminated pyrite & pyrrhotite on fracture planes from 213.1 - 213.6m.
212.00	213.00	0.35	250	110	150	2	1.20%	650	15275						
213.00	214.00	0.72	650	100	100	6	5.00%	38	15276						
214.00	215.00	1.40	590	40	300	22	76.00	1200	15277						214.0 - 227.29m <u>MINERALISED ZONE</u> 213.6 - 216.8m <u>INTERBEDDED SANDSTONE AND SHALE</u> Light grey fine grained quartzite sandstone with lesser interbedded black shale. Bedding planes irregular due to intense deformation. Foliation 60° LCA. Strong silicic-chloritic alteration. 8cm of 80% pyrite-arsenopyrite in quartz-chlorite gangue at 214.0m oriented at 80° LCA. 2cm of 5% pyrite at 214.7m. 3cm of 60% pyrite at 215.4m. 20cm of 15% pyrite - pyrrhotite at 215.7m. 12cm of 17.5% pyrite - pyrrhotite at 216.0m. 7cm of 20% pyrite - arsenopyrite at 216.4m. 4cm of 15% pyrite at 216.57m. 1-2% disseminated pyrite on fracture planes throughout remainder. 216.8 - 219.38m <u>SANDSTONE</u> Light grey quartzite sandstone containing minor interbedded lenses of siltstone and shale. Strong silicic-chloritic alteration throughout. Foliation at 63° LCA. 45cm of 50% arsenopyrite - pyrite - pyrrhotite at 216.8m.
215.00	216.00	0.60	1120	56	430	6	16.60	1650	15278						
216.00	217.00	0.45	5600	240	1000	16	3.80%	4050	15279						
217.00	218.00	1.80	8200	140	820	24	6.25%	8200	15280						
218.00	219.00	0.08	950	650	710	7	2.25%	1860	15281						
219.00	220.00	1.76	3600	5600	6600	30	4.31%	2200	15282						
220.00	221.00	0.02	150	125	76	41	3.20	100	15283						
221.00	222.00	0.42	300	140	310	41	13.60	1420	15284						
222.00	223.00	0.09	64	70	99	41	5.20	440	15285						
223.00	224.00	1.90	710	160	197	7	3.70%	660	15286						
224.00	225.00	1.76	940	105	130	4	1.50%	185	15287						
225.00	226.00	0.12	46	72	26	41	65.0	34	15288						
226.00	227.00	0.10	96	78	44	1	1.20%	96	15289						
227.00	228.00	0.80	56	72	32	41	4.60%	110	15290						

ANALYSIS INFORMATION

049

701051

050

SPLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION
DRILL LOG SHEET
CONTINUATION SHEET

PROJECT ROSEBERY EAST HOLE NAME REO 88-2
LOGGED BY C. CREAUGH TOTAL DEPTH 289.3

DISTANCE FROM COLLAR		Au	Cu	Zn	Pb	Ag	As	Sn	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG	
TO TOP	TO BOTTOM															
																7cm of 60% pyrite-arsenopyrite at 217.55m 11cm of 85% pyrite-arsenopyrite at 219.2m 3% disseminated pyrite-arsenopyrite from 217.25 to 219.2m
																<u>219.38-224.9m INTERBEDDED SANDSTONE AND SHALE</u> Fine grained light gray quartzose sandstone interbedded with gray to black shales. Strong silicic-chloritic alteration associated with mineralization. Foliation 53°ACA. Mineralization in fill. Fractures parallel to foliation. 5cm of 15% pyrite at 219.5m 20cm of 7.5% pyrite at 221.4m 1cm of arsenopyrite-pyrite at 223.1 and 223.6m 15cm massive pyrite-arsenopyrite at 223.9m Cataclasis formed at 223.9m, possible fault. ~1% disseminated pyrite throughout remainder
																<u>METACLASTIC SAND 1507 FROM 223.9m</u> <u>224.4-250.6m SANDSTONE</u> Light gray fine grained quartzose sandstone containing siliceous lenses and ribs of black shale. Angling from 60-75°ACA. Soft sedimentary structures abundant from 244.3-250.6m Moderate chloritic-silicic-carbonate alteration. Qtz-carbonate mix, clay, irregularly orientated throughout, some parallel to foliation at 50°ACA. ~1% disseminated pyrite throughout 9cm of 80% pyrite at 226.6m in qb gangue 10cm of 7.5% pyrite at 224.6m 1cm of 95% pyrite-arsenopyrite-pyrrhotite at 224.9m 9cm of 35% pyrite-arsenopyrite at 227.15m 2cm of 10% pyrite at 229.3m 5cm of 5% pyrrhotite in qb-chlorite gangue at 229.8m 1cm at 229.7m of pyrite-pyrrhotite. ~1% disseminated pyrrhotite at 232m 2.5cm of 5% pyrite-pyrrhotite disseminated within matrix at 238.7m 1cm of 20% pyrite-pyrrhotite at 238.2 and 238.9m 35cm of 2% disseminated pyrite-pyrrhotite in qb gangue at 239.8m 2cm of 50% pyrite at 243.15m in quartz gangue 1cm of 85% pyrite-pyrrhotite at 244m 5cm of galena-sphalerite at 245.6m 1cm of 15% pyrite at 250.2m
228.00	218.00	0.01	3.6	7.3	2.4	<1	1.0	9.0	1539.4							
231.00	210.00	0.01	3.6	5.2	2.6	<1	1.7	10.5	1539.7							
232.00	222.00	<0.01	7.2	20.8	1.05	<1	1.1	7.8	1539.8							
233.00	235.00	<0.01	1.7	2.7	1.15	<1	7.2	1.8	1539.9							
234.00	235.00	0.03	3.8	17.1	2.9	<1	1.2	3.6	1540.0							
236.00	238.00	0.17	3.9	1.45	0.4	2	9.9	1.0	1540.1							
238.00	240.00	0.32	4.2	2.9	1.25	<1	5.0	2.4	1540.2							
240.00	242.00	<0.01	4.2	4.9	1.55	<1	6.4	1.6	1540.3							
242.00	244.00	0.04	8.0	7.7	2.8	<1	7.5	1.8	1540.4							
244.00	246.00	<0.01	1.7	7.2	2.8	<1	7.3	1.4	1540.5							
246.00	248.00	<0.01	2.4	9.1	3.9	<1	9.8	1.4	1540.6							
248.00	250.00	<0.01	9	2.8	1.6	<1	1.7	1.6	1540.7							
250.00	251.00	0.01	2.0	5.3	1.85	<1	7.0	1.8	1540.8							

ASSAY INFORMATION

701053

SMLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION
DRILL LOG SHEET
CONTINUATION SHEET

PROJECT *ROSEBERRY EAST* HOLE NAME *RED 88-2*
LOGGED BY *C. CARRAGH* TOTAL DEPTH *289.3m*

DISTANCE FROM COLLAR		SAMPLE NO	CORE ANGLE	ROCK TYPE	DIMS	DESC COOR	GRAPHIC LOG	DESCRIPTIVE LOG
TO TOP	TO BOTTOM							
								<p>indicates west dipping - west facing. Lithology: Minor gte - chlorite veins developed in fractures. Minor disseminated pyrite throughout. 5mm of pyrite - sphalerite at 252.3 and 284.7m 1cm of 50% pyrite at 283.8m</p>
								E. O. H. 289.3m

ASBAY INFORMATION

052

701054

Sample Number : 15704
 Identification : Andesitic volcanolithic arenite with heavy propylitic alteration and moderate foliation

Description :

The sample is a drill core specimen displaying coarsely grained textures of volcanolithic arenites, including densely packed, light grey feldspar and orthoclase crystals, grey and light grey lithic clasts set in a quartzitic matrix.

A staining test revealed weak foliation.

In thin section the sample displays heavy alteration and moderate shear foliation, but primary textures involving moderately sorted, densely packed mineral and lithic clasts, which are mainly about 0.5 to 2mm. There is a matrix matrix of foliated chlorite.

The mineral clasts are mainly prismatic plagioclase with moderate alteration to sericite, subhedral epidote and some calcite. There are also some leucocrone pseudomorphs of opaque oxides and some chlorite-leucocrone pseudomorphs of mafic alteration. Lithic clasts are commonly inconspicuous, being deformed aggregates of mainly fine albite and chlorite. They carry phenocrysts analogous to the mineral clasts. A few clasts are less deformed and recognisably andesitic.

Fine pyrite is confined to a finely lithic lithic clast.

A deformed fissure vein, about 0.5mm wide carries albite, calcite and chlorite.

An approximate mode is :

55-60%	plagioclase clasts, moderately altered to sericite-epidote-calcite
10-15%	altered and deformed andesitic lithic clasts chloritized and leucocrone mafic silicate clasts
2-3%	
0.5-1%	leucocrone oxide clasts
5-7%	chloritic matrix
1%	pyrite, confined to a lithic clast
0.5-0.7%	fissure vein of albite-calcite-chlorite

Comments and Interpretations :

This sample is essentially similar to Sample 15701 : it is a little coarser, more feldspathic, carries less epidote and lacks K-feldspar. In essence it is interpreted to be an epilitic sediment derived from andesitic detritus. It has since experienced heavy alteration to a propylitic mineral assemblage and moderate shear foliation.

Pyrite is confined to a lithic clast.

Veining by albite-calcite-chlorite preceded deformation.

Sample Number : 15705

Identification : Chloritic, andesitic volcanolithic arenite with mildly deformed veins of albite-calcite-chlorite-quartz

Description :

The sample is a drill core specimen of greenish grey, chloritic, andesitic rock with poorly sorted, sandy volcanoclastic textures. There are several hard, light grey fissure veins, ranging up to about 5mm wide.

A staining test revealed no K-feldspar.

In thin section the sample displays poorly sorted, densely packed subrounded and subangular clasts of chloritized porphyritic andesite and a few mineral clasts set in a mildly foliated minor matrix of chlorite and leucocrone. Clasts range in size from about 0.2 to 2mm.

The lithic clasts show minor variations in texture, but commonly involve fresh to slightly sericitized and carbonated phenocrysts of plagioclase ranging from fine to at least very fine and a few chloritized mafic phenocrysts set in a groundmass of variously randomly aligned plagioclase laths with interstitial chlorite and leucocrone. A few are sparsely ophthaloidal in albite, calcite and chlorite.

Mineral clasts are plagioclase and a few chloritized and leucocrone mafic silicates and oxides.

Numerous fissure veins, ranging up to 5mm wide, are dominated by subhedral, well-sorted fine albite and calcite (0.25 to 0.5mm), but carry minor chlorite and quartz. The veins have been deformed by the foliation which pervades the rock. Sparse lithic clasts have been replaced by similarly fine albite and minor calcite and chlorite.

An approximate mode is :

70-80%	clasts of chloritized andesite
0.5-1%	albitized lithic clasts
5-10%	plagioclase clasts
1%	chloritized and leucocrone mafic mineral clasts
4-6%	matrix chlorite and leucocrone
10-12%	veins of albite-calcite-chlorite-quartz

Comments and Interpretations :

This rock is considered to have originated as a volcanolithic arenite, composed of poorly sorted clasts of andesite and derived phenocrysts. Mafic minerals have been converted to chlorite and leucocrone, but plagioclase shows little obvious alteration.

Numerous thin and thick fissure veins carry mainly albite and calcite, but with some chlorite and quartz. A few lithic clasts have been replaced by similar minerals. Mild shear foliation post-dates the veining.

Sample Number : 15706

Identification : Andesitic volcanolithic arenite with heavy propylitic alteration and moderate foliation

Description :

The sample is a drill core specimen displaying coarsely grained textures of volcanolithic arenites, including densely packed clasts of mainly light grey orthoclase, altered feldspar set in a quartzitic matrix.

A staining test revealed weak foliation.

In thin section the sample displays heavy alteration and moderate shear foliation, but primary textures involving moderately sorted, densely packed mineral and lithic clasts, which are mainly about 0.5 to 2mm. There is a foliated matrix of chlorite.

There are many subhedral plagioclase, all moderately sericitized and lightly carbonated. Small clasts of mafic silicates are non-chlorite leucocrone aggregates, and former opaque oxides are non-leucocrone. A few altered lithic clasts of porphyritic andesitic style are plainly recognizable, but many others are less obvious, being stretched, finely albitic and chloritic aggregates. Very fine pyrite occurs in one altered plagioclase clast and in a lithic clast.

There are a few thin, deformed fissure veins (about 0.5mm wide) of albite with calcite. A few clasts have been selectively replaced by fine clear albite.

An approximate mode is :

50-55%	plagioclase clasts, moderately sericitized and lightly carbonated
15-40%	altered and deformed andesitic lithic clasts
2-3%	chlorite-leucocrone pseudomorphs of mafic silicate clasts
1-2%	leucocrone oxide clasts
5-10%	chloritic matrix
1%	pyrite
0.5-0.7%	albite-calcite fissure veins

Comments and Interpretations :

This rock is considered to have originated as volcanolithic arenite, essentially similar to samples 15701 and 15704, but with clast sizes transitional between the two. There has been heavy alteration of propylitic style, but with sericite dominating the alteration of the plagioclase. Perhaps there is a some trend expressed by epidote dominating in 15701, epidote and sericite in 15704 and sericite in 15705. Chlorite, leucocrone and calcite are constant associates in all three samples.

Fissure veins which produced deformation carried albite and calcite. Pyrite is rare and developed in feldspar and in a lithic clast.

Sample Number : 15707

Identification : Massive sulphide (probably vein material) composed of pyrite-arsenopyrite-chalcopyrite-chlorite-sphalerite

Description :

The sample is a small specimen of drill core composed of massive fine to medium-grained sulphides. The bulk colour of the sawn surfaces is medium dark grey, but some brassy pyrite is also visible.

In thin section the sample is confirmed to consist mainly of sulphides. The minor transparent matrix consists mainly of carbonate (apparently calcite), but there are a few patches of fine, pale chlorite and rare, subhedral grains of quartz (up to 0.5mm).

In polished section the sulphides are seen to be dominated by about equal amounts of subhedral pyrite and arsenopyrite. The former is the coarsest (about 0.05 to 1.5mm), occurring as fairly massive aggregates and as some scattered cubes; the arsenopyrite tends to be finer (0.2 to 0.5mm) and occurs partly as aggregates with carbonate and partly as a subhedral, interstitial mineral in pyrite areas. The arsenopyrite crystals are about equidimensional and commonly cracked. Pyrite shows minor cracking.

Chalcopyrite occurs as one patch about 1mm by 1mm and as sparse smaller subhedral grains. There are also examples of subhedral sphalerite (ranging up to about 0.5mm) thickly rimmed by chalcopyrite and interstitial pyrite and arsenopyrite.

Several laths, very thin (up to 0.05mm thick) fracture veins carry calcite.

An approximate mode is :

40-45%	pyrite
35-40%	arsenopyrite
10-15%	calcite
2-3%	chalcopyrite
1-2%	chlorite
0.2-0.5%	sphalerite

Comments and Interpretations :

This sample consists of essentially massive sulphides with a minor matrix of carbonate and subhedral chlorite.

The sulphides do not seem to be bedded, include some relatively coarse grains, and feature much arsenopyrite, in my opinion the sample is more likely to represent massive vein sulphides than syngenetic sulphides.

053

701056

055

SHIMMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

All samples also analysed for Ba, Sb and W.
* Average of 2 analyses
** Average of 3 analyses

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	ROSEBERY EAST	HOLE NAME	RED 88-2
LOGGED BY	C. CREAUGH	TOTAL DEPTH	289.3m

DISTANCE FROM COLLAR	TO TOP		TO BOTTOM		Au	Cu	Zn	Pb	Ag	As	Sn	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
	TO TOP	TO BOTTOM	TO TOP	TO BOTTOM														
																		0 - 33m NO CORE Fluvial-glacial sediments - tri-cone drilling, no recovery
																		33.0 - 75.9m FELSIC GRANITIC ANDESITIC ? LAVAS Massive dark grey/green porphyritic intermediate flow feldspar phenocrysts 2-9mm in size, anhedral to mostly anhedral, randomly arranged. Groundmass aphanitic and strongly chloritized. Fine grained narrow basaltic lenses occur from 42.5-44m, 47.9-49.2m and 51.0-51.05m. Alteration is predominantly chloritic with lesser overprinted siliceous and carbonate alteration. Silicification more intense from 52.2-53.3m, 65.9-66.2m and 75.2-75.85m. Minor qtz-carbonate veining occurs throughout, commonly oriented parallel to foliation between 46° - 56° LCA
	75.00	76.00			0.27	72	640	180	<1	88	52	15516						15cm of 75% pyrite at 75.2m PERMEOLOGICAL SAMPLE 15705 FROM 75.55m PERMEOLOGICAL SAMPLE 15706 FROM 34m 75.9 - 93.6m BASALT ? LAVAS
	76.00	77.00			0.01	980	270	42	<1	270.0	115	15527						Fine grained dark green basalt flow. Largely strongly chloritized aphanitic groundmass with occasional white feldspar phenocrysts, <1mm in size, and chloritized fragments, 2.5mm in size. Core badly broken in parts Alteration largely chloritic with minor epidote developed (lower greenschist facies), overprinted by siliceous chloritic alteration associated with mineralisation. Strong silica-chlorite alteration developed around fractures parallel to foliation 60° LCA No core from 84.5 - 84.7m Minor disseminated pyrite throughout
	77.00	78.00			0.01	17	175	36	<1	28	10	15538						2cm of 15% pyrite-sphalerite-chalcopyrite at 75.9m in qtz/calc gangue
	83.00	84.00			0.01	29	195	82	<1	400	125	15519						15cm of 90% pyrite-galena-chalcopyrite-sphalerite at 76.0m
	84.00	85.00			0.00	700	185	116	<1	1100	340	15530						1cm of 20% pyrite-sphalerite at 76.05m
	85.00	86.00			0.01	105	135	60	<1	70	50	15528						10cm of 5% pyrite-sphalerite at 76.75m
	86.00	87.00			0.01	780	350	115	<1	275.0	50.0	15529						1cm of 50% pyrite at 78.7m
	87.00	88.00			0.01	23	135	38	<1	70	850	15537						5cm of 90% pyrite at 78.75m
	88.00	89.00			0.01	74	480	195	<1	1260	200	15539						2cm of 50% pyrite at 84.3m in qtz/chlorite gangue
	89.00	90.00			0.01	19	590.0	680	<1	40	52	15538						3cm of 40% pyrite at 84.8m
	90.00	91.00			0.01	110	2200	390	<1	270.0	175	15526						3cm of 2.5% pyrite-chalcopyrite-sphalerite-galena at 85.1m
	91.00	92.00			0.01	8	1270	210	<1	58	120	15537						6cm of brominated host (PGH) at 82.3m containing 90-92% disseminated pyrite-chalcopyrite-galena + sphalerite
	92.00	93.00			0.01	14	780	610	<1	330	640	15520						1.5cm of 50% pyrite-chalcopyrite-galena-sphalerite at 87.5m

ASSAY INFORMATION

701057

SI-MET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	ROSBURY EAST	HOLE NAME	RED 88-2
LOGGED BY	C. CREAUGH	TOTAL DEPTH	289.3m

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG	
									1
								<p>9cm of 10-15% pyrite-chalcopyrite-galena + sphalerite at 87.35m</p> <p><5% disseminated pyrite + sphalerite + chalcopyrite on fracture planes from 89.0-92.2m. Foliation 40° SCA.</p>	
								<p>93.6 - 106.3m <u>ANDOSITE</u></p> <p>Massive porphyritic intermediate volcanic feldspar phenocrysts 2-4mm in size, anhedral, randomly distributed. Groundmass aphanitic, dk green, strongly aphanitic. Silicification increases down hole, accompanied by lesser chloritisation, resulting in relict feldspars replaced by chlorite in a fine green silicified groundmass. Foliation strong at 50° SCA.</p> <p>Quartz-chlorite veins irregularly overprint earlier silicification. Upper contact irregular.</p>	
								<p>106.3 - 122.05m <u>EPICLASTIC</u></p> <p>Epilastic containing fragments of chloritic shale up to 3cm across in a matrix derived largely from feldspar porphyritic intermediate volcanics. From 116.0m consists largely of interbedded lenses of possible basaltic derivation containing large clasts of coarser andesitic material. Intense leucitisation accompanied by silicification from 114.3-115.4m, 116-116.3m, 116.9-117.1m, 117.4-117.5m, and 119.3-119.1m.</p> <p>Very minor disseminated pyrite throughout. Irregularly orientated qtz veins, also, common throughout.</p>	
								<p>PETROLOGICAL SAMPLE 15706 FROM 106.5m</p> <p>122.05 - 125.7m <u>FINE TO MEDIUM GRAINED ANDOSITE</u></p> <p>Medium grained feldspar porphyritic intermediate volcanic, gradually becoming finer grained down hole.</p> <p>Foliation 54° SCA</p> <p>Intense silicification from 122.75 to 122.95m</p> <p>Irregularly orientated qtz veins, also, common throughout.</p>	
								<p>125.7 - 170.4m <u>ANDOSITE</u></p> <p>Massive porphyritic intermediate volcanic. Feldspar phenocrysts 2-4mm in size, anhedral to subhedral, randomly distributed. Dark green aphanitic groundmass resulting from lower greenschist facies regional metamorphism largely overprinted by silicification</p>	

ASSAY INFORMATION

056

701058

057

SMLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	ROSEMARY EAST	HOLE NAME	REO 08-2
LOGGED BY	C. CREAGH	TOTAL DEPTH	289.3m

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	Au	Cu	Zn	Pb	Ag	As	Sn	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
132.00	133.00	0.02	7	110	50	41	48	14	15515						and lesser carbonatation - chloritisation associated with the formation of several zones of brecciation. Brecciation occurs intermittently from 138-169m, largely infilled by quartz with lesser carbonate. From 127.9-138.2m and 144.6-151.05m K-feldspar alteration accompanies silicification. Qtz >>> carbonate veins occur up to 20cm wide, irregularly oriented throughout, mostly < 1.5cm. 50cm of 1% disseminated pyrite-arsenopyrite at 127.9m 20cm of 25% pyrite-arsenopyrite at 133.9m 30cm of 5% arsenopyrite-pyrite at 133.25m 1.5cm of 35% pyrite at 139.3m 2cm of 2% pyrite at 139.8m 2cm of 2% pyrite at 135.9m 20cm of 40% pyrite at 160.5m 2cm of 80% pyrite at 160.9m 5cm of 50% pyrite at 161.05m 25cm of 7.5% pyrite at 161.4m Minor disseminated pyrite throughout remainder Chalcedony and amethyst quartz developed at 164.2 and 167m.
133.00	124.00	0.19	70	72	110	41	6076	88	15516						
134.00	135.00	0.04	54	74	72	41	770	98	15517						
135.00	136.00	0.01	22	125	164	1	185	34	15518						
158.50	160.00	0.01	46	72	13	41	230	42	15519						
160.00	161.00	0.11	220	60	100	2	5700	42	15520						
161.00	162.00	0.15	72	60	92	2	2750	24	15521						
162.00	163.00	0.01	10	100	38	41	360	12	15522						
															170.4 - 176.37m <u>BASALT</u> Fine grained massive dark green basalt. Silicification strong in parts resulting in a pink green colour. Alteration predominantly chloritic > silicic > carbonate > pyrite. Minor disseminated pyrite throughout.
															176.37 - 209.1m <u>ANDESITE</u> Massive dark green porphyritic intermediate volcanic. Feldspar phenocrysts 2-9mm in size, euhedral to largely anhedral. Groundmass aphanitic - strongly chloritised. Gradually becomes fine grained towards 209.1m. Silicification increases downhole from 192m. Alteration is chloritic - silicic > carbonate > pyrite. Silicification accompanies breccia zones and fractures. Irregularly oriented qtz veining common. Disseminated pyrite throughout. 1cm of 90% galena - sphalerite-chalcopyrite at 185.83m. 1cm of 90% chalcopyrite - sphalerite ± galena at 185.92m. < 1% galena in qtz - carbonate min at 187.1m.

ANALYSIS INFORMATION

701059

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SMLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited

METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT	ROSEBERY EAST	HOLE NAME	RED 88-2
LOGGED BY	C. CREAUGH	TOTAL DEPTH	289.3m

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	Au	Cu	Zn	Pb	Ag	As	Sn	SAMPLE NO	CORE ANGLE	POCR TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
209.80	210.00	0.03	17	440	290	<1	9	28	15277						209.1 - 211.7m <u>HEAVY FAULT ZONE</u> Medium grained porphyritic intermediate volcanic to 210.0m. From 210.0m finely interbedded black shales and light gray quartzose sandstone. Contact diffuse due to strongly developed silicic-chloritic alteration. Multiply deformed with predominant foliation at 50° LCA. Cataclastic features developed at 210.6, 210.9 and 211.7m. 1-2% disseminated pyrite developed mainly on fracture surfaces.
210.00	211.00	0.60	2300	160	350	6	2.10%	2850	15378						
211.00	212.00	0.39	155	7800	1760	8	1.03%	60	15329						211.7 - 213.6m <u>BLACK SHALE</u> Black shale, partly graphitic, interbedded with minor light gray quartzose sandstone. Strong foliation developed at 60° LCA. Silicic-chloritic alteration developed throughout. 2cm of 10% pyrite - pyrrhotite at 213.05m. 1-2% disseminated pyrite > pyrrhotite on fracture planes from 213.1 - 213.6m.
212.00	213.00	0.35	250	110	150	2	1.20%	650	15330						
213.00	214.00	0.52	280	100	100	6	5.00%	34	15331						
															214.0 - 227.24m <u>MINERALISED ZONE</u>
															213.6 - 216.8m <u>INTERBEDDED SANDSTONE AND SHALE</u>
214.00	215.00	1.40	890	40	300	12	7600	1200	15332						Light gray fine grained quartzose sandstone with lesser interbedded black shale. Bedding planes irregular due to intense deformation. Foliation 60° LCA. Strong silicic-chloritic alteration. 8cm of 80% pyrite-arsenopyrite in qtz-chlorite gangue at 214.0m oriented at 80° LCA. 2cm of 5% pyrite at 214.2m. 2cm of 10% pyrite at 215.9m. 20cm of 15% pyrite-pyrrhotite at 215.7m. 12cm of 17.5% pyrite-pyrrhotite at 216.0m. 7cm of 20% pyrite-arsenopyrite at 216.4m. 4cm of 15% pyrite at 216.57m. 1-2% disseminated pyrite on fracture planes throughout remainder.
215.00	216.00	0.60	1120	46	430	6	1660	1650	15333						
216.00	217.00	0.45	8600	240	1000	16	2.30%	4050	15334						
217.00	218.00	1.80	8200	140	820	24	6.25%	3200	15335						
218.00	219.00	0.08	950	650	710	7	2350	1840	15336						
219.00	220.00	1.76	3600	5600	6600	30	4.36%	2820	15337						
220.00	221.00	1.02	150	125	76	<1	320	100	15338						
221.00	222.00	0.42	300	140	310	<1	1360	1420	15339						
222.00	223.00	0.09	46	70	94	<1	520	440	15340						
223.00	224.00	4.90	710	160	190	7	3.70%	660	15341						
224.00	225.00	1.96	940	705	130	4	1.50%	185	15342						
225.00	226.00	0.12	46	72	26	<1	680	34	15343						
226.00	227.00	0.10	46	78	94	1	1320	96	15344						
227.00	228.00	0.80	56	72	32	<1	4600	110	15345						
															Light gray quartzose sandstone containing minor interbedded lenses of siltstone and shale. Strong silicic-chloritic alteration throughout. Foliation at 63° LCA. 45cm of 50% arsenopyrite-pyrite-pyrrhotite at 216.8m.

ASSAY INFORMATION

701060

SHLNET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

PROJECT	ROSEBERY EAST	HOLE NAME	REO 88-2
LOGGED BY	C CREAUGH	TOTAL DEPTH	289.3

CONTINUATION SHEET

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	Au	Cu	Zn	Pb	Ag	As	Sn	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DEBC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
															7m of 60% pyrite-arsenopyrite at 217.5m 11cm of 85% pyrite-arsenopyrite at 219.2m 3% disseminated pyrite-arsenopyrite from 217.25 to 219.2m
															219.38-229.9m INTERBEDDED SANDSTONE AND SHALE Fine grained light grey quartzose sandstone interbedded with grey to black shales. Strong siliceous-chloritic alteration associated with mineralization. Foliation 53° ECA. Mineralization in fills fractures parallel to foliation 5cm of 15% pyrite at 219.53m 30cm of 7.5% pyrite at 221.4m 1cm of arsenopyrite-pyrite at 223.1 and 223.6m 15cm massive pyrite-arsenopyrite at 223.9m Cataclasis formed at 223.9m, possible fault. ~1% disseminated pyrite throughout remainder
															PETROLOGICAL SAMPLE 15707 FROM 223.9m 224.4-250.6m SANDSTONE Light grey fine grained quartzose sandstone containing minor lenses and riffs of black shale. Bounding from 60-75° ECA. Soft sediment structures abundant from 244.3-250.6m Moderate chloritic-siliceous-carbonate alteration. Qtz-carbonate veins, also, irregularly orientated throughout, some parallel to foliation at 50° ECA. ~1% disseminated pyrite throughout 4cm of 80% pyrite at 226.6m in qtz gangue 10cm of 7.5% pyrite at 224.6m 1cm of 95% pyrite-arsenopyrite-pyrrhotite at 224.9m 9cm of 30% pyrite-arsenopyrite at 227.15m 3cm of 10% pyrite at 229.3m 5cm of 5% pyrrhotite in qtz-chlorite gangue of 229.8m 1cm of 20% pyrite-pyrrhotite ~1% disseminated pyrrhotite at 237m 2.5cm of 5% pyrite-pyrrhotite disseminated within breccia at 238.7m 1cm of 20% pyrite-pyrrhotite at 238.8 and 238.9m 2.5cm of 2% disseminated pyrite-pyrrhotite in qtz gangue at 239.8m 2cm of 50% pyrite at 243.25m in quartz gangue 1cm of 20% pyrite-pyrrhotite at 244m 5cm of galena-sphalerite at 245.6m 1cm of 25% pyrite at 250.2m
228.00	229.00	0.01	36	72	24	<1	140	90	1539.6						
229.00	230.00	0.06	36	57	26	<1	170	185	1539.7						
230.00	232.00	<0.01	20	200	105	<1	110	28	1539.8						
232.00	234.00	<0.01	17	370	115	<1	72	14	1539.9						
234.00	236.00	0.03	38	1720	370	<1	120	26	1540.0						
236.00	238.00	0.27	39	145	94	2	940	10	1540.1						
238.00	240.00	0.34	62	290	125	<1	500	24	1540.2						
240.00	242.00	<0.01	42	490	155	<1	64	16	1540.3						
242.00	244.00	0.04	40	740	280	<1	88	18	1540.4						
244.00	246.00	<0.01	15	980	280	<1	82	14	1540.5						
246.00	248.00	<0.01	24	910	390	<1	98	14	1540.6						
248.00	250.00	<0.01	9	240	160	<1	170	16	1540.7						
250.00	251.00	0.01	20	520	185	<1	74	18	1540.8						

ASSAY INFORMATION

059

701062

SMLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT <i>ROSEBERY EAST</i>	HOLE NAME <i>RED 88-2</i>
LOGGED BY <i>C. CABAGH</i>	TOTAL DEPTH <i>289.3m</i>

DISTANCE FROM COLLAR	TO TOP		TO BOTTOM		SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
	1	2	3	4							
1											
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indicates west dipping - west facing lithology
 Minor gte - chlorite veins developed in fractures
 Minor disseminated pyrite throughout
 5mm of pyrite - sphalerite at 283.3 and 284.7m
 1cm of SDYc pyrite at 283.8m

E. O. H. 289.3m

ASSAY INFORMATION

1190

Sample Number : 15704
 Identification : Andesitic volcanolithic arenite with heavy propylitic alteration and moderate foliation
 Description :
 The sample is a drill core specimen displaying essentially sandy textures of well-sorted, agglomerate, pebbly clasts, including very light grey clasts of feldspar and coarse grained grey and light grey lithic clasts set in a groundmass of quartz.

A staining test revealed no K-feldspar.
 In thin section the sample displays heavy alteration and moderate shear foliation, but primary features include moderately sorted, densely packed mineral and lithic clasts, which are mainly about 0.5 to 1mm. There is a minor matrix of related chlorite.
 The mineral clasts are mainly granitic plagioclase with patches of albite, orthoclase, andesine, perthite and some calcite. There are also some leucosene pseudomorphs of mafic silicates and some calcite leucosene pseudomorphs of mafic silicates. Lithic clasts are commonly inconspicuous, being deformed aggregates of mainly fine albite and chlorite. They carry pyrite analogous to the mineral clasts. A few clasts are less deformed and recognisably andesitic.

Pine pyrite is confined to a finely felsic lithic clast.
 A deformed fissure vein, about 0.5mm wide carries albite, calcite and chlorite.

An approximate mode is :
 55-60% plagioclase clasts, moderately altered to sericite-epidote-calcite
 10-15% altered and deformed andesitic lithic clasts
 2-3% chloritized and leucosened mafic silicate clasts
 0.5-1% leucosened oxide clasts
 5-7% chloritic matrix
 rare pyrite, confined to a lithic clast
 0.5-0.7% fissure vein of albite-calcite-chlorite

Comments and Interpretations :

This sample is essentially similar to Sample 15701; it is a little coarser, more feldspathic, carries less epidote and lacks K-feldspar. In essence it is interpreted to be an epiclastic sediment derived from andesitic detritus. It has since been leached heavily altering propylitic mineral assemblage and moderate shear foliation.

Pyrite is confined to a lithic clast.

Veining by albite-calcite-chlorite preceded deformation.

Sample Number : 15706
 Identification : Chloritic, andesitic volcanolithic arenite with mildly deformed veins of albite-calcite-chlorite-quartz
 Description :

The sample is a drill core specimen of greenish grey, chloritic, andesitic rock but with poorly sorted, mainly volcanoclastic textures. There are several hard, light grey fissure veins, ranging up to about 4mm wide.

A staining test revealed no K-feldspar.
 In thin section the sample displays poorly sorted, densely packed subangular clasts of chloritized porphyritic andesite and a few mineral clasts set in a mildly foliated minor matrix of chlorite and leucosene. Clasts range in size from about 0.2 to 4mm.

The lithic clasts show minor variations in texture, but commonly involve fresh to slightly sericitized and carbonated phenocrysts of plagioclase (ranging from tiny to at least 1mm) and a few chloritized mafic phenocrysts set in a groundmass of variously randomly aligned plagioclase laths with interstitial chlorite and leucosene. A few are sparsely amygdaloidal in albite, calcite and chlorite.

Mineral clasts are plagioclase and a few chloritized and leucosened mafic silicates and oxides.

Numerous fissure veins, ranging up to 6mm wide, are dominated by anhedral, unsorted fine albite and calcite (0.05 to 1.5mm), but carry minor chlorite and quartz. The veins have been deformed by the foliation which pervades the rock. Sparse lithic clasts have been replaced by similarly fine albite and minor calcite and chlorite.

An approximate mode is :
 70-80% clasts of chloritized andesite
 0.5-1% albited lithic clasts
 5-10% plagioclase clasts
 tr chloritized and leucosened mafic mineral clasts
 4-6% matrix chlorite and leucosene
 10-12% veins of albite-calcite-chlorite-quartz

Comments and Interpretations :

This rock is considered to have originated as a volcanolithic arenite, composed of poorly sorted clasts of andesite and derived phenocrysts. Mafic minerals have been converted to chlorite and leucosene, but plagioclase shows little obvious alteration.

Numerous thin and thick fissure veins carry mainly albite and calcite, but with some chlorite and quartz. A few lithic clasts have been replaced by similar minerals. Mild shear foliation post-dates the veining.

Sample Number : 15707
 Identification : Andesitic volcanolithic arenite with heavy propylitic alteration and moderate foliation
 Description :

The sample is a drill core specimen displaying essentially sandy textures of well-sorted, agglomerate, pebbly clasts of mainly light greenish grey, altered feldspar set in a groundmass of quartz.

A staining test revealed no K-feldspar.

In thin section the sample displays heavy alteration and moderate shear foliation, but primary features include moderately sorted, densely packed mineral and lithic clasts, which are mainly about 0.5 to 2mm. There is a foliated matrix of chlorite.

There are many subhedral phenocrysts of plagioclase, all moderately sericitized and lightly carbonated. Small clasts of mafic silicates and some chlorite leucosene aggregates, and former opaque oxides and iron leucosene. A few altered lithic clasts of porphyritic andesitic style are plainly recognizable, but many others are less obvious, being stretched, finely albitic and chloritic aggregates. Very fine pyrite occurs in one altered plagioclase clast and in a lithic clast.

There are a few thin, deformed fissure veins (about 0.2mm wide) of albite with calcite. A few clasts have been selectively replaced by fine clear albite.

An approximate mode is :

50-55%	plagioclase clasts, moderately sericitized and lightly carbonated
35-40%	altered and deformed andesitic lithic clasts
7-11%	chlorite-leucosene pseudomorphs of mafic silicate clasts
1-2%	leucosened oxide clasts
5-10%	chloritic matrix
rare	pyrite
0.5-0.7%	albite-calcite fissure veins

Comments and Interpretations :

This rock is considered to have originated as volcanolithic arenite, essentially similar to samples 15701 and 15704, but with clast sizes transitional between the two. There has been heavy alteration of propylitic style, but with sericite dominating the alteration of the plagioclase. Perhaps there is a zoned trend expressed by epidote dominating in 15701, epidote and sericite in 15704 and sericite in 15705. Chlorite, leucosene and calcite are constant associates in all three samples.

Fissure veins which predated deformation carried albite and calcite. Pyrite is rare and developed in feldspar and in a lithic clast.

Sample Number : 15707
 Identification : Massive sulphide (probably vein material) composed of pyrite-arsenopyrite-chalcopyrite-chlorite-sphalerite
 Description :

The sample is a small specimen of drill core composed of massive fine to medium-grained sulphides. The bulk colour of the seam surfaces is medium dark grey, but some brassy pyrite is also visible.

In thin section the sample is confirmed to consist mainly of sulphides. The major transparent matrix consists mainly of carbonate (apparently calcite), but there are a few patches of fine, pale chlorite and rare, anhedral grains of quartz (up to 0.6mm).

In polished section the sulphides are seen to be dominated by about equal amounts of subhedral pyrite and arsenopyrite. The former is the coarsest (about 0.05 to 1.5mm), occurring as fairly massive aggregates and as some scattered cubes; the arsenopyrite tends to be finer (0.03 to 0.5mm) and occurs partly as aggregates with carbonate and partly as a subordinate, interstitial mineral in pyrite areas. The arsenopyrite crystals are about equidimensional and commonly cracked. Pyrite shows minor cracking.

Chalcopyrite occurs as one patch about 1mm by 1mm and as sparse smaller anhedral grains. There are also examples of anhedral sphalerite (ranging up to about 0.5mm) thickly rimmed by chalcopyrite and interstitial pyrite and arsenopyrite.

Several late, very thin (up to 0.05mm thick) fracture veins carry calcite.

An approximate mode is :

40-45%	pyrite
35-40%	arsenopyrite
10-15%	calcite
2-3%	chalcopyrite
1-2%	chlorite
0.5-0.5%	sphalerite

Comments and Interpretations :

This sample consists of essentially massive sulphides with a minor matrix of carbonate and subordinate chlorite.

The sulphides do not seem to be bedded, include some relatively coarse grains, and feature much arsenopyrite. In my opinion the sample is more likely to represent massive vein sulphides than syngenetic sulphides.

701065

064

SHLMEY SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT ROSEBERY EAST HOLE NAME RED 88-3
LOGGED BY C. CREAUGH TOTAL DEPTH 178.5

DISTANCE FROM COLLAR	TO TOP		TO BOTTOM		SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
	1	2	3	4							
											0-36.3m <u>NO CORE</u> Fluvio-glacial sediments. Tri-cone drilling no core.
											<u>NO CORE</u> 36.3-36.65m 10cm barren quartz from 36.3m followed by 25cm of grey/green clay.
											36.65-38.1m <u>ANDESITE - OXIDISED ZONE</u> Massive porphyritic intermediate volcanic. Feldspar phenocrysts 2-5mm in size, randomly oriented. Quartz phenocrysts rare. Groundmass dark green, strongly chloritic in parts - otherwise pink/orange colour due to the development of hematite. Feldspars also altered to pink colour in places.
											38.1-53.7m <u>ANDESITE</u> Massive dark green porphyritic intermediate volcanic. Feldspar phenocrysts 2-5mm in size, randomly oriented, anhedral. Groundmass aphanitic, strongly chloritised. Strong chloritic-silicic alteration in parts has completely removed original texture being replaced by silica, chlorite and epidote. Minor disseminated pyrite occurs throughout. Qtz veins also wide occur sporadically, randomly oriented. Foliation at 47° LCA. 3cm qtz veins at 52.9 and 53.2m.
											53.7-55.6m <u>Basalt</u> Fine grained green massive basalt. Upper contact 30° LCA. Alteration to chlorite, quartz, epidote elong. Rfts of andesite. 5cm across at base indicating possible lava. Lower contact 95° LCA.
											55.6-66.2 <u>INTERMEDIATE VOLCANICLASTIC/ PYROCLASTIC</u> Clasts of rhyolite, 2-3cm in size, from 55.9-56.6m hosted by feldspar porphyritic intermediate volcanic. Feldspar phenocrysts largely completely replaced by chlorite in a groundmass altered to quartz-chlorite-epidote. Feldspars aligned parallel to foliation at 90° LCA. Minor qtz veins randomly oriented throughout. Minor disseminated pyrite throughout.

ASSAY INFORMATION

SHEET 3 OF 6

701066

SHLNET SYSTEM METRIC DECIMAL POINTS AS REQUIRED		Average of 2 analyses All samples also analysed for Sb, Ba and W.		The Shell Company of Australia Limited METALS DIVISION DRILL LOG SHEET CONTINUATION SHEET										PROJECT	HOLE NAME	LOGGED BY	TOTAL DEPTH					
DISTANCE FROM COLLAR		Au		Cu		Zn		Pb		Ag		As		Sn		SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
TO TOP	TO BOTTOM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM							
																						<p><u>PETROLOGICAL SAMPLE 15708 FROM 55.9m</u> <u>66.2 - 71.1m BASALT</u> Massiv fine grained basalt. Dark green to pink green colour. Strong silicification with lesser alteration to chlorite and epidote. Upper contact 33° ECA Minor irregularly orientated quartz veins - com. throughout. Very minor disseminated pyrite throughout.</p>
																						<p><u>71.1 - 82.1m ANDESITE</u> Medium grained porphyritic intermediate volcanic. Feldspar phenocrysts 2-5mm in size, completely altered to chlorite. Deformation strong with relic foliation flattened and aligned at 52° ECA. Chlorite ages schist developed from 73.0 - 73.1m. Irregularly orientated quartz-chlorite-epidote veins, 2cm wide, from 73.3 - 81.5m. Very minor disseminated pyrite throughout. Silicification increases downwards.</p>
																						<p><u>PETROLOGICAL SAMPLE 15709 FROM 73m</u> <u>82.1 - 91.3m HEAVY FAULT ZONE</u> Core badly broken. Original texture absent. Strong silicification has imparted pale grey/green colour. Association of silicified rocks prior to development of regional cleavage. Chloritic alteration accompanied regional deformation. Chlorite and pyrite deposited on cleavage planes. Disseminated pyrite up to 3% in parts. Irregularly orientated narrow, elong, milky quartz veins common.</p>
		82.00	84.00	0.03	42	66	19	<1	28	6	15	15	15	15	15	15	15	15	15	15	15	
		84.00	86.00	0.02	4	24	8	<1	15	6	15	15	15	15	15	15	15	15	15	15	15	
		86.00	88.00	0.01	12	28	6	<1	18	<4	15	15	15	15	15	15	15	15	15	15	15	
		88.00	90.00	0.01	4	92	20	<1	24	8	15	15	15	15	15	15	15	15	15	15	15	
		90.00	92.00	0.02	20	125	30	<1	48	<4	15	15	15	15	15	15	15	15	15	15	15	
		92.00	94.00	<0.01	20	110	84	2	54	4	15	15	15	15	15	15	15	15	15	15	15	
		94.00	96.00	<0.01	18	250	160	1	68	<4	15	15	15	15	15	15	15	15	15	15	15	
		96.00	98.00	<0.01	18	680	185	1	88	<4	15	15	15	15	15	15	15	15	15	15	15	
																						<p><u>91.3 - 97.9m BLACK SHALE</u> Fine grained black graphitic shale. Strong siliceous and chloritic alteration. Multiply deformed. Upper contact appears gradational. Minor pyrite on cleavage surfaces. Irregularly orientated milky qtz veins, 2-3mm, common.</p>
																						<p><u>97.9 - 104.05m INTERBEDDED SHALE AND SLTSTONE</u> Core badly broken from 100.3 - 102.25m. Finely laminated dark grey shale and grey siltstone. Multiply deformed. Sericite developed on cleavage surfaces. Milky quartz veins, 2-3mm in size, common.</p>

ASSAY INFORMATION

065

701007

SHELLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION
DRILL LOG SHEET
CONTINUATION SHEET

PROJECT ROSEBEARY EAST HOLE NAME RED 88-3
LOGGED BY C. CREAM TOTAL DEPTH 178.5

DISTANCE FROM COLLAR	TO TOP		TO BOTTOM		SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG	
	7	3	6	0								
18.3					6485	70	11	74	13	17	80	<p><u>104.05 - 109.5 INTERBEDDED SLTSTONE SANDSTONE AND SHALE</u> Finely laminated gray siltstones interbedded with light grey quartzose sandstone and lesser dark grey shale. Multiply deformed in part, common foliation orientation parallel to bedding at 65° LCA. Irregularly oriented milky quartz veins, 2-3mm in size, common. 4cm lens of grey clay at 109.3m.</p>
109.5												<p><u>109.5 - 111.0m EPICLASTIC</u> Medium grained epiclastic. Clast of lithic fragments and feldspar grains, 5.5mm in size, in a fine grained dark grey matrix. Strong silicic alteration. Chlorite and pyrite developed on cleavage surfaces. Very minor disseminated pyrite throughout.</p>
111.0												<p><u>111.0 - 122.3m INTERBEDDED SANDSTONE, SLTSTONE AND SHALE</u> Core badly broken 118.1 - 120.2m. Light grey quartzose sandstone interbedded with grey siltstone and lesser shales dominant from 110 to 116.3. Sandstone content decreases to 12.3m. Bedding to LCA is 90° antithetic to cleavage. Bedding is at 78° LCA, average at 67° LCA. Kinked cleavage folds prominent below 116.3m. Milky quartz veins, 1-5mm wide, mostly parallel to foliation. Quartz veins precede kink folding. Disseminated pyrite throughout.</p>
122.3												<p><u>122.3 - 123.7m SANDSTONE</u> Conformable contact down hole with pale grey fine grained quartzose sandstone. Chloritic alteration developed on cleavage surfaces.</p>
123.7												<p><u>123.7 - 128.0 INTERBEDDED SANDSTONE, SLTSTONE AND SHALE</u> Interbedded 2m lamellae of light grey quartzose sandstone, grey siltstone and dark grey shale with shale content increasing downhole. Minor disseminated pyrite throughout. Silicification increasing down hole. See milky quartz vein at 127.9m. 4cm milky quartz vein at 127.6m.</p>

ASSAY INFORMATION

066

701068

SMLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION
DRILL LOG SHEET
CONTINUATION SHEET

PROJECT	ROSEBERRY EAST	HOLE NAME	RED 88-3
LOGGED BY	C. CREAIGN	TOTAL DEPTH	178.5m

DISTANCE FROM COLLAR		SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
TO TOP	TO BOTTOM							
1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
20	21	22	23	24	25	26	27	28
30	31	32	33	34	35	36	37	38
40	41	42	43	44	45	46	47	48
50	51	52	53	54	55	56	57	58
60	61	62	63	64	65	66	67	68
70	71	72	73	74	75	76	77	78
80	81	82	83	84	85	86	87	88
90	91	92	93	94	95	96	97	98
100	101	102	103	104	105	106	107	108
110	111	112	113	114	115	116	117	118
120	121	122	123	124	125	126	127	128
130	131	132	133	134	135	136	137	138
140	141	142	143	144	145	146	147	148
150	151	152	153	154	155	156	157	158
160	161	162	163	164	165	166	167	168
170	171	172	173	174	175	176	177	178

ASSAY INFORMATION

128.0 - 131.0m QUARTZ VEIN SYSTEM
Strongly silicified interbedded sandstone siltstone and shale sequence brecciated and is filled by quartz) carbonate.
5cm quartz vein at 128.0m
2cm quartz vein at 128.15m
13cm quartz vein at 128.35m
6cm quartz vein at 128.55m
2cm quartz vein at 128.8m
9cm quartz vein at 129.1m
2cm quartz vein at 129.55m
10cm quartz vein at 129.7m
8m quartz vein at 129.9m
35m quartz vein at 130.73m

131.08 - 146.1m INTERBEDDED SANDSTONE SILTSTONE AND SHALE
Finely laminated multiply deformed sequence of fine grained quartzose sandstone - siltstone and shales. Sequence grain size changes gradually downhole with sandstones dominating at 140.0m then fining down hole.
Foliation at 135.0m at 63° LCA
Foliation at 144.0m at 5-10° LCA
Kink foliation common
Disseminated pyrite occurs near quartz veins.
10cm quartz) carbonate) chlorite vein at 141.98m
9cm quartz) carbonate) chlorite vein at 142.37m

146.1 - 147.8m VOLCANICLASTIC
Clasts of talysar and quartz, up to 8mm in size, deformed into ribbon shapes, in grey/green aphanitic groundmass. Gradational coarsening downwards contact with previous lithology.
Foliation varies from 15° to LCA to parallel to LCA

147.8 - 152.7m INTERBEDDED SANDSTONE AND SILTSTONE WITH LESSER SHALES
Light grey - fine grained quartzose sandstone and siltstone interbedded with lesser grey shales. Shale content decreases down hole.
Soft sediment slump structures marked by multiple deformations in part. Foliation at 149m at 40° LCA
Bedding parallel to foliation at 152m at 63° LCA
Disseminated pyrite throughout.
5cm quartz) carbonate) K-spar) chlorite vein at 150.7m
30cm quartz) carbonate) K-spar) chlorite vein at 148.0m

067

070702

Sample Number : 15708
Identification : Intensely albitized, sericitized, chloritized, carbonated and leucoxenized andesitic lava with an epidotized and more chloritic fragmental (?) contact zone

Description :
The sample is a specimen of drill core, displaying mainly greenish grey, altered fine-grained rock cut by many fine, pale olive and some thicker, pinkish grey veins. One end of the core is darker, more chloritic and of fragmental appearance, it also has a 20mm orange pink clast.

A staining test revealed that the orange pink material is partly K-feldspar.

In thin section the bulk of the specimen is seen to be intensely altered but there are plainly recognisable, finely porphyritic, hypidiomorphic crystalline volcanic textures. Phenocrysts were about 0.3 to 0.7mm and the groundmass featured moderately flow-aligned feldspar laths about 0.2mm long.

The phenocrysts of inferred plagioclase have been completely finely albitized and carbonated. The groundmass plagioclase has been heavily sericitized, mafic silicates have been completely chloritized and oxides have been leucoxenized.

Irregular fracture veins (up to 4mm thick) carry outer zones of very fine, untwinned albite and a core of coarser, anhedral calcite and in one case some quartz. Later, finer (0.1mm wide) fracture veins carry a very cloudy, fine epidote group mineral.

The darker, chloritic end of the specimen has quite different textures of fragmental and possibly amygdaloidal style. There are many sericitized 1mm clasts of plagioclase set in a cellular matrix of chlorite and fine epidote. The pebble-sized pink clast is a piece of heavily altered coarsely porphyritic, finely amygdaloidal latite : it has 0.5 to 2mm sericitized and epidotized feldspar phenocrysts and smaller carbonated phenocrysts set in an epidotized very finely feldspathic groundmass with quartzose amygdales.

An approximate mode of the drill core is :

65-75%	intensely altered, finely crystalline andesite
10-15%	richly chloritized and epidotized, fragmental and amygdaloidal regime
4-6%	pink clast of latite
8-10%	veins of albite-calcite(-quartz)
2-3%	veins of cloudy fine epidote

The composition of the main andesitic regime is :

15-20%	completely albitized and carbonated feldspar phenocrysts
55-65%	heavily sericitized groundmass plagioclase
15-20%	chlorite
3-5%	leucoxene

Comments and Interpretations :

The bulk of this specimen clearly possesses remnant textures of finely porphyritic, andesitic style, but one end of the specimen has some fragmental and probably amygdaloidal textures. Probably the specimen represents andesite lava and an upper or lower amygdaloidal, flow brecciated contact zone with incorporated feldspar sand and a latite rock fragment. The simple andesite is intensely albitized, sericitized, chloritized, carbonated and leucoxenized. The breccia zone is more chloritic and also epidotized.

Thick fracture veins carry fine albite, coarser calcite and some quartz. Thinner, later veins carry cloudy fine epidote.

Sample Number : 15709
Identification : Albite-chlorite-calcite augen schist
Description :

The sample is a well foliated, fine-grained greenish grey rock with disseminated lenticular clasts or augen.

A staining test revealed no K-feldspar.

In thin section the sample displays strongly foliated textures deviating around lenticular rigid augen which are commonly about 5mm in length.

Most of the augen consist of aggregates of anhedral calcite (about 0.2 to 0.5mm grainsize) with subordinate, finer, anhedral, untwinned albite (about 0.02 to 0.03mm). Some also contain minor chlorite and several carry leucoxenized oxide grains (about 0.2 to 0.4mm). One of the largest augen has deformed, abundantly feldspar porphyritic, andesitic textures and carries calcite, sericite, remnant plagioclase, chlorite and leucoxene.

The foliated matrix is dominated by anhedral, elongated calcite (about 0.02 to 0.03mm), but with minor fine chlorite, anhedral, untwinned, fine albite, and leucoxene.

There are a few pyrite crystals (0.2 to 1mm) with strain shadows of chlorite and calcite.

An approximate mode is :

20-25%	heavily carbonated, finely albitic and related augen
70-75%	matrix calcite
2-3%	matrix chlorite
1-2%	matrix albite
tr	matrix leucoxene
tr	pyrite

Comments and Interpretations :

This rock is an augen schist, apparently generated by shearing of an intensely carbonated rock. The augen represent rigid remnants of heavily carbonated but also finely albitized rock. In a few cases there are remnant indications that the augen represent intensely altered porphyritic andesite.

There is no sound basis on which to judge whether the original rock was andesite lava, now intensely carbonated and sheared, or some fragmental rock with clasts of andesite set in a finer, more easily carbonated and sheared matrix.

A few grains of pyrite were in existence prior to shearing : they have strain shadows of calcite and chlorite.

069

701071

SINMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Steel Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

HEADING SHEET

COLLAR INFORMATION	DATA TYPE	COLLAR CO-ORDINATES			COLLAR SURVEY		HOLE NAME	TOTAL DEPTH	COLL TYPE	DESC CODE	REMARKS
		EASTING	NORTHING	ELEVATION	AZIMUTH	DIP					
B	WOLC	384386	0375352	1167.9	90	-85	RED 88-A				

SURVEY INFORMATION	DISTANCE FROM COLLAR		AZIMUTH	DIP	REMARKS
	TO TOP	TO BOTTOM			
	25.00		185	68	AZIMUTH IN ANG (MAG +12°)
	75.00		80	61	
	125.00		80	60	"TURN INSIDE CASING"
	177.00		81	58	
	225.00		81	58	
	275.00		81	58	
	323.00		82	55	

PLOTTING KEY					
SYMBOL	INTERVAL		SYMBOL	INTERVAL	
	DES. CODE	G/LOG		DES. CODE	G/LOG
	FROM	TO		FROM	TO

PROJECT	ROSEBERY EAST	HOLE NAME	RED 88-A		
LOGGED BY	C. J. CREAGH	TOTAL DEPTH	325m		
CONTRACTOR	DIAMOND PALLING TASMANIA	RIG	LONGVARK 38		
CREW	K. HOW	J. OUNSTAN	DATE STARTED FINISHED		
CORE STORAGE		SAMPLE STORAGE			
NO OF TRAYS		LOCATION			
S1		DEVONPORT			
M&P LAB		ASSAY LAB			
		CLASSIC COMPLAS			
		MURKIN			
DESC.	SIZE	FROM	TO	TOTAL	REMARKS
NON CORE	HW	0	32.5	32.5	
CORE	HD	32.5	59.9	27.4	
	HO	59.9	325	270.1	
	BO				AVC SLOTTED CASING
CASING					TO 325m
CASING LEFT					(S) steel (P) plastic

ASSAY INFORMATION	DISTANCE FROM COLLAR		AZIMUTH	DIP	REMARKS	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
	TO TOP	TO BOTTOM										

DRILLING OBJECTIVES / SUMMARY TO TEST A SIGNIFICANT DOWN-HOLE BA CONDUCTOR BELOW AND TO THE NORTH OF RED 88-2. THE HENRY FAULT ZONE WAS INTERSECTED FROM 292.2 - 266m. MINERALIZATION WITHIN THE PARALLEL SEQUENCE WEST OF THE FAULT AVERAGE 1.3 g/t Au FROM 269 - 273m.

REPORT REFERENCE :

070

701072

SHELLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT ROSEBURY EAST	HOLE NAME REO 88-4
LOGGED BY C. CRENCH	TOTAL DEPTH 325m

DISTANCE FROM COLLAR		SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
TO TOP	TO BOTTOM							
								0 - 32.5m <u>NO CORE</u> Fluvio-glacial sediments - 46 recovery
								<u>HQ CORE</u> 32.5 - 48.98m <u>FELDSPAR PORPHYRITIC ANDRESITIC VOLCANOCLASTICS</u> Massive green porphyritic intermediate? volcanoclastic. Feldspar phenocrysts are randomly arranged and anhedral, approximately 4mm in size. Minor qtz phenocrysts. Minor mafic component altered to chlorite. Largely chloritic, aphanitic groundmass. 2cm rhyolite fragments rare. Minor qtz veining, also parallel to cleavage at 45° LCA. Very minor disseminated apite throughout.
								48.98 - 51.23m <u>FELDSPAR PORPHYRITIC ANDRESITIC VOLCANOCLASTICS</u> Massive green, sporadically porphyritic, intermediate volcanoclastic. Feldspar phenocrysts 2mm, anhedral, in aphanitic chloritic groundmass. Bedding at 45-50° LCA Very minor disseminated apite throughout.
								51.23 - 52.9m <u>ANDRESITIC? VOLCANOCLASTIC</u> Massive dark green fine grained basaltic volcanoclastic. Strongly chloritic. Minor coarse, also, qtz veining at upper and lower contacts. Bedding at 40° LCA
								52.9 - 78.68m <u>FELDSPAR PORPHYRITIC ANDRESITIC VOLCANOCLASTICS</u> <u>NO CORE FROM 59.9m</u> Massive green porphyritic intermediate volcanoclastic. Feldspar phenocrysts anhedral, 4-6mm in size, randomly oriented. Phenocryst size diminishing down-hole. Chloritic aphanitic groundmass. Mild silice alteration throughout. Barren lenses of fine grained basaltic material occur sporadically. Maximum 1.5cm, milky to waxy qtz veins parallel to cleavage throughout. Cleavage at 45° LCA 1.5cm qtz-chlorite vein at 69.9m containing ~1% apite
								78.68 - 79.08m <u>ANDRESITIC VOLCANOCLASTIC</u> Massive dark green fine grained andesitic volcanoclastic. Strong chloritic alteration. Cleavage at 40° LCA Bedding at 45° LCA

ASSET INFORMATION

120

701073

072

GMLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT ROSEBERRY EAST

HOLE NAME REO 88-4

LOGGED BY C J CREAIGN

TOTAL DEPTH 325m

DISTANCE FROM COLLAR		SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
TO TOP	TO BOTTOM							
1	2							79.08m - 90.1m FELDSPAR PORPHYRITIC ANDSITIC VOLCANOCLASTICS Massive green porphyritic intermediate volcanoclastic. Prominent subtidal feldspar phenocrysts, euhedral. Chloritic, apatitic groundmass. Small zones of silicification, parallel to cleavage, are accompanied by minor sulphide mineralization. 4cm of 10% pyrite at 86.67m. 10cm of 10% pyrite && chalcopyrite at 87.02m
								90.1 - 96.32m ? BASALTIC VOLCANOCLASTIC Fine grey/green fine grained intermediate volcanoclastic accompanied by narrow lenses of feldspar porphyritic volcanoclastics. Weak to moderate silicic and chloritic alteration. Minor carbonate alteration. Very minor disseminated pyrite and sphalerite throughout
								96.32 - 102.3m FELDSPAR PORPHYRITIC ANDSITIC VOLCANOCLASTICS Green porphyritic intermediate volcanoclastic. Feldspar phenocrysts prominent. Bouding is parallel to cleavage at 35° SCA. Moderate silicic and chloritic alteration throughout. Minor carbonate alteration. Minor disseminated pyrite throughout. 29cm of 30% pyrite in Qtz-carbonate gangue at 98.99m
								102.7 - 104.43 FELDSPAR PORPHYRITIC ANDSITIC VOLCANOCLASTICS Massive green, sporadically porphyritic, intermediate volcanoclastic. Feldspar phenocrysts, 2mm, anhedral, in a chloritic, apatitic groundmass. Minor intense silicification. Maximal amethyst Qtz veins (c.1cm) at 103.4 and 103.9m. Very minor disseminated pyrite throughout.
								104.93 - 131.4m INTENSELY SILICIFIED PORPHYRITIC VOLCANOCLASTICS Hot rock is green feldspar porphyritic andsitic volcanoclastic. Strong to intense silicification throughout gives a white/grey colour. Original textures largely absent throughout. Minor carbonate alteration. Very minor disseminated pyrite throughout.

ASSAY INFORMATION

701074

073

SILMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION
DRILL LOG SHEET
CONTINUATION SHEET

PROJECT	ROSEBERY EAST	HOLE NAME	REO 88-4
LOGGED BY	C. J. CREAUGH	TOTAL DEPTH	325m

DISTANCE FROM COLLAR	TO TOP		TO BOTTOM		SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG																																										
	TO TOP	TO BOTTOM	TO TOP	TO BOTTOM																																																	
11.2	9.10	15.17	22.25	28.32	34.39	40.46	46.53	52.60	58.67	64.74	70.81	76.88	82.95	89.02	95.09	101.16	107.23	113.30	119.37	125.44	131.51	137.58	143.65	149.72	155.79	161.86	167.93	174.00	180.07	186.14	192.21	198.28	204.35	210.42	216.49	222.56	228.63	234.70	240.77	246.84	252.91	258.98	265.05	271.12	277.19	283.26	289.33	295.40	301.47	307.54	313.61	319.68	325.75
												5m of massive coarse pyrite at 119.9m in qtz gangue 5m vein of pyrite at 122.69m 10cm of 30% disseminated galena at 123.69m in a qtz-chlorite-carbonate gangue. 15cm of core removed at 124.55m as hand specimen 15cm of 50% pyrite & Cu-carbonates at 124.55m. <u>131.9 - 135.9m MODERATELY SILICIFIED PORPHYRITIC ANDRESITIC VOLCANOCLASTIC</u> Partly brecciated green feldspar porphyritic intermediate volcanoclastic. Moderate to strong silicification developed throughout accompanied by irregular massive qtz veining. Minor carbonate alteration. <u>135.9 - 157m INTENSELY SILICIFIED PORPHYRITIC VOLCANOCLASTICS</u> Feldspar porphyritic intermediate volcanoclastic displaying strong to intense silicification throughout. Original textures largely absent. Host rock brecciated in parts leading to the development of irregularly orientated qtz veins. Minor carbonate alteration. 1cm vein of massive pyrite at 149.16m 2cm vein of 10% pyrite at 149.56m <u>157 - 160.6m MODERATELY SILICIFIED PORPHYRITIC ANDRESITIC VOLCANOCLASTIC</u> Feldspar porphyritic intermediate volcanoclastic, moderately to strongly silicified. Areas of intense silicification completely replaced by qtz. Original textures largely absent. <u>160.6 - 171.9m INTENSELY SILICIFIED PORPHYRITIC VOLCANOCLASTIC</u> Feldspar porphyritic intermediate volcanoclastic displaying strong to intense silicification. Large qtz veins, < 10cm, developed where silicification strongest. Original texture largely absent. Minor, dense, qtz-carbonate veins occur irregularly orientated. 1cm vein of massive pyrite at 165.87m in qtz-carbonate gangue. <u>171.9m - 174.55m MODERATELY SILICIFIED PORPHYRITIC ANDRESITIC VOLCANOCLASTICS</u> Feldspar porphyritic intermediate volcanoclastic.																																									

ASBEST INFORMATION

701075

BHMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT ROSEMARY EAST

HOLE NAME RED 88-4

LOGGED BY C. J. CREAGH

TOTAL DEPTH 325m

DISTANCE FROM COLLAR		CORRECTION	DEPTH	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
TO TOP	TO BOTTOM									
11.5	0.0		0.0							moderately to strongly silicified.
			174.55							<u>174.55 - 174.9m MODERATELY SILICIFIED</u> <u>BASALTIC VOLCANOCLASTICS</u> Fine grained, grey/green basaltic volcanoclastic displaying moderate silicic and chloritic alteration.
			174.9							<u>174.9 - 180.2m MODERATELY SILICIFIED</u> <u>PORPHYRITIC ANDESITE VOLCANOCLASTICS</u> Coarse feldspar porphyritic intermediate volcanoclastic. Moderate silicic and chloritic alteration.
			180.2							<u>180.2 - 193.4m INTENSELY SILICIFIED</u> <u>PORPHYRITIC VOLCANOCLASTIC</u> Feldspar porphyritic intermediate volcanoclastic displaying strong to intense silicification. Original texture largely absent. Irregularly oriented qtz veins, silty, accompany brecciation of host rock.
			193.4							<u>193.4 - 195.13m MODERATELY SILICIFIED</u> <u>BASALTIC VOLCANOCLASTICS</u> Green fine grained basaltic volcanoclastic. Moderate to strong silicic and chloritic alteration throughout. Minor narrow, silty, irregular qtz veins.
			195.13							<u>195.13 - 212m MODERATELY SILICIFIED</u> <u>PORPHYRITIC ANDESITE VOLCANOCLASTICS</u> Grey/green feldspar porphyritic intermediate volcanoclastic displaying moderate to strong silicification. Minor narrow qtz veining.
			212							<u>212 - 218.18m INTENSELY SILICIFIED</u> <u>PORPHYRITIC VOLCANOCLASTIC</u> White/grey feldspar porphyritic intermediate volcanoclastic displaying strong to intense silicification. Original texture largely absent. Sum of 2 1/2 veins at 216.6m high vein. Approximately 1% disseminated and fissure. All pyrite - arsenopyrite - pyrrhotite after 216.6m.
			218.18							<u>218.18 - 220.96 MODERATELY SILICIFIED</u> <u>PORPHYRITIC VOLCANOCLASTIC</u> Green feldspar porphyritic intermediate volcanoclastic

ABBAY INFORMATION

074

701076

075

SPLMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

All samples also analysed for Co, Sb and W
* Average of 2 analyses.

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT ROSEBERY EAST
LOGGED BY C.J. CREAGH

HOLE NAME RED 88-4
TOTAL DEPTH 325m

DISTANCE FROM COLLAR		Au	Cu	Zn	Pb	Ag	As	Sn	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	RECORD CODE	GRAPHIC LOG	DESCRIPTIVE LOG
TO TOP	TO BOTTOM	PPM	PPM	PPM	PPM	PPM	PPM	PPM							
235.00	237.00	0.02	<2	50	8	<1	9	8	15551						displaying moderate to strong silicification. More intensely altered regions form irregularly orientated qtz veins, 5-3cm wide. Minor disseminated pyrite & pyrrhotite throughout. 15cm of 5% disseminated and fissure filled pyrite at 219.03m
237.00	238.00	0.02	<2	17	<2	<1	9	12	15552						230.96 - 233.9m INTENSELY SILICIFIED PORPHYRITIC VOLCANOCLASTIC white/grey intensely silicified host rock. Original textures absent. <1% disseminated pyrite and galena throughout
238.00	239.00	<0.01	2	490	68	<1	111	8	15553						223.9 - 225.31m MODERATELY SILICIFIED PORPHYRITIC ANDESITIC VOLCANOCLASTIC Grey feldspar porphyritic intermediate volcanoclastic displaying moderate to strong silicification. Minor carbonate alteration.
239.00	240.00	<0.01	<2	79	34	<1	110	4	15554						225.31 - 241.6m INTENSELY SILICIFIED PORPHYRITIC VOLCANOCLASTIC white/grey strong to intensely silicified feldspar porphyritic intermediate volcanoclastic. Partly associated. Original texture largely absent. Minor disseminated and fissure fill pyrite where silicification is strongest.
240.00	241.00	<0.01	3	46	72	<1	19	4	15555						241.6 - 242.2m INTENSELY SILICIFIED BASALTIC VOLCANOCLASTIC Fine grained green basaltic volcanoclastic displaying strong to intense silicic and chloritic alteration. Minor carbonate alteration. Original texture largely absent. Irregularly fractured. Minor disseminated pyrite throughout.
241.00	243.00	<0.01	5	330	175	1	110	30	15556						
242.00	243.00	0.02	170	150	500	3	860	150	15557						
243.00	244.00	0.11	160	120	80	3	1930	94	15558						
															NEARLY FAULT ZONE
															242.2 - 244.1m CATACLASTIC Multiply deformed fragments of grey/green sandstone volcanoclastic and black shales. Strong silicic and chloritic alteration. Minor carbonate alteration. Original texture largely absent. Approximately 2% disseminated and fissure filled pyrite throughout. Minor disseminated arsenopyrite, galena and chalcocite throughout.

ANALYSIS INFORMATION

DATE: 6/10

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SHLNET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

All samples also analysed for Ba, Sb and W The Shell Company of Australia Limited
METALS DIVISION
* Average of 2 analyses

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT ROSEBERG EXT
LOGGED BY C. J. CROAGH

HOLE NAME RES 88-4
TOTAL DEPTH 325m

DISTANCE FROM COLLAR		Au	Cu	Zn	Pb	Ag	As	Sn	SAMPLE #	CORE ANGLE	ROCK TYPE	PLAN	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
TO TOP	TO BOTTOM														
		PPM	PPM	PPM	PPM	PPM	PPM	PPM							
244.00	245.00	0.04	4.10	80	84	2	2.00	6.30	155159						244.1 - 245.8m SANDSTONE Fine grained dark green sandstone with lesser interbedded lenses of black shale. Multiply deformed in parts. Most prominent cleavage 40° LCA. Strong silicic and chloritic alteration. Minor carbonate alteration. Approximately 2% disseminated and fissure filled pyrite throughout. Minor disseminated arsenopyrite and chalcopyrite throughout. 3cm of 30% pyrite >> chalcopyrite at 244.9m
245.00	246.00	0.03	1.45	48	98	2	1.40	2.90	155160						245.8 - 246.4m BLACK SHALES Multiply deformed black shales. Strong silicic and chloritic alteration <1% disseminated and fissure filled pyrite throughout
															246.4 - 259.77m INTERBEDDED SANDSTONES AND SILTSTONES WITH LESSER BLACK SHALES Strongly deformed grey green sandstones and siltstones interbedded with lesser black shales. Shale content increases down hole. Moderate to strong silicic and chloritic alteration throughout. Minor carbonate alteration. Silicification more intense in the sandstones and siltstones. 1-2% disseminated and fissure filled pyrite is accompanied by minor disseminated pyrrhotite and arsenopyrite associated with the more intensely silicified zones throughout. 3cm vein of 30% pyrrhotite > chalcopyrite at 252.99m in a pyrite-chlorite gangue.
246.00	247.00	0.02	1.25	34	30	3	2.00	4.80	155161						
247.00	248.00	0.01	1.05	40	8.9	1	2.00	8.50	155162						
248.00	249.00	0.01	1.65	7.6	7.6	2	1.00	4.50	155163						
249.00	250.00	0.01	3.8	5.4	6.4	1	6.4	3.20	155164						
250.00	251.00	0.04	6.4	38.0	56.0	1	1.35	4.60	155165						
251.00	252.00	0.01	1.35	5.4	12.0	1	3.00	12.40	155166						
252.00	253.00	0.01	3.60	7.2	16.0	2	6.8	8.50	155167						
253.00	254.00	0.01	4.4	4.0	11.0	1	2.30	6.60	155168						
															MINERALIZED ZONE 254.77 - 260.7m INTERBEDDED SANDSTONES, SILTSTONES AND LESSER BLACK SHALES Strongly altered (multiply deformed in parts) fine grained grey interbedded sandstones, siltstones and lesser black shales. Black shale content decreases down-hole. Cleavage is parallel to bedding varying from 50° LCA at 256m to 40° LCA at 259m. Strong silicic and chloritic alteration throughout. Minor carbonate alteration. Silicification more intense within the sandstones and siltstones. Sulphides more frequent where brecciation has accompanied silicification. 1-2% disseminated and fissure fill pyrite occurs throughout, accompanied by lesser disseminated

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SHLMEY SYSTEM
METRIC
DECIMAL POINTS AS SHOWN

All samples also analysed for Ba, Sb, W
* Average of Analyses

The Shell Company of Australia Limited
METALS DIVISION
DRILL LOG SHEET
CONTINUATION SHEET

PROJECT **ROSEBERY EAST** HOLE NAME **REG 88-4**
LOGGED BY **C. J. CREAUGH** TOTAL DEPTH **325m**

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	Au	Cu	Zn	Pb	Ag	As	Sn	SAMPLE NO	CORE ANGLE	ROCK TYPE	DIA	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
254.00	255.00	0.41	13.20	95	270	7	4900	760	15569						pyrrhotite and arsenopyrite 1cm of massive pyrite-arsenopyrite at 254.98m
255.00	256.00	1.72	31.00	610	1140	39	257	1760	15572						3cm of massive pyrite-arsenopyrite at 255.04m
256.00	257.00	0.54	4.00	46	540	2	2050	2900	15577						2cm of 40% pyrite-arsenopyrite at 255.33m
257.00	258.00	0.34	22.00	2950	5700	22	5700	3700	15574						3cm of 20% pyrrhotite > pyrite at 258.6m
258.00	259.00	0.13	38.0	76	450	3	1540	2000	15573						28cm of 5% pyrite-arsenopyrite > pyrrhotite at 257.65m
259.00	260.00	1.04	8.0	1105	300	4	237	1300	15574						4cm of 70% pyrite-arsenopyrite at 259.55m
260.00	261.00	0.25	47.0	36	260	3	800	1580	15575						1.5cm of 90% pyrite-pyrrhotite at 260.52m
260.7 - 268.3m SANDSTONE															
Strongly cleaved grey/green fine grained quartzose sandstone. Multiply deformed in parts. Bedding parallel to cleavage at -60° LCA. Moderate to strong siliceous and chloritic alteration throughout. Minor carbonate alteration. Approximately 1% disseminated and fissure filled pyrite > pyrrhotite throughout.															
5cm of 5% pyrite-arsenopyrite at 261.65m															
5cm of 10% pyrite at 265.2m															
261.00	262.00	0.27	3.20	52	80	2	1740	155	15576						29cm of 5% pyrite > arsenopyrite at 266.02m
262.00	263.00	0.86	68	54	48	1	350	810	15577						5cm of 90% pyrite-arsenopyrite at 266.92m
263.00	264.00	0.28	83	98	42	1	145	140	15578						3cm of 90% pyrrhotite > pyrite at 267.22m
264.00	265.00	0.12	57	30	300	1	3050	1840	15579						1cm of massive pyrite-arsenopyrite at 267.5m
265.00	266.00	0.13	56	74	120	1	590	620	15580						
266.00	267.00	0.22	280	48	130	2	2200	450	15581						
267.00	268.00	0.24	900	40	300	6	540	1520	15582						268.3 - 276.18m SANDSTONES WITH LESSER INTERBEDDED BLACK SHALES
Cleaned grey/green fine grained quartzose sandstones containing lesser interbedded black shales. Cleavage parallel to bedding at 99° LCA. Moderate to strong siliceous and chloritic alteration throughout.															
~1% disseminated and fissure filled pyrite > pyrrhotite-arsenopyrite throughout.															
10cm of 85% arsenopyrite > pyrite at 268.33m															
23cm of 30% arsenopyrite > pyrite at 268.89m															
8cm of massive arsenopyrite > pyrite at 269m															
13cm of 5% pyrite-arsenopyrite at 269.75m															
10cm of 10% pyrite > arsenopyrite > chloropyrite at 270.79m															
268.00	269.00	1.10	970	24	720	24	6.15%	1600	15583						15cm of 15% arsenopyrite > pyrite at 271m
269.00	270.00	2.30	940	98	230	7	60%	3950	15584						5cm of massive arsenopyrite > pyrite > chloropyrite at 271.25m
270.00	271.00	0.35	270	84	930	17	4800	840	15585						32cm of 5-10% pyrite-arsenopyrite at 271.3m
271.00	272.00	1.90	2600	550	6400	84	7.00%	2450	15586						4cm of semi-massive arsenopyrite-pyrite at 271.62m
272.00	273.00	1.08	1960	68	580	14	5.5%	1600	15587						5cm of 2% pyrite > pyrrhotite-arsenopyrite at 271.75m
273.00	274.00	0.74	290	108	320	5	3300	250	15588						2cm of massive arsenopyrite > pyrite at 272.2m
4cm of 30% pyrite > arsenopyrite at 272.39m															
7cm of 5-10% pyrite-arsenopyrite at 273.6m															
274.00	275.00	0.39	490	145	100	3	420	290	15589						
275.00	276.00	0.27	200	52	150	3	390	680	15590						
276.00	277.00	0.10	54	170	82	7	135	30	15591						
END OF MINERALISED ZONE															
276.18 - 276.9m INTERBEDDED SILTSTONES AND SHALES															
Cleaned dark grey/black interbedded siltstone															

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BHMET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Shell Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT <u>ROSEBAY EAST</u>	HOLE NAME <u>RD 88-4</u>
LOGGED BY <u>C. J. CRAGH</u>	TOTAL DEPTH <u>325m</u>

DISTANCE FROM COLLAR	TO TOP		TO BOTTOM		SAMPLE NO	CORE ANGLE	ROCK TYPE	DIAM	DESC CODE	DIAPHRAGM LOG	DESCRIPTIVE LOG
	1	2	3	4							
											and shales. Cleavage parallel to bedding at 77° LGA. Minor qtz - carbonate veining parallel to cleavage. ~1% disseminated pyrite throughout.
											<u>276.9 - 282m INTERBEDDED SANDSTONES, SILTSTONES AND BLACK SHALES</u> Cloned grey/green sandstones and siltstones interbedded with black shales. Weak to moderate siliceous and chloritic alteration. Minor qtz - carbonate veining parallel to cleavage. Minor disseminated pyrite throughout. 2cm qtz veins containing 1% pyrite at 280.33 and 280.46
											<u>282 - 287.58m INTERBEDDED SILTSTONES AND SHALES</u> Cloned interbedded grey/green siltstones and shales. Cleavage parallel to bedding at 50° LGA. Moderate to strong siliceous and chloritic alteration. Minor qtz - carbonate veining parallel to cleavage. Very minor disseminated and ferric fill pyrite throughout. 8cm vein of ~1% galena, sphalerite and pyrite at 289.87m in qtz - carbonate gangue.
											<u>287.59 - 302.4m INTERBEDDED SANDSTONES, SILTSTONES AND BLACK SHALES</u> Cloned grey/green interbedded sandstones and siltstones with lesser 'waxy' black shales. Cleavage parallel to bedding at 16° LGA. Moderate siliceous and chloritic alteration. Minor qtz - carbonate veining parallel to cleavage. Minor sulphides accompany areas of more intense silicification. Very minor disseminated pyrite throughout. Approximately 1% disseminated pyrite - pyrrhotite from 292.9 - 294.85m. Minor disseminated sphalerite at 302m. 17cm of 5% pyrite-pyrrhotite - arsenopyrite at 292.81m. 5cm of 1-2% pyrite - pyrrhotite at 296m in qtz - chlorite gangue.
											<u>302.4 - 308.9m INTERBEDDED SANDSTONES, SILTSTONES AND LESSER SHALES</u> Cloned, pale grey/green interbedded sandstones,

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SI-MET SYSTEM
METRIC
DECIMAL POINTS AS REQUIRED

The Steel Company of Australia Limited
METALS DIVISION

DRILL LOG SHEET

CONTINUATION SHEET

PROJECT ROSEBERRY EAST
LOGGED BY C. J. CREAGH

HOLE NAME REQ 88-4
TOTAL DEPTH 325m

DISTANCE FROM COLLAR TO TOP	DISTANCE FROM COLLAR TO BOTTOM	SAMPLE NO.	CORE ANGLE	ROCK TYPE	DIAM.	DESC CODE	GRAPHIC LOG	DESCRIPTIVE LOG
								<p>siltstones and minor shales. Strong silicic and chloritic alteration throughout. Minor disseminated pyrite-galena-sphalerite - pyrrhotite throughout. 10cm of 5% pyrite at 303.03m in qtz-chlorite gangue.</p> <p><u>308.4 - 325m INTERBEDDED SANDSTONES, SILTSTONES AND SHALES</u> Cloned interbedded grey/green sandstones, siltstone shales and black shales. Bedding parallel to cleavage at 60° LCA. Moderate silicic and chloritic alteration throughout. Minor qtz-calc veining parallel to cleavage. Very minor disseminated pyrite-sphalerite-galena-pyrrhotite to 319m. Otherwise, minor disseminated pyrite throughout. 10cm of 10% pyrite, sphalerite-galena at 321.7m.</p> <p style="text-align: right;">325m END OF HOLE</p>

ASSAY INFORMATION

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APPENDIX 2

PETROLOGICAL REPORTS FOR LAKESIDE AND MURCHISON MINE LINE.

Geochempet Services

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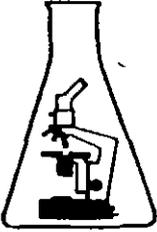
PETROLOGICAL and GEOCHEMICAL CONSULTANTS

REGISTERED IN QUEENSLAND

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

Telephone: (07) 892 1789
A/H 378 6467

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PETROLOGICAL REPORT ON
SIX SAMPLES OF DRILL CORE
FROM THE VICINITY OF THE HENTY FAULT
IN THE MOUNT READ VOLCANICS, TASMANIA

prepared for

BILLITON AUSTRALIA

Ref : D. Hall

Order Code : 11663/LJ50/JGP

RED 87-4
RED 87-8

Stan Joyce

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

29th January, 1988.

Sample Number : RED 87-4 90.5m

Identification : Mildly foliated, intensely chloritized, abundantly porphyritic mafic andesite or calc-alkali basalt, carrying deformed veins of calcite with chlorite, albite and trace sulphide

Description :

The sample is a specimen of drill core, displaying abundant deformed dark greenish grey phenocrysts of feldspar set in a mildly foliated, dark greenish grey groundmass. There are several very light grey carbonate veins, the largest being a sheared lenticular structure with a maximum thickness of about 5mm.

A staining test revealed no K-feldspar.

In thin section the sample displays remnant abundantly porphyritic, hypidiomorphic, crystalline volcanic textures, but the phenocrysts have been cracked and altered and the groundmass altered and mildly foliated.

The abundant phenocrysts were plagioclase about 0.4 to 2mm in size, now penetrated by many chloritic fractures, flecked by sericite and calcite and of apparently albitic composition. The groundmass has laths of similarly modified plagioclase, about 0.1 to 0.3mm long. Inferred mafic silicates are represented by mildly stretched aggregates of chlorite and inferred oxides are represented by similarly stretched aggregates of fine sphene.

Sheared and recrystallized fissure veins about 0.5 to 5mm thick carry calcite, minor chlorite and albite and a few grains of anhedral sulphide, probably pyrite.

An approximate mode is :

45-55%	chlorite
25-30%	albite
10-15%	sphene
3-5%	sericite
3-5%	calcite
1-3%	veins of calcite with minor chlorite and albite and traces of sulphide

Comments and Interpretations :

Well preserved, abundantly porphyritic, finely crystalline textures are quite consistent with former lava, but it has experienced intense alteration to a chlorite-albite-sphene assemblage and mild deformation. Fissure veins of calcite with minor chlorite and albite, and traces of sulphide have also been deformed.

The original lava was rich in plagioclase phenocrysts but it carried about 10-15% opaque oxides in its groundmass and the observed abundance of chlorite implies a high mafic index. There are no suggestions of any former olivine. Thus, the original rock was probably mafic andesite or calc-alkali basalt.

Sample Number : RED 87-4 95.8m

Identification : Moderately foliated, intensely chloritized, porphyritic mafic andesite or calc-alkali basalt, carrying deformed and disrupted veins of chlorite and calcite with minor albite

Description :

The sample is a specimen of drill core, displaying dark greenish grey, finely crystalline rock with moderate foliation and some deformed fissure veins (ranging up to 5mm thick) carrying mainly very light grey carbonate.

A staining test revealed no K-feldspar.

In thin section the sample is seen to be intensely chloritized and moderately deformed, but there are obvious remnant textures of finely porphyritic, volcanic style.

Phenocrysts constitute about 10-15% of the rock and were about 0.3 to 1mm in size, but their recognition has been obscured by alteration. Some were apparently mafic silicate (probably pyroxene) now replaced by chlorite and stretched. Others were probably plagioclase, now altered to fine-grained aggregates of albite and chlorite; a few plagioclase phenocrysts are represented more conspicuously by tabular aggregates of sericite. The groundmass had primary grainsizes around 0.1 to 0.3mm : plagioclase laths are now represented by albite with sericite and calcite, mafic silicates by stretched aggregates of chlorite and oxides by stretched aggregates of sphene.

Fissure veins about 0.1 to 5mm thick have been deformed, disrupted and partly recrystallized. Thin veins are commonly dominated by chlorite, but thick veins feature mainly calcite. They also carry minor albite.

An approximate mode is :

50-60%	chlorite
15-20%	albite
10-15%	sphene
4-6%	calcite
3-5%	sericite
5-7%	veins of calcite and chlorite with minor albite

Comments and Interpretations :

Remnant primary textures are consistent with mafic lava, carrying phenocrysts of plagioclase and probable pyroxene. The rock has been intensely altered to a chlorite-albite-sphene mineral assemblage and fissure veined by mainly calcite and chlorite, and moderately sheared.

The original lava was similar in composition to that at 90.5m in RED 87-4 but it carried fewer feldspar phenocrysts and they were accompanied by probable pyroxene phenocrysts. There are no indications of any olivine. The original lava was probably mafic andesite or calc-alkali basalt.

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Sample Number : RED 87-4 118.3m

Identification : Folded and macro-faulted, graded, laminated, chloritized silty turbidite with mildly deformed late veinlets of chlorite-sericite-quartz-calcite

Description :

The sample is a specimen of drill core, displaying dark greenish grey, fine-grained rock with mildly disturbed and macro-faulted, fine laminations.

A staining test revealed no K-feldspar.

In thin section the sample displays graded silty laminations variously about 1 to 4mm thick. The laminations dip steeply, but have facing directions orientated upwards within the segment incorporated in the thin section. The silty basal zone of each laminated unit amounts generally to about 25% of the thickness, but there are exceptions. The silt grains in the basal zones are generally less than about 0.05mm and they include plagioclase, sphene after oxide, and chloritized grains. Some of the plagioclase is sericitic. The muddy upper zones carry more chlorite and sphene.

A few thin mildly deformed fissure veins (about 0.2mm wide) carry chlorite, sericite, quartz and calcite. They post-date folding and faulting of the laminations.

An approximate mode is :

70-75%	chlorite
10-15%	plagioclase
10-12%	sphene
4-6%	sericite
0.2-0.3%	veins of chlorite-sericite-quartz-calcite

Comments and Interpretations :

This sample is interpreted to represent a fine turbidite sediment composed of graded silty to muddy laminations composed of detritus drawn from mafic volcanic sources.

It has been pervasively altered to an assemblage of chlorite, sphene, probably albite, and sericite. The laminations have been folded and faulted. Thin fracture veins of chlorite-sericite-quartz-calcite developed after the visible faulting, but also experienced some mild deformation.

Sample Number : RED 87-8 41m

Identification : Moderately sorted, andesitic, volcanoclastic arenite, now intensely altered to chlorite-epidote-albite-orthoclase-calcite-sericite-sphene and moderately foliated

Description :

The sample is a drill core specimen of speckled light grey and greenish grey rock. Many phenoclasts of feldspar and a few porphyritic lithic clasts are recognisable on sawn surfaces.

A cobaltinitrite staining test revealed that most plagioclase clasts show partial replacement by fine K-feldspar.

In thin section the sample is seen to be intensely altered and moderately foliated, but remnant primary textures are consistent with moderately sorted, densely packed phenoclasts and lithic clasts, mainly 0.5 to 3mm in size. There is only a minor matrix or cement, now represented by chlorite and sphene. Recognisable phenoclasts are mainly plagioclase, now heavily speckled with epidote, sericite and calcite and showing patchy replacement by clear K-feldspar, apparently orthoclase. Other phenoclasts are opaque oxide, partly altered to leucoxene. Lithic clasts have generally been stretched into lenticular shapes: many are dominated by fine albite, chlorite and sphene with a few feldspar phenocrysts, but others are quite sericitic. There are rare aggregates of fine pyrite, localized in lithic clasts.

In terms of present mineralogy the sample consists of about :

25-35%	chlorite
15-25%	epidote
15-20%	plagioclase (probably albite)
10-15%	calcite
8-10%	K-feldspar
7-9%	sericite
3-5%	sphene and leucoxenized opaques
tr	pyrite

In terms of original components it consisted of about :

50-60%	volcanic lithic clasts
40-50%	plagioclase clasts
0.5-1%	oxide clasts
5-8%	cement or muddy matrix

Comments and Interpretations :

This rock has remnant textures which are quite consistent with moderately sorted volcanoclastic arenite, composed originally of clasts of porphyritic andesitic or similar rock and phenoclasts of probably related plagioclase and opaque oxide.

The rock has been intensely altered to a propylitic mineral assemblage of chlorite-epidote-albite-calcite-sericite-sphene and moderately foliated. Traces of fine pyrite developed in a few altered lithic clasts. There was probably some introduction of potassium, to account for partial replacement of plagioclase clasts by K-feldspar.

This rock is essentially similar to that at 44.8m in RED 87-8, but more deformed, richer in replacement K-feldspar and carrying traces of pyrite.

Sample Number : RED 87-8 44.8m

Identification : Moderately sorted, andesitic, volcanoclastic arenite, now intensely altered to chlorite-albite-epidote-calcite-sericite and mildly deformed

Description :

The sample is a drill core specimen of speckled light grey and greenish grey rock. Many phenocrasts of feldspar and several examples of porphyritic lithic clasts are recognisable on sawn surfaces.

A staining test revealed minor K-feldspar occurring as partial replacements of plagioclase.

In thin section the sample is seen to be intensely altered to a propylitic mineral assemblage and mildly deformed, but remnant primary textures are recognisable as involving moderately sorted, densely packed phenocrasts and porphyritic volcanic lithic clasts, thinly cemented by chlorite and sphene.

The most abundant phenocrasts are plagioclase, about 0.3 to 4mm in size, heavily speckled with sericite, epidote and minor calcite. There are some leucoxenized oxide clasts. The lithic clasts (commonly 1 to 4mm) are more difficult to delineate, but they involve phenocrysts of altered plagioclase and oxide (and less commonly chloritized mafic phenocrysts) set in a finely recrystallized mosaic of albite, chlorite and sphene.

Disrupted segments of a fissure vein, up to 4mm wide, carry calcite and albite.

In terms of present mineralogy the rock consists of about :

35-45%	feldspar
25-30%	chlorite
10-15%	epidote
7-9%	calcite
7-9%	sphene and leucoxene
3-5%	sericite

In terms of original components it consisted of about :

50-60%	volcanic clasts of andesitic style
40-50%	plagioclase clasts
0.3-0.4%	oxide clasts
5-8%	cement or muddy matrix

Comments and Interpretations :

This rock has remnant textures which are quite consistent with moderately sorted volcanoclastic arenite, composed originally of clasts of porphyritic andesite or similar rock and related phenocrasts of plagioclase and opaque oxide.

Its mafic components have been altered to chlorite and sphene and its plagioclase clasts have been heavily altered to epidote, calcite and sericite; some have also apparently been partly replaced by K-feldspar (detected by staining, but not otherwise obvious). A fissure vein of calcite and minor albite has been disrupted by mild deformation.

There are no distinctly tuffaceous features. The detritus may have originated simply from lavas.

Sample Number : RED 87-8 105m

Identification : Moderately sorted, andesitic, volcanoclastic arenite, now heavily chloritized and lightly epidotized, but essentially undeformed

Description :

The sample is a drill core specimen of speckled light grey and greenish grey rock. Abundant clasts of feldspar are recognisable.

A staining test revealed no K-feldspar.

In thin section the sample plainly displays moderately sorted, densely packed subangular to subrounded clasts of plagioclase, finely porphyritic andesitic rock, and altered oxide set in a non-foliated cement of chlorite and sphene. The clasts are mainly about 0.4 to 3mm in size.

The plagioclase is apparently oligoclase or andesine and lightly altered to sericite and epidote. The oxide clasts have been heavily altered to leucoxene and in some cases sphene. The andesitic clasts retain most of their plagioclase, but mafic components have altered to sphene and chlorite.

In terms of present mineralogy the rock consists of about :

55-65%	plagioclase
25-30%	chlorite
7-9%	epidote
5-7%	sphene and leucoxene
1-2%	sericite

In terms of original components it consisted of about :

40-45%	plagioclase clasts
25-30%	andesitic lithic clasts
0.5-1%	oxide clasts
25-35%	cement or matrix, now chloritic

Comments and Interpretations :

This rock has textures plainly consistent with moderately sorted volcanoclastic arenite composed of clasts of plagioclase, clasts of andesite and clasts of opaque oxide. The source materials were probably lavas, since there are no distinctly tuffaceous components.

The rock has been heavily chloritized and lightly epidotized and sericitized. There is very little deformation and no foliation.

It seems that the three samples from 105m, 44.8m and 41m in RED 87.8 represent quite similar andesitic volcanoclastic arenites, but there is an increase in the intensity of alteration and deformation up the hole.

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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) 892 1789
A/H 378 6467

PETROLOGICAL REPORT ON NINETEEN SAMPLES
FROM THE MOUNT READ VOLCANICS, TASMANIA

prepared for

BILLITON AUSTRALIA

Order No. : 08458

Ref : C.J. Creagh

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

29th July, 1988.

Sample Number : 15701 REJ 88-1 65-1

Identification : Andesitic volcanolithic arenite with heavy propylitic alteration, moderate foliation and probable potassium metasomatism

Description :

The sample is a specimen of drill core displaying coarsely sandy textures of volcanoclastic style, involving densely packed very light grey clasts of feldspar, a few dark greenish grey clasts and many subtle volcanic lithic clasts set in a greenish grey matrix.

A cobaltinitrite staining test revealed that many plagioclase clasts have been partly replaced by K-feldspar. Fine K-feldspar was also revealed in some volcanic lithic clasts.

In thin section the sample displays heavy alteration and moderate shear foliation, but primary textures involve moderately sorted, densely packed mineral and lithic clasts which are mainly 0.5 to 3mm in size. There is a foliated, chloritic minor matrix.

There are many phenoclasts of plagioclase, all moderately epidotized and in some cases also carrying orthoclase, sericite and calcite. There are some clasts of opaque oxide and related leucoxenized clasts. Some chlorite-leucoxene aggregates may represent mafic silicate clasts. There are many volcanic lithic clasts, commonly stretched, finely chloritic and albitic, and not very obvious; however, there are some quite distinctly preserved porphyritic andesitic lithic clasts with heavy alteration to epidote, albite, chlorite and leucoxene.

There are several deformed and cross-foliated fissure veins (up to 2mm wide) composed of calcite and chlorite.

Very fine pyrite occurs as an abundant component of a few epidotized lithic clasts.

An approximate mode is :

40-45%	plagioclase clasts, moderately epidotized and altered in other ways
40-45%	altered andesitic lithic clasts
1-2%	opaque oxide clasts and leucoxenized derivatives
1-2%	chloritized and leucoxenized mafic silicate clasts
5-10%	chloritic matrix
tr	pyrite, confined to a few lithic clasts
2-3%	fissure veins of calcite and chlorite.

Comments and Interpretations :

This rock is interpreted to be a coarsely sandy textured epiclastic sediment of andesitic derivation. It originally consisted of about an equal mix of clasts of andesitic lava and related phenoclasts. It has since experienced heavy alteration to a propylitic mineral assemblage, veining and moderate foliation.

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Very fine pyrite occurs as abundantly disseminated grains in a few altered andesitic clasts : it is unclear whether the clasts were mineralized before sedimentation or selectively impregnated during the pervasive alteration.

The rock carries about 8% K-feldspar partly replacing plagioclase and lithic clasts : it was probably introduced metasomatically.

091

Sample Number : 15702 RLD 88-1 93-Identification : Meta-basalt (or "greenstone")Description :

The sample is a drill core specimen of altered, fine-grained, greenish grey rock with subtle darker greenish grey, altered phenocrysts.

A cobaltinitrite staining test revealed about 10% K-feldspar as fine grains outlining groundmass laths.

In thin section the sample is seen to be intensely altered, but well preserved primary textures are of porphyritic, hypidiomorphic, holocrystalline volcanic style. Abundant phenocrysts are about 0.5 to 3mm in size and the groundmass was dominated by feldspar laths about 0.3mm long.

The phenocrysts have crudely equant, prismatic shapes of pyroxene style : they have been pseudomorphed by chlorite and tremolite, accompanied in some cases by epidote, sphene or calcite. There are less abundant intensely sericitized and epidotized plagioclase phenocrysts. The groundmass has finely epidotized, partly recrystallized and potassium feldspathized plagioclase laths, leucoxene pseudomorphs of primary oxide grains, and tremolite with subordinate epidote and chlorite after mafic silicates.

There is a fissure vein, about 0.5mm wide, containing calcite, subordinate epidote and minor, poorly twinned microcline.

An approximate mode is :

20-30%	phenocrysts of inferred pyroxene, pseudomorphed by mainly chlorite and tremolite
2-3%	phenocrysts of plagioclase, intensely sericitized and epidotized
30-40%	groundmass plagioclase, epidotized and potassium feldspathized
30-40%	groundmass mafic silicates, now tremolite with some epidote and chlorite
3-5%	groundmass leucoxene after primary oxides
0.4-0.6%	fissure vein of calcite-epidote-microcline

Comments and Interpretations :

This rock is interpreted to have originated as basalt, of probably calc-alkali type, composed of many phenocrysts of pyroxene and a few of plagioclase set in a groundmass of pyroxene, plagioclase and opaque oxide.

Low grade metamorphism, with little accompanying deformation, has converted the basalt to a greenstone assemblage, dominated by tremolite, chlorite, epidote and leucoxene. Remnant plagioclase shows some potassium feldspathization and microcline is a minor component of a fissure vein of calcite with epidote. It seems likely that the potassium was introduced during recrystallization of the rock.

Sample Number : 15703 QED 88-1 252.4-

Identification : Graphitic and chloritic slate/phyllite cut by fissure veins of cassiterite-pyrite-quartz-chlorite-calcite-arsenopyrite-chalcopyrite

Description :

The sample is a small specimen of drill core, displaying dark greenish grey, slaty to phyllitic rock cut by irregular veins rich in brassy pyrite and brown cassiterite.

In thin section the host rock is seen to have crenulated, finely foliated textures and to consist of about 5% fine graphite, 1% quartz and/or feldspar fine silt and the rest chlorite.

The host rock is cut by mildly deformed, irregular fissure veins, about 0.5 to 3mm wide, carrying sulphides, cassiterite, quartz, calcite and chlorite.

In polished section the sulphides are seen to be mainly subhedral cubes of pyrite mainly 0.3 to 3mm, but there are a few patches of finer arsenopyrite (mainly less than 0.4mm) and a few small, short veinlet-like aggregates of chalcopyrite mainly hosted by calcite. Cassiterite is abundant and occurs as semi-massive aggregates of anhedral, equant, yellowish brown grains about 0.1 to 0.4mm in size. Quartz was anhedral to toothy with grainsizes ranging up to 2mm; it is now strained and recrystallized to varying degrees to smaller grainsizes. Calcite (about 0.1 to 0.3mm) occurs with cassiterite more than pyrite; there is local remobilization along fractures in pyrite and other minerals. Chlorite hosts the sulphide and cassiterite where quartz is deficient.

An approximate composition of the vein component of the sample is :

40-50%	cassiterite
25-35%	pyrite
10-20%	quartz
7-9%	chlorite
2-4%	calcite
0.2-0.3%	arsenopyrite
0.1-0.2%	chalcopyrite

Comments and Interpretations :

This rock originated as carbonaceous shale (or more strictly claystone), was converted to graphitic, chloritic slate/phyllite by regional metamorphism, and was then fractured and fissure veined. Mild deformation succeeded the veining.

The fissure veins are rich in cassiterite and pyrite, carry a significant amount of quartz and chlorite and calcite and have traces of arsenopyrite and chalcopyrite. Grainsizes are medium to coarse. The composition and grainsizes of the veins are suggestive of a granitoid source.

Sample Number : 15704 R.C.S 88-2 34

Identification : Andesitic volcanolithic coarse arenite with heavy propylitic alteration and moderate foliation

Description :

The sample is a drill core specimen displaying coarsely sandy textures of volcanoclastic appearance, involving densely packed very light grey clasts of feldspar and subtle greenish grey and light grey lithic clasts set in a greenish grey matrix.

A staining test revealed no K-feldspar.

In thin section the sample displays heavy alteration and moderate shear foliation, but primary textures involve moderately sorted, densely packed mineral and lithic clasts which are mainly about 0.5 to 5mm. There is a minor matrix of foliated chlorite.

The mineral clasts are mainly prismatic plagioclase with moderate alteration to sericite, subordinate epidote and some calcite. There are also some leucoxene pseudomorphs of opaque oxides and some chlorite-leucoxene pseudomorphs of mafic silicates. Lithic clasts are commonly inconspicuous, being deformed aggregates of mainly fine albite and chlorite; they carry phenocrysts analogous to the mineral clasts. A few clasts are less deformed and recognisably andesitic.

Fine pyrite is confined to a finely felsic lithic clast.

A deformed fissure vein, about 0.5mm wide carries albite, calcite and chlorite.

An approximate mode is :

55-60%	plagioclase clasts, moderately altered to sericite-epidote-calcite
30-35%	altered and deformed andesitic lithic clasts
2-3%	chloritized and leucoxenized mafic silicate clasts
0.5-1%	leucoxenized oxide clasts
5-7%	chloritic matrix
rare	pyrite, confined to a lithic clast
0.5-0.7%	fissure vein of albite-calcite-chlorite

Comments and Interpretations :

This sample is essentially similar to Sample 15701 : it is a little coarser, more feldspathic, carries less epidote and lacks K-feldspar. In essence it is interpreted to be an epiclastic sediment derived from andesitic detritus. It has since experienced heavy alteration to a propylitic mineral assemblage and moderate shear foliation.

Pyrite is confined to a lithic clast.

Veining by albite-calcite-chlorite preceded deformation.

Sample Number : 15705 REX 88-2 75.55.

Identification : Andesitic volcanolithic arenite with heavy propylitic alteration and moderate foliation

Description :

The sample is a drill core specimen displaying coarsely sandy textures of volcanoclastic style, involving densely packed clasts of mainly light greenish grey, altered feldspar set in a greenish grey matrix.

A staining test revealed no K-feldspar.

In thin section the sample displays heavy alteration and moderate shear foliation, but primary textures involve moderately sorted, densely packed mineral and lithic clasts which are mainly about 0.3 to 2mm. There is a foliated matrix of chlorite.

There are many subhedral phenocrasts of plagioclase, all moderately sericitized and lightly carbonated. Small clasts of mafic silicate are now chlorite-leucoxene aggregates, and former opaque oxides are now leucoxene. A few altered lithic clasts of porphyritic andesitic style are plainly recognisable, but many others are less obvious, being stretched, finely albitic and chloritic aggregates. Very fine pyrite occurs in one altered plagioclase clast and in a lithic clast.

There are a few thin, deformed fissure veins (about 0.2mm wide) of albite with calcite. A few clasts have been selectively replaced by fine clear albite.

An approximate mode is :

50-55%	plagioclase clasts, moderately sericitized and lightly carbonated
35-40%	altered and deformed andesitic lithic clasts
2-3%	chlorite-leucoxene pseudomorphs of mafic silicate clasts
1-2%	leucoxenized oxide clasts
5-10%	chloritic matrix
rare	pyrite
0.5-0.7%	albite-calcite fissure veins

Comments and Interpretations :

This rock is considered to have originated as volcanolithic arenite, essentially similar to Samples 15701 and 15704, but with clast sizes transitional between the two. There has been heavy alteration of propylitic style, but with sericite dominating the alteration of the plagioclase. Perhaps there is a zonal trend expressed by epidote dominating in 15701, epidote and sericite in 15704 and sericite in 15705. Chlorite, leucoxene and calcite are constant associates in all three samples.

Fissure veins which predated deformation carried albite and calcite. Pyrite is rare and developed in feldspar and in a lithic clast.

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Sample Number : 15706 RCD 88-2 106.5Identification : Chloritic, andesitic volcanolithic arenite
with mildly deformed veins of albite-calcite-
chlorite-quartzDescription :

The sample is a drill core specimen of greenish grey, chloritic, andesitic rock but with poorly sorted, sandy volcanoclastic textures. There are several hard, light grey fissure veins, ranging up to about 4mm wide.

A staining test revealed no K-feldspar.

In thin section the sample displays poorly sorted, densely packed subrounded and subangular clasts of chloritized porphyritic andesite and a few mineral clasts set in a mildly foliated minor matrix of chlorite and leucoxene. Clasts range in size from about 0.2 to 4mm.

The lithic clasts show minor variations in texture, but commonly involve fresh to slightly sericitized and carbonated phenocrysts of plagioclase (ranging from tiny to at least 1mm) and a few chloritized mafic phenocrysts set in a groundmass of variously randomly aligned plagioclase laths with interstitial chlorite and leucoxene. A few are sparsely amygdaloidal in albite, calcite and chlorite.

Mineral clasts are plagioclase and a few chloritized and leucoxenized mafic silicates and oxides.

Numerous fissure veins, ranging up to 4mm wide, are dominated by anhedral, untwinned fine albite and calcite (0.03 to 0.3mm), but carry minor chlorite and quartz. The veins have been deformed by the foliation which pervades the rock. Sparse lithic clasts have been replaced by similarly fine albite and minor calcite and chlorite.

An approximate mode is :

70-80%	clasts of chloritized andesite
0.5-1%	albitized lithic clasts
5-10%	plagioclase clasts
tr	chloritized and leucoxenized mafic mineral clasts
4-6%	matrix chlorite and leucoxene
10-12%	veins of albite-calcite-chlorite-quartz

Comments and Interpretations :

This rock is considered to have originated as a volcanolithic arenite, composed of poorly sorted clasts of andesite and derived phenocrysts. Mafic minerals have been converted to chlorite and leucoxene, but plagioclase shows little obvious alteration.

Numerous thin and thick fissure veins carry mainly albite and calcite, but with some chlorite and quartz. A few lithic clasts have been replaced by similar minerals. Mild shear foliation post-dates the veining.

Sample Number : 15707 260 88-2 2239~.

Identification : Massive sulphide (probably vein material)
composed of pyrite-arsenopyrite-calcite-
chalcopyrite-chlorite-sphalerite

Description :

The sample is a small specimen of drill core composed of massive fine to medium-grained sulphides. The bulk colour of the sawn surfaces is medium dark grey, but some brassy pyrite is also visible.

In thin section the sample is confirmed to consist mainly of sulphides. The minor transparent matrix consists mainly of carbonate (apparently calcite), but there are a few patches of fine, pale chlorite and rare, anhedral grains of quartz (up to 0.4mm).

In polished section the sulphides are seen to be dominated by about equal amounts of subhedral pyrite and arsenopyrite. The former is the coarsest (about 0.05 to 1.5mm), occurring as fairly massive aggregates and as some scattered cubes; the arsenopyrite tends to be finer (0.03 to 0.5mm) and occurs partly as aggregates with carbonate and partly as a subordinate, interstitial mineral in pyrite areas. The arsenopyrite crystals are about equidimensional and commonly cracked. Pyrite shows minor cracking.

Chalcopyrite occurs as one patch about 3mm by 3mm and as sparse smaller anhedral grains. There are also examples of anhedral sphalerite (ranging up to about 0.5mm) thickly rimmed by chalcopyrite and interstitial pyrite and arsenopyrite

Several late, very thin (up to 0.05mm thick) fracture veins carry calcite.

An approximate mode is :

40-45%	pyrite
35-40%	arsenopyrite
10-15%	calcite
2-3%	chalcopyrite
1-2%	chlorite
0.3-0.5%	sphalerite

Comments and Interpretations :

This sample consists of essentially massive sulphides with a minor matrix of carbonate and subordinate chlorite.

The sulphides do not seem to be bedded, include some relatively coarse grainsizes, and feature much arsenopyrite. In my opinion the sample is more likely to represent massive vein sulphides than syngenetic sulphides.

Sample Number : 15708 RCD 883 55.5

Identification : Intensely albitized, sericitized, chloritized, carbonated and leucoxenized andesitic lava with an epidotized and more chloritic fragmental (?) contact zone

Description :

The sample is a specimen of drill core, displaying mainly greenish grey, altered fine-grained rock cut by many fine, pale olive and some thicker, pinkish grey veins. One end of the core is darker, more chloritic and of fragmental appearance; it also has a 20mm orange pink clast.

A staining test revealed that the orange pink material is partly K-feldspar.

In thin section the bulk of the specimen is seen to be intensely altered but there are plainly recognisable, finely porphyritic, hypidiomorphic crystalline volcanic textures. Phenocrysts were about 0.3 to 0.7mm and the groundmass featured moderately flow-aligned feldspar laths about 0.2mm long.

The phenocrysts of inferred plagioclase have been completely finely albitized and carbonated. The groundmass plagioclase has been heavily sericitized, mafic silicates have been completely chloritized and oxides have been leucoxenized.

Irregular fracture veins (up to 4mm thick) carry outer zones of very fine, untwinned albite and a core of coarser, anhedral calcite and in one case some quartz. Later, finer (0.1mm wide) fracture veins carry a very cloudy, fine epidote group mineral.

The darker, chloritic end of the specimen has quite different textures of fragmental and possibly amygdaloidal style. There are many sericitized 1mm clasts of plagioclase set in a cellular matrix of chlorite and fine epidote. The pebble-sized pink clast is a piece of heavily altered coarsely porphyritic, finely amygdaloidal latite: it has 0.5 to 2mm sericitized and epidotized feldspar phenocrysts and smaller carbonated phenocrysts set in an epidotized very finely feldspathic groundmass with quartzose amygdaloids.

An approximate mode of the drill core is :

65-75%	intensely altered, finely crystalline andesite
10-15%	richly chloritized and epidotized, fragmental and amygdaloidal regime
4-6%	pink clast of latite
8-10%	veins of albite-calcite(-quartz)
2-3%	veins of cloudy fine epidote

The composition of the main andesitic regime is :

15-20%	completely albitized and carbonated feldspar phenocrysts
55-65%	heavily sericitized groundmass plagioclase
15-20%	chlorite
3-5%	leucoxene

098

Comments and Interpretations :

The bulk of this specimen clearly possesses remnant textures of finely porphyritic, andesitic style, but one end of the specimen has some fragmental and probably amygdaloidal textures. Probably the specimen represents andesite lava and an upper or lower amygdaloidal, flow brecciated contact zone with incorporated feldspar sand and a latite rock fragment. The simple andesite is intensely albitized, sericitized, chloritized, carbonated and leucoxenized. The breccia zone is more chloritic and also epidotized.

Thick fracture veins carry fine albite, coarser calcite and some quartz. Thinner, later veins carry cloudy fine epidote.

099

Sample Number : 15709 RCA 88-3 73.
Identification : Albite-chlorite-calcite augen schist
Description :

The sample is a well foliated, fine-grained greenish grey rock with disseminated lenticular clasts or augen.

A staining test revealed no K-feldspar.

In thin section the sample displays strongly foliated textures deviating around lenticular rigid augen which are commonly about 5mm in length.

Most of the augen consist of aggregates of anhedral calcite (about 0.2 to 0.5mm grainsize) with subordinate, finer, anhedral, untwinned albite (about 0.02 to 0.03mm). Some also contain minor chlorite and several carry leucoxenized oxide grains (about 0.2 to 0.4mm). One of the largest augen has deformed, abundantly feldspar porphyritic, andesitic textures and carries calcite, sericite, remnant plagioclase, chlorite and leucoxene.

The foliated matrix is dominated by anhedral, elongated calcite (about 0.02 to 0.03mm), but with minor fine chlorite, anhedral, untwinned, fine albite, and leucoxene.

There are a few pyrite crystals (0.2 to 1mm) with strain shadows of chlorite and calcite.

An approximate mode is :

20-25%	heavily carbonated, finely albitic and related augen
70-75%	matrix calcite
2-3%	matrix chlorite
1-2%	matrix albite
tr	matrix leucoxene
tr	pyrite

Comments and Interpretations :

This rock is an augen schist, apparently generated by shearing of an intensely carbonated rock. The augen represent rigid remnants of heavily carbonated but also finely albitized rock. In a few cases there are remnant indications that the augen represent intensely altered porphyritic andesite.

There is no sound basis on which to judge whether the original rock was andesite lava, now intensely carbonated and sheared, or some fragmental rock with clasts of andesite set in a finer, more easily carbonated and sheared matrix.

A few grains of pyrite were in existence prior to shearing : they have strain shadows of calcite and chlorite.

Sample Number : 15711 MORUMISON MINE

Identification : Moderately foliated, mildly chloritic,
moderately sericitic, slightly pyritic,
dacitic volcanolithic arenite

Description :

The sample is a superficially weathered hand specimen of moderately foliated, sandy textured, volcanoclastic rock. It is greenish grey but rich in phenoclasts of light grey feldspar and transparent quartz.

A staining test revealed about 8% K-feldspar as fine grains in lithic clasts and microveining plagioclase.

In thin section the sample displays well sorted, densely packed lithic clasts and related phenoclasts, about 0.5 to 3mm in size, with a minor, foliated, sericitic matrix.

The lithic clasts have subrounded, but stretched shapes. They are finely quartzofeldspathic (about 0.01 to 0.02mm grainsize) and many carry phenoclasts or possibly phenocrysts of plagioclase and quartz; fine chlorite and sericite are minor components. There are hints of welded tuffaceous textures. The mineral clasts are broken but subhedral phenocrysts of plagioclase (largely unaltered) and quartz. There are a few sphene aggregates after possible oxides and chlorite after possible biotite. Sericite occurs in some feldspar and rock fragments as well as forming a matrix.

There are sparsely disseminated cubes (less than about 0.1mm) and small aggregates of pyrite. Fine untwinned albite and coarser calcite occurs in several deformed fracture veins (up to 0.5mm wide).

An approximate mode is :

60-70%	lithic clasts of lightly chloritized dacite or tuff
10-15%	discrete phenoclasts of plagioclase
5-7%	discrete phenoclasts of quartz
tr	sphene and chlorite after mafic clasts
15-20%	sericite (in the matrix and in clasts)
tr	disseminated pyrite
0.2-0.3%	veins of albite-calcite

Comments and Interpretations :

This rock has hand specimen characteristics which might well see it classified as crystal tuff. However microscopic examination indicates sandy, well sorted textures involving fragments of dacitic rock (probably welded tuff rather than lava) and related phenoclasts of mainly plagioclase and quartz. Erosion, transport and deposition by water is implied.

The rock is moderately sericitic, mildly chloritic, slightly pyritic and moderately foliated.

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Sample Number : 15712 MURKINSON GRD. (E of M.L.).Identification : Moderately foliated, moderately chloritic, mildly sericitic, dacitic volcanolithic areniteDescription :

The sample is a superficially weathered hand specimen of greenish grey, moderately foliated, sandy textured volcanoclastic rock, rich in clasts of quartz.

A staining test revealed no K-feldspar.

In thin section the sample displays well sorted, densely packed, stretched lithic clasts and many phenoclasts, about 0.4 to 2mm. The lithic clasts and a minor matrix are rich in foliated fine chlorite; sericite occurs locally.

The most common phenoclasts are quartz. There are only a few plagioclase clasts. Leucoxene pseudomorphs many small clasts of inferred opaque oxide and chlorite replaces inferred mafic silicates. Lithic clasts in some cases consist of fine mosaics of untwinned plagioclase, quartz and chlorite; in other cases there are phenoclasts of quartz in a similar fine mosaic.

An approximate mode is :

55-65%	lithic clasts of chloritized dacite or recrystallized tuff
30-35%	discrete phenoclasts of quartz
0.5-1%	discrete phenoclasts of plagioclase
0.5-1%	leucoxenized clasts
1-2%	chloritized mafic clasts
4-6%	sericite

Comments and Interpretations :

This sample is likely to be described at hand specimen scale as crystal tuff, but in detail it shows well sorted sandy textures involving chloritized and finely recrystallized lithic clasts of dacite (or quite probably dacitic welded tuff) and many phenoclasts of mainly quartz. Erosion of welded tuff and sorting and deposition of resultant detritus by water is deduced.

The rock is broadly similar to Sample 15711, except that the alteration is chloritic, there were few feldspar clasts and many quartz clasts, and there is no pyrite. A moderate shear foliation has stretched lithic clasts and aligned chlorite.

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Sample Number : 15713 Murchison Grid.Identification : Well foliated, chloritized, intensely sericitized probable pumiceous vitric tuffDescription :

The sample is a slightly weathered hand specimen of well foliated greenish grey rock with suggestions of tuffaceous textures.

A staining test revealed no K-feldspar.

In thin section the sample is seen to be rich in well foliated, fine sericite, accompanied by subordinate chlorite. There are some stretched fiamme style structures, about 1 to 5mm long and generally mainly composed of sericite. A few other lenticular to ragged clasts carry some fine quartz and untwinned plagioclase as well as sericite and chlorite; one carries several broken phenocrysts of quartz and another carries several apatite phenocrysts. There are rare angular phenocrysts of quartz (up to 0.4mm), a few heavily sericitized feldspar phenocrysts and a few oxide clasts. Other finer grains of opaque oxide are unevenly disseminated.

An approximate mode is :

80-90%	sericite
10-15%	fine quartz and feldspar
3-5%	chlorite
0.2-0.3%	fine opaque oxide
tr	plagioclase phenocrysts
tr	oxide phenocrysts
rare	apatite phenocrysts
rare	quartz clasts and phenocrysts

Comments and Interpretations :

This rock has a well developed shear foliation and consists mainly of sericite. Remnant textures fairly strongly suggest a formerly tuffaceous rock involving sparse phenocrysts of quartz and feldspar and many fiamme of probable pumice; the matrix may well have been vitric, but there are no remnant textures.

The original rock was apparently leucocratic and probably acid. It is impossible to judge whether it was potassic or calcic because of the intense sericitization.

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Sample Number: 15714 *MORNING GLD : 376802*
385570L

Identification: Foliated poorly sorted lithic sandstone
 (greywacke)

Description:

The sample is a lightly weathered, hand specimen of finely porous, olive grey rock with foliated sandy textures.

A staining test revealed some lenticular, finely potassic clasts.

In thin section the sample displays well foliated, poorly sorted, densely packed, sandy textures. Mineral clasts range in size from about 0.1 to 1mm and lithic clasts, commonly quite stretched, are about 0.3 to 2mm long. There is a minor matrix of foliated, iron-stained sericite and pores after probable carbonate.

The mineral clasts are mainly subangular to subrounded, equant quartz. There are a few clasts of plagioclase, several of muscovite and a few iron-stained sericitized clasts of probable biotite. Many of the least deformed lithic clasts resemble fine quartzite or recrystallized chert (about 0.02mm quartz sizes) with a few flecks of sericite and with small rhombic pores after carbonate. Some similarly rigid clasts are finely quartzofeldspathic and of broadly rhyolitic style. The most common and most deformed clasts are silty and slaty fragments composed of fine quartz with varying amounts of fine sericite and carbonaceous matter or graphite. A few small rigid clasts are microgranitoid, consisting of quartz, plagioclase and orthoclase.

An approximate mode is:

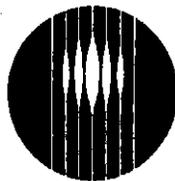
45-55%	slaty clasts
15-20%	clasts of fine quartzite or recryst. chert
10-15%	quartz clasts
5-10%	rhyolitic clasts
0.5-1%	granitoid clasts
0.2-0.3%	feldspar clasts
tr	mica clasts
8-10%	sericitic matrix
3-5%	matrix pores after carbonate

Comments and Interpretations

This rock is a poorly sorted lithic sandstone which appears to qualify for description as greywacke or at least subgreywacke. Deposition was probably by turbidite processes. Source materials were carbonaceous and non-carbonaceous slates, fine quartzite or recrystallized chert, granitoid rock and minor volcanic rock of rhyolitic or rhyodacitic type. The slaty clasts have been stretched or compressed and there is a foliated matrix of sericite and inferred carbonate (now pores).

APPENDIX 3
Pb ISOTOPE COMPOSITIONS REPORT.

105
Sirotope



CSIRO
AUSTRALIA

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

701106

Chief: Dr. B.J.J. Embleton

REPORT TO SHELL AUSTRALIA
ON
THE Pb
ISOTOPE COMPOSITIONS
OF
EXPLORATION SAMPLES
FROM THE Mt READ VOLCANICS
NORTHWEST TASMANIA

GRAHAM R. CARR
21/10/88

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

Floreat Park
Location: Underwood Avenue, Floreat Park
Postal Address: CSIRO Private Bag, PO Wembley WA 6014
Telephone: (09) 387 4211
Telex: AA9217R

Lindfield
Location: Bradfield Road, Lindfield
Postal Address: PO Box 218, Lindfield NSW 2070
Telephone: (02) 467 6733
Telex: AA26296

SUMMARY

THE Pb ISOTOPE COMPOSITIONS OF EXPLORATION SAMPLES FROM THE CATTLEY RANGE ARE CONSISTENT WITH DERIVATION FROM FLUIDS WITH A SIMILAR ORIGIN TO THOSE RESPONSIBLE FOR THE FORMATION OF THE CAMBRIAN MASSIVE SULFIDE DEPOSITS OF THE REGION. IN CONTRAST, LAKESIDE, MURCHISON MINE SITE AND THE STERLING VALLEY MINE ALL HAVE A HIGH PROBABILITY OF BEING RELATED TO DEVONIAN THERMAL EVENTS.

1. AIM

The aim of this study has been to determine the Pb isotopic compositions of geological exploration samples from the Cattley Range, Lakeside, Murchison Mine site and Sterling Valley Mine site in northeastern Tasmania and compare them with the known signatures for volcanogenic mineralization associated with the Mt Read Volcanics and vein mineralization associated with Devonian thermal events.

2. SAMPLES

A total of 13 samples from the 4 prospects were received for analysis (Table 1). The Pb contents varied from 650ppm to over 30%.

3. TARGET SIGNATURES

The Pb isotopic signature of mineralization from this region has been thoroughly studied over the past decade. Massive sulfide mineralization such as Rosebery, Que River and Hellyer have homogeneous isotopic compositions. On Figures 1 and 2 the data from each of these deposits are represented by 95% confidence ellipses which plot as overlapping fields. Devonian vein mineralization on the other hand is generally far less homogeneous in any one deposit (see for e.g the range for Queen Hill mineralization in Figs. 1 and 2) and there is broad range of distributions with $^{206}\text{Pb}/^{204}\text{Pb}$ values of between about 18.43 to over 18.7.

4. METHODS

A 0.1g subsample of the pulverised drill core material was leached in a solution of 7N HNO_3 + 7N HCl in sealed Savillex teflon beakers. The solutions were centrifuged and passed through

anion exchange resin columns prior to electroplating onto Pt electrodes. The two galena samples were dissolved in HNO_3 prior to electroplating as above. The purified Pb was analysed for its isotopic composition on a VG Isomass 54E solid source mass spectrometer in fully automated mode. The precision estimates of the method are presented graphically in the top left hand corner of the accompanying diagrams and are based on over 1000 analyses of standards.

5. RESULTS

1. Of the 6 samples from the Cattley Range prospect, 5 form a homogeneous cluster which overlaps the Cambrian massive sulfide signatures (Table 2, Figs 1 and 2). Sample Cattley 3 (10400N, 11792E) contains a higher proportion of radiogenic Pb (i.e. higher $6/4$ etc.) and plots outside the Cambrian signature and at the least radiogenic end of the Devonian fields.

2. The Lakeside and Murchison mine site samples have $^{206}\text{Pb}/^{204}\text{Pb}$ ratios of greater than about 18.6. On both Figures 1 and 2 they plot in or near the field for Devonian mineralization at Queen Hill.

3. The Sterling Valley mine site samples plot between the Cambrian massive sulfide and the Queen Hill signatures. Other Devonian mineralization such as Mt Farrell have similar isotopic compositions.

6. DISCUSSION AND CONCLUSIONS

1. The Pb isotopic composition of the Cattley Range mineralization is consistent with derivation from fluids with a similar origin to those responsible for the formation of the

Cambrian massive sulfide deposits of the region. The single Cattle Range sample which contains more radiogenic Pb than the the Cambrian Massive sulfides may indicate overprinting by Devonian vein mineralization or it may result from radiogenic addition of Pb since the Cambrian due to higher than normal U contents. Whichever explanation is correct, this single enigmatic result does not detract from the relatively high exploration priority that is assigned to this prospect.

The possibility that the Cambrian signature at Cattle Range is related to the intrusion of granitoids can only be addressed indirectly. There is no information in the SIROTOPE database on mineralization that has been definitely ascribed to the Cambrian granitoids. Mineralization such as at Lake Selina which may be related to plutonic rather than volcanic events has similar isotopic compositions to the massive sulfide signatures. We would expect there to be some isotopic contrast between two such events, especially in the $^{208}\text{Pb}/^{204}\text{Pb}$ ratios. Until we have hard information on the isotopic composition of the granites we can only suggest that mineralization that has the massive sulfide signature and can be seen to be associated with the Mt Read Volcanics is unlikely to be related to Cambrian granites.

2. Mineralization at Lakeside, Murchison Mine site and Sterling Valley mine site all have a high probability of being related to Devonian thermal events and as such would be considered to have only a low probability of representing significant base metal resources.

TABLE I

LEAD ISOTOPE SAMPLES

<u>PROJECT</u>	<u>LOCATION</u>	<u>SAMPLE NO</u>	<u>SAMPLE TYPE</u>	<u>PB ASSAY</u>
CATTLEY RANGE	1 10400N 11757.5E		Costean	1020ppm
	2 10400N 11792E		Costean	1040ppm
	3 9600N 11105E		Costean	880ppm
	4 10600N 11750E		Auger	910ppm
	5 10400N 11750E		Auger	650ppm
	6 CRD86-1 191.8-193.8m	13526	Drill Core	1700ppm
LAKESIDE	RED 87-3 112-113m	14055	Drill Core	0.23%
	RED 87-6 118.6-119.9m	13832	Drill Core	0.71%
	RED 86-1 126.05-126.9m	13631	Drill Core	30.7%
MURCHISON	Mine Site	MP30-250	Drill Core	3250
		MP32-323.6	Drill Core	1850
STERLING VALLEY	Mine Site	3036	Rock Chip	2.72%
		3039	Rock Chip	12.43%

Table 2. Lead isotope ratios of Mt Read Volcanic samples - Billiton.

sample	$\frac{208 \text{ Pb}}{206 \text{ Pb}}$	$\frac{207 \text{ Pb}}{206 \text{ Pb}}$	$\frac{206 \text{ Pb}}{204 \text{ Pb}}$	$\frac{207 \text{ Pb}}{204 \text{ Pb}}$	$\frac{208 \text{ Pb}}{204 \text{ Pb}}$	Pb(
ATTLEY RANGE						
1 CATTLEY 1	2.0813	0.8523	18.280	15.581	38.048	
2 CATTLEY 2	2.0757	0.8468	18.428	15.604	38.250	
3 CATTLEY 3	2.0825	0.8524	18.281	15.583	38.069	
4 CATTLEY 4	2.0813	0.8527	18.258	15.569	38.000	
5 CATTLEY 5	2.0813	0.8515	18.316	15.596	38.121	
6 CATTLEY 6	2.0824	0.8528	18.288	15.596	38.084	1
AKESIDE						
1 L'SIDE 14055	2.0703	0.8396	18.603	15.619	38.515	
2 L'SIDE 13832	2.0672	0.8373	18.644	15.611	38.541	
3 L'SIDE 13832R	2.0681	0.8375	18.663	15.631	38.599	
4 L'SIDE 13631	2.0690	0.8387	18.612	15.610	38.509	
5 L'SIDE 13631R	2.0686	0.8388	18.601	15.603	38.477	
MURCHISON MINE SITE						
1 MURCHISON 30	2.0713	0.8401	18.584	15.612	38.492	
2 MURCHISON 32	2.0716	0.8401	18.604	15.629	38.540	
TERLING VALLEY MINE SITE						
1 STERL V 3036	2.0755	0.8458	18.455	15.609	38.305	
2 STERL V 3039	2.0756	0.8464	18.422	15.592	38.236	

.. "R" denotes repeat analysis.

.. Pb contents for Cattley Range determined by isotope dilution.

Fig. 1

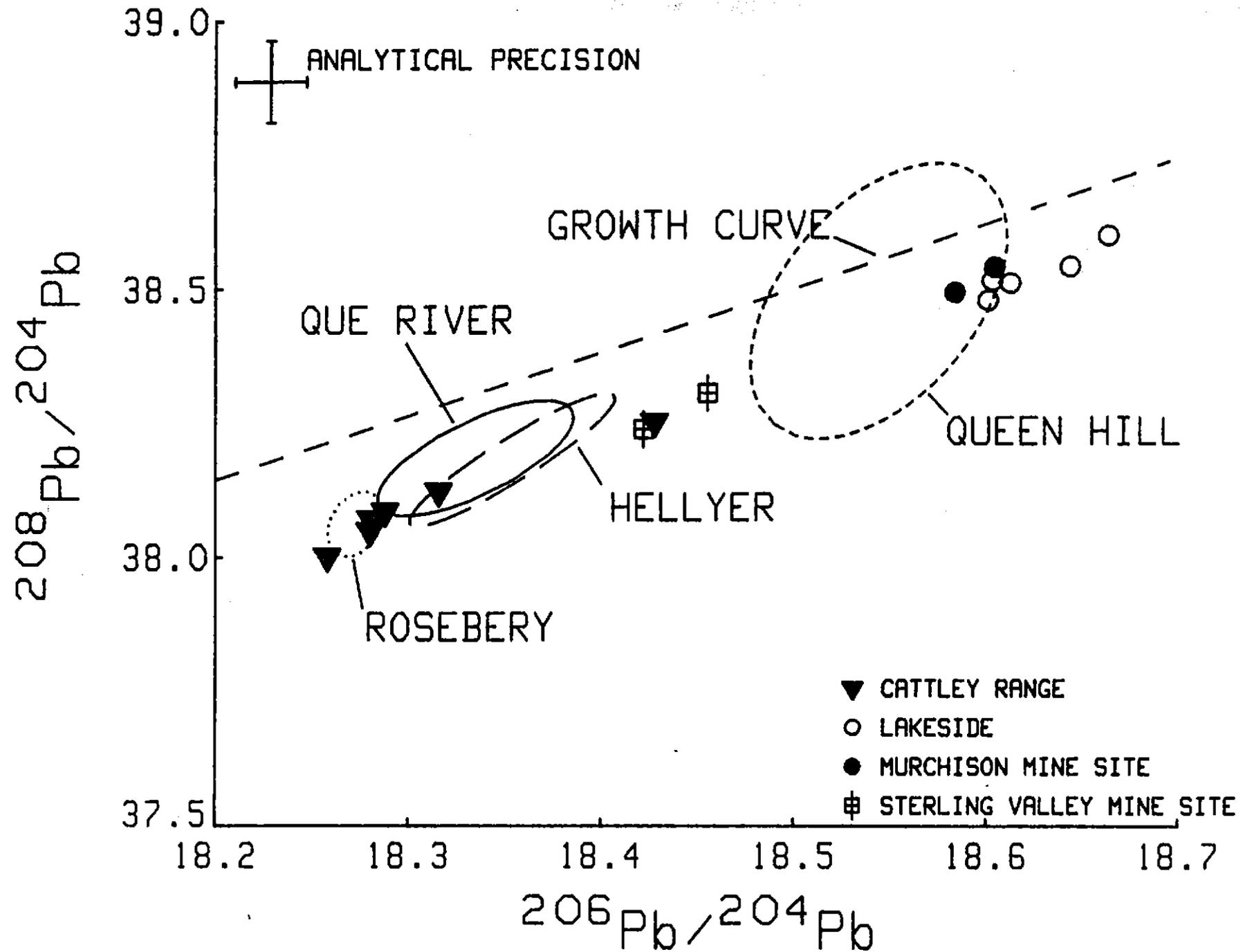
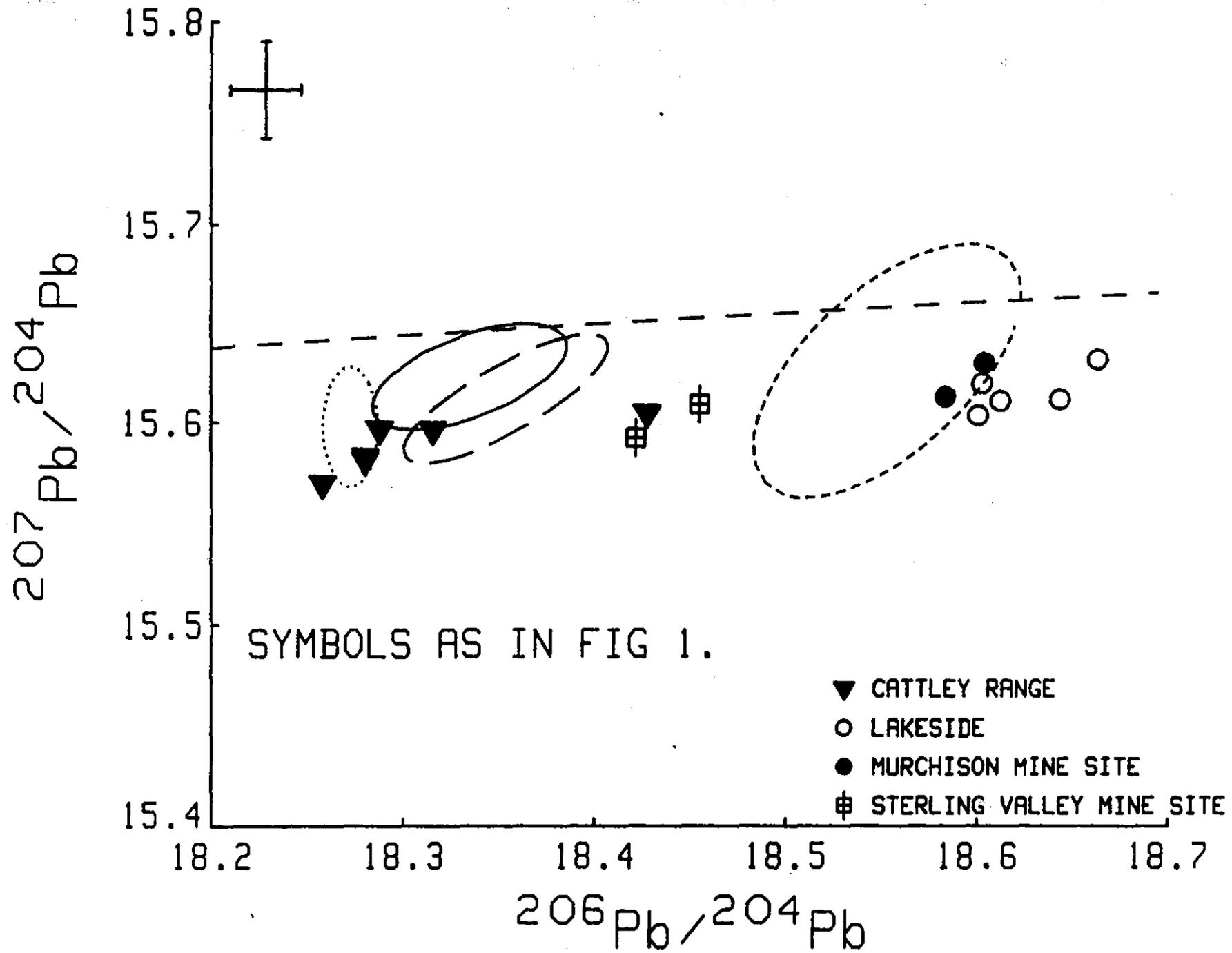


Fig. 2



APPENDIX 4
PETROPHYSICAL REPORT

PETROPHYSICAL AND SPECTRAL IP DATA, W. TASMANIA

Attached are lists of various rock property measurements done on our behalf by Prof. Don Emerson, Sydney University over the last few years and up to 6/1988. The following is a summary of the results:-

DENSITY

As expected the heavily mineralised samples have densities in excess of 4 gm/cc (including one from Chester Pyrite Mine). The remaining samples are predominantly black shales and have densities of about 2.7 to 2.8 gm/cc.

MAGNETIC SUSCEPTIBILITIES

The core from the Lakeside holes (RED 86, 87) is only weakly magnetic as is that from Pinnacles. However Robbie's Creek DDH core is very magnetic and readily explains the surface magnetic anomaly.

ELECTRICAL CONDUCTIVITY/RESISTIVITY

(One is the reciprocal of the other)

Of greatest interest is fact that all the black shale samples from the Farrell sequence are resistive. Only when they contain some sulphide do they become more conductive. This implies that the black shales are not graphitic as is so commonly assumed and therefore are unlikely to be the cause of strong EM anomalies within this sequence.

On the attached list inductive (at 2.5 MHz high frequency) and galvanic (at 1 Hz low frequency) measurements are listed. The first is a non-contact method, which responds to conductive inclusions (e.g. stockwork, disseminated sulphides), and is best for conductive specimens. The second uses contact electrodes and the results largely reflect the resistive matrix. Thus there are differences in the results from the two techniques although they usually show the same relative results (i.e. high or low resistivity).

The samples of Lakeside mineralisation are almost as conductive as those from Mt. Lyell. The Lakeside TEM anomaly is not strong however due to the restricted volume of mineralisation. The same applies to the Pinnacles @UGmineralisation.

The RED 87-1 core (Robbie's Creek TEM anomaly) is surprisingly conductive. This must be due to the massive magnetite as well as pyrite in the core.

IP PARAMETERS

The standard IP parameter results such as those of phase and PFE are generally what one would expect from these samples, although the Farrell black shales do not respond, confirming the absence of graphitic material. The Lakeside, Murchison Mine, Chester Pyrite Mine, Lyell Mines, Pinnacles and Robbies Creek mineralised samples all have moderate to strong IP responses. They are therefore good IP targets (assuming such mineralisation is large and shallow enough to be detected).

In order to discriminate between IP anomalies due to graphite and to massive sulphides, the IP response at different frequencies is required. This leads to spectral IP parameters of Resistivity (R), Chargeability (m), Time Constant (T) and Frequency Dependence parameter (c). It has been found from laboratory studies that m and T are different for the two types of conductor, massive sulphides usually have time constants less than graphite, with chargeabilities a little greater.

Two plots are attached, one is of laboratory measurements from Canada (R. von Blavicom, NW Mining Assn, US 1980) and W. Tasmania (Billiton), the other of in-situ (dipole-dipole) measurements from W. Tasmania (Lewis and Bishop, ASEG, 1988). Unfortunately the two data sets do not whole-heartedly agree with one another, since the time-constant range for the Tasmanian massive sulphide samples (Rosebery) overlaps the Canadian massive sulphide and graphite signatures. However since the Tasmanian (Farrell) black shales are probably not graphitic the Canadian example may not be so relevant. One can therefore generalise the parameters as follows:-

Massive sulphides : m = 0.7 to 1.0
T = .0001 to 0.1

Black shales (Tas) : m = 0 to 0.5
T = .0001 to 0.1

Graphite (Canada) : m = 0.7 to 1.0
T = 100 to 10,000

From small scale in-situ and laboratory measurements there would thus appear to be a means of discriminating between IP responses due to sulphides and due to graphitic shales.

When extending these criteria to field IP measurements other problems arise such as conflicting spectral signatures from different rock types, and difficulties of extracting inductive EM coupling effects due to interaction between transmitter and receiver dipoles in the field. Fortunately the latter is not too much of a problem in Tasmania with smallish dipole lengths and resistive ground. Billiton has only once obtained spectral IP (Cole-Cole) parameters from a field survey (one needs specific equipment and longer measurement times). This was at Lakeside using a time-domain receiver (IPR-11). Cole-Cole parameters are extracted from separate integrations under the time decay curve rather than over a range of specific frequencies as is more usually done.

Figures 3 and 4 are IP profiles across the Lakeside mineralisation (mainly pyrite). Figure 3 is the conventional display of IP and Resistivity pseudo-sections (IP in this case is the chargeability over a limited part of the decay curve, 30 to 1770 msec). Two features are apparent over the mineralisation - the high chargeability and the only moderately low resistivity implying heavily disseminated sulphides. Both parameters apparently increase with depth, this is due to the 40 metres or so of non-chargeable and resistive glacials (note also the decrease in resistivity with depth west of the Henty Fault but this has not been explained). Figure 4 shows the Cole-Cole spectral parameters of m and T. The m and T patterns confirm semi-massive sulphides where intersected in the drill holes, and suggest a greater amount of sulphide further east (not reflected in the UTEM profile however perhaps because of shielding or lack of massive sulphides). The spectral IP results for the line 200 metres south (5,375,100N) indicate very similar features, although on this line the time-constant, T, is higher possibly indicating the presence of significant graphite (Figure 5).

LOCALITY	SAMPLE NO	ROCK TYPE	DENSITY	MAG SUSC	TEMP	EM COND	EM RES	GRV RES	GALV PHASE	COLE-COLE				
			WET g/cc	$\times 10^{-9}$	°C	@ 2.5 MHz	@ 2.5 MHz	@ 1 Hz	@ 1 Hz	IP PARAMETERS				
						$\Omega \cdot m$	$\Omega \cdot m$	$\Omega \cdot m$	mt	R	m	τ	ϵ	
ROSEBERY E. 1/8/87	1	Silic. slate ~5% py	4.23	60	no. f	0.2	0.11 (low)	98 (mod)	+38 (mod)	0.1	60.4	0.66	Variable	
	2	Bl. slate + gtz, chl dist. py	2.82	60	no. f	0.1	0.9 (low)	50 (mod-low)	-136 (high)	1.0	0.01	0.43		
	3	sh + gtz + chl mass gn, sp, cb, py	4.48	60-160	—	0.4	0.3 (low)	80 (mod)	+37 (mod)	0.8	99	0.77		
	4	sst + chl +5% py aspy	3.65	20	no. f	0.5	0.03 (v. low)	412 (rel. posn)	-44 (mod)	0.05	50	0.87	Variable	
	5	Bl. slate dissem cb, py	2.68	30	no. f	0.5	2.0 (mod)	187 (mod)	-221 (high)	0.5	16	0.43		
MURCHISON MINE	1	Silic. volcs gn vein	3.04			0	(high)	963 (high)	-12 (low)	1010	0.1	0.001	0.5	Variable
"	2	mass. py, cb, gn	4.75			0	0.02 (v. low)	60 (low)	-112 (high)	510	0.9	80	0.7	
" (nearby)	3	Bl. sh.	2.68			0	(high)	94000 (v. high)	-21 (low)	96200	0.8?	0.001	0.6	Poor
" (nearby)	5	Bl. shale	2.75			0	(high)	4154 (v. high)	-5 (low)	4200	0.3	0.001	0.45	Variable
" (nearby)	6	Bl. shale	2.74			0	(high)	8947 (v. high)	-11 (low)	9000	0.7?	1×10^{-5}	0.6	Variable
"	7	Bl. shale	2.72			0	(high)	8399 (v. high)	-7 (low)	3455	0.05	0.01	0.4	Variable
L. Mackintosh (Spillway)	8	Bl. shale minor py	2.46			0	(high)	2805 (v. high)	-30 (mod)	2950	0.3	0.02	0.25	Variable
L. Mackintosh (Quarry)	9	Bl. shale	2.73			0	(high)	3658 (v. high)	-5 (low)	3660	0.13	5×10^{-5}	0.65	
Chester Py Mine	10	Massive siliceous py	4.10			0	(high)	251 (mod-high)	-168 (high)	330	0.9	0.3	0.4	
ROSEBERY E. RES 87-4	11	Bl. sh minor py	2.80			0	(high)	742 (high)	-38 (mod)	?	?	?	?	cannot model c.c.
ROSEBERY E. RES 86-1	12	Bl. sh minor py	2.78			0	(high)	715 (high)	-86 (mod-high)	956	0.53	1.1	0.5	Variable
										0.95	0.0001	0.23		

NB) Measurements made by Prof. D. F. MeHou
University of Sydney

NB) EM COND. - INDUCTIVE, NON-CONTACT @ 2.5 MHz
 1) GALV. RES + PHASE - 4 ELECTRODE ON POTTED SAMPLES (Water bath 60mm) @ 1 Hz
 2) COLE-COLE PARAMETERS FROM 0.01 TO 1000 Hz

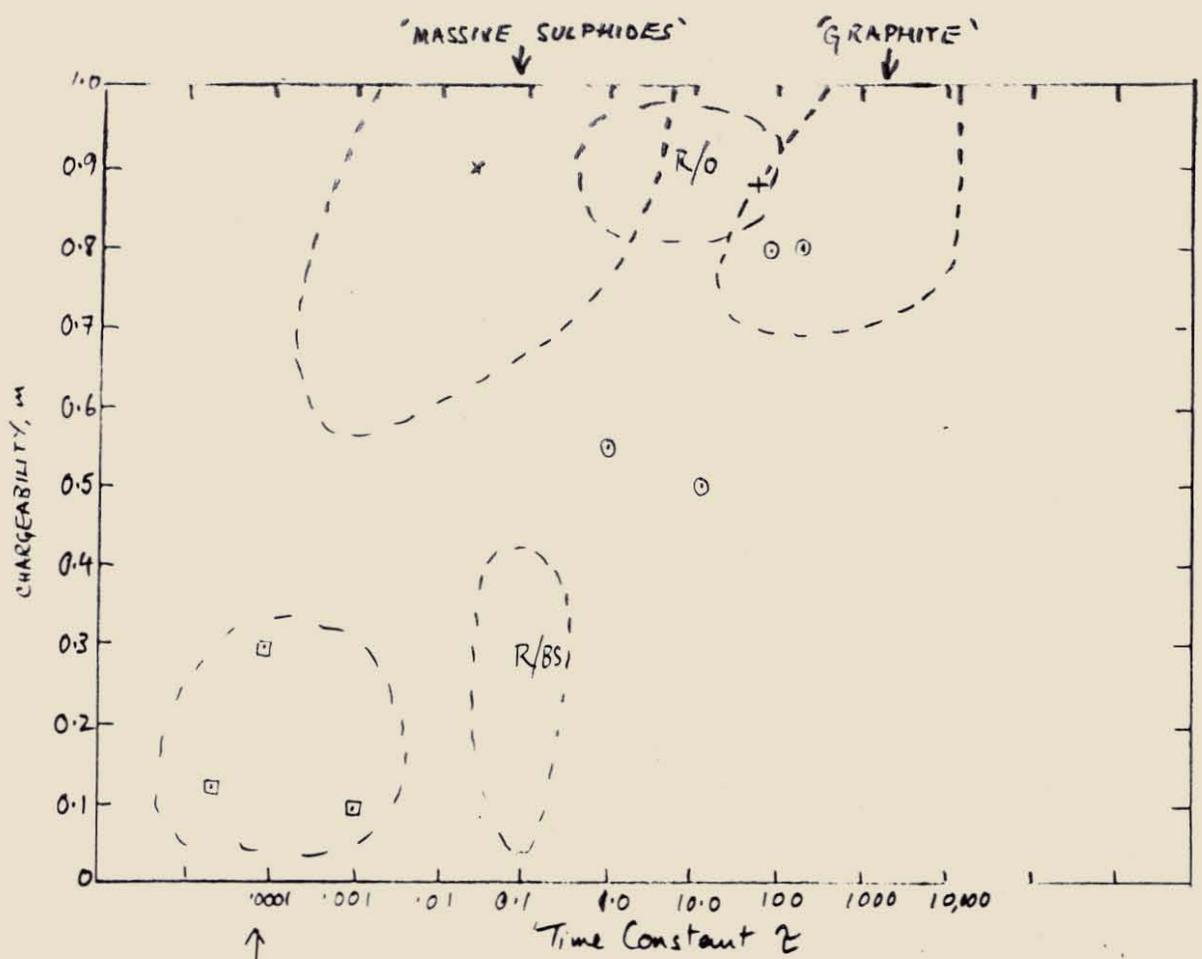
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LOCALITY	SAMPLE NO.	ROCK TYPE	DENSITY WET g/cc	MAG SUSC. CGSM 10 ⁻⁶	TEMP. °C	EM COND.	EM RES.	GRV RES.	GRV PHASE	COLE-COLE IP PARAMETERS				PFE
						@ 2.5 MHz	@ 2.5 MHz	@ 0.1 Hz	@ 0.1 Hz	R	m	φ	ε	0.1-1.0 Hz %
						Ω/m	Ωm	Ωm	mV					
LOT 86/1	NORTH LYELL	1					0.08 (v. low)	1.3 (low)	-8 (low)					2 (low)
	"	2					0.002 (v. low)	0.02-0.008 (v. low)	-113 - -317 (v. high)					14-44 (high)
	PRINCE LYELL	3					0.3 (low)	302 (mod-high)	-31 (mod)					9 (mod)
	PRINCE LYELL	4					0.5 (low)	84 (mod)	-185 (high)					33 (high)
	MT. BLACK 537600N/381415E	5	Volcanics Alt + chl + magne					7800 (v. high)	57 (mod)					
LOT 95/4	PINNACLES (Coastal)	1		20				47 (mod)	-282 (v. high)					38 (high)
	" (Brown's)	2		60				58 (mod)	-245 (v. high)					35 (high)
LOT 87/1	ROSEBERY E RED 87-1	1		> 100K		13	0.08 (low)	7.5 (10 Hz) (low)						
	"	2		> 100K		5	0.02 (v. low)	0.08 (10 Hz) (v. low)						
	"	3	Altered andesite 90% py		3K-30K		12	0.02 (v. low)	0.59 (10 Hz) (v. low)					
	"	4	BL. shale		200		4	0.1 (low)	300, 600 (mod)					

NB Measurements made by Prof. D. FURMION University of Sydney

NB) EM COND. - INDUCTIVE, NON-CONTACT @ 2.5 MHz
 1) GRV. RES + PHASE - 4 ELECTRODE ON POTTED SAMPLES (4 electrode surface scan) @ 0.1 Hz
 3) COLE-COLE PARAMETERS FROM 0.01 TO 1000 Hz

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R/BS = Rosebery Black Shales
R/O = Rosebery Ore

↑
non-sulphidic
non-graphitic
(v. resistive)

- RED 87 HOLES (Bl. shale + semi-mass. to dissem. sulphides)
- X CHESTER PYRITE MINE + MURCHISON MINE (Bl. shale + sulphides)
- MURCHISON MINE, LAKE MACKINTOSH (Bl. shale)

Billiton Australia <small>The Strength of the World's Largest Iron Ore Miner</small>			
Project W. TASMANIA			
Title COLE-COLE IP PARAMETERS (from LAB MEASUREMENTS) (after R.V. BLARICOM, 1980)			
Author NH	Date 8/88	Scale	
Drawn	Office	Revised	Date
Drawing No			Fig No

The figures on this page are referred to in the preceding section *Use of spectral IP measurements for possible mineral discrimination.*

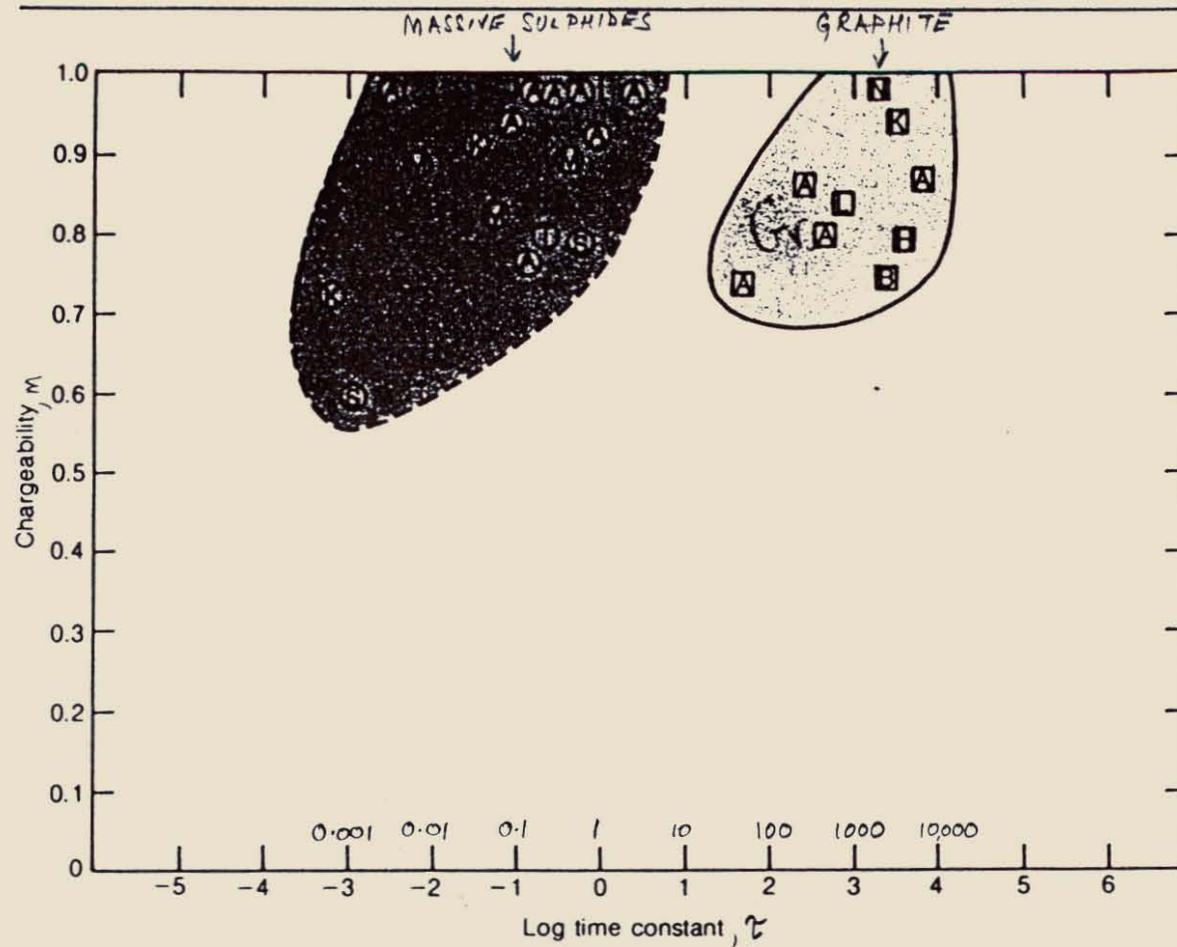


FIGURE 2.135

Discrimination of massive sulfide and graphite

Massive sulfides

- Ⓢ Seneca, B.C.
- Ⓐ Anvil, Y.T.
- Ⓣ Sturgeon Lake, Ont.
- Ⓜ Matabi, Ont.
- Ⓚ Kidd Creek, Ont.

Graphite

- Ⓜ Harper Creek, B.C.
- Ⓐ Anvil, Y.T.
- Ⓟ Bancroft, Ont.
- Ⓛ Labelle, Que.
- Ⓝ Noranda, Que.
- Ⓚ Kidd Creek, Ont.

Fig. 1

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The figures on this page are referred to in the preceding section *Use of spectral IP measurements for possible mineral discrimination.*

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120

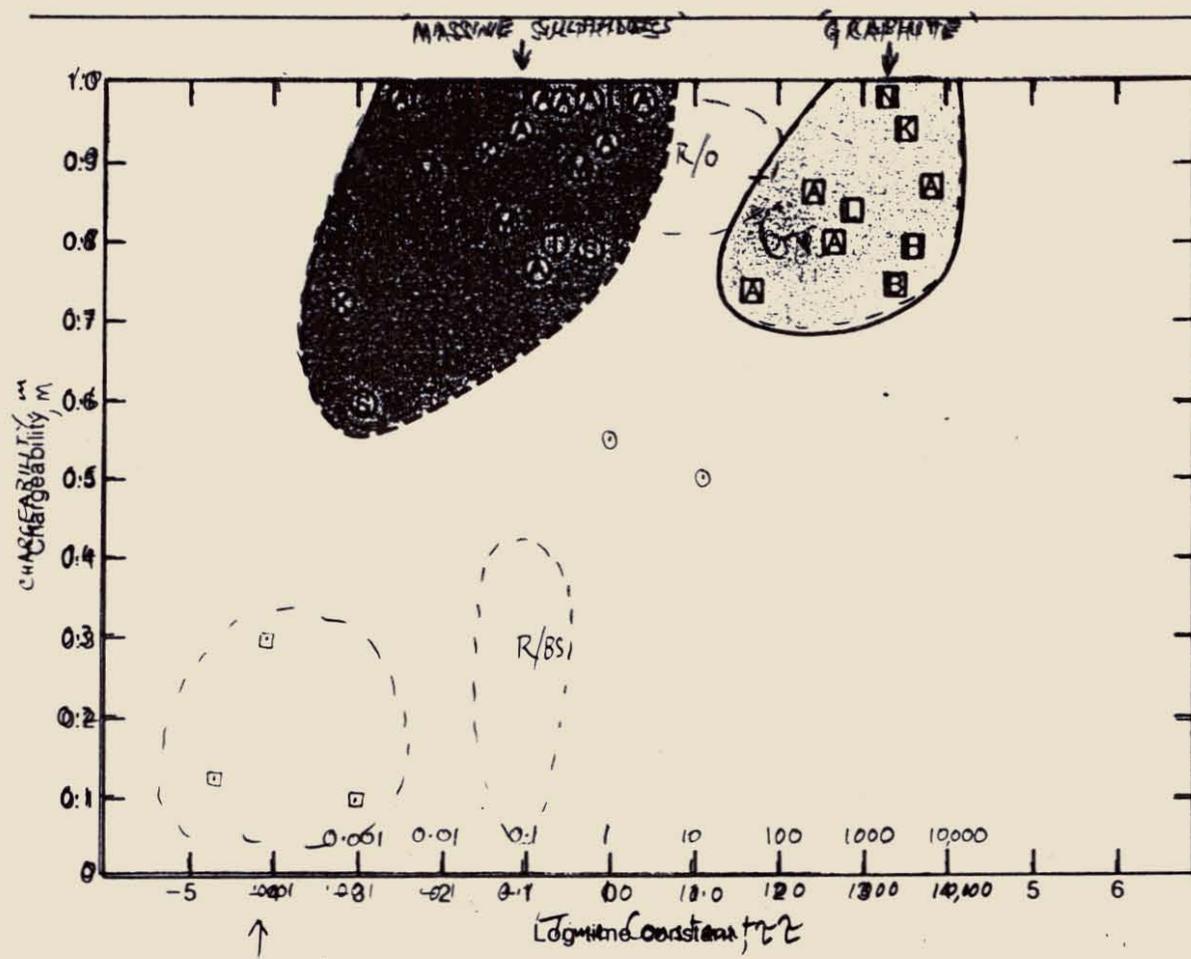


FIGURE 2.135
Discrimination of massive sulfide and graphite

- Massive sulfides
- Ⓢ Seneca, B.C.
 - Ⓐ Anvil, Y.T.
 - Ⓣ Sturgeon Lake, Ont.
 - Ⓜ Mattabi, Ont.
 - Ⓚ Kidd Creek, Ont.

- Graphite
- Ⓛ Harper Creek, B.C.
 - Ⓐ Anvil, Y.T.
 - Ⓟ Bancroft, Ont.
 - Ⓛ Labelle, Que.
 - Ⓝ Noranda, Que.
 - Ⓚ Kidd Creek, Ont.

R/BS = Roseberry Black Shales
R/O = Roseberry Ore

Fig. 1

non-sulphidic
non-quartzitic
(v. resistive)

- Ⓛ RES 87 HOLES (Bl. shale + semi-mass. to dissemin. sulphides)
- × CHESTER PYRITE MINE + MURCHISON MINE (Bl. shale + sulphides)
- Ⓛ MURCHISON MINE, LAKE MACKINTOSH (Bl. shale)

Billiton Australia <small>The Metals Division of the Shell Companies of Australia Limited</small>			
Project		W. TASMANIA	
Title		COLE-COLE IP PARAMETERS (from LAB MEASUREMENTS) (after R.V. BLARICOM, 1980)	
Author	NH	Date	8/89
Drawn		Office	
Revised		Date	
Drawing No.		Fig No.	

LAB MEASUREMENTS {

- RES-87 HOLES (Bl. shale. semi-mass to diss py)
- x CHESTER PYRITE MINE
- + MURCHISON MINE (Bl. shale + sulphides)

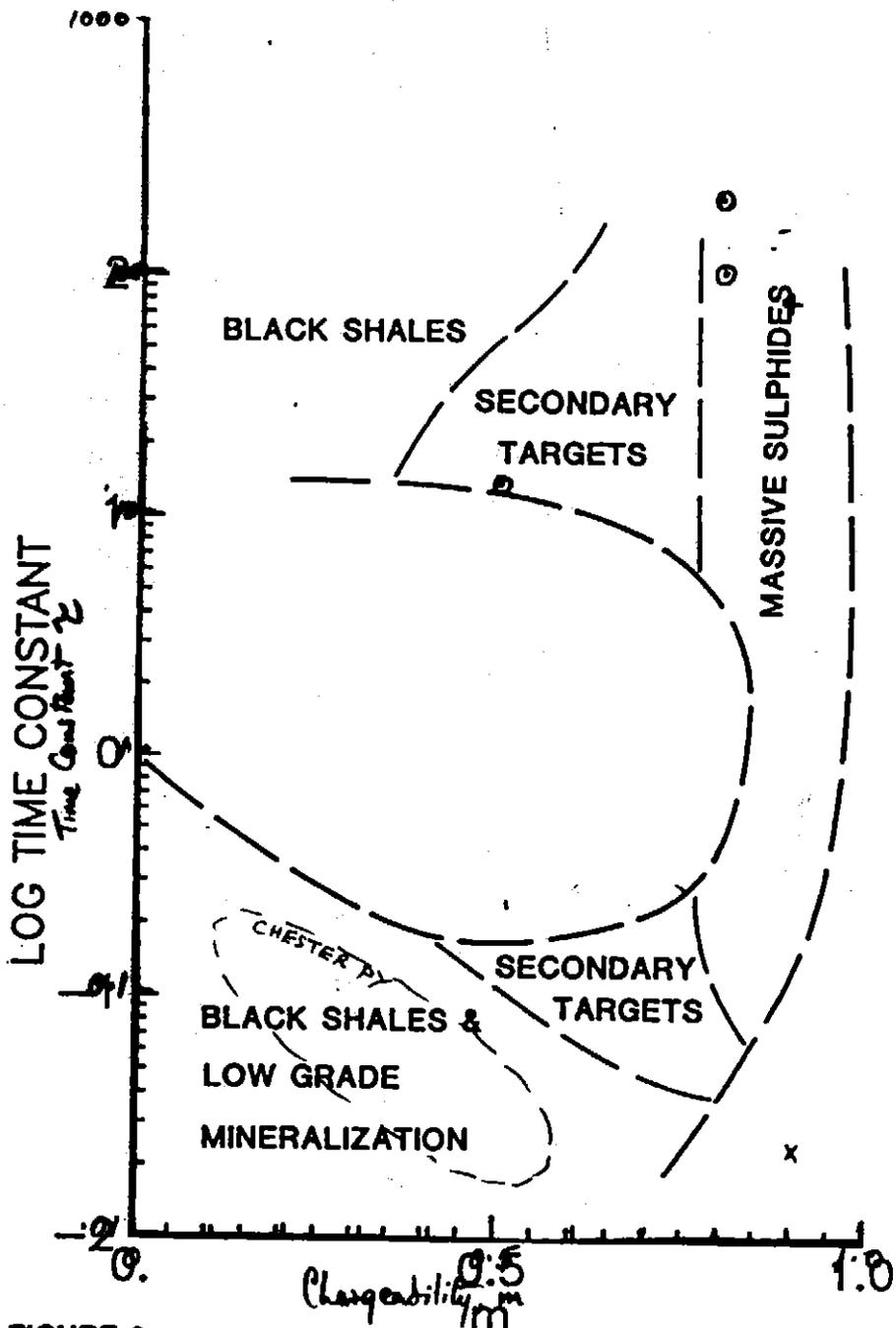


FIGURE 6
A synthesis of the spectral IP data for western Tasmania.
(in-situ measurements)

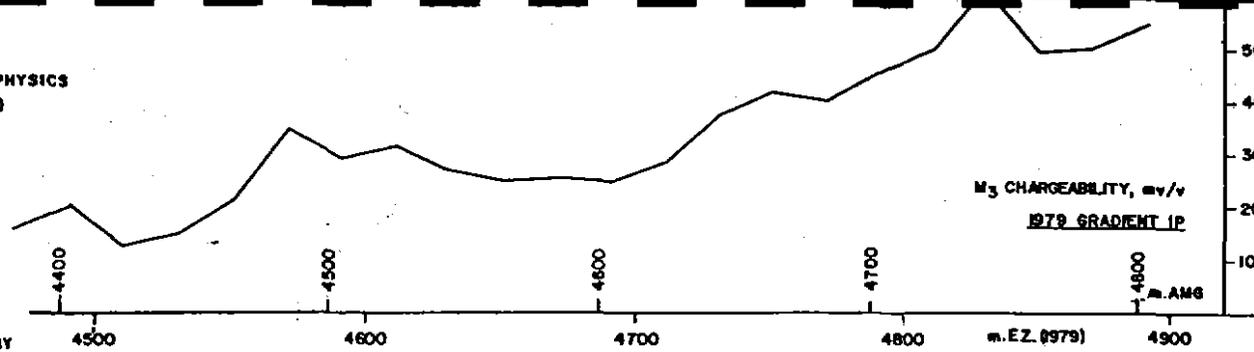
Fig. 4


 N. TASMANIA
 COLE-COLE TP PARAMETERS
 (from IN-SITU MEASUREMENTS)
 (after Lewis & Sauer, 1980)

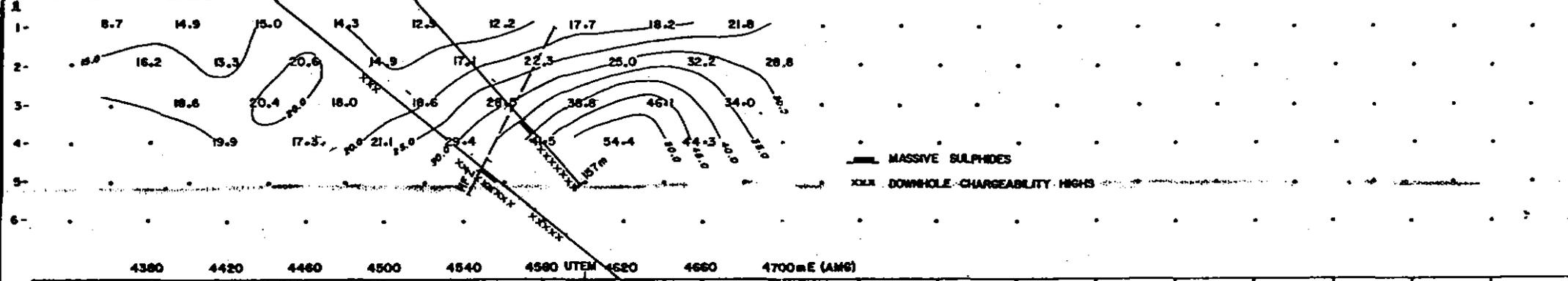
AMBORNE GEOPHYSICS
(EM, MAG, etc)

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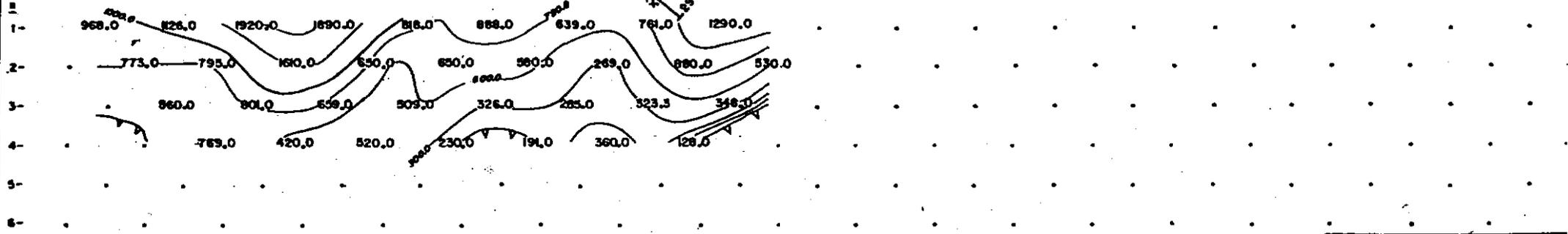
GEOLOGY
& TOPOGRAPHY



APPARENT CHARGEABILITY.

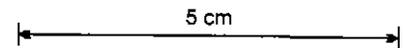


APPARENT RESISTIVITY.



F03.3

Contractor : SCINTREX
Date : 8/87
Timing : 2 sec.
Transmitter : 10 KW
Receiver : IPR-II
Integration time : Ms-Mp (30-1770 ms)
Array : DIPOLE - DIPOLE
Dipole length : 40m

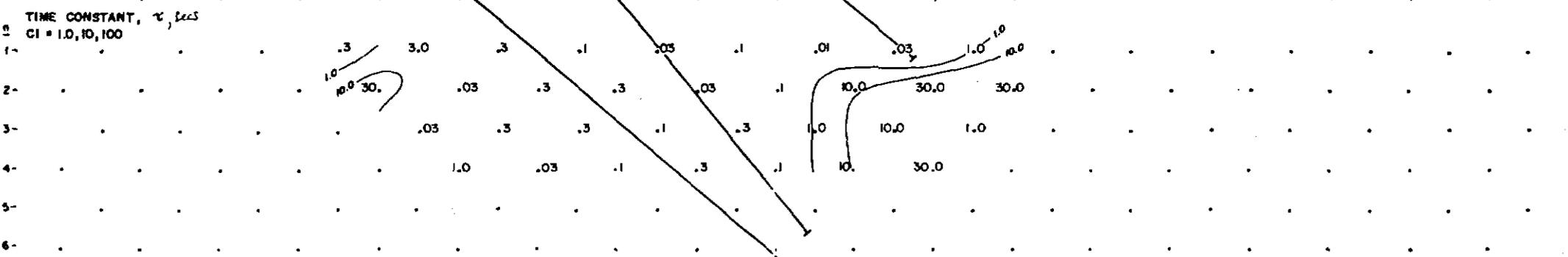
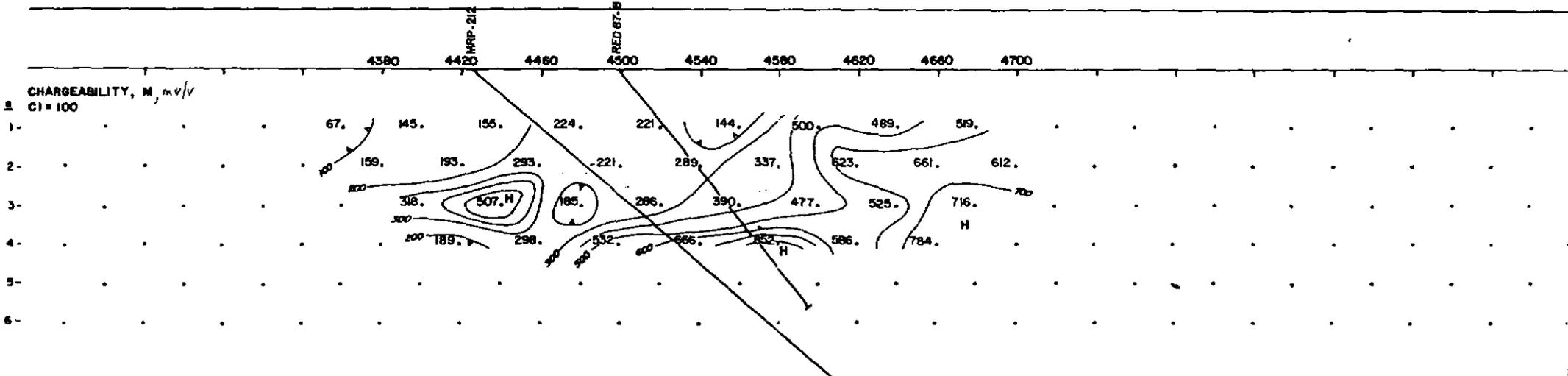


Billiton Australia The World's Largest and Most Experienced in Groundwater	
Project: ROSEBERRY EAST JV. LAKEBIDE PROSPECT	
Title: LP./RESISTIVITY SURVEY LINE 8,578,800M	
Author: B.J.L.	Date: 8/87
Drawn: B.J.L.	Scale: 1:2,000
Checked: B.J.L.	Sheet: L450/1101

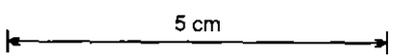
AIRBORNE GEOPHYSICS
(EM, MAG, etc)

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GEOLOGY
& TOPOGRAPHY



F3.4.



Contractor: SCINTREX
 Date: 11/87
 Timing: 2 sec.
 Transmitter:
 Receiver: IPR-II
 Integration time: Mo - Mg (30-1770 ms)
 Array: DIPOLE - DIPOLE
 Dipole length: 40 m

SPECTRAL PARAMETERS
 C generally < 0.2

Billiton Australia	
ROSEBERY EAST J.V. LAKESIDE PROSPECT	
I.P./RESISTIVITY SURVEY LINE 5,578,300N	
Author: R.H.	Date: 11/87
Drawn: R.H.	Checked: A.J.G.
L J50/1102	

AIRBORNE GEOPHYSICS
(EM, MAG, etc)

125
701125

M₃ CHARGEABILITY, mv/v
1979 GRADIENT IP

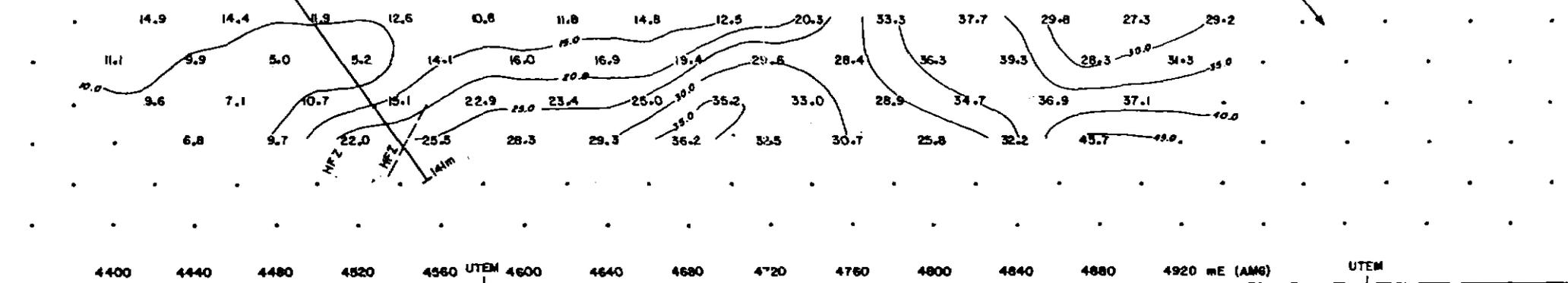
GEOLOGY & TOPOGRAPHY

m. BAUS

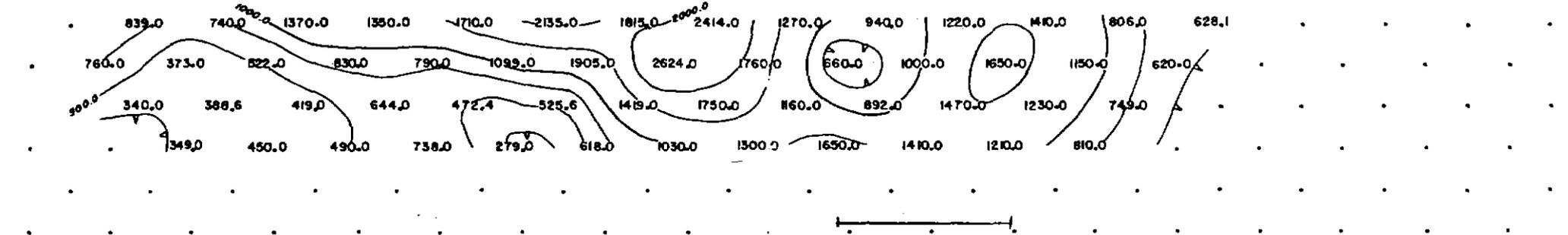
4900 mE. (1979)

(BAUS grid 30m WEST of AMG Co-ords)

APPARENT CHARGEABILITY.



APPARENT RESISTIVITY.



Contractor : SCINTREX
Date : 8/87
Timing : 2 sec.
Transmitter : 10KW
Receiver : IPR-11
Integration time : Mo-M₃(30-(770ms)
Array : DIPOLE-DIPOLE
Dipole length : 40m

High IP
Low (fish) Resistivity
(no UTEM anomaly)

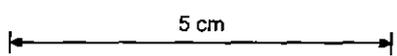


fig 5

Billiton Australia			
Project: ROSEBERRY EAST J.V. LAKESIDE PROSPECT			
Title: I.P./RESISTIVITY SURVEY LINE 5,375,100N			
Author: M.H.	Date:	Scale: 1:2,000	
Drawn: 12/87	Office: AMG	Revised:	Date:
Drawing No: LJ50/1104			Fig No:

APPENDIX 5

MURCHISON MINE LINE AUGER SAMPLING ASSAY RESULTS.

NORTHING	EASTING	CU	ZN	AG	AU AVG	BA	PB	AS
376300	385520	20	40	0.005	0.005	460	8	28
376300	385530	24	50	0.005	0.005	410	13	15
376300	385540	60	105	0.005	0.005	440	24	22
376300	385550	52	68	0.005	0.005	280	34	30
376300	385560	48	56	0.005	0.005	150	22	24
376300	385570	17	38	0.005	0.005	130	20	19
376335	385620	52	105	0.005	0.005	400	18	28
376335	385630	48	68	0.005	0.005	380	38	4
376335	385640	62	105	0.005	0.005	440	4	24
376335	385650	70	98	0.005	0.005	560	22	14
376335	385660	32	270	0.005	0.005	200	470	66
376300	385685	6	13	0.005	0.005	520	16	16
376300	385730	6	10	0.005	0.005	260	7	7
376300	385750	5	5	0.005	0.005	40	0.005	9
376300	385760	7	4	0.005	0.005	20	0.005	5
376300	385780	2	12	0.005	0.005	105	2	9
376400	385520	30	90	0.005	0.005	340	24	22
376400	385530	42	190	0.005	0.005	570	40	48
376400	385540	42	140	0.005	0.005	220	44	52
376400	385550	32	50	0.005	0.010	195	18	30
376400	385580	74	135	0.005	0.005	380	12	19
376400	385590	30	115	0.005	0.005	340	26	15
376400	385600	17	54	0.005	0.005	175	30	22
376400	385620	22	60	0.005	0.005	185	26	24
376400	385630	32	68	0.005	0.005	175	16	26
376400	385640	32	74	0.005	0.005	240	24	24
376400	385650	26	86	0.005	0.005	175	38	30
376400	385660	46	120	0.005	0.010	195	150	48
376400	385670	64	250	0.005	0.005	270	1020	390
376400	385680	13	24	0.005	0.005	380	20	13
376400	385690	6	2	0.005	0.005	35	8	10
376400	385700	5	7	0.005	0.005	580	3	9
376400	385720	5	6	0.005	0.005	1080	4	19
376400	385760	6	19	0.005	0.005	910	36	17
376600	385514	40	60	0.005	0.005	110	24	28
376600	385550	52	72	0.005	0.005	125	42	32
376600	385560	46	110	0.005	0.005	340	24	30
376600	385570	42	68	0.005	0.020	360	32	19
376600	385580	28	54	0.005	0.020	330	42	16
376600	385590	20	34	0.005	0.005	115	22	26
376600	385600	22	36	0.005	0.010	110	36	28
376600	385610	24	72	0.005	0.005	85	44	42
376600	385630	22	105	0.005	0.005	120	540	18
376600	385670	7	58	0.005	0.005	490	82	330
376600	385680	12	110	0.005	0.005	520	290	800
376600	385690	7	28	0.005	0.005	300	52	46
376600	385700	7	48	0.005	0.005	800	170	500
376600	385710	6	44	0.005	0.005	720	200	470
376600	385720	8	86	0.005	0.005	840	260	520
376600	385730	9	15	0.005	0.005	390	150	180
376600	385740	11	82	0.005	0.005	780	240	52
376600	385750	18	54	0.005	0.005	570	370	70
376700	385977	3	84	0.005	0.005	430	40	9
376700	385710	4	15	0.005	0.005	310	5	18
376700	385680	3	6	0.005	0.005	360	5	9
376700	385670	4	3	0.005	0.005	280	0.005	11

376700	385630	11	52	0.005	0.005	370	26	44
376700	385620	58	620	1.000	0.005	330	380	84
376700	385610	24	120	0.005	0.005	195	60	54
376700	385600	62	98	0.005	0.005	180	52	98
376700	385590	22	90	0.005	0.005	195	38	56
376700	385580	28	92	0.005	0.005	320	38	60
376700	385570	19	82	0.005	0.005	200	42	58
376700	385560	52	210	0.005	0.005	420	92	98
376700	385550	54	185	0.005	0.005	250	72	130
376700	385540	30	210	0.005	0.005	230	90	92
376700	385530	50	160	0.005	0.005	210	105	110
376800	385500	34	130	0.005	0.005	120	38	30
376800	385510	24	46	0.005	0.005	125	20	26
376800	385520	28	46	0.005	0.005	115	30	24
376800	385530	26	48	0.005	0.005	140	30	26
376800	385540	30	86	0.005	0.005	420	26	26
376800	385550	22	44	0.005	0.005	150	24	24
376800	385560	18	26	0.005	0.005	85	17	26
376800	385570	12	12	0.005	0.005	70	10	15
376800	385580	18	30	0.005	0.005	120	13	32
376800	385590	16	32	0.005	0.005	230	10	18
376800	385600	19	28	0.005	0.005	160	10	22
376800	385610	42	34	0.005	0.005	130	13	38
376800	385620	22	17	0.005	0.005	55	16	46
376800	385630	56	54	0.005	0.005	195	28	42
376800	385640	44	78	0.005	0.005	420	10	36
376800	385650	44	78	0.005	0.005	500	13	18
376800	385660	14	26	0.005	0.005	95	17	32
376800	385700	4	32	0.005	0.005	290	30	105
376400	385730	3	13	0.005	0.005	650	13	9
376800	386000	7	185	0.005	0.005	990	115	4
376900	385780	5	92	0.005	0.005	170	2	17
376500	385926	13	130	0.005	0.005	1080	22	12
	MEAN	26.3	78.3	0.0	NA	325.1	72.0	66.3
	STD. DEV.	18.7	80.5	0.1	NA	234.3	142.2	126.7
	X+SD	45.0	158.8	0.1	NA	559.4	214.2	193.0
	X+2SD	63.7	239.3	0.2	NA	793.8	356.4	319.7

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		MURCHISON MINE LINE AUGER						
	8/12/88							
NORTHING	EASTING	CU	ZN	AG	AURVG	BA	PB	AS
376200	385500	4	19	0.005	0.005	25	0.005	5
376200	385520	3	50	0.005	0.005	1180	2	2
376200	385540	0.005	28	0.005	0.005	880	0.005	7
376200	385560	14	42	0.005	0.005	270	13	7
376200	385580	7	46	0.005	0.005	270	13	10
376200	385600	13	34	0.005	0.005	110	13	9
376200	385620	9	38	0.005	0.01	150	17	20
376200	385640	9	78	0.005	0.005	180	62	17
376200	385660	4	22	0.005	0.005	350	7	4
376200	385680	2	22	0.005	0.005	370	5	4
376400	385780	2	8	0.005	0.005	70	6	4
376400	385800	0.005	9	0.005	0.005	130	3	5
376400	385820	4	6	0.005	0.005	410	5	5
376400	385840	5	8	0.005	0.005	200	2	0.005
376700	385720	4	16	0.005	0.005	490	7	10
376700	385740	5	13	0.005	0.005	115	4	3
376700	385760	6	24	0.005	0.005	600	9	3
376700	385780	5	19	0.005	0.01	570	9	2
376700	385800	7	26	0.005	0.005	800	10	4
376700	385820	5	12	0.005	0.005	300	0.005	2
376800	385700	6	7	0.005	0.005	420	2	5
376800	385720	7	42	0.005	0.005	250	40	120
376800	385740	6	82	0.005	0.005	520	48	12
376800	385760	6	30	0.005	0.005	620	7	9
376800	385780	5	36	0.005	0.01	490	13	11
376800	385800	6	24	0.005	0.005	330	4	4
376800	385820	11	24	0.005	0.005	430	4	3
376800	385840	7	7	0.005	0.01	55	2	0.005
376900	385640	13	19	0.005	0.01	80	14	22
376900	385660	13	40	0.005	0.005	95	94	180
376900	385680	7	4	0.005	0.03	45	4	2
376900	385700	4	52	0.005	0.005	380	52	16
376900	385720	5	4	0.005	0.01	150	0.005	4
376900	385740	4	13	0.005	0.01	260	11	4
376900	385760	5	16	0.005	0.005	210	13	0.005
376900	385780	7	11	0.005	0.005	210	0.005	7
376900	385800	5	17	0.005	0.005	170	3	0.005
376900	385820	5	18	0.005	0.01	1380	4	6
376900	385840	5	8	0.005	0.01	95	5	0.005
376900	385860	3	7	0.005	0.005	135	2	3
377000	385640	5	92	0.005	0.03	410	19	32
377000	385660	40	48	0.005	0.005	160	17	24
377000	385680	3	24	0.005	0.005	300	11	12
377000	385700	6	8	0.005	0.005	600	2	0.005
377000	385720	9	480	0.005	0.005	980	270	1240
377000	385740	12	130	0.005	0.04	1420	24	8
377000	385760	3	90	0.005	0.005	500	40	24
377000	385780	7	130	0.005	0.005	420	36	10
377000	385800	5	145	0.005	0.005	420	50	20
377000	385820	8	320	0.005	0.005	460	125	17
377000	385840	6	280	0.005	0.01	580	130	22
377000	385860	3	62	0.005	0.005	750	13	10
377000	385880	4	19	0.005	0.005	260	0.005	2
377200	385620	6	160	0.005	0.005	460	68	210

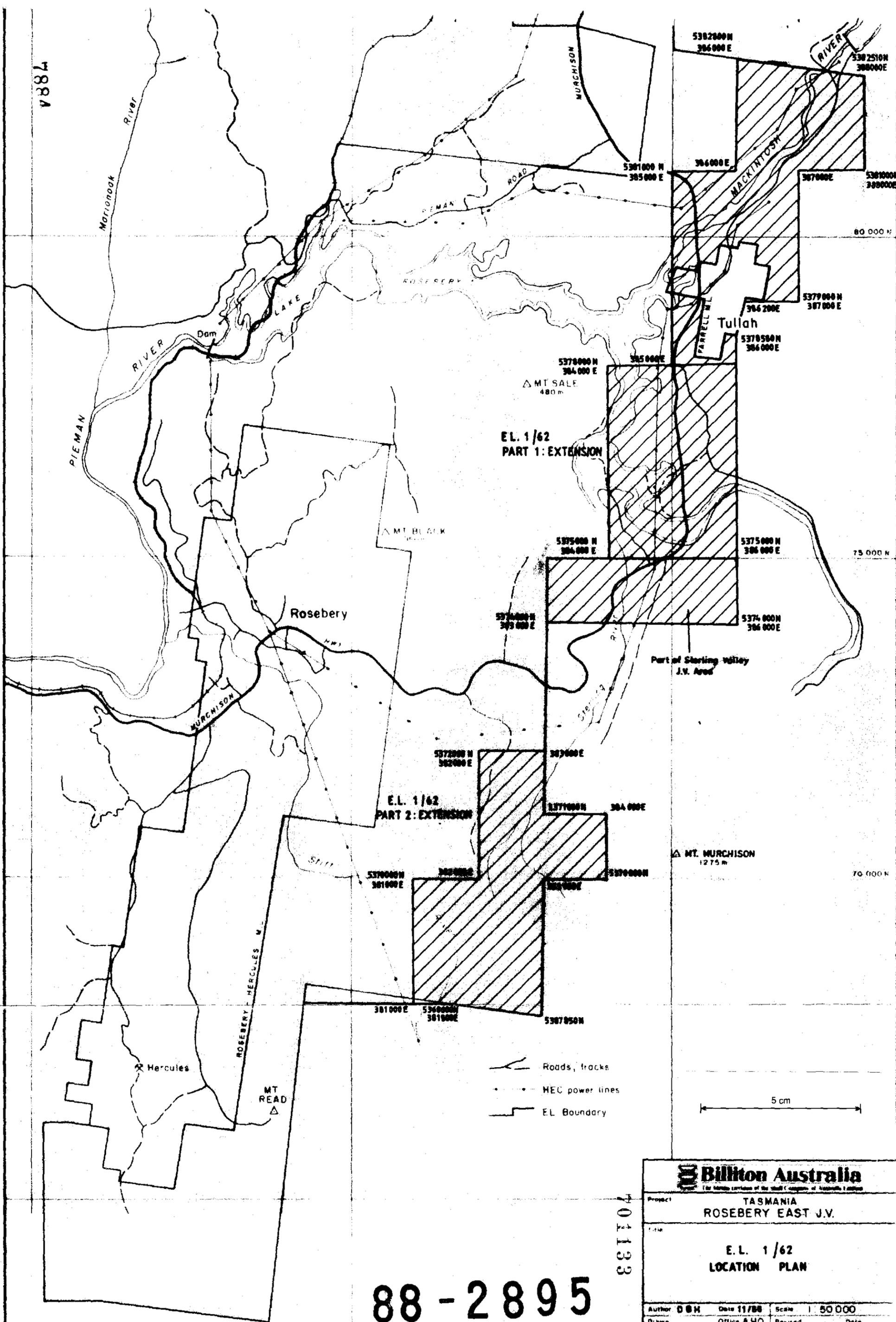
MURCHISON MINE LINE AUGER

131

377200	385640	6	14	0.005	0.01	960	10	11
377200	385660	3	8	0.005	0.01	105	4	6
377200	385680	6	15	0.005	0.01	600	6	3
377200	385700	7	6	0.005	0.02	185	0.005	4
377200	385720	2	7	0.005	0.01	210	9	5
377200	385740	6	17	0.005	0.02	340	14	4
377200	385760	9	140	0.005	0.04	420	90	14
377200	385780	4	5	0.005	0.01	320	4	3
377200	385800	3	28	0.005	0.005	880	8	6
377200	385820	7	12	0.005	0.02	55	7	0.005
377200	385840	18	120	0.005	0.02	340	105	9
377200	385860	3	125	0.005	0.01	520	42	8
377200	385880	14	145	0.005	0.02	430	180	30
377200	385900	6	94	0.005	0.005	640	34	8
377200	385920	3	20	0.005	0.005	220	13	8
377400	385640	3	5	0.005	0.01	130	4	2
377400	385660	3	4	0.005	0.01	55	2	2
377400	385680	4	6	0.005	0.005	75	6	13
377400	385700	3	18	0.005	0.005	850	76	7
377400	385720	3	12	0.005	0.005	240	6	3
377400	385740	4	12	0.005	0.005	260	5	4
377400	385760	5	660	0.005	0.005	590	76	19
377400	385780	2	24	0.005	0.005	300	14	6
377400	385800	6	11	0.005	0.005	250	5	5
377400	385820	0.005	3	0.005	0.01	630	2	0.005
377400	385840	0.005	16	0.005	0.01	370	6	3
377400	385860	2	6	0.005	0.04	35	2	4
377400	385880	2	7	0.005	0.01	70	7	0.005
377400	385900	3	9	0.005	0.005	85	8	2
377400	385920	3	58	0.005	0.005	450	32	4
377400	385940	2	22	0.005	0.005	350	10	2
377600	385720	46	100	0.005	0.005	880	46	22
377600	385740	6	24	0.005	0.005	530	30	17
377600	385760	0.005	-2	0.005	0.005	35	0.005	0.005
377600	385780	2	4	0.005	0.005	80	2	3
377600	385800	0.005	2	0.005	0.02	35	0.005	2
377600	385820	8	56	0.005	0.005	450	11	2
377600	385840	5	18	0.005	0.005	130	3	4
377600	385860	4	4	0.005	0.005	140	2	2
377600	385880	4	16	0.005	0.005	210	7	3
377600	385900	3	5	0.005	0.005	90	0.005	4
377600	385920	4	14	0.005	0.005	55	0.005	3
377600	385940	4	-2	0.005	0.005	90	0.005	5
377600	385960	6	9	0.005	0.005	340	0.005	4
377800	385760	5	2	0.005	0.005	120	2	3
377800	385780	8	15	0.005	0.005	135	8	4
377800	385800	6	12	0.005	0.005	75	2	4
377800	385820	40	105	0.005	0.03	580	7	13
377800	385840	6	13	0.005	0.005	200	3	6
377800	385860	7	5	0.005	0.005	95	4	0.005
377800	385880	3	3	0.005	0.03	250	2	0.005
377800	385900	6	6	0.005	0.005	210	3	3
377800	385920	8	13	0.005	0.01	220	9	0.005
377800	385940	6	12	0.005	0.01	110	8	2
377800	385960	5	2	0.005	0.005	75	4	3
377800	385980	6	7	0.005	0.005	420	2	4

MURCHISON MINE LINE AUGER

378000	385820	11	20	0.005	0.005	120	13	12
378000	385840	10	54	0.005	0.005	350	15	15
378000	385860	11	88	0.005	0.005	155	74	6
378000	385880	11	36	0.005	0.005	300	11	13
378000	385900	6	44	0.005	0.005	195	22	14
378000	385920	10	30	0.005	0.005	290	12	6
378000	385940	22	94	0.005	0.005	430	15	10
378000	385960	7	66	0.005	0.005	320	54	11
378000	385980	5	16	0.005	0.005	220	9	16
378000	386000	6	9	0.005	0.005	360	0.005	6
MEAN		6.62	45.82	0.01	0.01	339.79	20.68	21.49
STD. DEV		6.67	85.60	ERR	0.01	272.92	37.50	114.90
X+SD		13.29	131.42	ERR	0.02	612.71	58.18	136.39
X+2SD		19.96	217.02	ERR	0.02	885.62	95.68	251.29

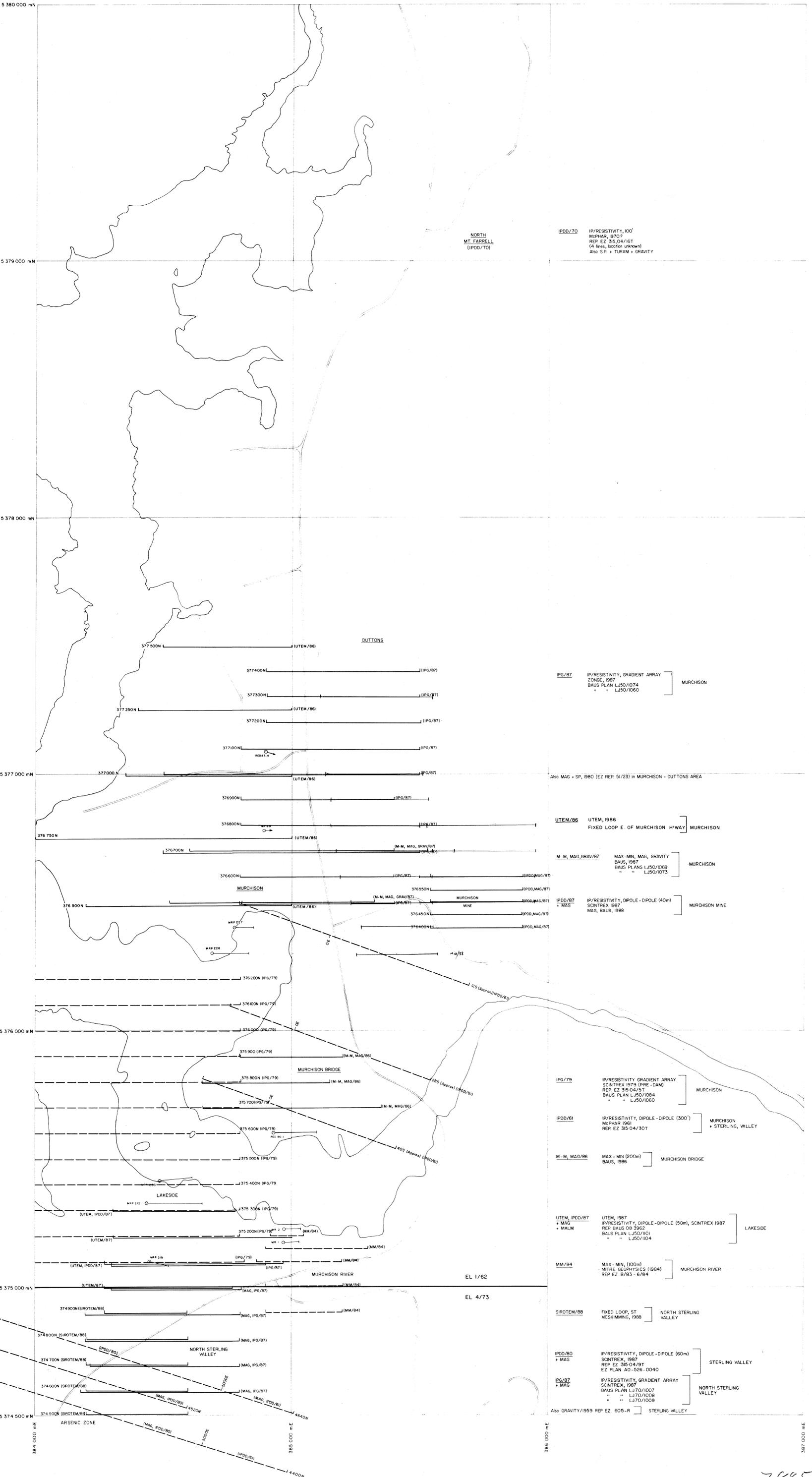


788A

70133

88-2895

Project: TASMANIA ROSEBERY EAST J.V.			
Title: E.L. 1/62 LOCATION PLAN			
Author: DGH	Date: 11/88	Scale: 1:50 000	
Drawn: AHO	Office: AHO	Revised:	Date:
Drawing No: LJS0/			Fig. No. 1



IPDD/70 IP/RESISTIVITY, 100'
 McPHAR, 1970?
 REP. EZ 315 04/16T
 (4 lines, location unknown)
 Also S.P. + TURAM + GRAVITY

IPG/87 IP/RESISTIVITY, GRADIENT ARRAY
 ZONGE, 1987
 BAUS PLAN LJ50/1074
 " " LJ50/1060

UTEM/86 UTEM, 1986
 FIXED LOOP E. OF MURCHISON H'WAY

M-M, MAG, GRAV/87 MAX-MIN, MAG, GRAVITY
 BAUS, 1987
 BAUS PLANS LJ50/1069
 " " LJ50/1073

IPDD/87 IP/RESISTIVITY, DIPOLE-DIPOLE (40m)
 + MAG SCINTREX 1987
 MURCHISON MINE
 MAG, BAUS, 1988

IPG/79 IP/RESISTIVITY GRADIENT ARRAY
 SCINTREX 1979 (PRE-DAM)
 REP. EZ 315 04/5T
 BAUS PLAN LJ50/1084
 " " LJ50/1060

IPDD/81 IP/RESISTIVITY, DIPOLE-DIPOLE (300')
 McPHAR 1981
 REP. EZ 315 04/30T
 MURCHISON + STERLING VALLEY

M-M, MAG/86 MAX-MIN (200m)
 BAUS, 1986
 MURCHISON BRIDGE

UTEM, IPDD/87 UTEM, 1987
 + MAG IP/RESISTIVITY, DIPOLE-DIPOLE (50m), SCINTREX 1987
 + MALLM REP. BAUS 08 3962
 BAUS PLAN LJ50/1104
 " " LJ50/1104
 LAKESIDE

MM/84 MAX-MIN, (100m)
 MITRE GEOPHYSICS (1984)
 REP. EZ 6/83 - 6/84
 MURCHISON RIVER

SIROTEM/88 FIXED LOOP, ST
 MCSKIMMING, 1988
 NORTH STERLING VALLEY

IPDD/80 IP/RESISTIVITY, DIPOLE-DIPOLE (60m)
 + MAG SCINTREX, 1987
 REP. EZ 315 04/9T
 EZ PLAN A0-526-0040
 STERLING VALLEY

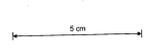
IPG/87 IP/RESISTIVITY, GRADIENT ARRAY
 SCINTREX, 1987
 BAUS PLAN L.J70/1007
 " " L.J70/1008
 " " L.J70/1009
 NORTH STERLING VALLEY

Also GRAVITY/959 REP. EZ. 605-R
 STERLING VALLEY

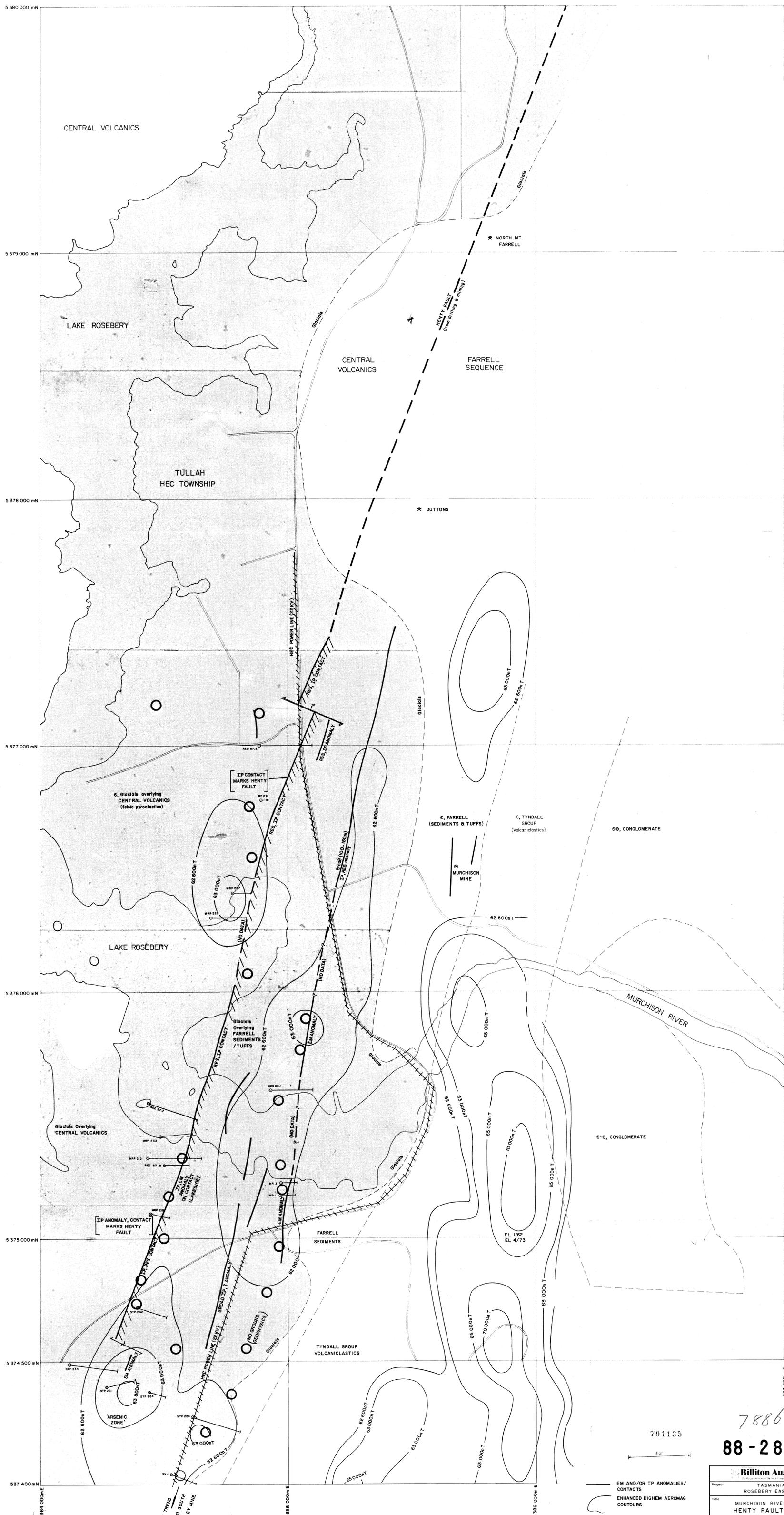
7885

88-2895

701134



Billiton Australia <small>By Appointment to the Hon. Minister of Resources</small>	
Project	TASMANIA ROSEBERY EAST JV
Title	HENTY FAULT ZONE GEOPHYSICAL SURVEYS
Author	J.M.
Date	12/88
Scale	1:5000
Drawn	A.M.
Office	ELC
Revised	
Date	
Drawing No.	LJ50/1119
Fig. No.	2



701135
 5 cm

7886
88-2895

- EM AND/OR IP ANOMALIES/CONTACTS
- ENHANCED DIGHEM AEROMAG CONTOURS
- DIGHEM EM ANOMALIES (excluding Cultural)

Billiton Australia			
TASMANIA ROSEBERY EAST J.V.			
Title MURCHISON RIVER AREA HENTY FAULT ZONE GEOPHYSICAL INTERPRETATION & COMPILATION			
Author: h.w.	Date: 2/88	Scale: 1:5000	
Drawn: AB	Office: AHO	Revised:	Date:
Drawing No: LJSO/1121			Fig. No: 3

LAKESIDE LOCATION PLAN

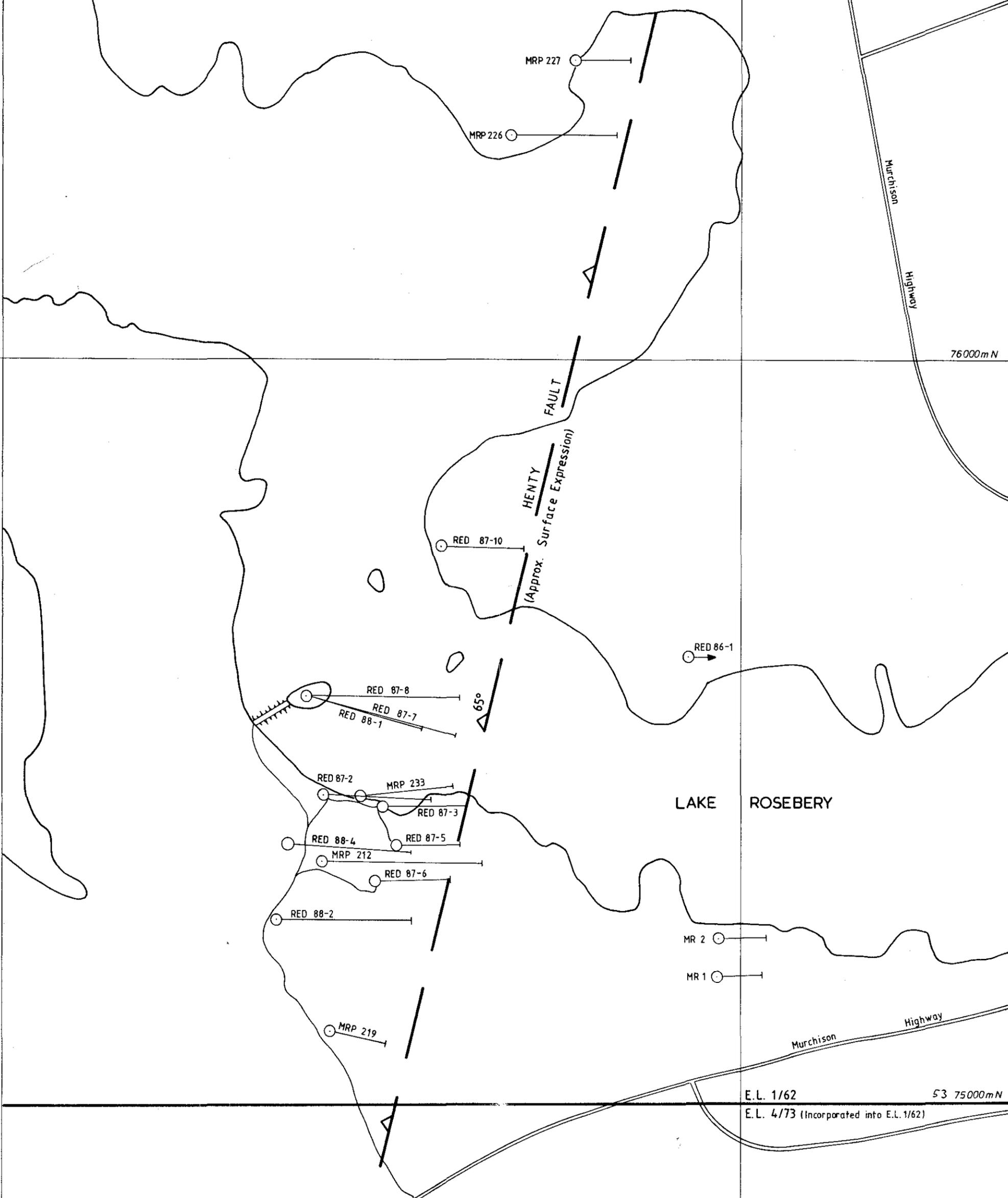
7887

3 84 000m E

85 000m E

76 000m N

53 75000m N



LAKE ROSEBERY

E.L. 1/62
E.L. 4/73 (Incorporated into E.L. 1/62)

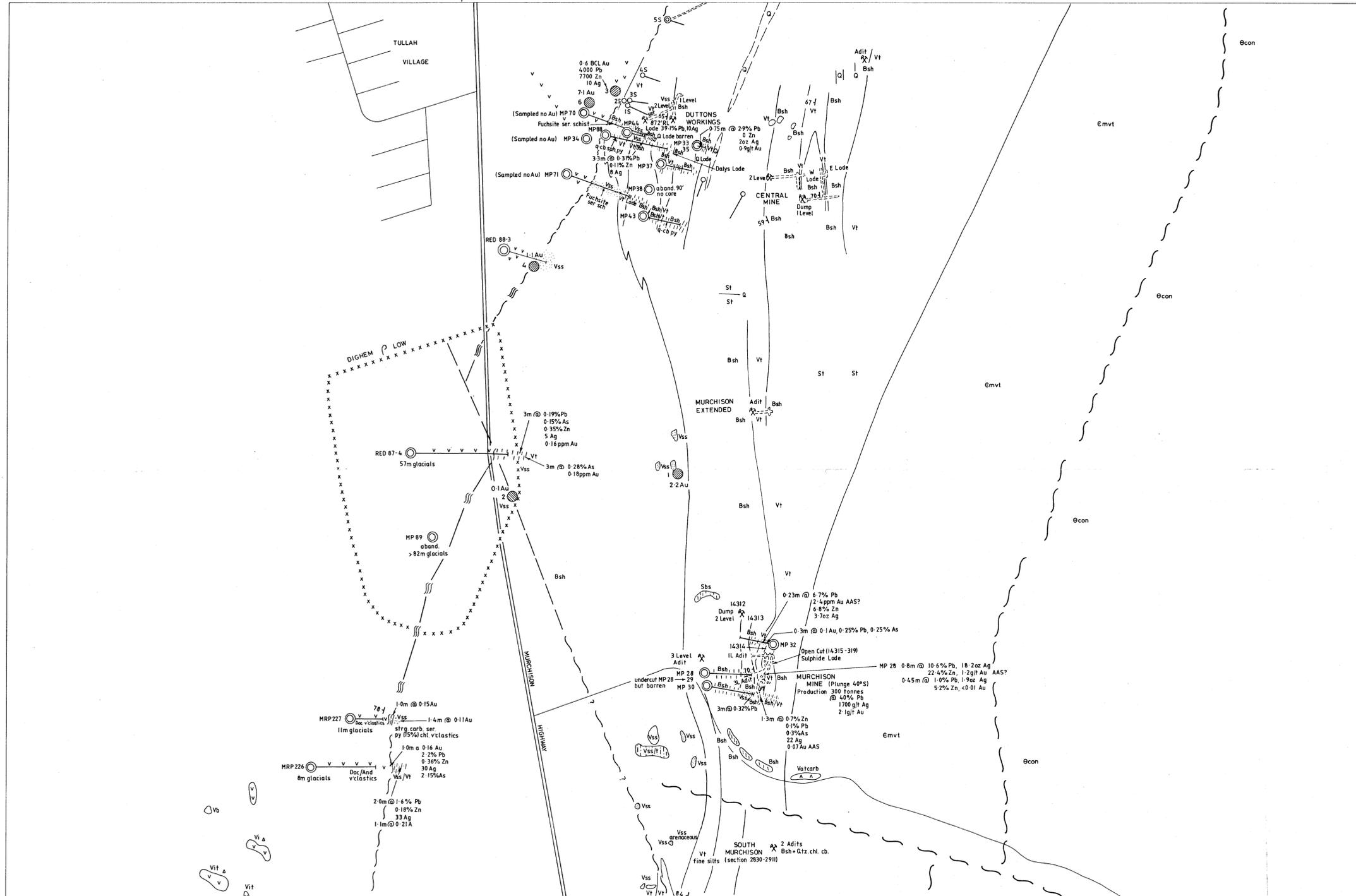
5 cm

0 1:5,000 500m

701136
88-2895

Fig 4

DRAWING No. D/LJ 50/042



LEGEND

- ORDOVICIAN**
 - Bcon Owen Conglomerate - mixed and undifferentiated sands, pebbles, boulders of predominantly Tyennan origin.
 - Bsh - grey fissile pyritic often crenulated and variably graphitic shales.
 - Vt - fine grained tuffaceous volcaniclastics, strongly sericitized often silicified and quartz veined.
- CAMBRIAN**
 - Vss - dirty poorly bedded arenaceous volcaniclastic.
 - V - feldspar phyric andesitic lavas.
 - Va - Mt Black Volcanics - siliceous acid lavas.
- Other Symbols:**
 - m/Vi - medium feldspar porphyritic intermediate volcanic lava.
 - q/vn - quartz veining.
 - Ssilt - siltstone.
 - ser - sericite.
 - cb - carbonate.
 - sil - silicified.
 - Bedding strike/dip + facing.
 - Old working.
 - 1986 BCL Survey (Bulk Cyanide Leach).
 - 1987 BCL Survey (Bulk Cyanide Leach).

ROCK CHIP SAMPLING							
	Cu	Zn	Ag	Au	Ba	Pb	As
14312	9900	20.6%	560	0.24	< 10	3.15%	1.28%
14313	75	4.800	9	< 0.01	240	4.000	4.8
14314	46.0	510	95	0.05	180	1.63%	4.150
14315	490	1100	430	0.40	90	5.75%	8.700
14316	250	1250	46	< 0.01	460	1.600	4.00
14317	750	1.70%	440	1.09	105	7.70%	3.85%
14318	860	1700	220	0.10	580	5.00%	3.950
14319	210	1550	50	0.01	110	1.37%	1.300
	AAS		F.A.		XRF (ppm)		

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

Project: **HENTY FAULT ZONE**

Title: **GEOLOGICAL BASE**

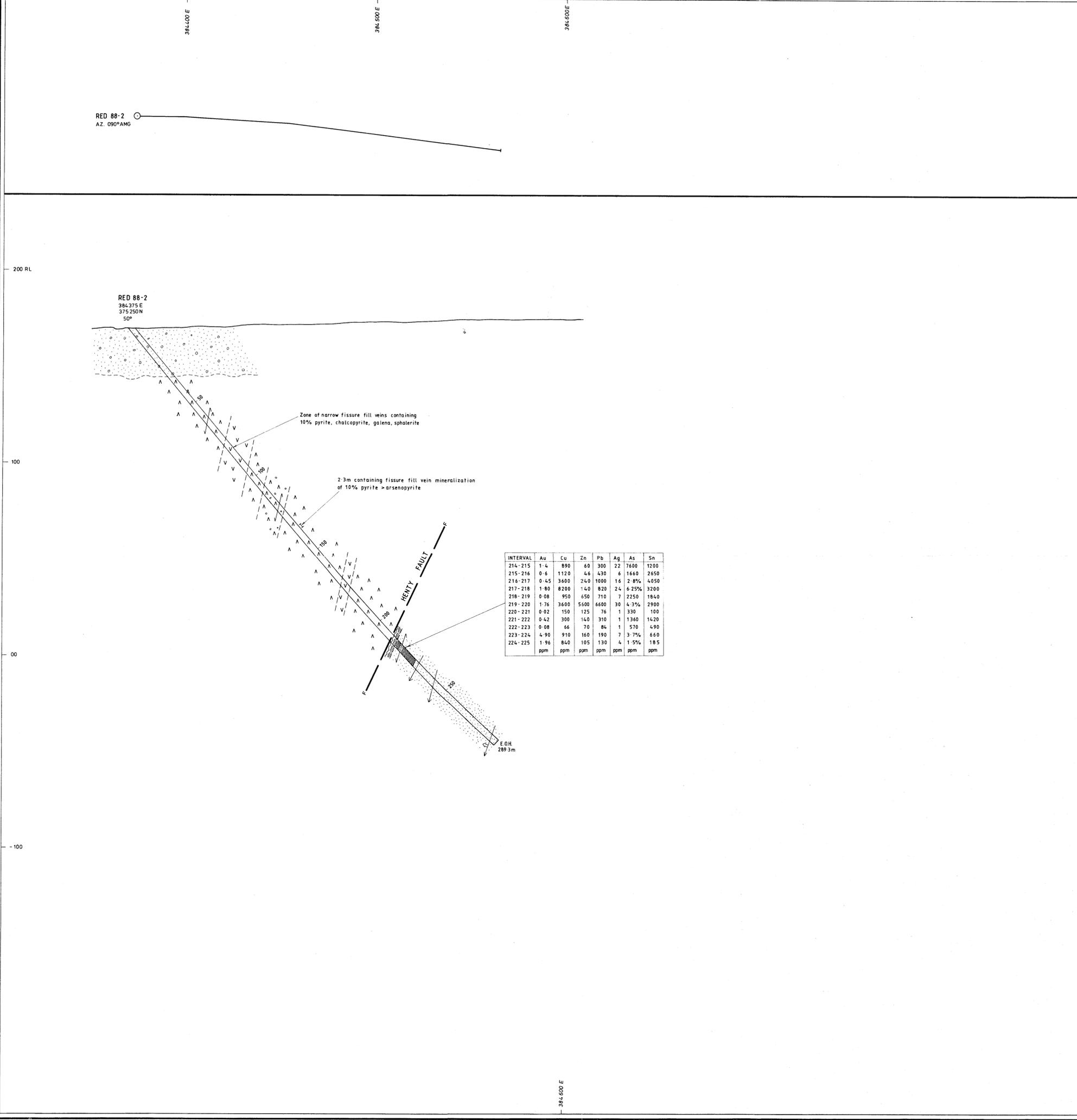
SHEET 4

Author	J.P.R.	Dept.	Scale	1:5000
Drawn	Q.H.	Date	10/87	Revised
Checked	Date	S'ced	Date	8/88
Sheet No.	FIG. No.	5	Drawing No.	D/LJ 50/024



Billiton Australia The Metals Division of the Shell Company of Australia Limited			
Project ROSEBERY EAST			
Title E.L. 1/62 RENEWAL AREA STATUS PLAN			
Author	DBH	Dept. TAS	Scale
Drawn	OH	Date 12/88	Revised Date
Checked		Date	S'ceded Date
Sheet No.	FIG 6	Drawing No.	D/LJ 50/046

5 cm

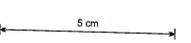


LEGEND

- QUATERNARY
 - FLUVID - GLACIAL SEDIMENTS
 - ANDESITE LAVAS
Medium grained feldspar porphyritic andesite. Pervasive chloritic and silicic alteration accompanied by minor disseminated pyrite throughout. Minor carbonate alteration.
 - BASALT LAVAS
Fine grained basalt lavas / dykes. Pervasive chloritic and silicic alteration accompanied by minor disseminated pyrite throughout. Minor carbonate alteration.
- CAMBRIAN
 - EPICLASTIC
Sediment largely derived from andesites containing chloritic shale clasts and sediment derived from basalt containing andesite clasts.
 - BLACK SHALES
Black shales containing lesser interbedded siltstones and sandstones. Strong silicic and chloritic alteration throughout. Disseminated pyrite throughout. Strongly cleaved.
 - SANDSTONE
Grey sandstone with lesser interbedded siltstones and shales. Strongly cleaved. Disseminated pyrite throughout more prominent on cleavage surfaces.
 - MINERALIZED ZONE
Grey quartzose sandstone with lesser siltstones and shales. Strongly altered. Massive to disseminated pyrite - pyrrhotite - arsenopyrite.

- Bedding
- Bedding facing
- Primary lineation in lavas, volcanoclastics etc.
- Schistosity
- Fault
- Shear
- Geological contact
- Geological contact - altitude unknown

701140



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

Project ROSEBERY EAST JV - EL 1/62

Title LAKESIDE SECTION RED 88-2 5375250mN (AMG)

Author	CJC	Dept.	TAS	Scale	1:1000
Drawn	OH	Date	7/88	Revised	Date
Checked	Date	S'ced	Date		
Sheet No.	Fig 8	Drawing No.	O/LJ 50/043		

PLAN

384 500 E 384 600 E 384 700 E

± 375 350 m N (AMG) RED 88-4 RED 87-5 EOH 145.5 m ± 375 350 m N

SECTION

WEST EAST

200 RL

100

00

-100

-200

384 500 E 384 600 E 384 700 E

LEGEND

- QUATERNARY
 - FLUVIO-GLACIAL GRAVELS, SANDS AND SILTS
- MT READ VOLCANICS
 - A: WEST OF HENTY FAULT
 - ANDESITE LAVAS
Coarsely feldspar-porphyrific andesite. Generally strongly silicified. Minor intercalated basalt (V₂) - some clearly dykes
 - ANDESITIC VOLCANICLASTICS AND TUFFS
Clastic material of same provenance as the above lavas. Includes reworked volcanoclastic breccias, tuffaceous sediments and feldspar-crystal tuffs.
 - B: EAST OF HENTY FAULT
 - VOLCANOMICT AND TUFFACEOUS SEDIMENTS OF THE FARRELL SLATE SEQUENCE
 - BLACK GRAPHITIC SHALE
 - TUFFACEOUS AND CARBONATE-RICH SILTSTONE, SANDSTONE AND SHALE
Sandstone, generally quartzose.
 - MINERALISED, BRECCIATED AND ALTERED SANDSTONE
Bands, patches and stringers of pyrite-arsenopyrite-chalcopyrite in silicified, chloritised and tourmalinised, quartzose graphitic sandstone. Minor interbedded graphitic tuffaceous shale.
- CAMBRIAN

- Bedding
- Bedding facing
- Primary lineation in lavas, volcanoclastics etc.
- Schistosity
- Fault
- Shear
- Geological contact
- Geological contact - attitude unknown

NB. Henty Fault intersects Section at an angle of 13° from perpendicular

701141

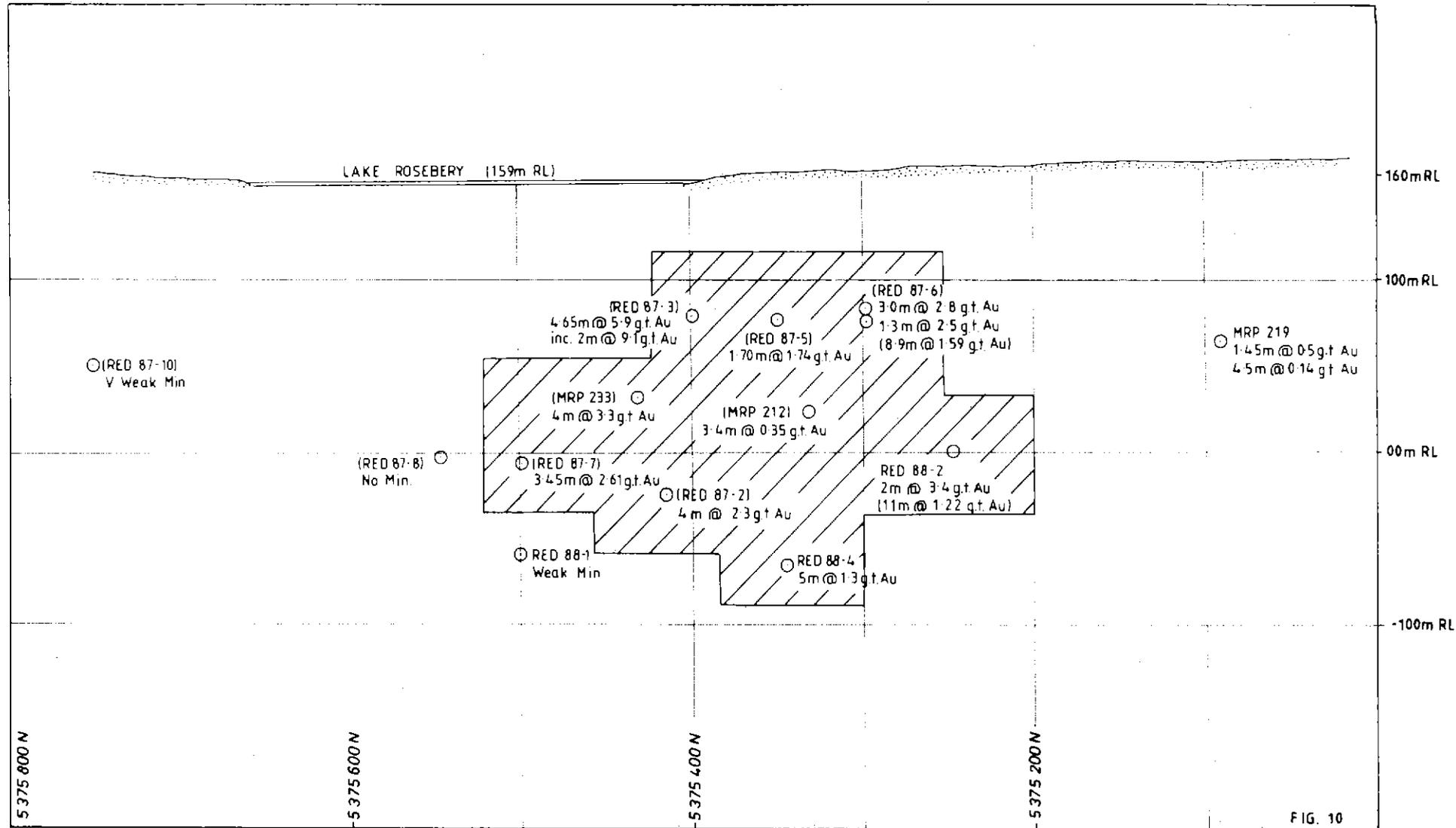
5 cm

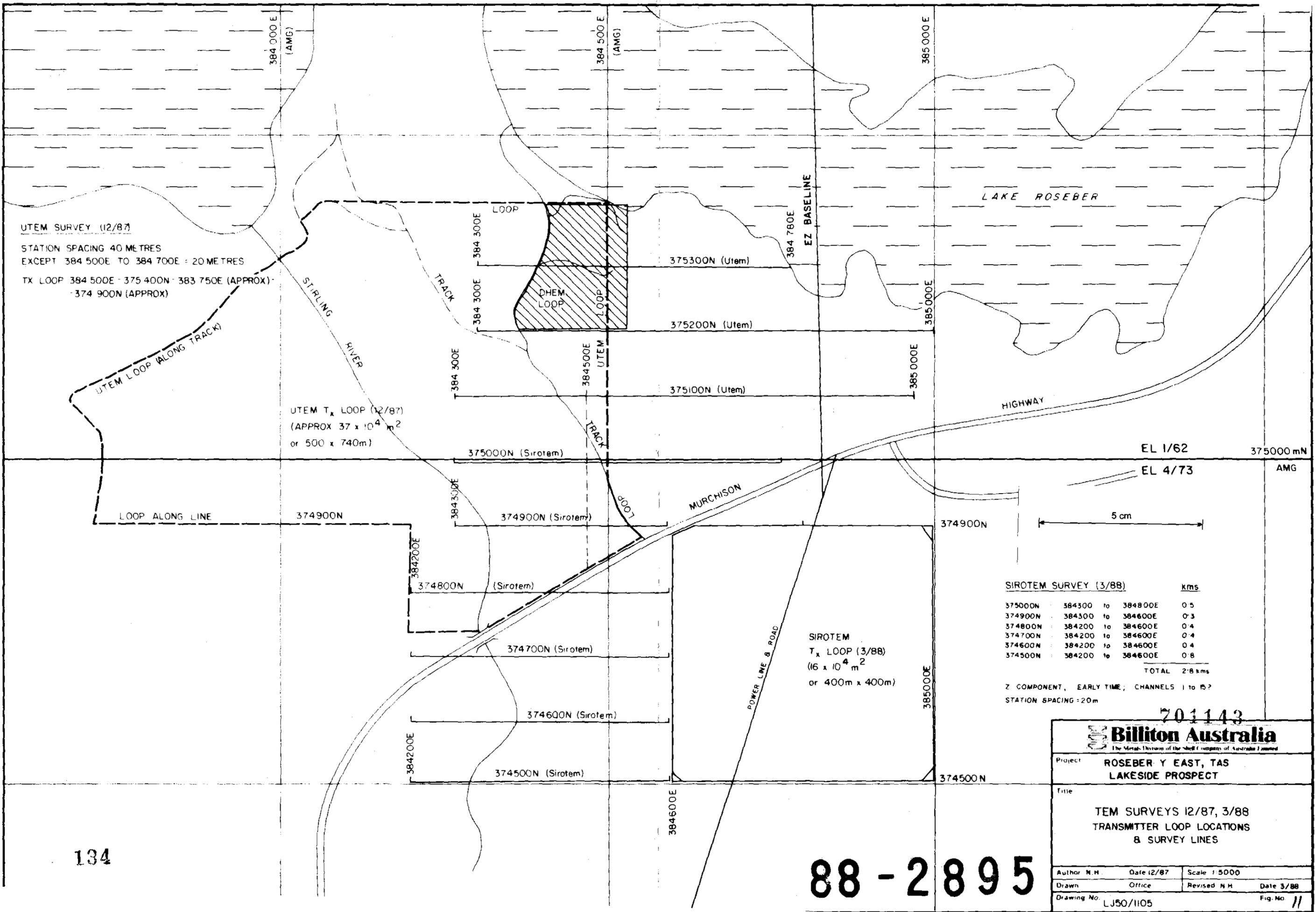
88-2895

Billiton Australia <small>The Merian Division of the Shell Company of Australia Limited</small>			
Project ROSEBERRY EAST J.V. - EL 1/62			
Title LAKESIDE SECTION ± 375 350 m N (AMG) RED 87-5, RED 88-4			
Author JGP	Dept. TAS	Scale 1:1000	
Drawn AS	Date 8/87	Revised CJC	Date 8/88
Checked	Date	S'ceded	Date
Sheet No.	FIG. No. 9	Drawing No.	LJ 50/1080

88-2895

ROSEBERY EAST JV
 LONGITUDINAL PROJECTION
 LAKESIDE
 INDICATED RESOURCE





UTEM SURVEY (12/87)
 STATION SPACING 40 METRES
 EXCEPT 384 500E TO 384 700E - 20 METRES
 TX LOOP 384 500E - 375 400N - 383 750E (APPROX) -
 374 900N (APPROX)

UTEM TX LOOP (12/87)
 (APPROX $37 \times 10^4 \text{ m}^2$
 or $500 \times 740\text{m}$)

SIROTEM
 TX LOOP (3/88)
 ($16 \times 10^4 \text{ m}^2$
 or $400\text{m} \times 400\text{m}$)

SIROTEM SURVEY (3/88) Kms

37500N	384300	to	384800E	0.5
374900N	384300	to	384600E	0.3
374800N	384200	to	384600E	0.4
374700N	384200	to	384600E	0.4
374600N	384200	to	384600E	0.4
374500N	384200	to	384600E	0.8
TOTAL				2.8 kms

Z COMPONENT, EARLY TIME; CHANNELS 1 to 15?
 STATION SPACING = 20m

701143

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

Project: ROSEBER Y EAST, TAS
 LAKESIDE PROSPECT

Title:
 TEM SURVEYS 12/87, 3/88
 TRANSMITTER LOOP LOCATIONS
 & SURVEY LINES

Author N.H.	Date 12/87	Scale 1:5000	
Drawn	Office	Revised N.H.	Date 3/88
Drawing No. LJ50/1105	Fig. No. //		

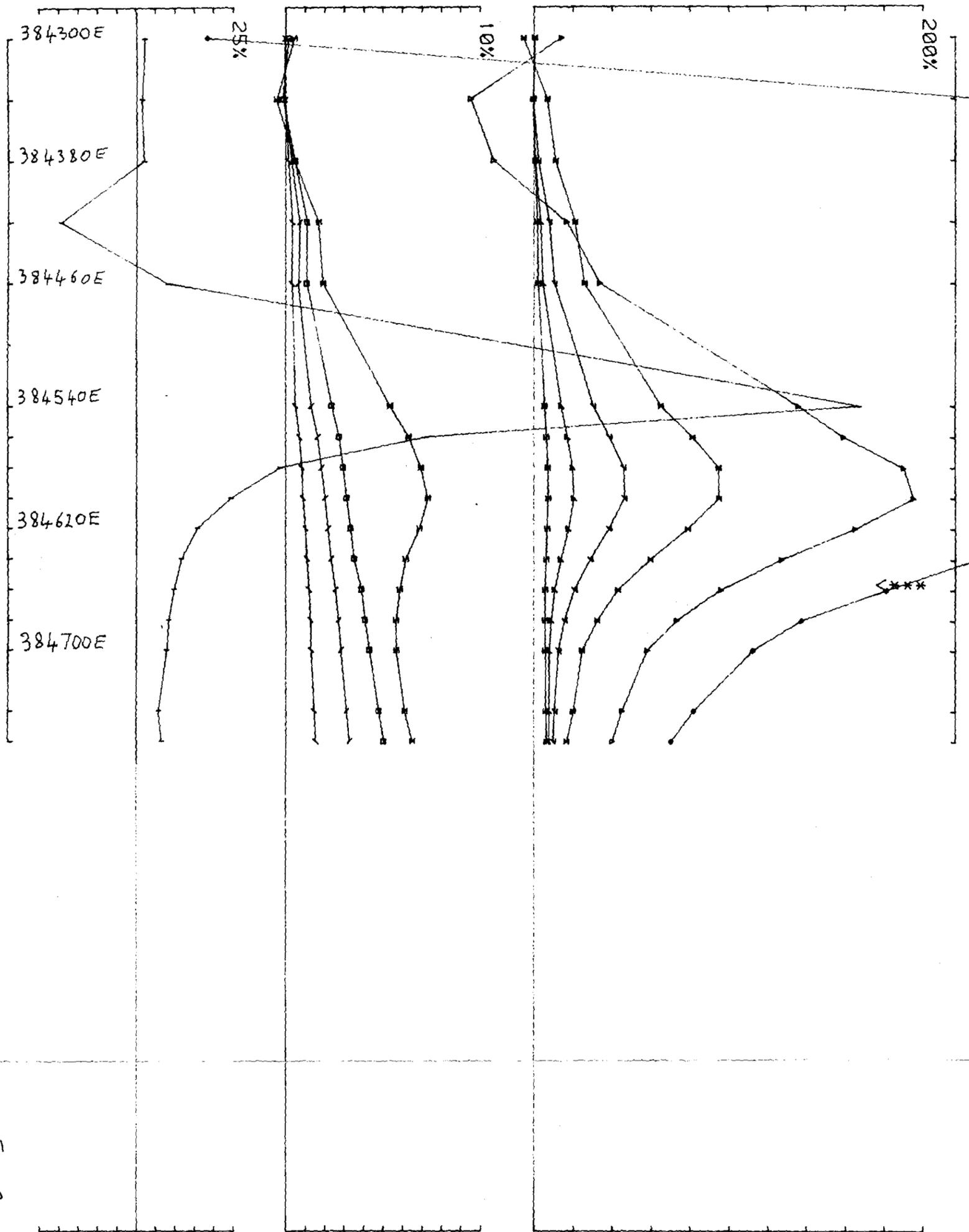


Fig. 12

UTEM SURVEY at LAKESIDE for BILLITON

conducted by PMM CAC Job 8725 base freq (hz) 26.230 8/12/87

Loop 0001 line 375300N component Hx secondary field Ch 1 point norm.

701144

88-2895

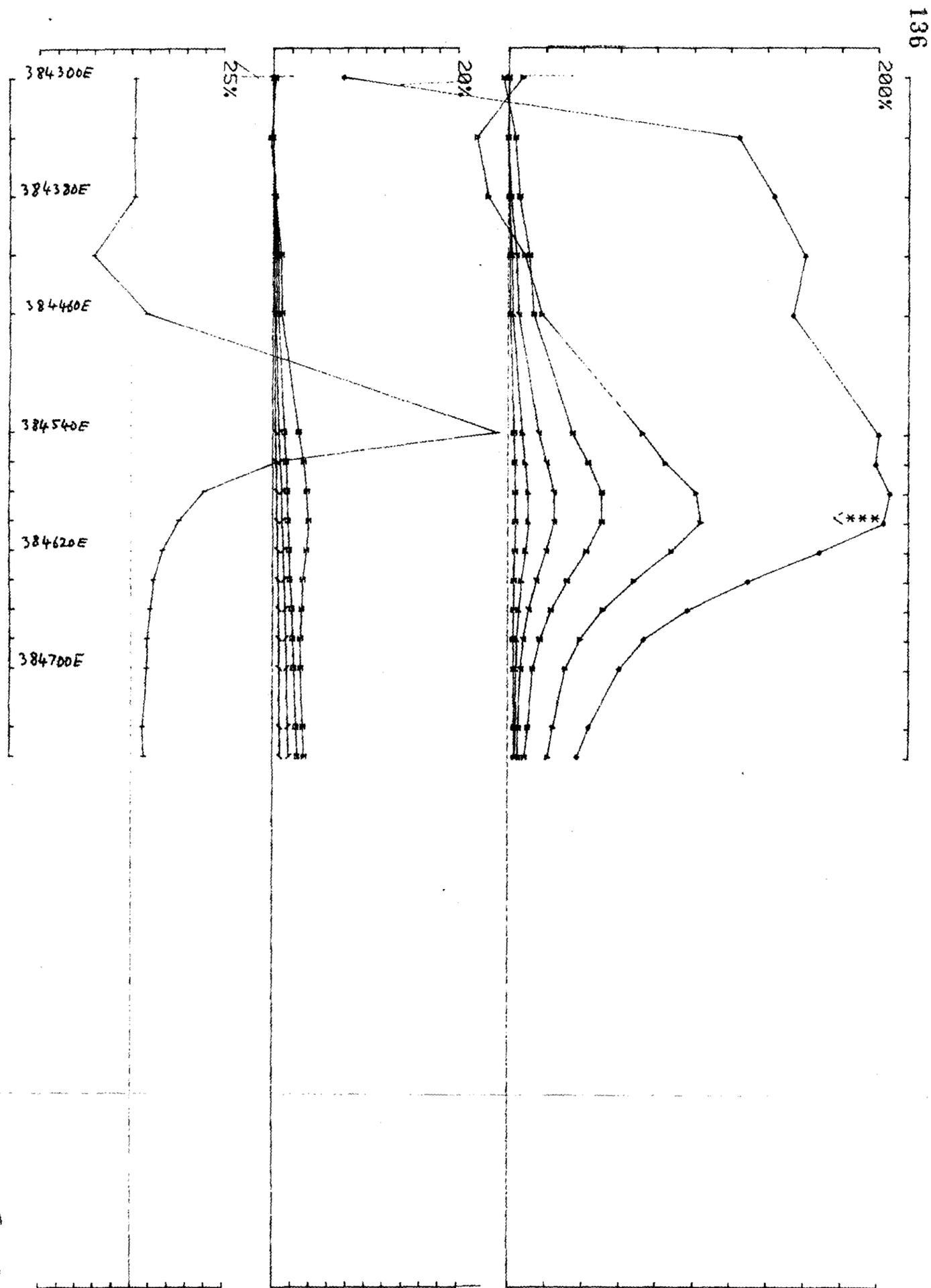


Fig. 13

UTEM SURVEY at LAKESIDE for BILLITON
 conducted by PMM CAC Job 8725 base freq (hz) 26.230 8/12/87
 Loop 0001 line 375300N component Hx secondary field Ch 1 point norm.

701145

88-2895

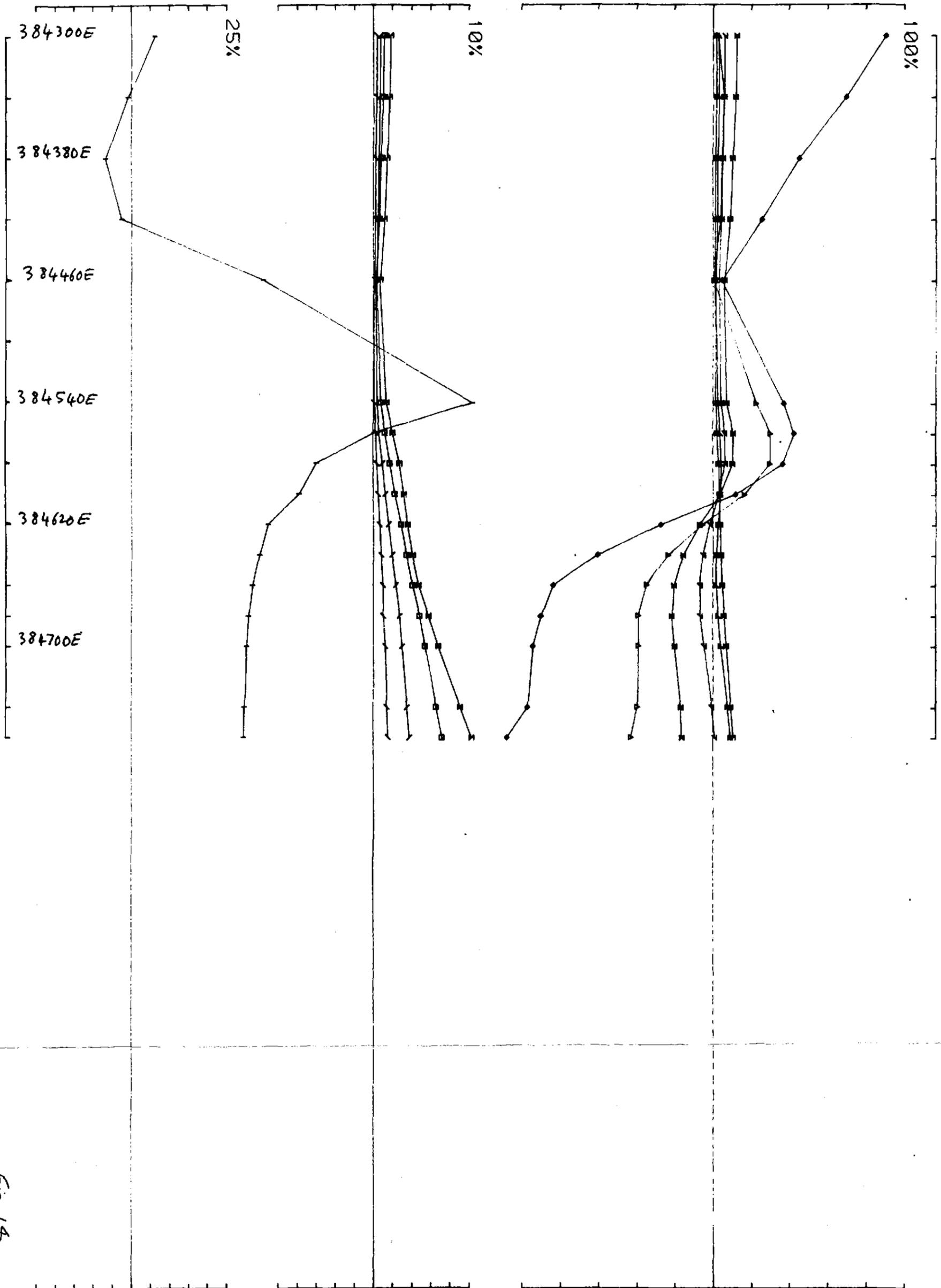


Fig. 14

UTEM SURVEY at LAKESIDE for BILLITON

conducted by PMM CAC Job 8725 base freq (hz) 26.230 8/12/87

Loop 0001 line 375300N component Hz secondary field Ch 1 contin. norm.

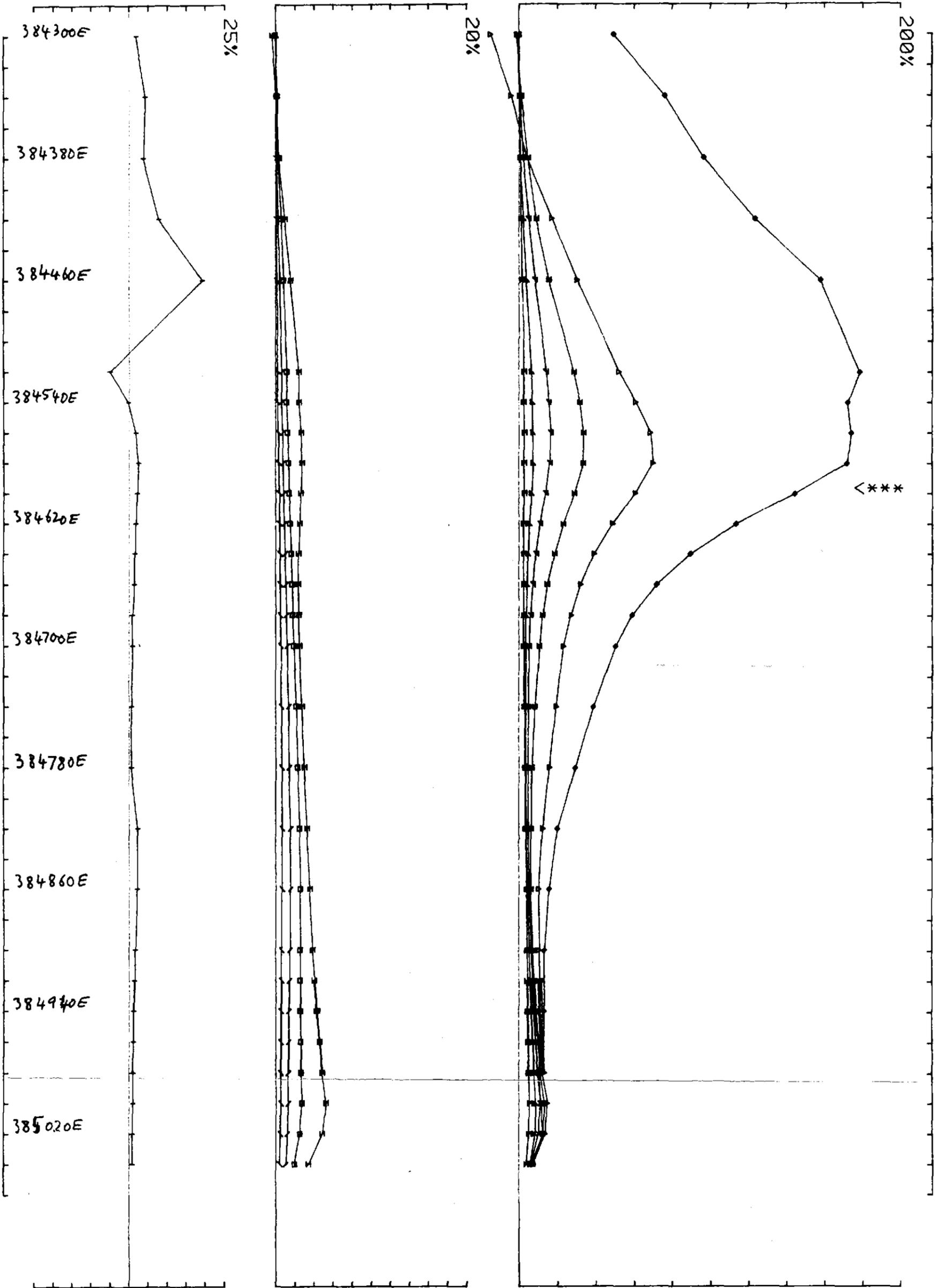


Fig. 15

UTEM SURVEY at LAKESIDE for BILLITON
 conducted by PMM CAC job 8725 base freq (hz) 26.230 8/12/87
 Loop 0001 line 375200N component Hx secondary field Ch 1 point norm.

200%

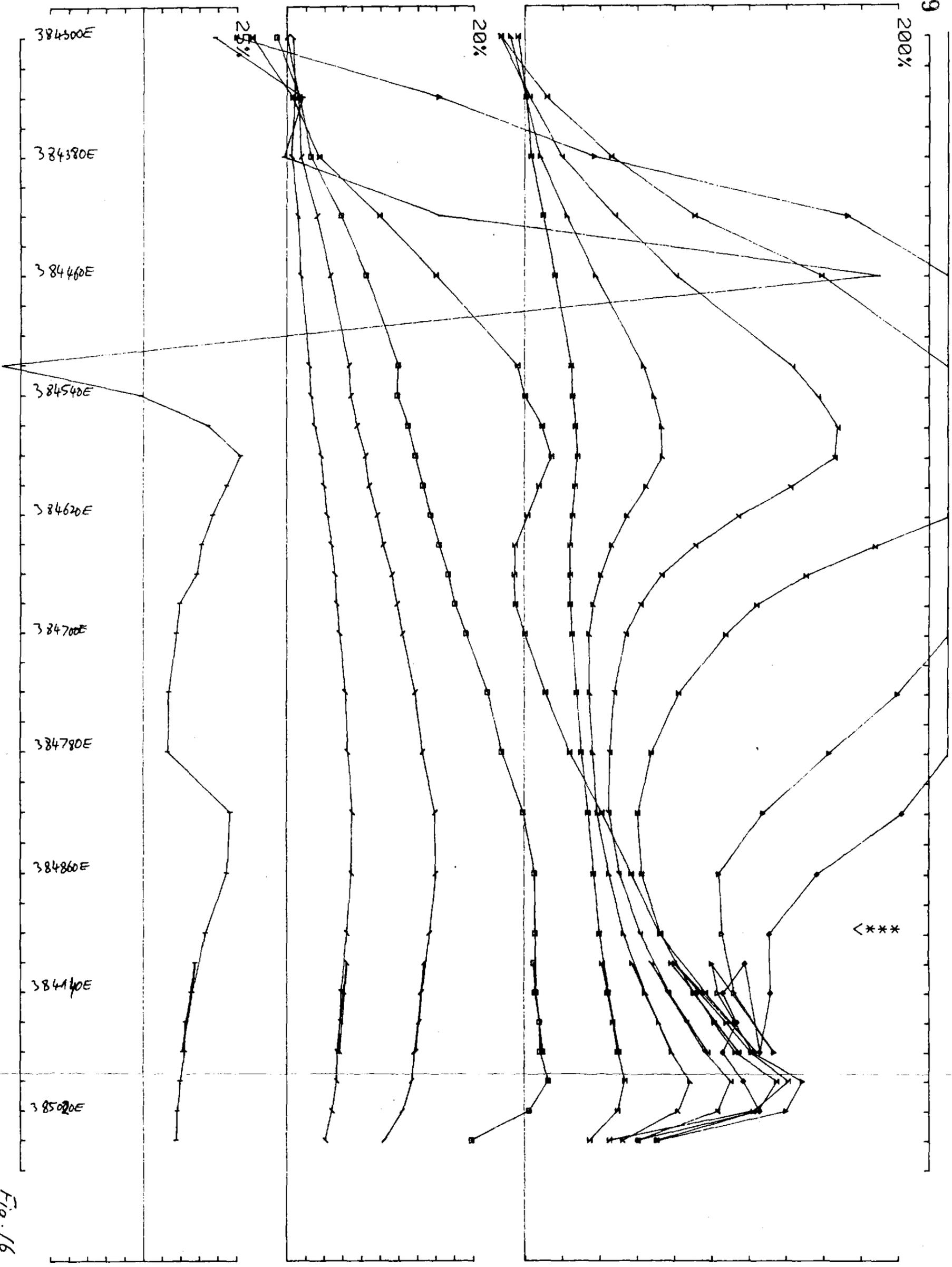


Fig. 16

UTEM SURVEY at LAKESIDE for BILLITON
 conducted by PMM CAC job 8725 base freq (hz) 26.230 8/12/87
 Loop 0001 line 375200N component Hx secondary field Ch 1 point norm.

701148

88-2895

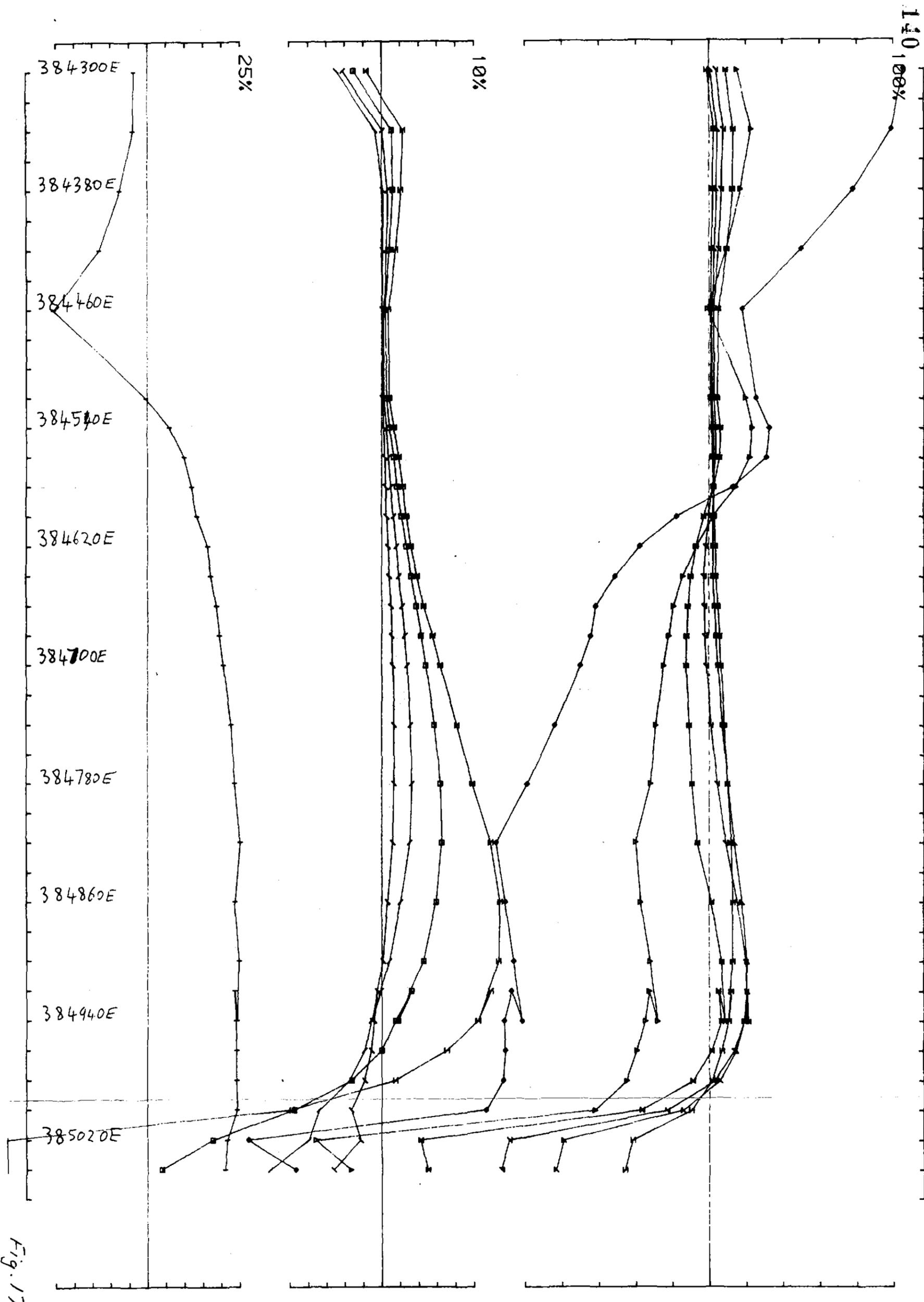


Fig. 17

UTEM SURVEY at LAKESIDE for BILLITON

conducted by PMM CAC Job 8725 base freq (hz) 26.230 8/12/87

Loop 0001 line 37520N component Hz secondary field Ch 1 contin. norm.

88-2895

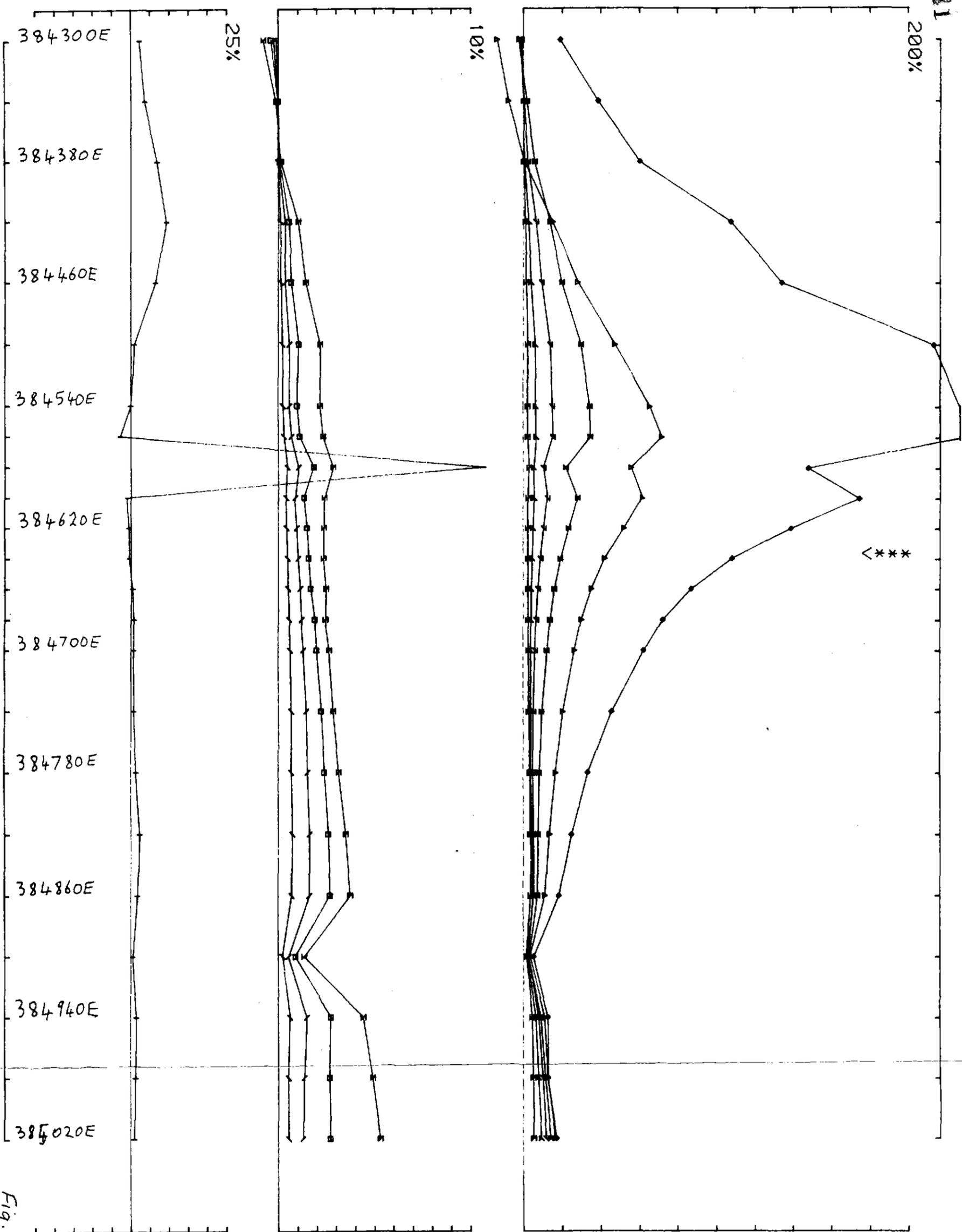


Fig. 18

UTEM SURVEY at LAKESIDE for BILLITON
 conducted by PMM CAC Job 8725 base freq (hz) 26.230 8/12/87
 Loop 0001 line 37500N component Hx secondary field Ch 1 point norm.

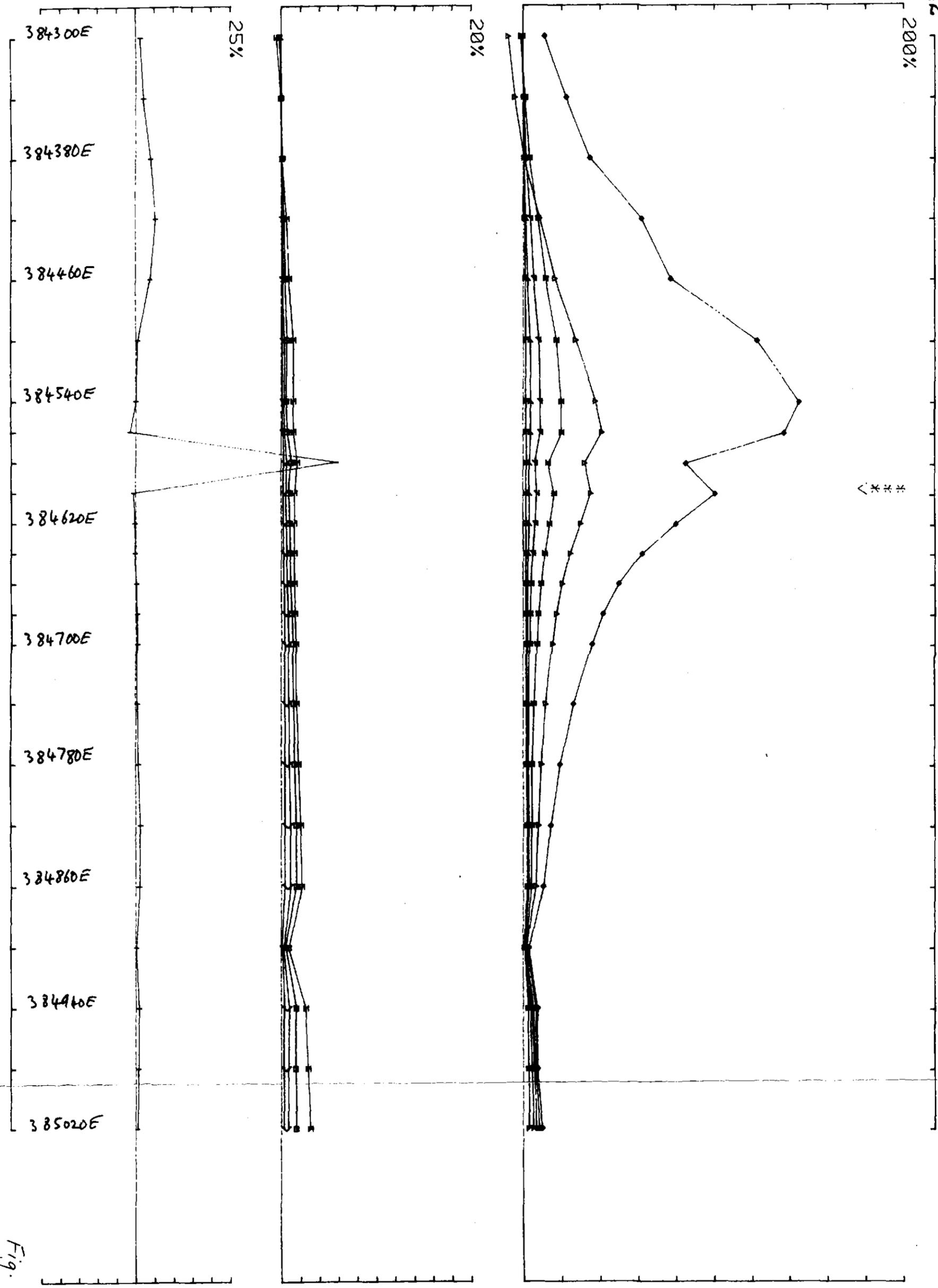


Fig. 19

UTEM SURVEY at LAKESIDE for BILLITON
 conducted by PMM CAC Job 8725 base freq (hz) 26.230 8/12/87
 Loop 0001 line 37500N component Hx secondary field Ch 1 point norm.

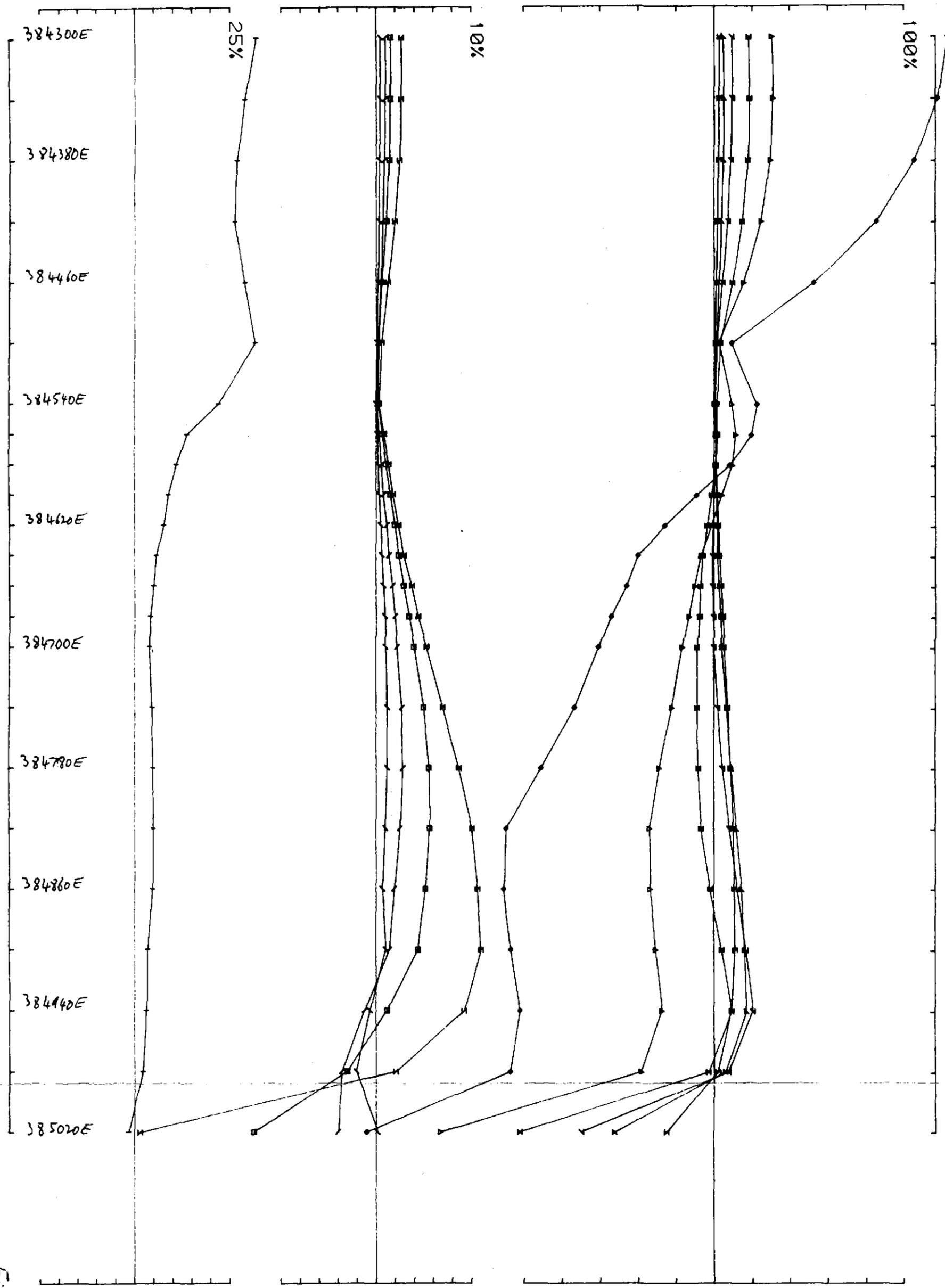


Fig. 20

UTEM SURVEY at LAKESIDE for BILLITON
 conducted by PMM CAC Job 8725 base freq (hz) 26.230 8/12/87
 Loop 0001 line 375000N component Hz secondary field Ch 1 contin. norm.

TRANSIENT EM PROFILE

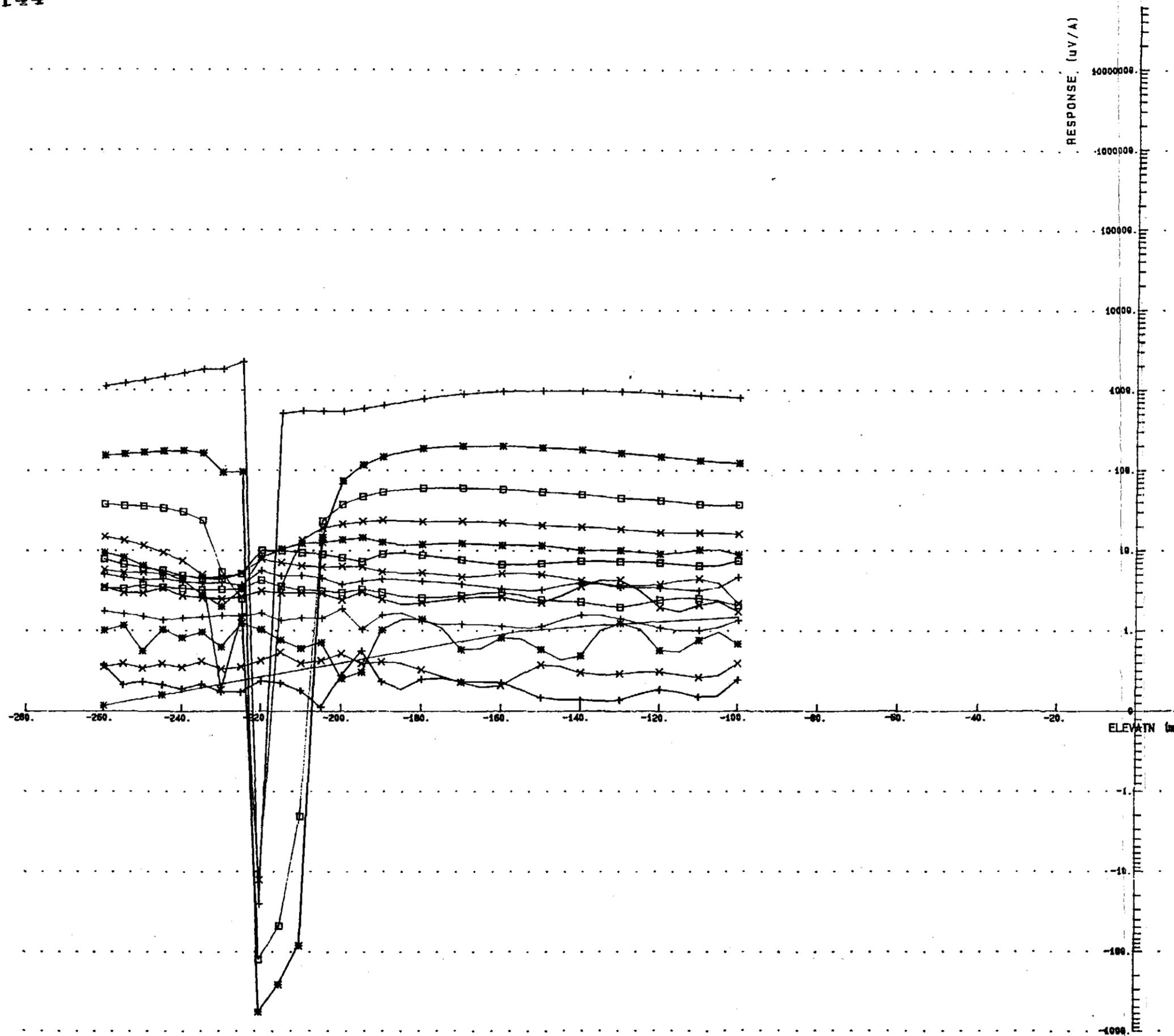
Line: DDH8863

PEBLE TEM file details

Loop config. = DOWNHOLE
 Device type = SIROTEM
 Rx Component = R
 Ramp turn-off = 0.14 ms
 Tx size = 150.m x 150.m
 Tx loop rotn. = 0 deg
 Tx loop orig. = 4360. 5200.
 Eff. Rx area = 10000. sq.m

Legend

- + Channel 1: 0.4870ms
- * Channel 2: 0.8790ms
- Channel 3: 1.2710ms
- x Channel 4: 1.6630ms
- Channel 5: 2.0550ms
- Channel 6: 2.6430ms
- × Channel 7: 3.4270ms
- + Channel 8: 4.2110ms
- Channel 9: 4.9950ms
- x Channel 10: 5.7790ms
- + Channel 12: 8.6230ms
- * Channel 14: 11.659ms
- x Channel 16: 15.679ms
- + Channel 18: 21.651ms
- * Channel 20: 28.123ms



88-2895



BILLITON AUSTRALIA
 ROSEBERY EAST JV
 LAKESIDE SIROTEM ST
 DDH RED87-2

FIG. NO: 21	REPT. NO:
ENCL. NO:	CRS. NO:
DATE: 12/87	AUTHOR: 44
DRAMA:	OFFICE:

701153

TRANSIENT EM PROFILE

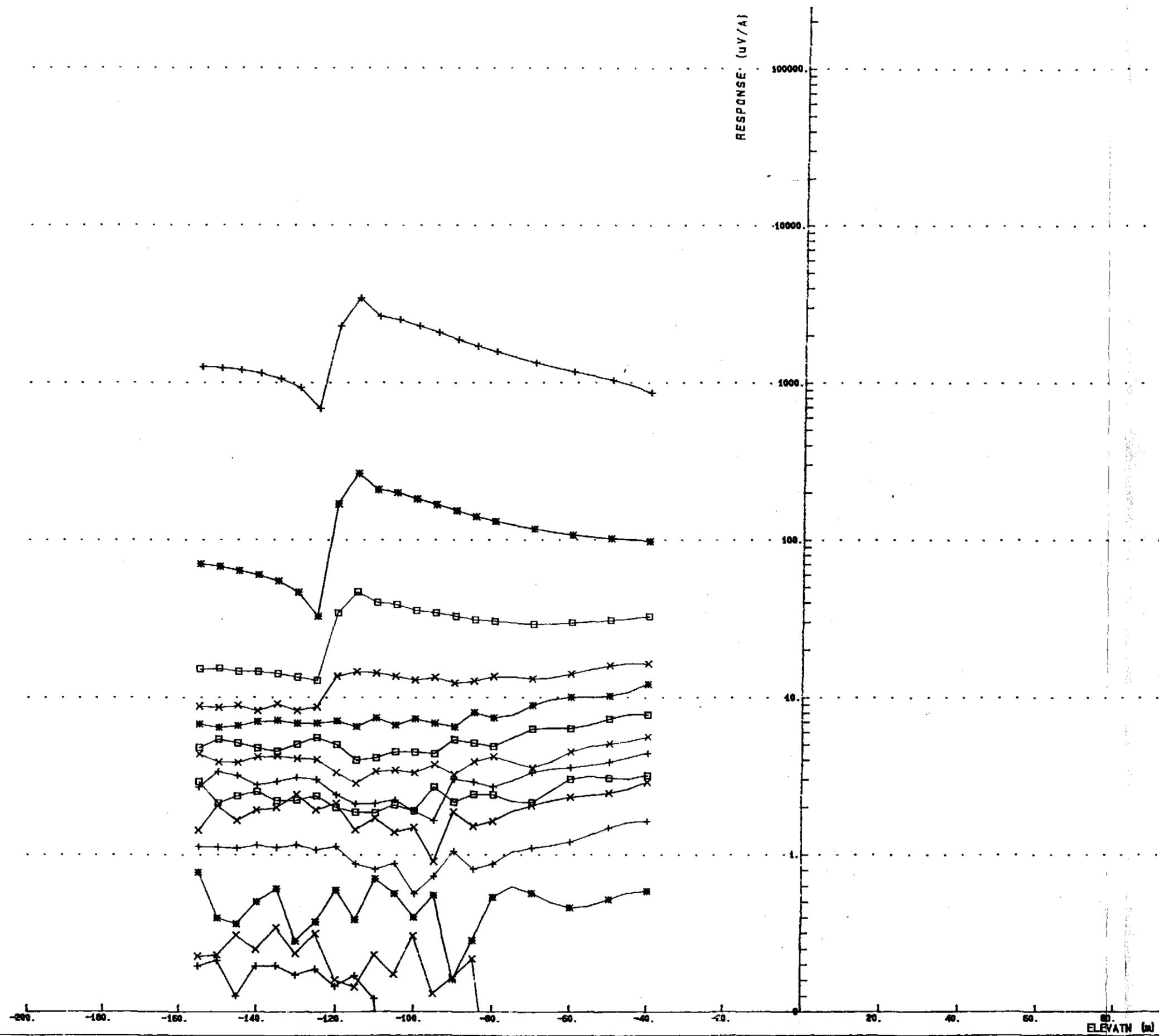
Line: 5300N

PEBLE TEX file details

Loop config. = DOWNHOLE
 Device type = SIROTEM
 Rx Component = R
 Resp turn-off = 0.14 ms
 Tx size = 150.m x 150.m
 Tx loop rath. = 0 deg
 Tx loop orig. = 4360., 5206.
 Eff. Rx area = 10000. sq.m

Legend

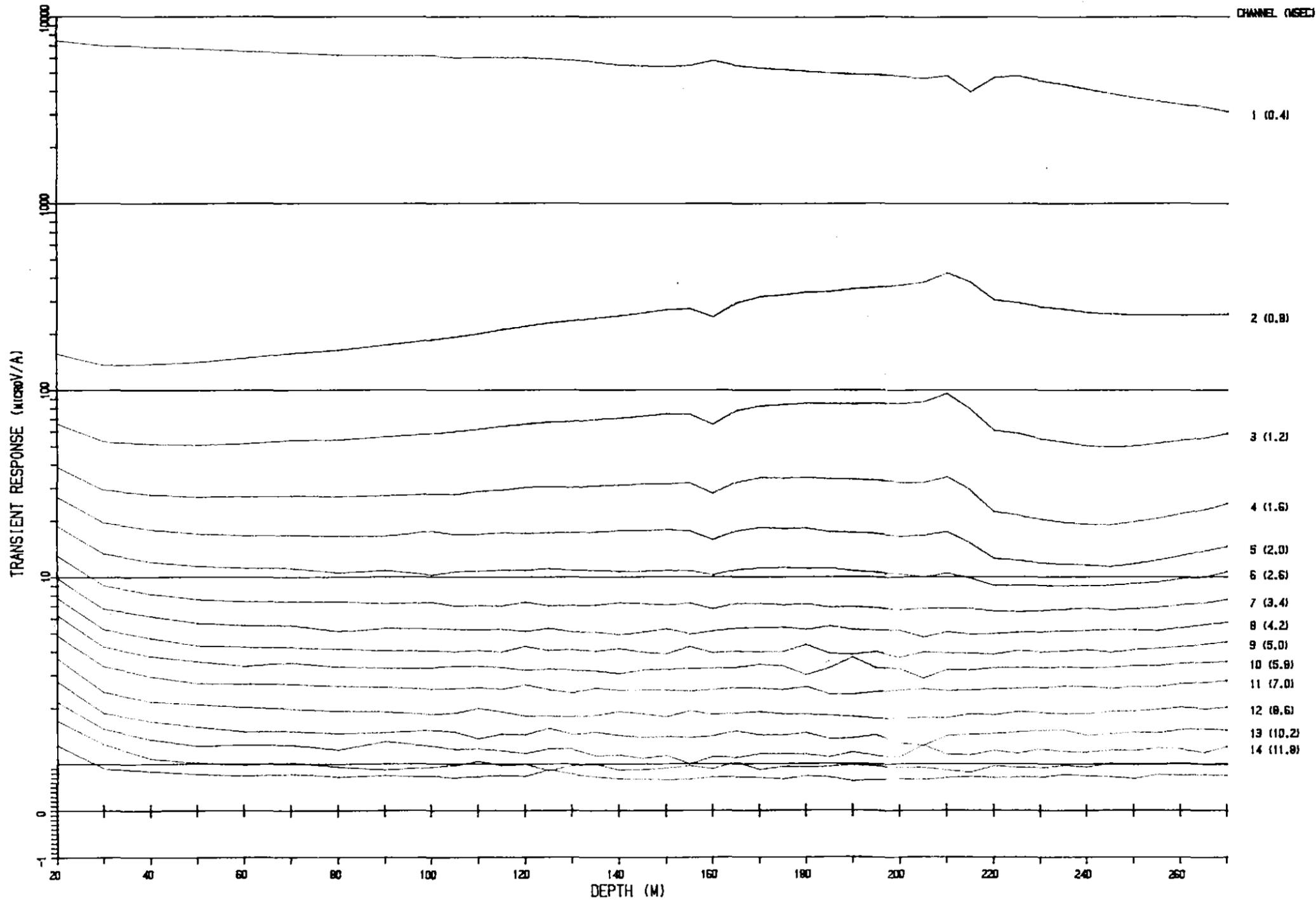
- + Channel 1: 0.4870ms
- * Channel 2: 0.8790ms
- Channel 3: 1.2710ms
- x Channel 4: 1.6630ms
- * Channel 5: 2.0550ms
- Channel 6: 2.4470ms
- x Channel 7: 2.8390ms
- + Channel 8: 3.2310ms
- Channel 9: 3.6230ms
- x Channel 10: 4.0150ms
- + Channel 11: 4.4070ms
- * Channel 12: 4.800ms
- Channel 13: 5.1920ms
- x Channel 14: 5.5840ms
- + Channel 15: 5.9760ms
- * Channel 16: 6.3680ms
- Channel 17: 6.7600ms
- x Channel 18: 7.1520ms
- + Channel 19: 7.5440ms
- * Channel 20: 7.9360ms



88-2895



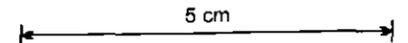
BILLITON AUSTRALIA	
ROSEBERRY EAST JV	
LAKESIDE SIROTEM ST	
DDH RED87-6	
FIG. NO: 22	REPT. NO:
ENCL. NO:	DRG. NO:
DATE: 12/87	AUTHOR: NR
DRAMA:	OFFICE:



SURVEY SPECIFICATIONS

DATA ACQUISITION : WESKIMMING GEOPHYSICS P/L

SURVEY DATE : JUNE 1988
 CONFIGURATION : 200M SQUARE TRANSMITTER LOOP,
 DRILL HOLE SURVEY
 READING INT. : 10 METRES
 NO. OF STACKS : 512
 TRANSMITTER : MEDIUM POWER
 RECEIVER : SIROTEM II S/N 1236
 CURRENT : 9.7 AMPS
 OPERATOR : P WESKIMMING



PLOT SPECIFICATIONS

HORIZONTAL SCALE - 1:1000
 VERTICAL SCALE - LOGARITHMIC
 4CM. PER DECADE
 LINEAR BETWEEN -1 AND #1

88 - 2895

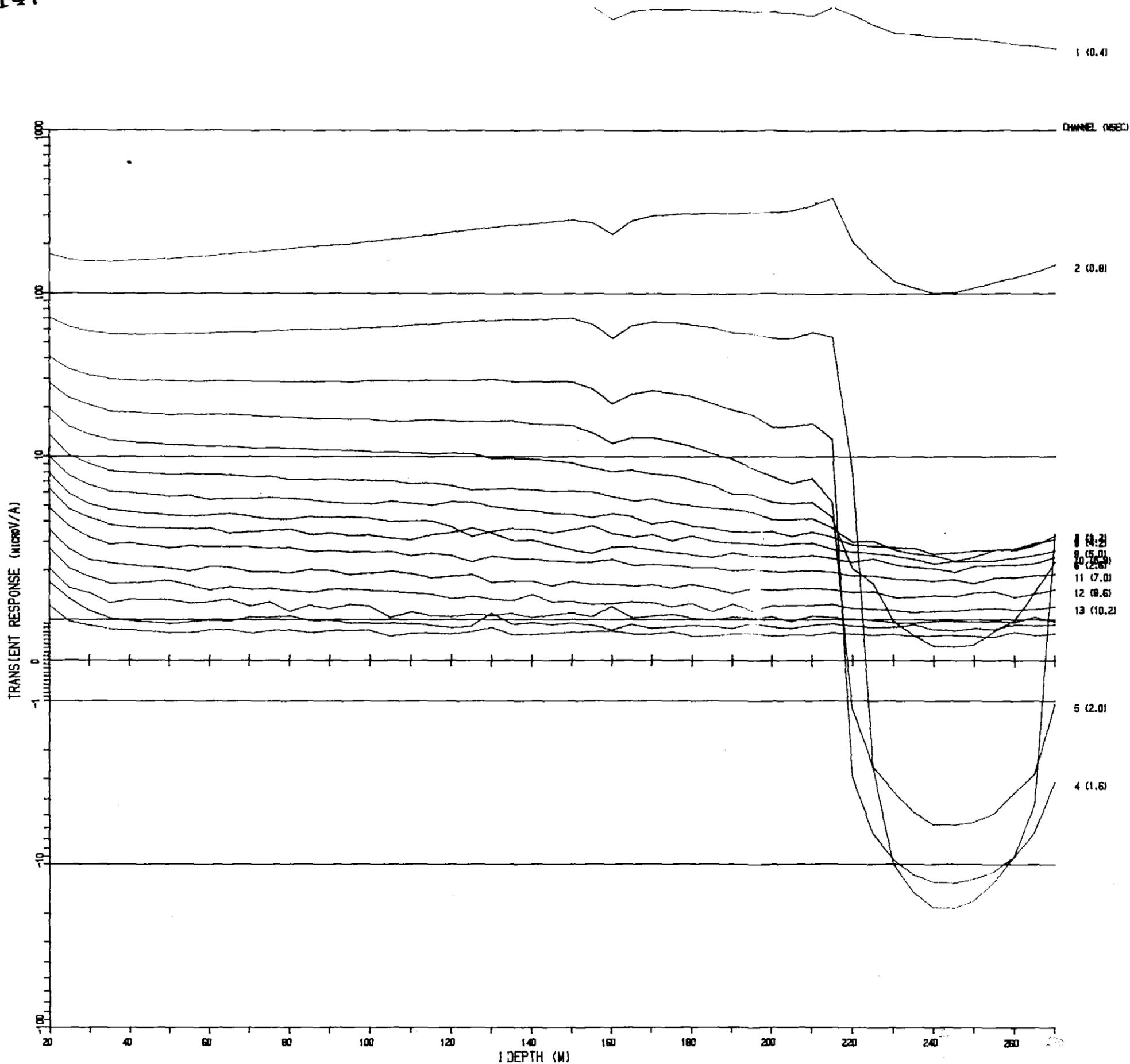
BILLITON AUST

TASMANIA
 LAKESIDE
 SIROTEM PROFILE
 LINE RED 88-2 LOOP 2

SCALE - 1:1000

Fig. 23

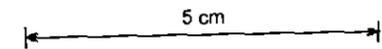
147



SURVEY SPECIFICATIONS

DATA ACQUISITION : MCKIMMING GEOPHYSICS P/L

SURVEY DATE : JUNE 1988
 CONFIGURATION : 200M SQUARE TRANSMITTER LOOP,
 DRILL HOLE SURVEY
 READING INT. : 10 METRES
 NO. OF STACKS : 512
 TRANSMITTER : MEDIUM POWER
 RECEIVER : SIROTEM II S/N 1226
 CURRENT : 9.6 AMPS
 OPERATOR : P MCKIMMING



PLOT SPECIFICATIONS

HORIZONTAL SCALE - 1:1000
 VERTICAL SCALE - LOGARITHMIC
 4CM. PER DECADE
 LINEAR BETWEEN -1 AND +1

88-2895

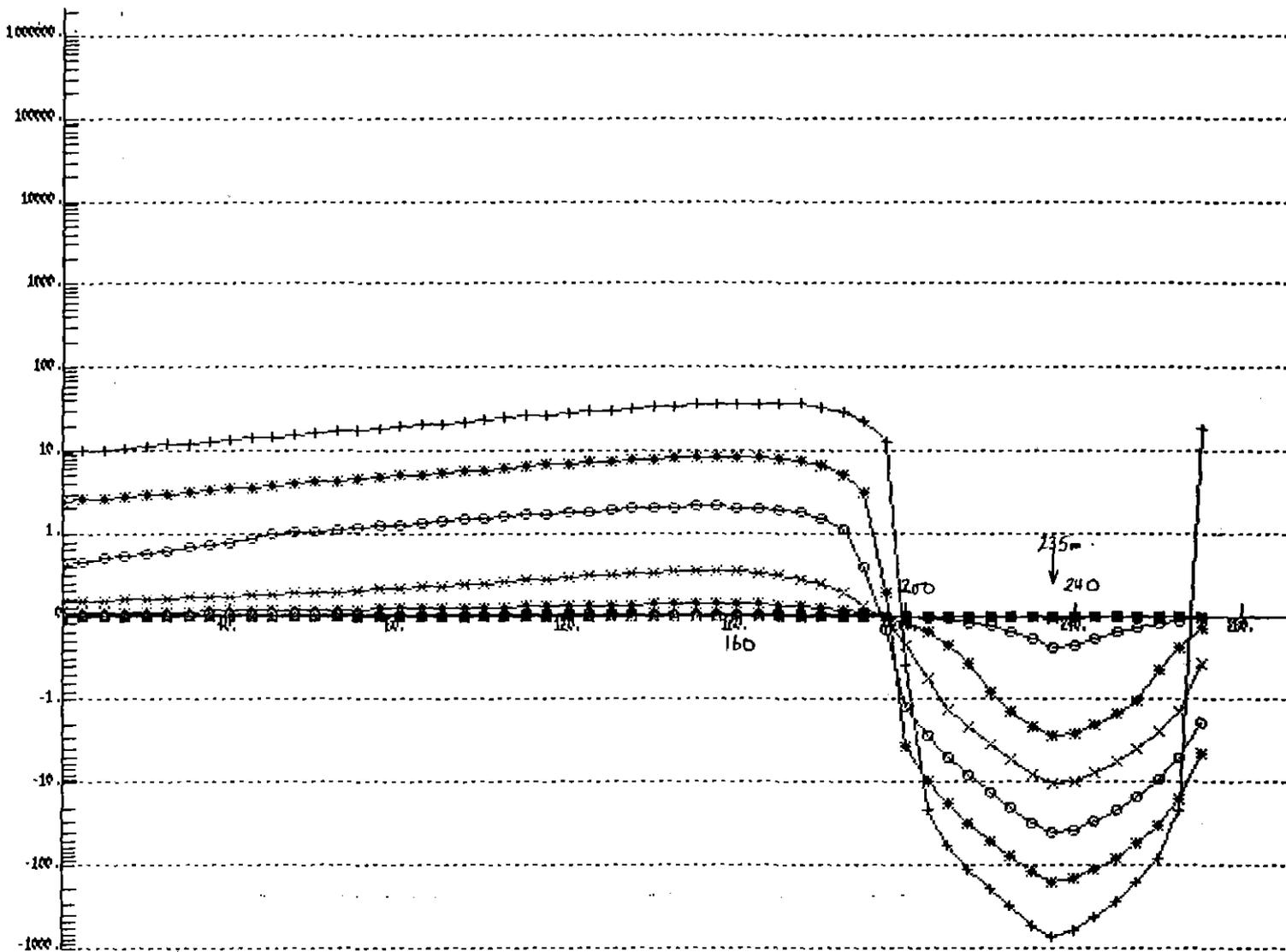
BILLITON AUST

TASMANIA
 LAKESIDE
 SIROTEM PROFILE
 LINE RED 88-2 LOOP 1

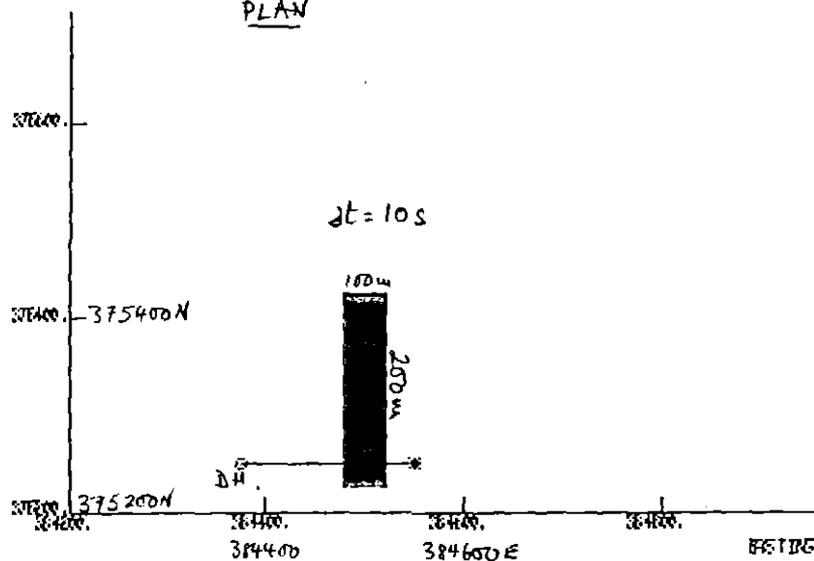
SCALE - 1:1000

Fig. 24

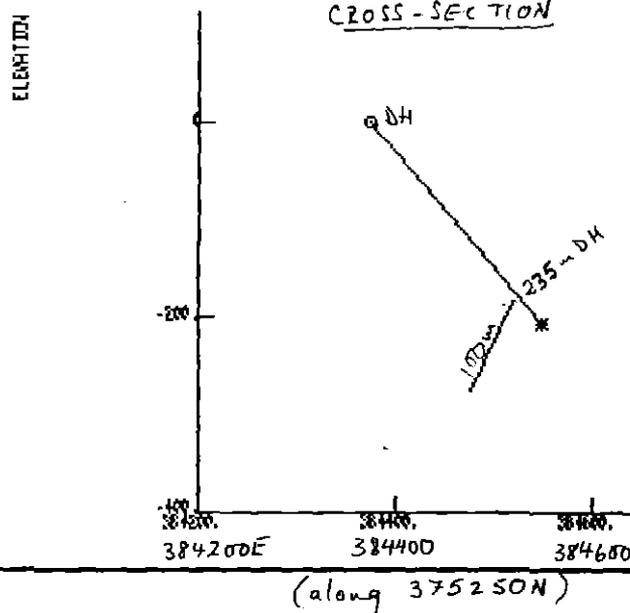
701156



PLAN



CROSS-SECTION



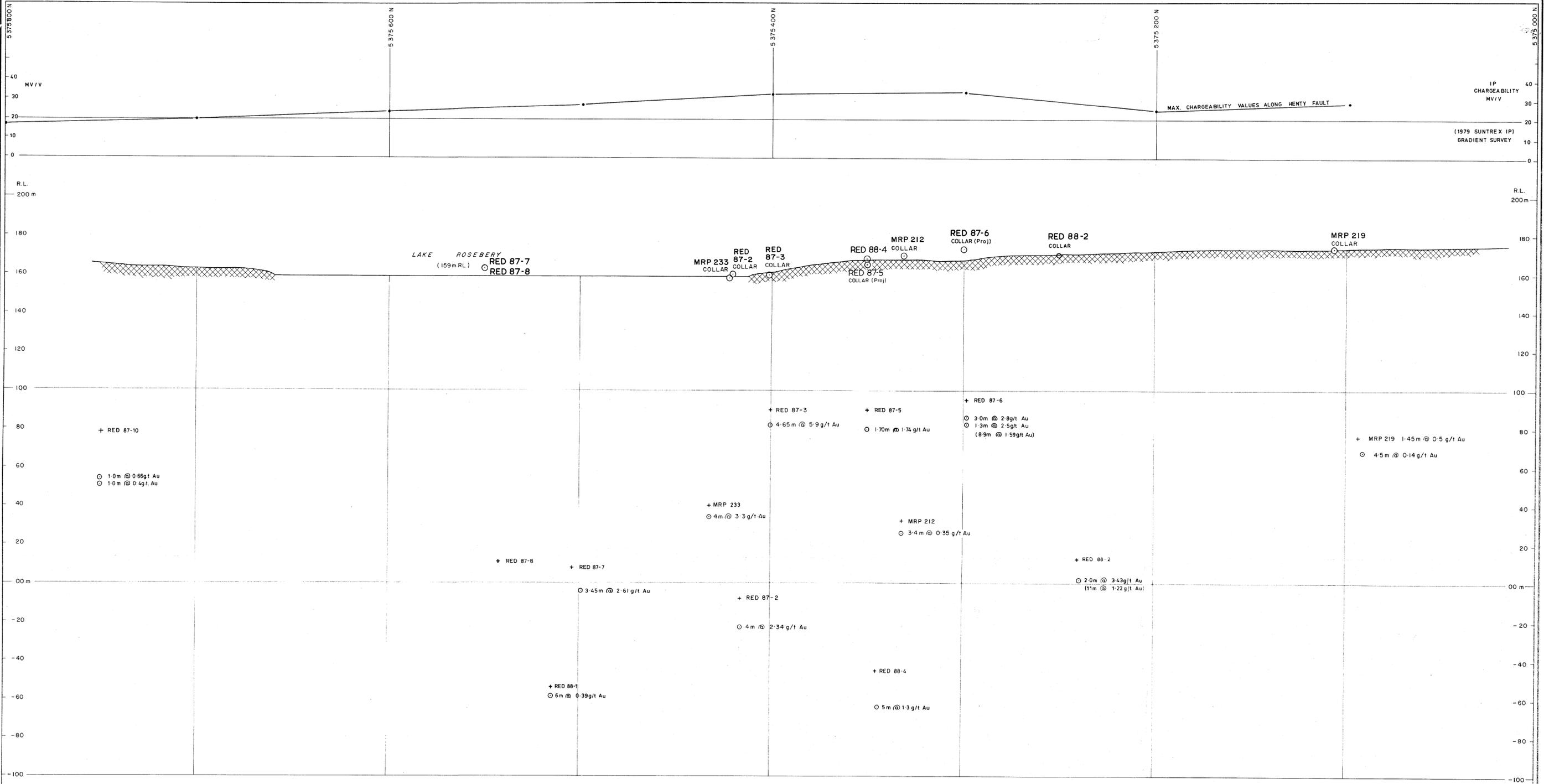
Best fit to observed THEM log?

701157

148

88 - 2895

Fig 2



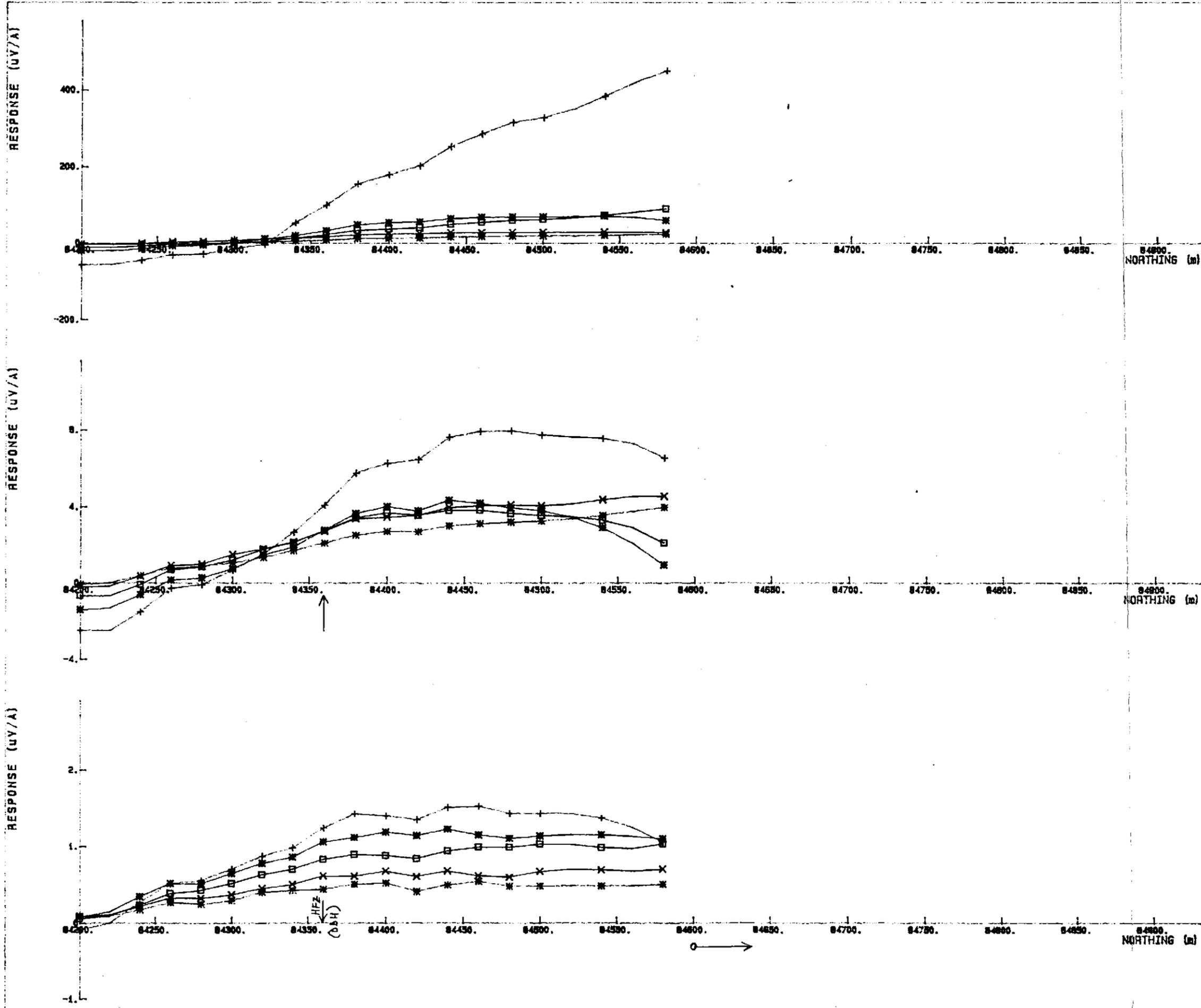
701158



- + Intercept on Henty Fault
- O Centre of mineralised zone

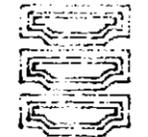
88-2895

Project ROSEBERY EAST J.V.			
Title LAKESIDE LONGITUDINAL PROJECTION SHOWING DRILL HOLE INTERCEPTS			
Author	JGP	Dept. TAS	Scale 1:1000
Drawn	AS	Date 6/87	Revised
Checked		Date	S'ceded
Sheet No.	FIG. No. 26	Drawing No.	LJ 50/1076



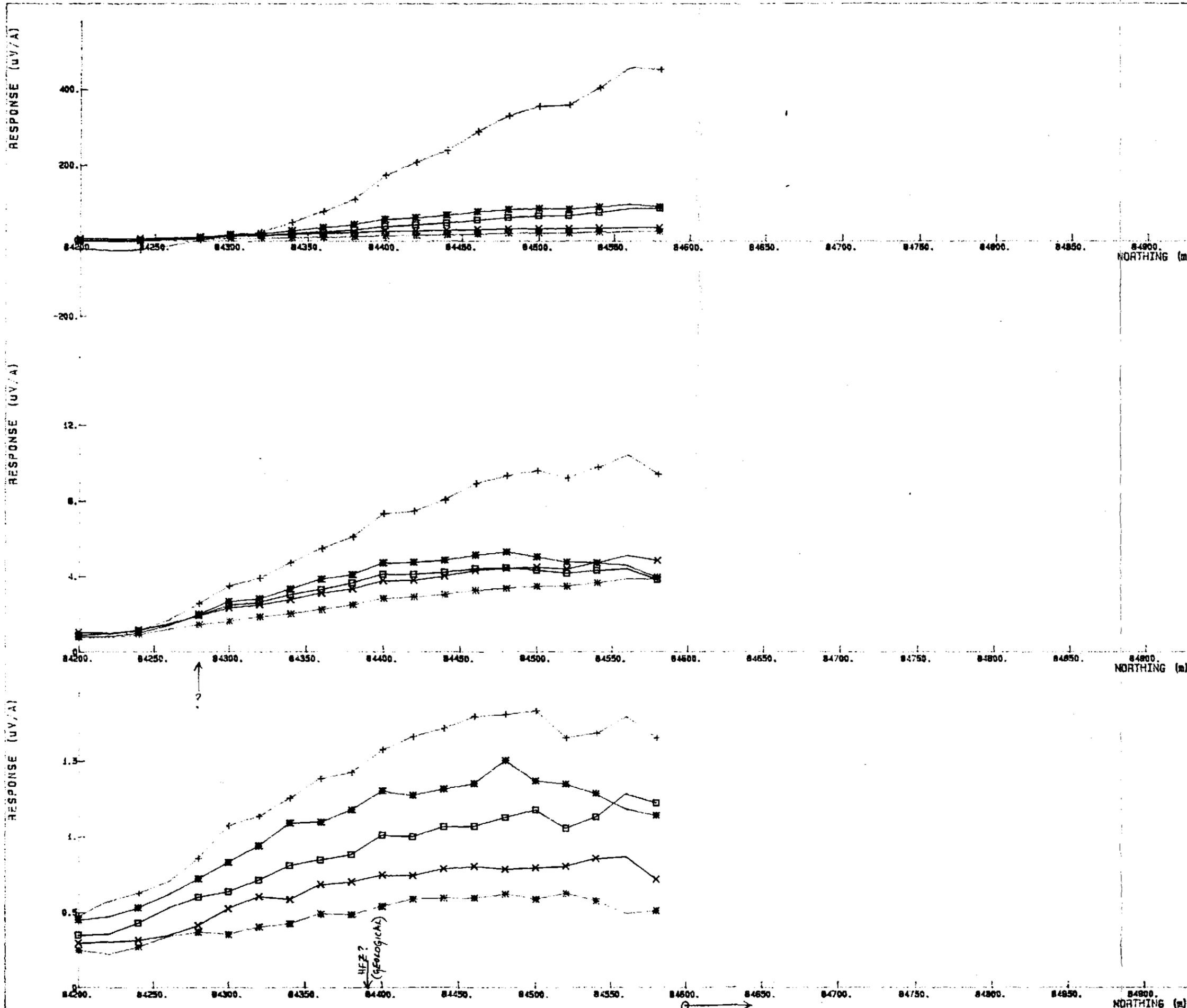
TRANSIENT EM PROFILE
 Line: 374500N
 PEBLE TEM file details
 Loop config. = TURAM
 Device type = SIROTEM
 Rx Component = Z
 Ramp turn-off = 0.14 ms
 Tx size = 400.m x 400.m
 Tx loop rotn. = 0 deg
 Tx loop orig. = 384500., 374500.
 Eff. Rx area = 10000. sq.m
 Legend for graph no: 1
 -+ Channel 1: 0.8790ms
 -# Channel 2: 1.2710ms
 -□ Channel 3: 1.6630ms
 -x Channel 4: 2.0550ms
 -* Channel 5: 2.4470ms
 Legend for graph no: 2
 -+ Channel 7: 3.4270ms
 -# Channel 8: 4.2110ms
 -□ Channel 9: 4.9950ms
 -x Channel 10: 5.7790ms
 -* Channel 11: 6.5630ms
 Legend for graph no: 3
 -+ Channel 12: 8.5230ms
 -# Channel 13: 10.091ms
 -□ Channel 14: 11.659ms
 -x Channel 15: 13.227ms
 -* Channel 16: 14.795ms

701159
88-2895



BILLITON AUSTRALIA
 ROSEBERY EAST, TAS
 LAKESIDE
 LINE 374500N, SIROTEM
 STANDARD TIMES

FIG. NO: 27	REPT. NO:
ENCL. NO:	DRG. NO:
DATE:	AUTHOR:
DRAWN:	OFFICE:



TRANSIENT EM PROFILE
 Line: 374600N
 PEBLE TEN file details
 Loop config. = TURAM
 Device type = SIROTEM
 Rx Component = Z
 Ramp turn-off = 0.14 ms
 Tx size = 400.m x 400.m
 Tx loop patn. = 0 deg
 Tx loop orig. = 384500., 374500.
 Eff. Rx area = 10000. sq.m

Legend for graph no: 1
 + - Channel 2: 0.8790ms
 x - Channel 3: 1.2710ms
 o - Channel 4: 1.6630ms
 x - Channel 5: 2.0550ms
 x - Channel 6: 2.4470ms

Legend for graph no: 2
 + - Channel 7: 3.4270ms
 x - Channel 8: 4.2110ms
 o - Channel 9: 4.9950ms
 x - Channel 10: 5.7790ms
 x - Channel 11: 6.5630ms

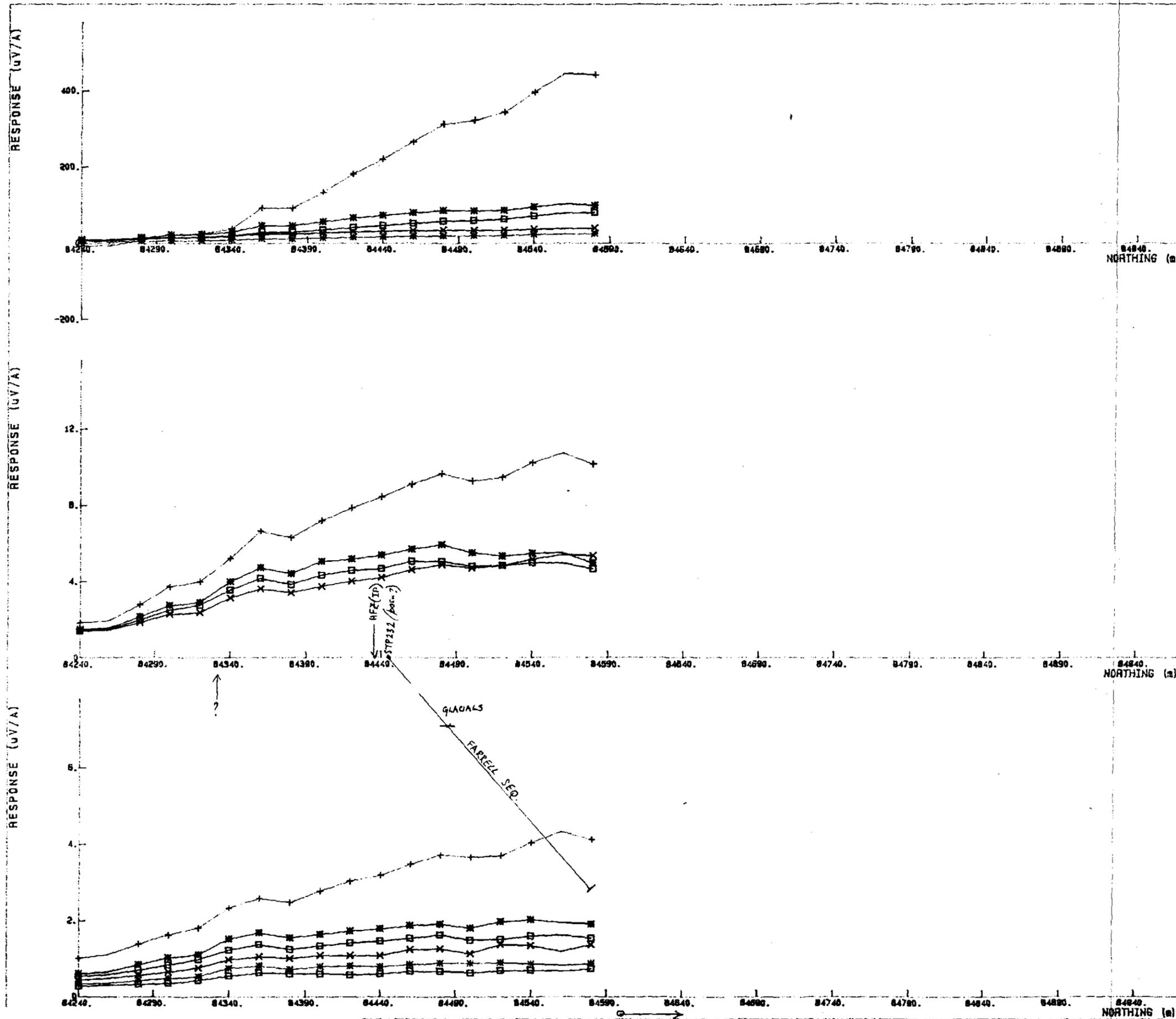
Legend for graph no: 3
 + - Channel 12: 8.5230ms
 x - Channel 13: 10.081ms
 o - Channel 14: 11.639ms
 x - Channel 15: 13.197ms
 x - Channel 16: 14.755ms

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BILLITON AUSTRALIA	
ROSEBERRY EAST, TAS	
LAKESIDE	
LINE 374600N, SIROTEM	
ST. FIXED LOOP	
FIG. NO: 28	REPT. NO:
ENCL. NO:	DRG. NO:
DATE:	AUTHOR:
DRAWN:	OFFICE:



TRANSIENT EM PROFILE

Line: 374700N

PEBLE TEM file details

Loop config. - TURLAM
 Device type - SIROTEM
 Rx Component - Z
 Ramp turn-off - 0.14 ms
 Tx size - 400.u x 400.u
 Tx loop rotn. - 0 deg
 Tx loop orig. - 384600., 374600.
 Eff. Rx area - 10000. sq.m

Legend for graph no: 1

Channel 2: 0.8790ms
 Channel 3: 1.2710ms
 Channel 4: 1.6630ms
 Channel 5: 2.0550ms
 Channel 6: 2.6430ms

Legend for graph no: 2

Channel 7: 3.4270ms
 Channel 8: 4.2110ms
 Channel 9: 4.9950ms
 Channel 10: 5.7790ms

Legend for graph no: 3

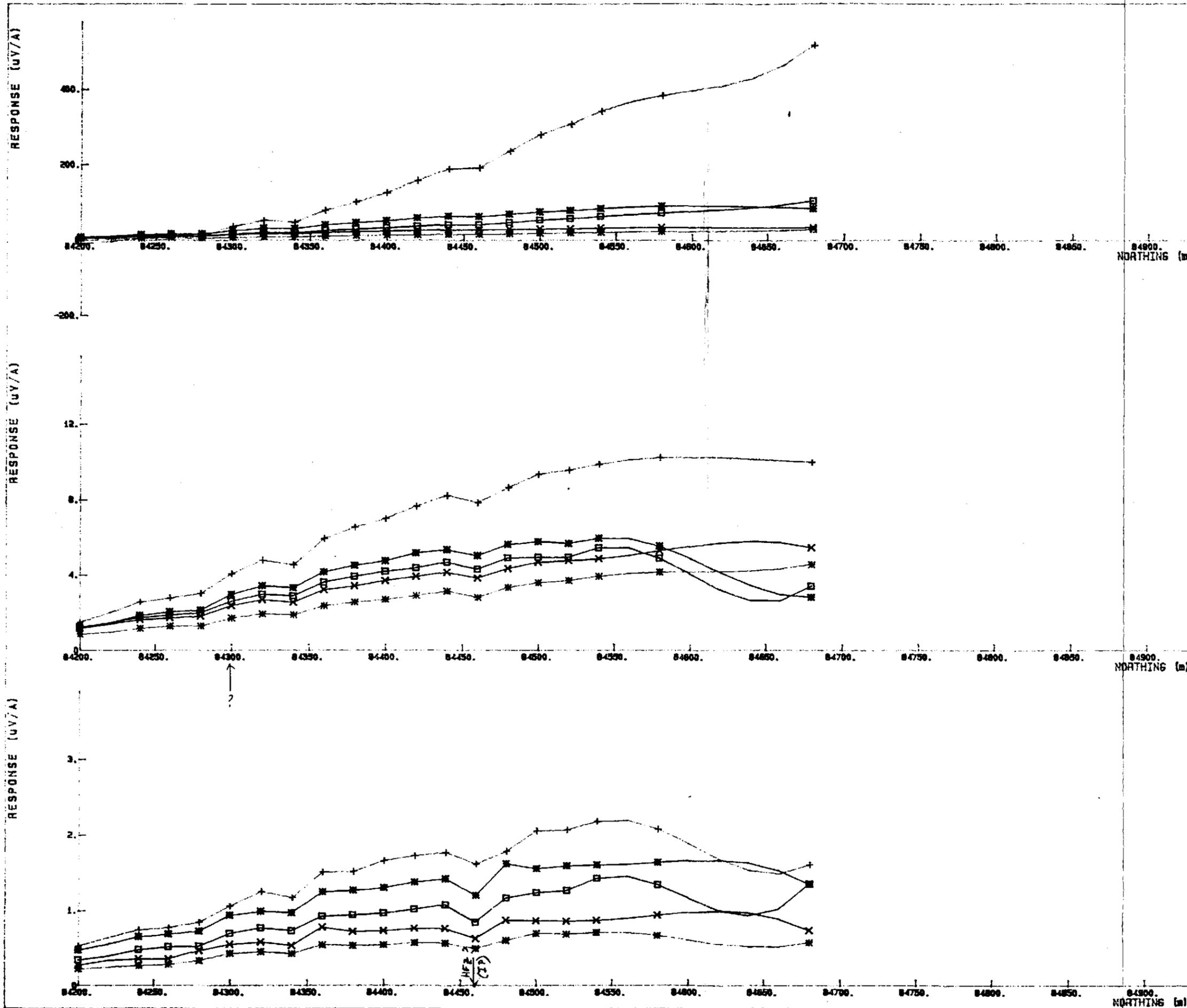
Channel 11: 6.9550ms
 Channel 12: 8.5330ms
 Channel 13: 10.081ms
 Channel 14: 11.609ms
 Channel 15: 13.227ms
 Channel 16: 15.979ms

701161

88-2895



BILLITON AUSTRALIA	
ROSEBERRY EAST, TAS	
LAKESIDE	
LINE 374700N, SIROTEM	
ST, FIXED LOOP	
FIG. NO: 29	REPT. NO:
ENCL. NO:	DRW. NO:
DATE:	AUTHOR:
DRWING:	OFFICE:



TRANSIENT EM PROFILE

Line: 374800N

PEBLE TEM file details

Loop config. = TURAN
 Device type = SIROTEM
 Rx Component = 2
 Resp turn-off = 0.14 ms
 Tx size = 400.m x 400.m
 Tx loop retr. = 0 deg
 Tx loop orig. = 384800., 374500.
 Eff. Rx area = 10000. sq.m

Legend for graph no: 1

- + Channel 2: 0.8700ms
- # Channel 3: 1.2710ms
- Channel 4: 1.6830ms
- x Channel 5: 2.0530ms
- * Channel 6: 2.8430ms

Legend for graph no: 2

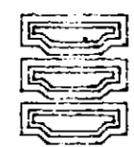
- + Channel 7: 3.4270ms
- # Channel 8: 4.2110ms
- Channel 9: 4.9850ms
- x Channel 10: 5.7790ms
- * Channel 11: 6.8550ms

Legend for graph no: 3

- + Channel 12: 8.5230ms
- # Channel 13: 10.0810ms
- Channel 14: 11.6590ms
- x Channel 15: 13.2270ms
- * Channel 16: 15.8700ms

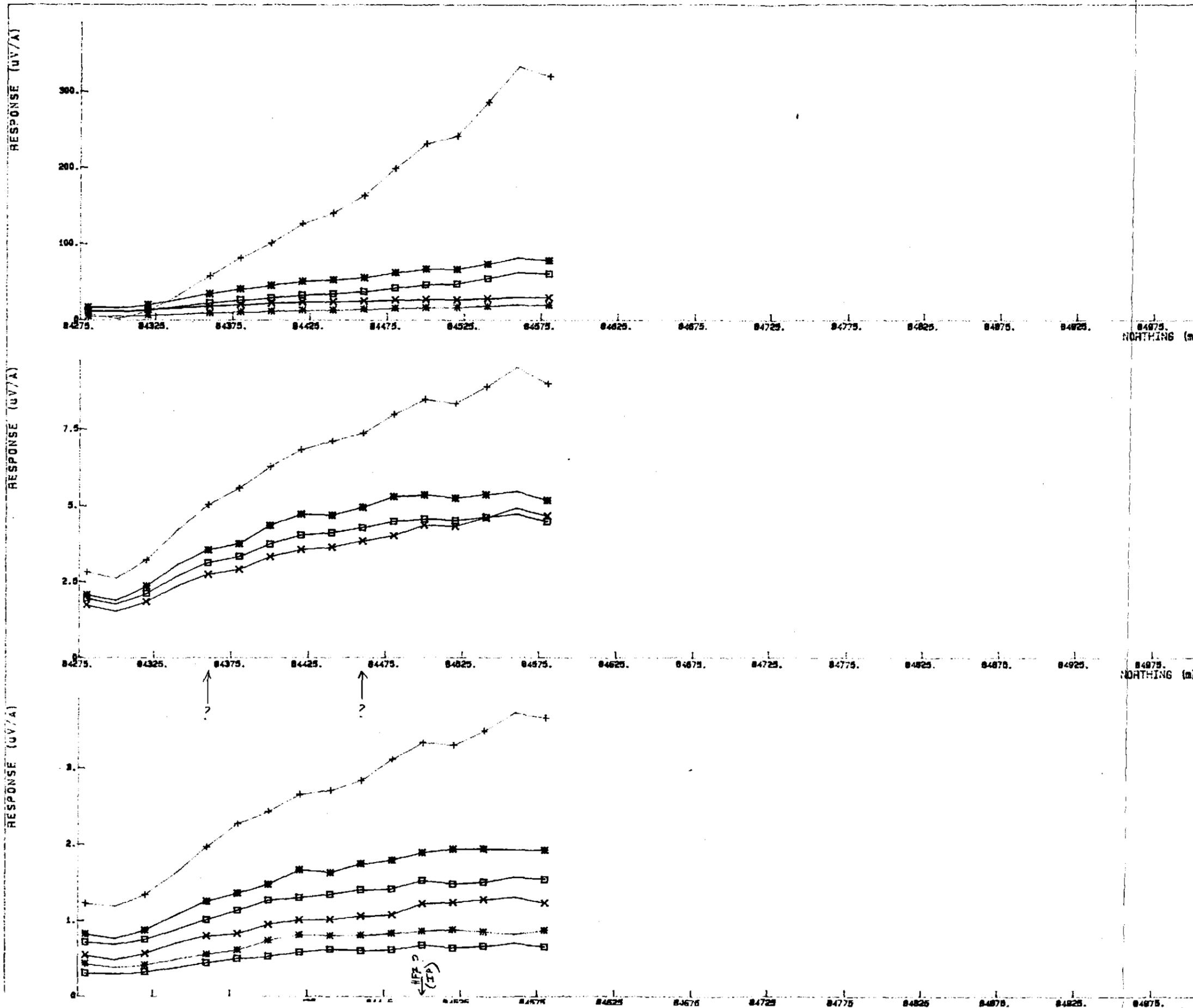
701162

88-2895



BILLITON AUSTRALIA
 ROSEBERY EAST, TAS
 LAKESIDE
 LINE 374800N, SIROTEM
 FIXED LOOP, ST

FIG. NO: 30	REPT. NO:
ENCL. NO:	DRG. NO:
DATE:	AUTHOR:
DRAG:	OFFICE:



TRANSIENT EM PROFILE

Line: 37490N

PEBLE TEM file details

Loop config. = TURN
 Device type = SIROTEM
 Rx Component = Z
 Amp turn-off = 0.14 ms
 Tx size = 400.0 x 400.0
 Tx loop reth. = 0 deg
 Tx loop orig. = 384800.. 374900.
 Eff. Rx area = 10000. sq.m

Legend for graph no: 1

+ Channel 2: 0.8790ms
 - Channel 3: 1.2710ms
 □ Channel 4: 1.6630ms
 * Channel 5: 2.0550ms
 - Channel 6: 2.4470ms

Legend for graph no: 2

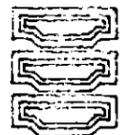
+ Channel 7: 3.4270ms
 - Channel 8: 4.2110ms
 □ Channel 9: 4.9950ms
 * Channel 10: 5.7790ms

Legend for graph no: 3

+ Channel 11: 6.9550ms
 - Channel 12: 8.5230ms
 □ Channel 13: 10.091ms
 * Channel 14: 11.659ms
 - Channel 15: 13.227ms
 □ Channel 16: 14.795ms

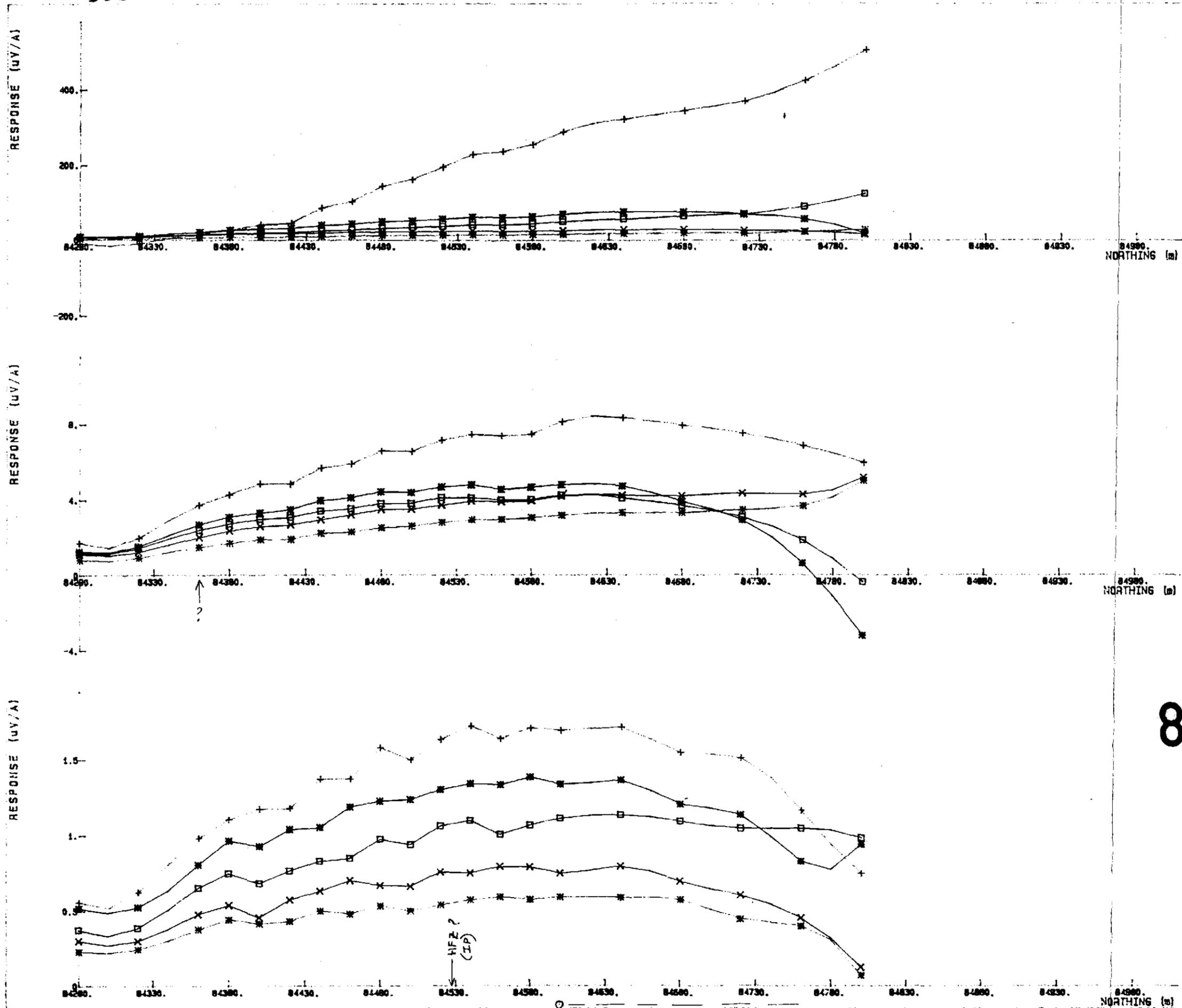
701163

88-2895



BILLITON AUSTRALIA
 ROSEBERY EAST, TAS
 LAKESIDE
 LINE 37490N, SIROTEM
 FIXED LOOP, ST

FIG. NO: 31	REPT. NO:
ENCL. NO:	DRG. NO:
DATE:	AUTHOR:



TRANSIENT EM PROFILE
 Line: 37500N
 PEBLE TEM file details
 Loop config. = TURAM
 Device type = SIROTEM
 Rx Component = Z
 Ramp turn-off = 0.14 ms
 Tx size = 400.m x 400.m
 Tx loop retrn. = 0 deg
 Tx loop orig. = 384500., 374500.
 Eff. Rx area = 10000. sq.m

Legend for graph no: 1
 + Channel 2: 0.8790ms
 - Channel 3: 1.2710ms
 □ Channel 4: 1.6630ms
 x Channel 5: 2.0550ms
 * Channel 6: 2.6430ms

Legend for graph no: 2
 + Channel 7: 3.4270ms
 - Channel 8: 4.2110ms
 □ Channel 9: 4.9950ms
 x Channel 10: 5.7790ms
 * Channel 11: 6.5630ms

Legend for graph no: 3
 + Channel 12: 8.5230ms
 - Channel 13: 10.081ms
 □ Channel 14: 11.639ms
 x Channel 15: 13.227ms
 * Channel 16: 15.579ms

701164

88-2895

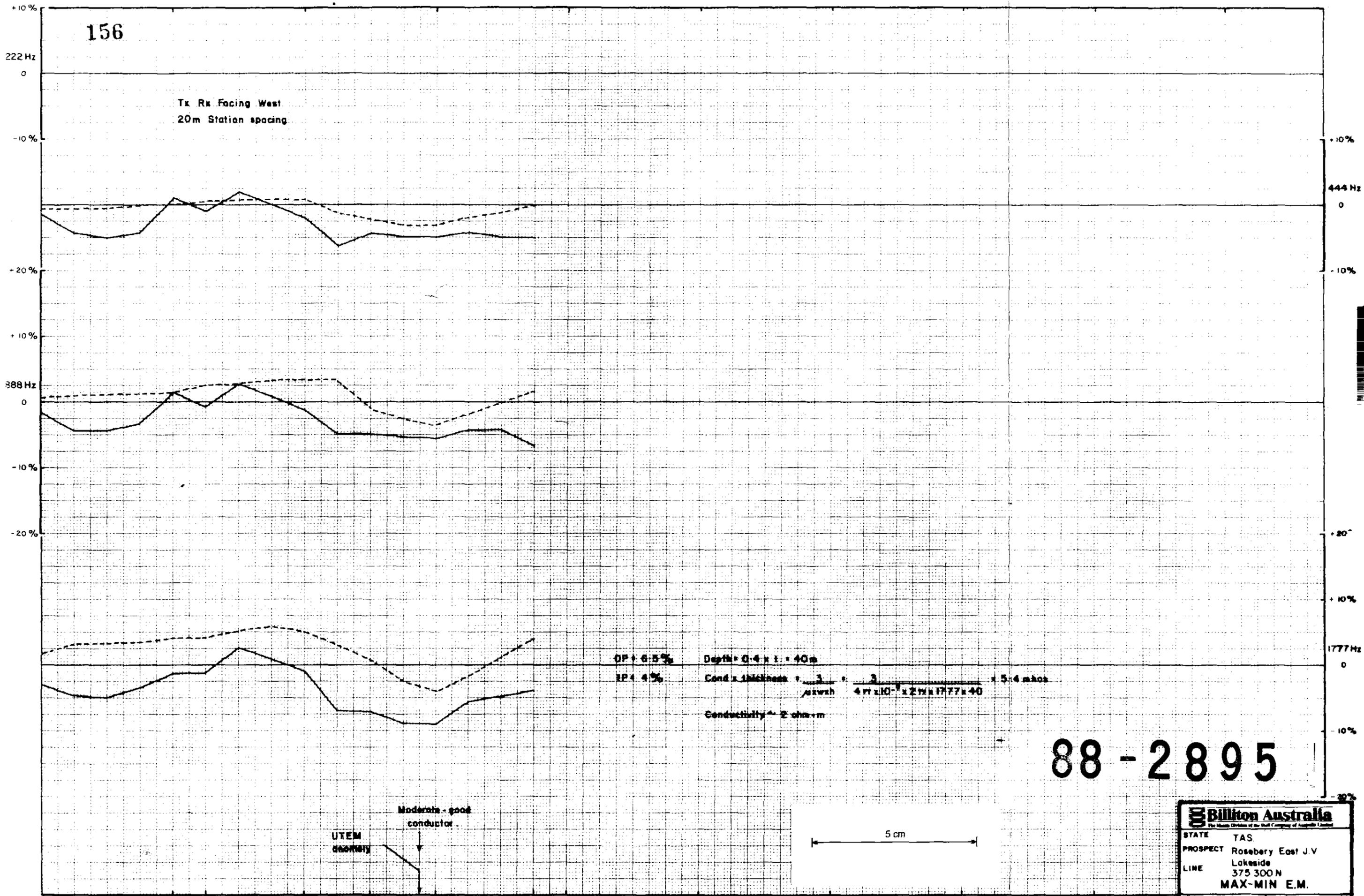


BILLITON AUSTRALIA
 ROSEBURY EAST, TAS
 LAKESIDE
 LINE 37500N, SIROTEM
 ST

FIG. NO: 32	REPT. NO:
ENCL. NO:	DRG. NO:
DATE:	AUTHOR:
DRAWN:	OFFICE:

156

Tx Rx Facing West
20m Station spacing



DP: 6.5% Depth: 0.4 x 1 = 40m
 IP: 4% Cond x thickness = $\frac{3}{4 \times 10^{-9}} \times 2 \times 10^4 = 5.4 \text{ mhos}$
 Conductivity = 2 ohm-m

UTEM
 geometry
 Moderate - good
 conductor

5 cm

——— In Phase
 - - - - - Out of Phase

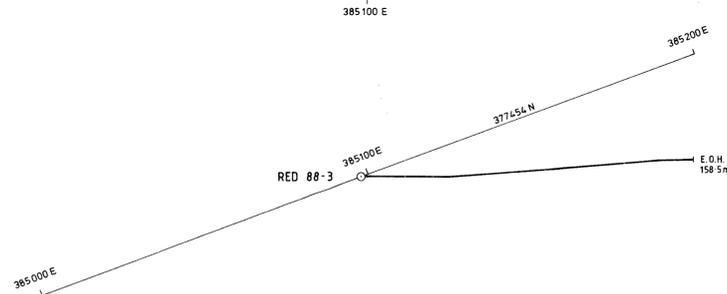
88-2895

384 370 E 384 470 E 384 570 E 384 670 E

Coil Separation = 100m

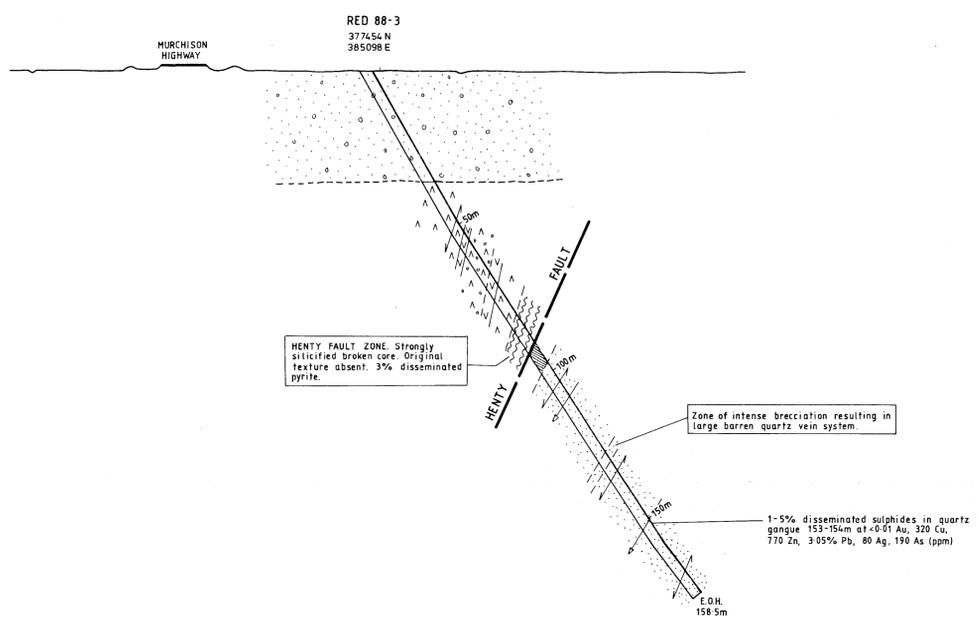
Billiton Australia <small>The Metals Division of the Shell Company of Australia Limited</small>	
STATE	TAS
PROSPECT	Rosebery East J.V
LINE	Lakeside 375 300N MAX-MIN E.M.
SCALE 1:2000	DATE 28.10.88
AUTHOR R.D.	DRAWN A.M.
OFFICE AND	REP. No.
DRG. No. LJ50/1128	FIG. No. 33

701165



SECTION

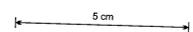
200 RL
170
100
00
-100
-200



LEGEND

- QUATERNARY
 - FLUVIO - GLACIAL SEDIMENTS
 - ANDESITE LAVAS
Medium grained feldspar porphyritic andesite. Generally silicified. Strong alteration to quartz, epidote and chlorite.
 - BASALT LAVAS
Fine grained basalt lavas/dykes. Strong alteration to quartz, chlorite and epidote.
- CAMBRIAN
 - VOLCANICLASTIC ANDESITE
Medium grained feldspar porphyritic andesite volcaniclastic containing fragments of rhyolite.
 - BLACK GRAPHITIC SHALES
 - Interbedded light grey fine grained quartzose sandstones siltstones and black shales. Minor lenses of epiclastics and volcaniclastics.
- Bedding
- Bedding facing
- Primary lineation in lavas, volcaniclastics etc.
- Schistosity
- Fault
- Shear
- Geological contact
- Geological contact attitude unknown

701166



88-2895

Billiton Australia <small>The Metals Division of the Shell Company of Australia Limited</small>			
Project ROSEBERY EAST JV - E.L. 1/62			
Title LAKESIDE SECTION RED 88-3			
Author	CJC	Dept. TAS	Scale 1:1000
Drawn	OH	Date 7/88	Revised Date
Checked	Date	Staged	Date
Sheet No.	34	Drawing No.	D/LJ 50/044

EAST

WEST

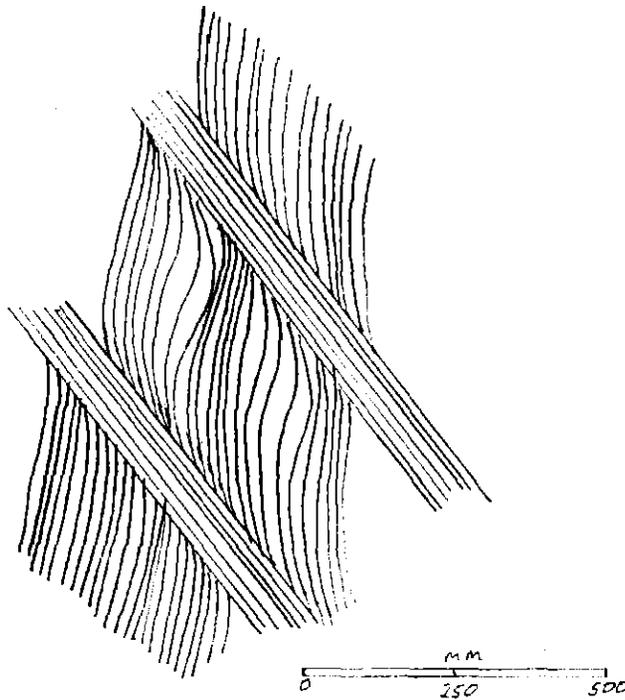
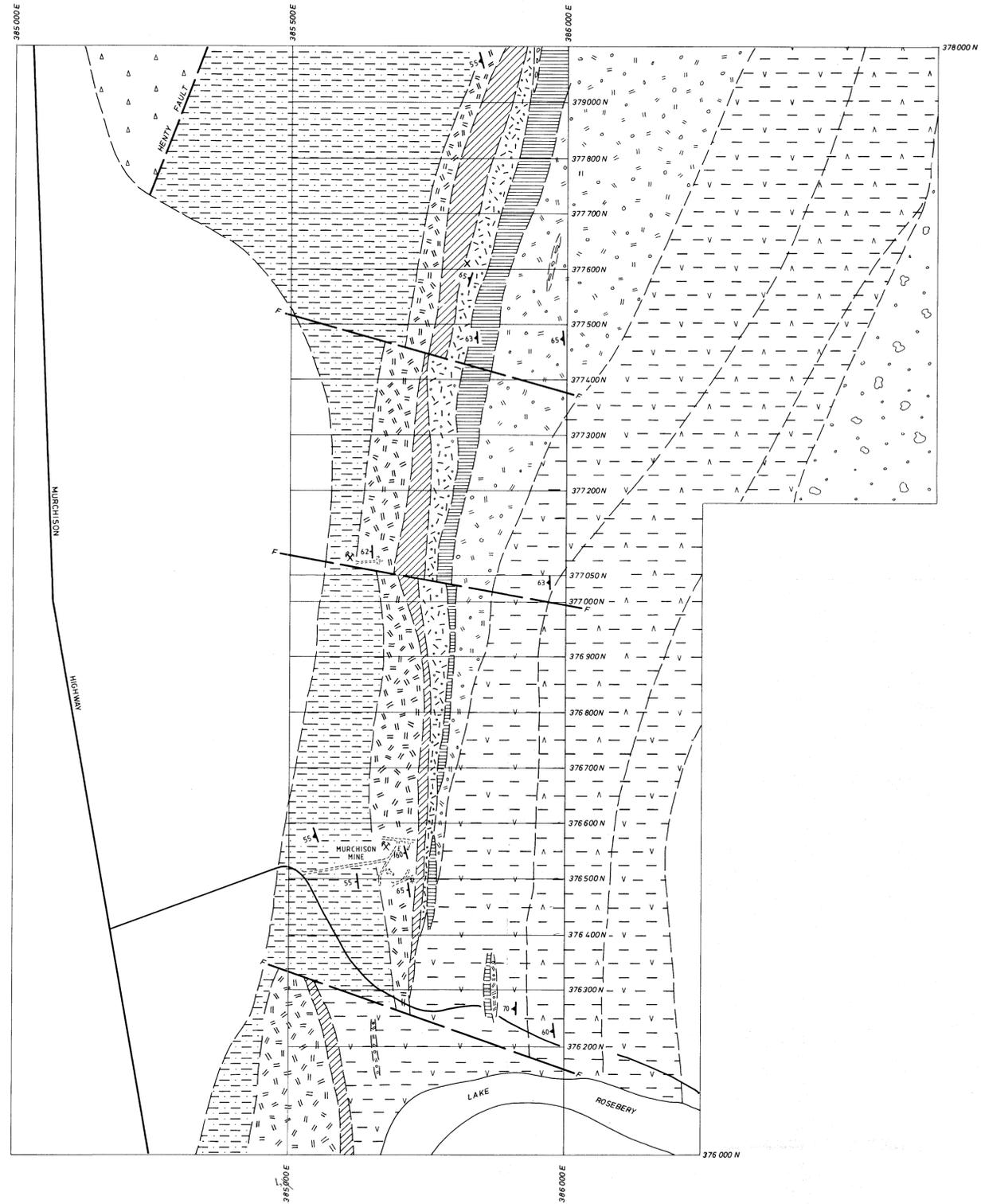


FIG. 35 CLEAVAGE WITHIN THE FARRELL SEQUENCE LOOKING SOUTH WITHIN NO. 3 AOIT OF THE MURCHISON MINE, 17M FROM THE ENTRANCE. ORIGINAL REVERSE MOVEMENT (WEST WALL UP), FOLLOWED BY NORMAL MOVEMENT (WEST WALL DOWN), CREATING A SIGMOIDAL TENSIONAL FRACTURE PATTERN.

701167

88 - 2895



LEGEND

-  Fluvio glacial sediments.
-  Owen Conglomerate.
-  Interbedded tuffaceous sandstones, siltstones and black shales.
-  Dacitic coarse feldspar - quartz phyrlic volcaniclastic.
-  Interbedded fine grained tuffaceous sandstones and black shales.
-  Dacitic volcaniclastic containing abundant quartz clasts (<2mm).
-  Finely laminated siliceous ash-fall tuff and dacitic volcaniclastics.
-  Rhyodacitic volcaniclastic containing two distinct quartz clast sizes (<2m, <4mm).
-  Epiclastic agglomerate.
-  Sericitic feldspar quartz phyrlic tuff
-  Sericitic fine grained rhyolite.
-  Andesitic volcanics.
-  Inferred geological boundary
-  Bedding
-  Cleavage
-  Fault
-  Abandoned mine
-  Workings
-  Adit and underground workings
-  Open cut

5 cm

701168
88-2895

Billiton Australia <small>The Metals Division of the Shell Company of Australia Limited</small>			
Project ROSEBERY EAST JV			
Title MURCHISON MINE GEOLOGICAL PLAN			
Author	CJC	Dept. TAS	Scale 1:5000
Drawn	OH	Date 9/88	Revised Date
Checked		Date	S'ceded Date
Sheet No.	36		Drawing No. D/LJ 50/045



SHELL COMPANY OF AUSTRALIA LTD

METALS DIVISION

R.O.C.S. - POST

ROSEBERRY EAST, J.V.

TULLAH FLATS

GROUND MAGNETICS

BASE 62000NT, C125nT
SCALE 1:5000

FIG No: 37

DATE: 10/88

AUTHOR: RD/N.H.

OFFICE: D'PORT

LEGEND

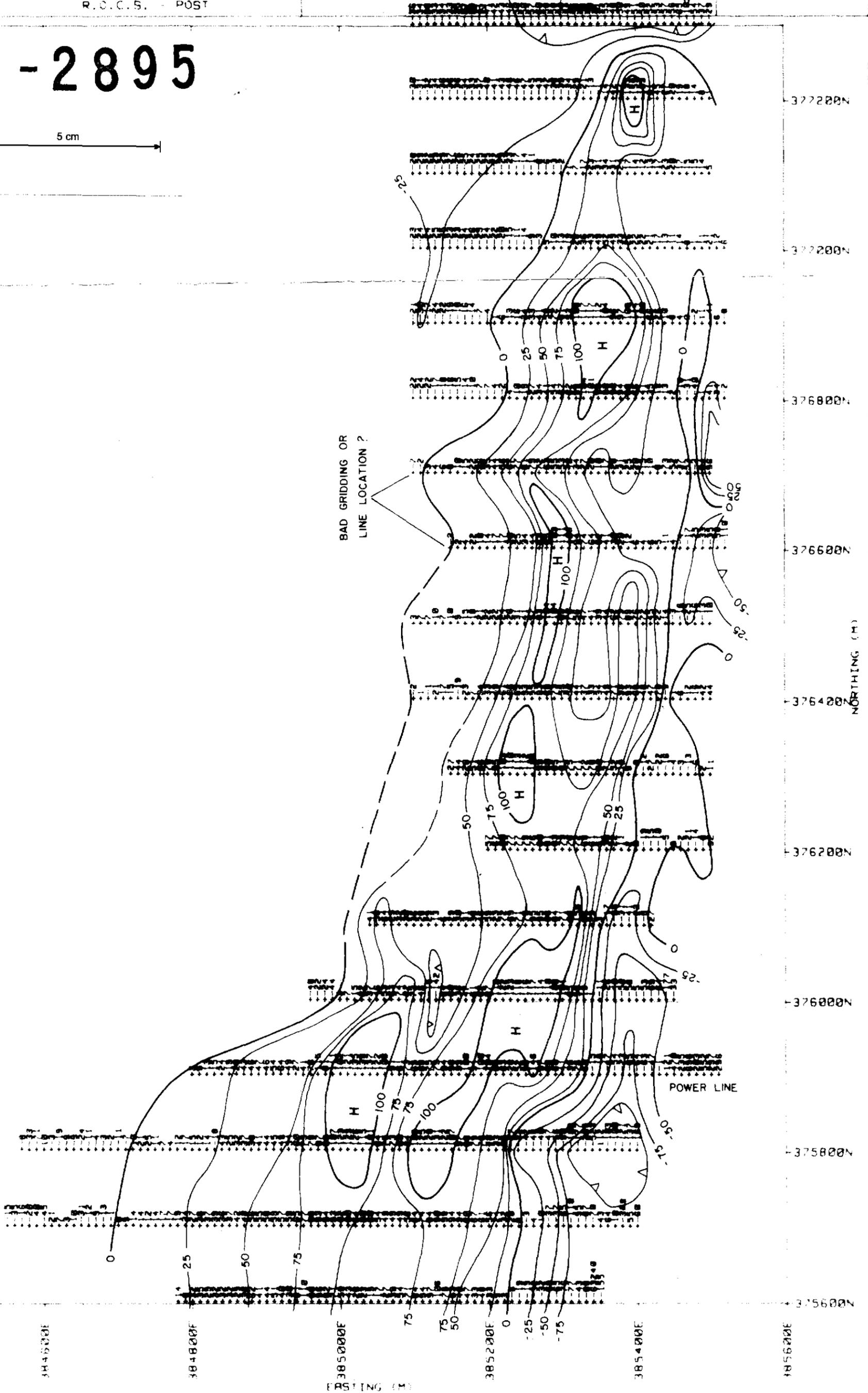
2 x G856

DRG No: LJ50/1149

(Also see Tullah Flats Max -
Min plan no. LJ50/1148)

88-2895

5 cm



160 691107 701169 091

384600E

384800E

385000E

385200E

385400E

385600E

375800N

375600N

375400N

375200N

375000N

374800N

374600N

374400N

374200N

NORTHING (M)

EASTING (M)



SHELL COMPANY OF AUSTRALIA

METALS DIVISION

R.O.C.S. - PROTEM

ROSEBERY EAST, TAS
MURCHISON MINE

GROUND MAG, TMI
BASE 62200, 100nT/CM

SCALE 1 : 5000

FIG No : 38

DATE : 4/5/88

AUTHOR : S.D.

OFFICE : D'PORT.

DRAWN : M.L.B.

LEGEND

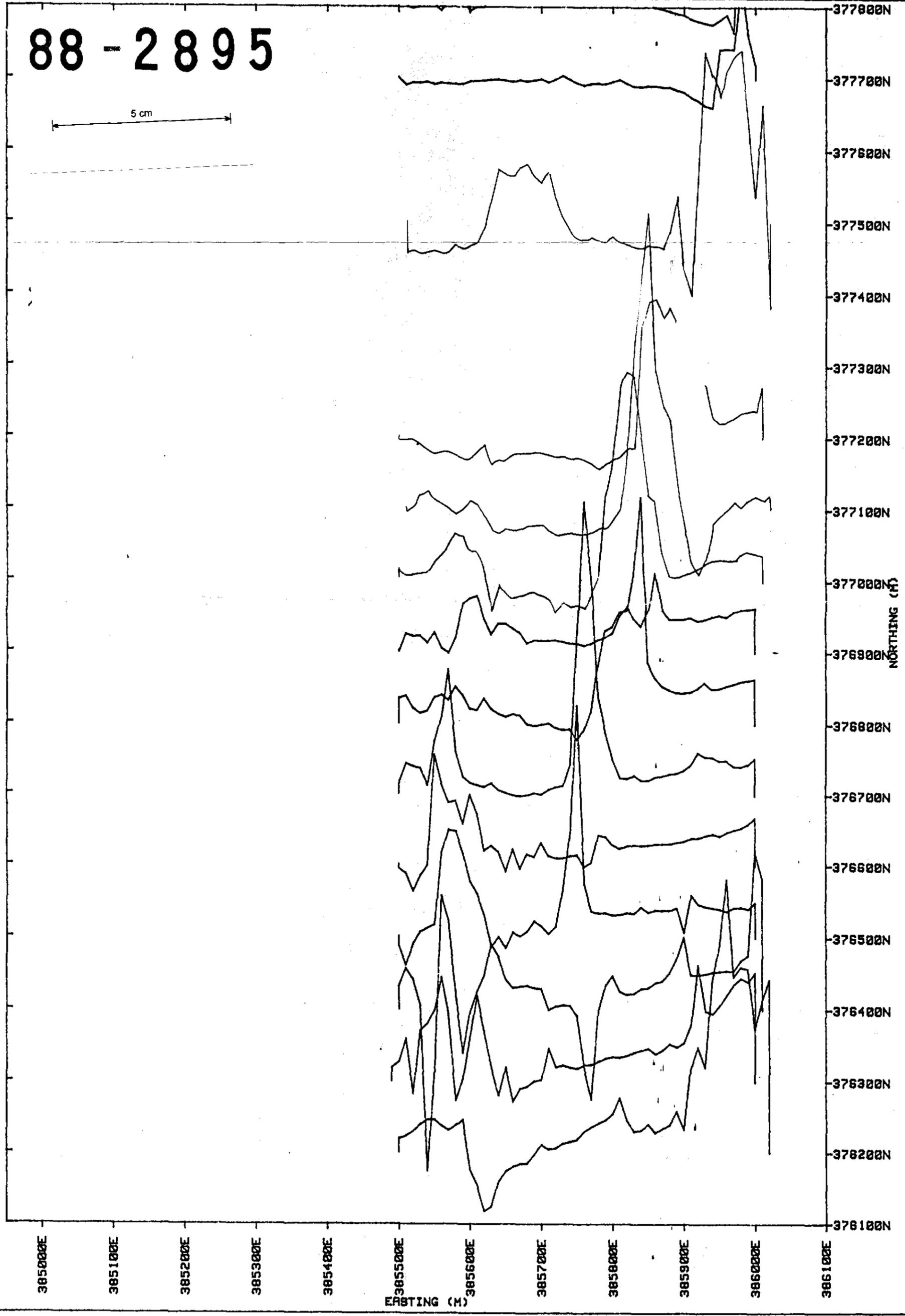
2x G 256 MAG

10m STNS

701170

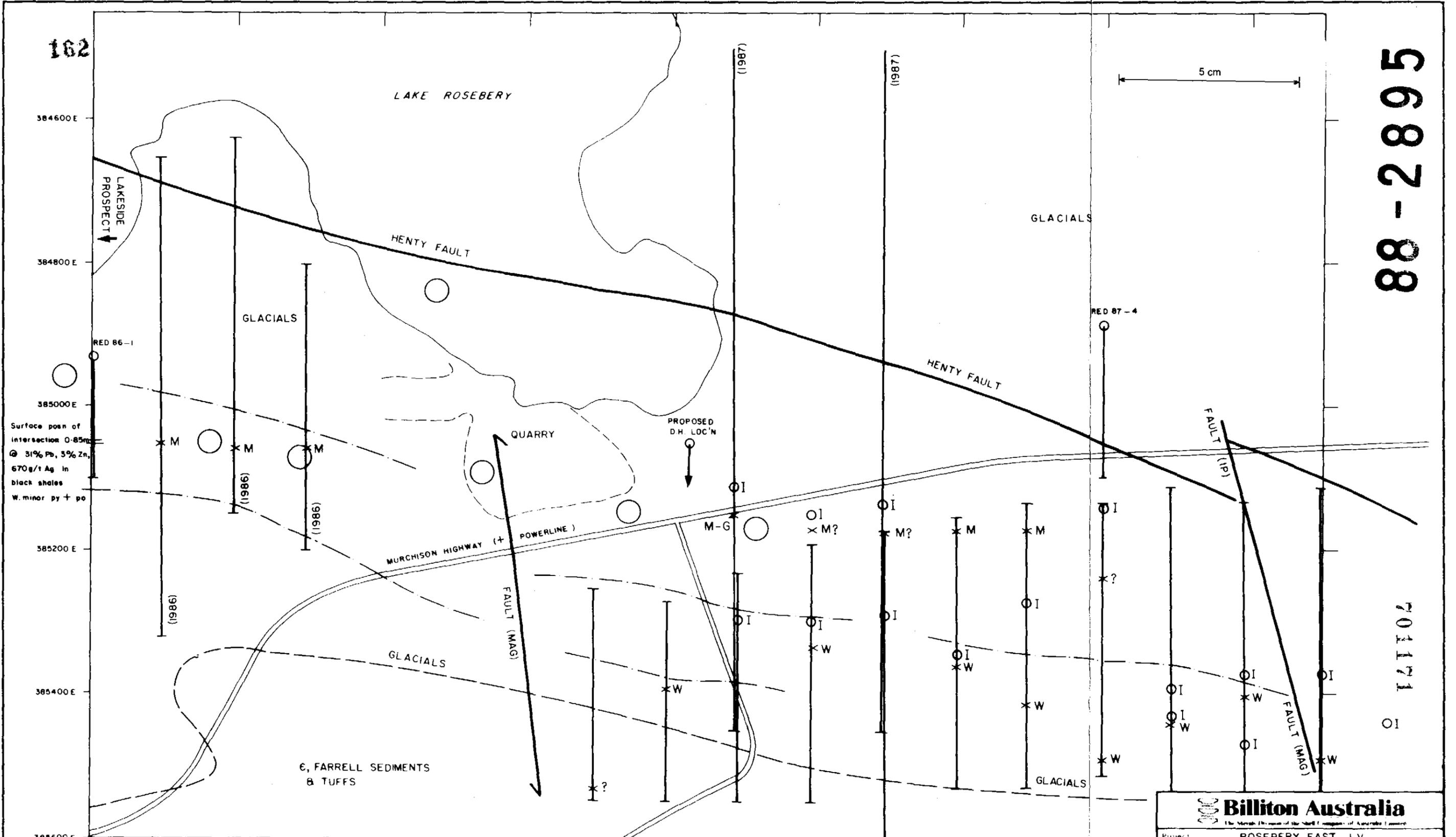
88 - 2895

5 cm



162

88-2895



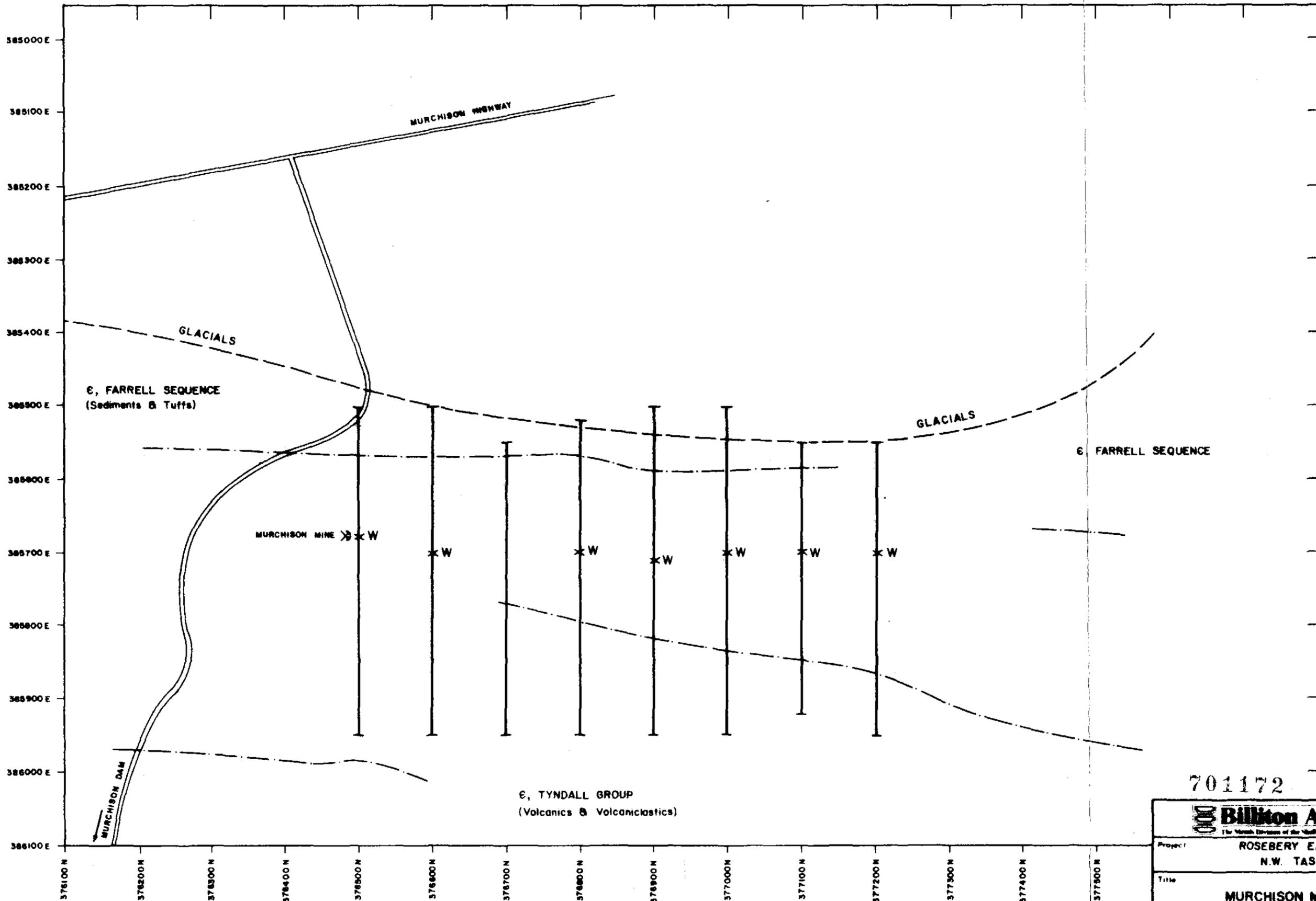
5 cm

Surface posn of intersection 0.85m @ 31% Pb, 5% Zn, 670g/t Ag in black shales w. minor py + po

701171

Project: ROSEBERY EAST J.V. N.W. TASMANIA		
Title: TULLAH FLATS MAX-MIN EM ANOMALIES (OVERLAYS GROUND MAG PLAN LJ50/1134)		
Author: N.H.	Date: 11/88	Scale: 1:5000
Drawn: Office Melb	Revised:	Date:
Drawing No: LJ50/1148	Fig. No: 39	

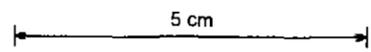
- IP PROFILES
 - GROUND MAGNETIC TRENDS
 - MAX-MIN LINES
 - DIGHEM EM ANOMALIES
 - W W - WEAK (OUT-OF-PHASE ONLY)
 - M M - MODERATE (IN & OUT-OF-PHASE RESPONSES)
- NB SEE ALSO: IP CONTOURS (LJ50/1060) (1987)
IP PROFILES (LJ50/1074)
FOR 1988 LINES, COIL SPACING = 100m



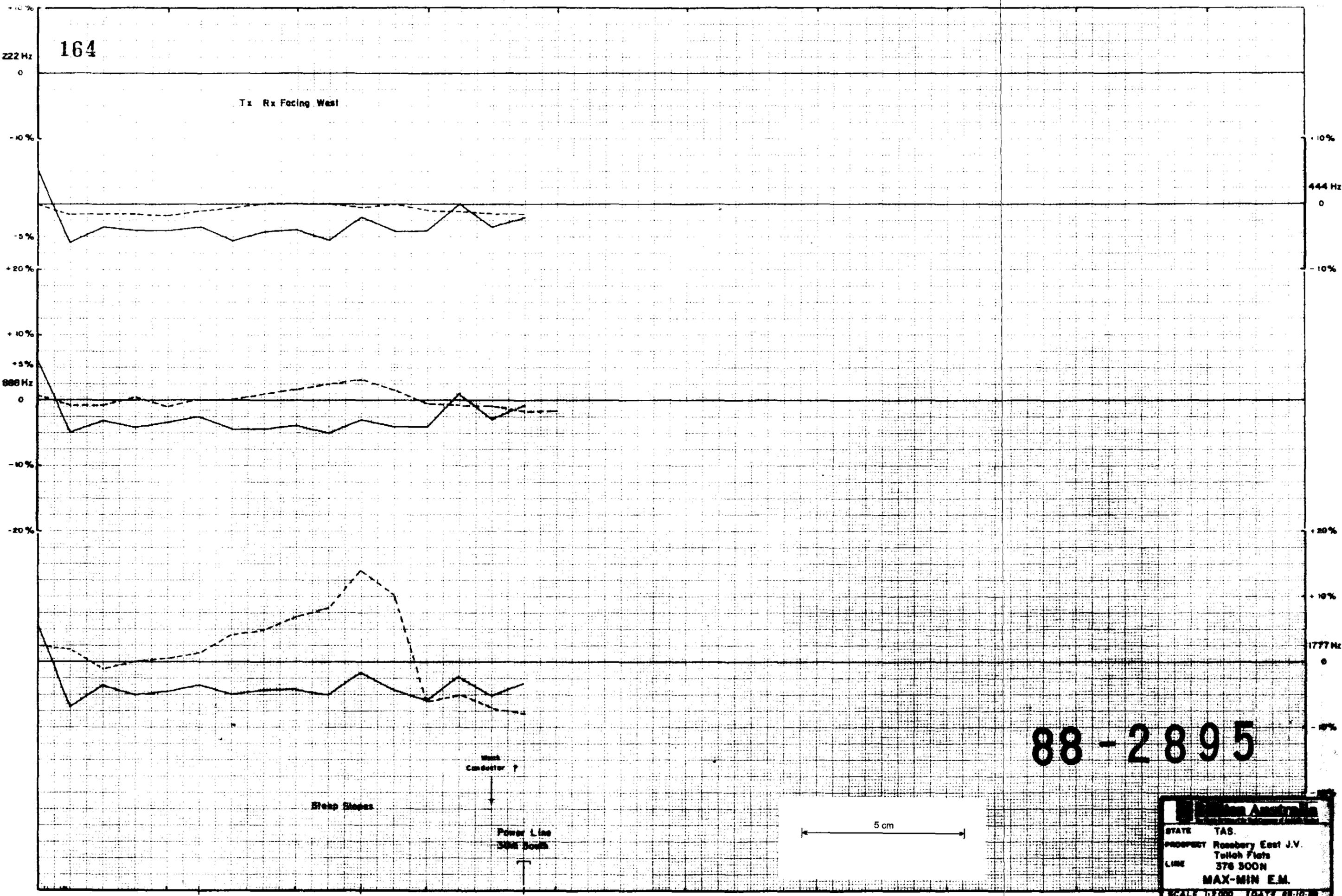
88-2895

701172

Billiton Australia <small>The Victorian Division of the Shell Company of Australia Limited</small>			
Project		ROSEBERY EAST J.V. N.W. TASMANIA	
Title			
MURCHISON MINE LINE MAX - MIN EM ANOMALIES (OVERLAYS GROUND MAG PLAN LJ50/1133)			
Author	N.H.	Date	11/88
Scale	1: 5000		
Drawn	Office Melb	Revised	Date
Drawing No	LJ50/1147	Fig No	40



— MAGNETIC TRENDS
 X W - WEAK ANOMALY (OUT - OF - PHASE)
 COIL - SPACING = 100m



164

Tx Rx Facing West

88-2895

385 250 E

385 350 E

385 450 E

385 550 E

100 metres

Coil Separation = 100m

5 cm

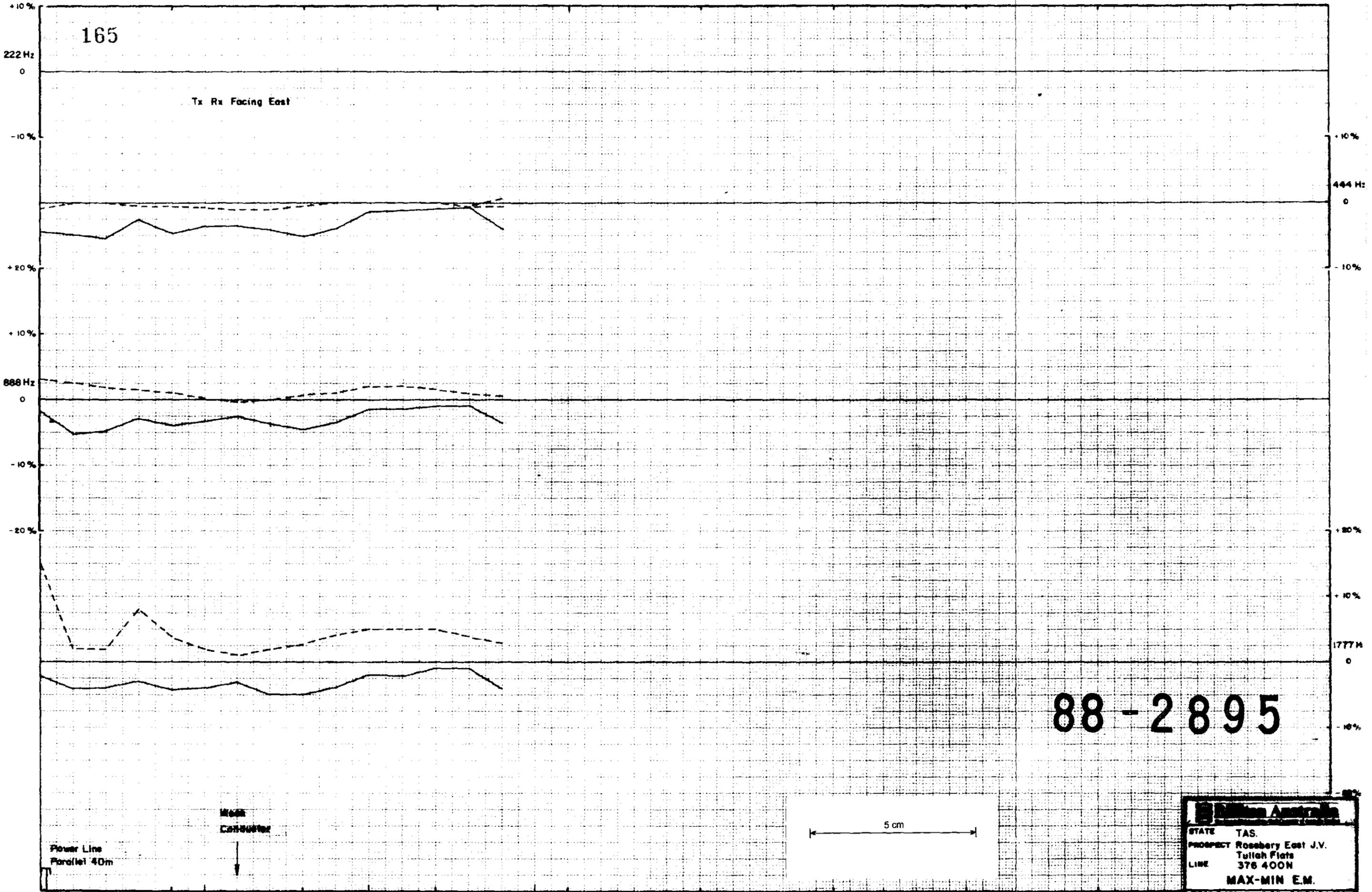
— In Phase
 - - - Out of Phase

STATE TAS.	
PROSPECT Rosebery East J.V.	
Tullah Flats	
LINE 378 300N	
MAX-MIN E.M.	
SCALE 1:1000	DATE 22-10-65
AUTHOR R.D.	DRAWN A.M.
OFFICE AND	REP.No.
DRG No. LJS0/10	FIG.No 47

701173

165

Tx Rx Facing East



88-2895

385 270E

385 370E

385 470E

Coil Separation = 100m

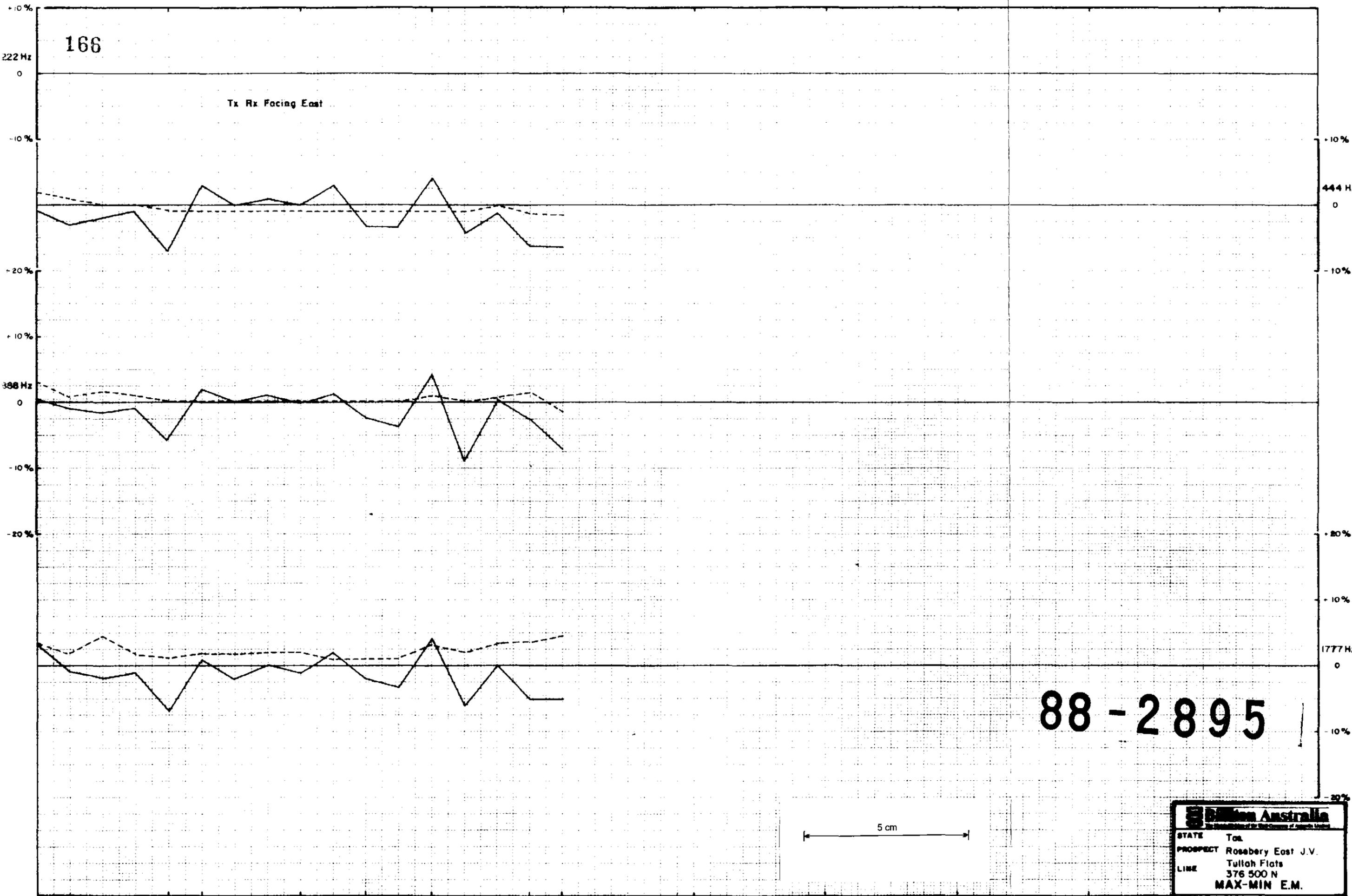
— In Phase
 - - - - - Out of Phase

BHP Australia	
STATE	TAS.
PROSPECT	Rosebery East J.V.
	Tullah Flats
LINE	376 400N
MAX-MIN E.M.	
SCALE	1:2 000
DATE	28/10/88
AUTHOR R.D.	DRAWN A.B.
OFFICE ANO	REP.No
DRG.No. L450/1135	FIG.No. 42

701174

166

Tx Rx Facing East



88-2895

5 cm

385 230 E

100 metres

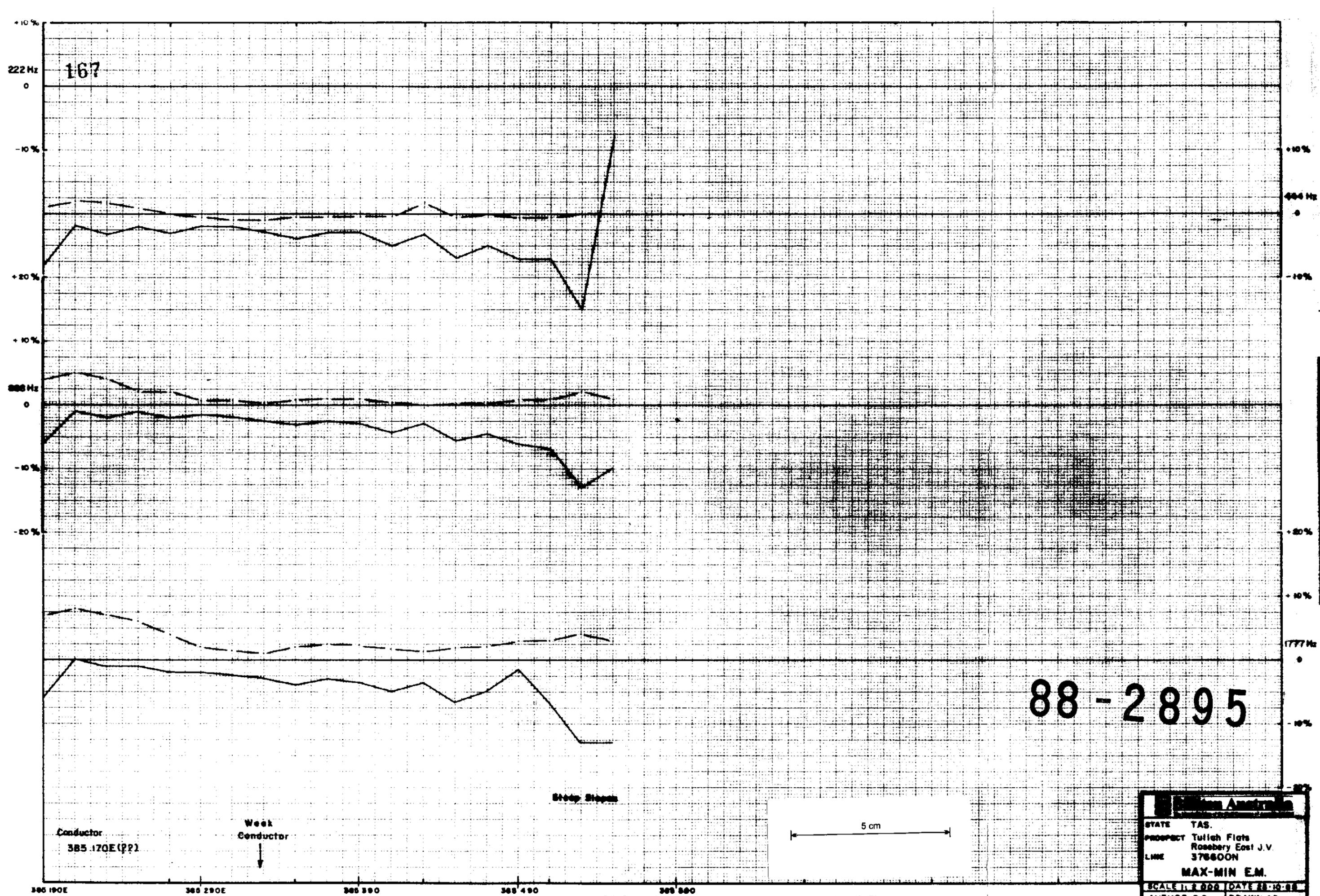
385 530 E

Coil Separation = 100m

— In Phase
 - - - Out of Phase

701175

Brimm Australia	
STATE	Tas
PROSPECT	Rosebery East J.V.
LINE	Tullah Flats
	376 500 N
	MAX-MIN E.M.
SCALE 1:2000	DATE 25-10-88
AUTHOR R.D.	DRAWN A.M.
OFFICE AND	REP. NO.
DRG. No. LJ50/1138	FIG. No. 43



167

Conductor
385 170E(??)

Weak
Conductor
↓

Step Step

88-2895

385 190E 385 290E 385 390 385 490 385 590
Coil Separation = 100m

100 metres

5 cm

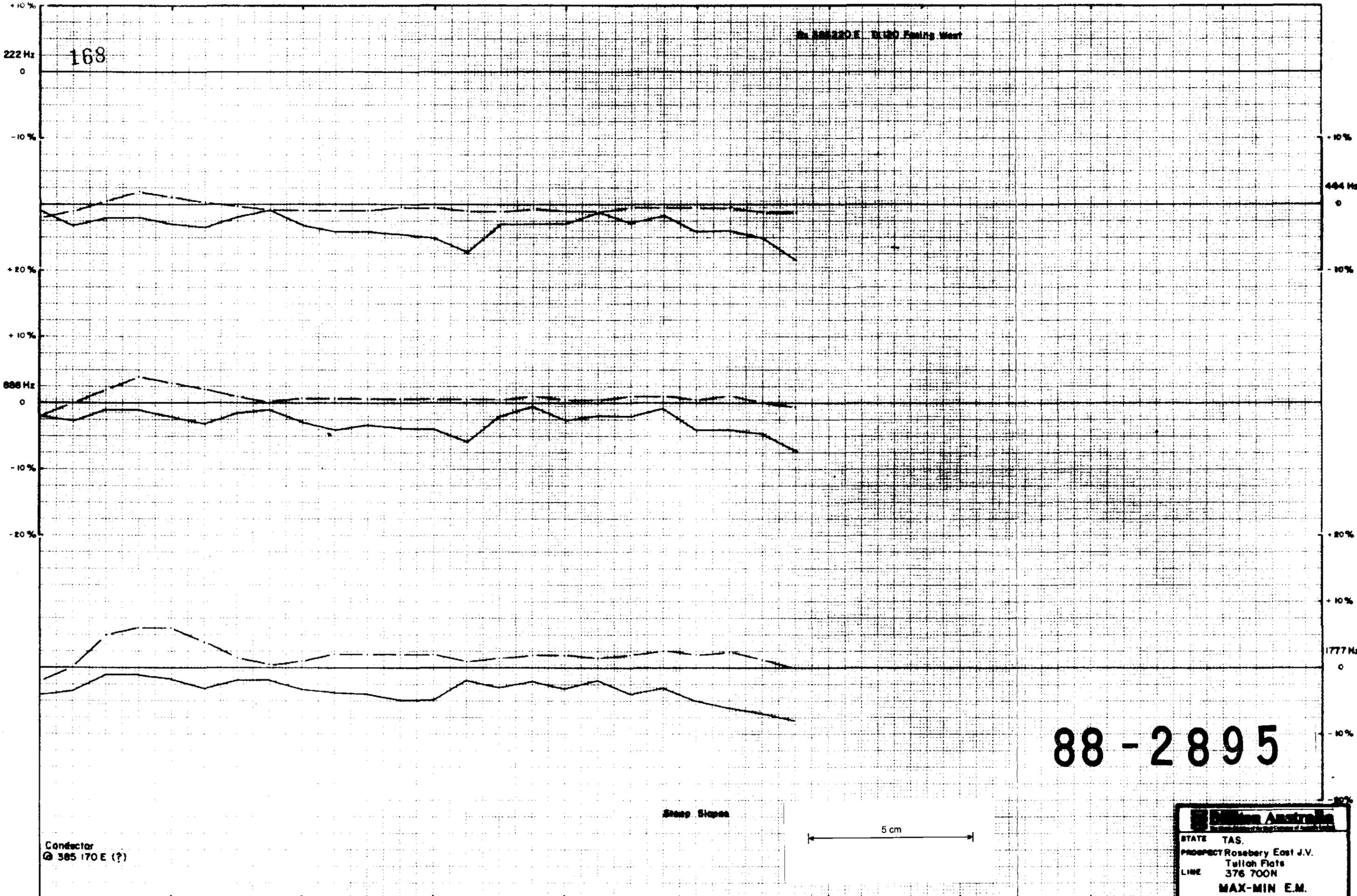
— In Phase
- - - Out of Phase

Geophysical Australia	
STATE	TAS.
PROJECT	Tullah Flats Rosebery East J.V.
LINE	376600N
MAX-MIN E.M.	
SCALE 1:2 000	DATE 28-10-88
AUTHOR R.D.	DRAWN A.B.
OFFICE AND	REP.No.
DRG.No. LJ50/137	FIG.No. 44

701176

385 220 E 3120 Facing West

168



Conductor
@ 385 170 E (?)

Steep Slopes

5 cm

88-2895

385 170 E

385 270 E

385 370 E

385 470 E

385 570 E

385 630 E

Coil Separation : 1000m

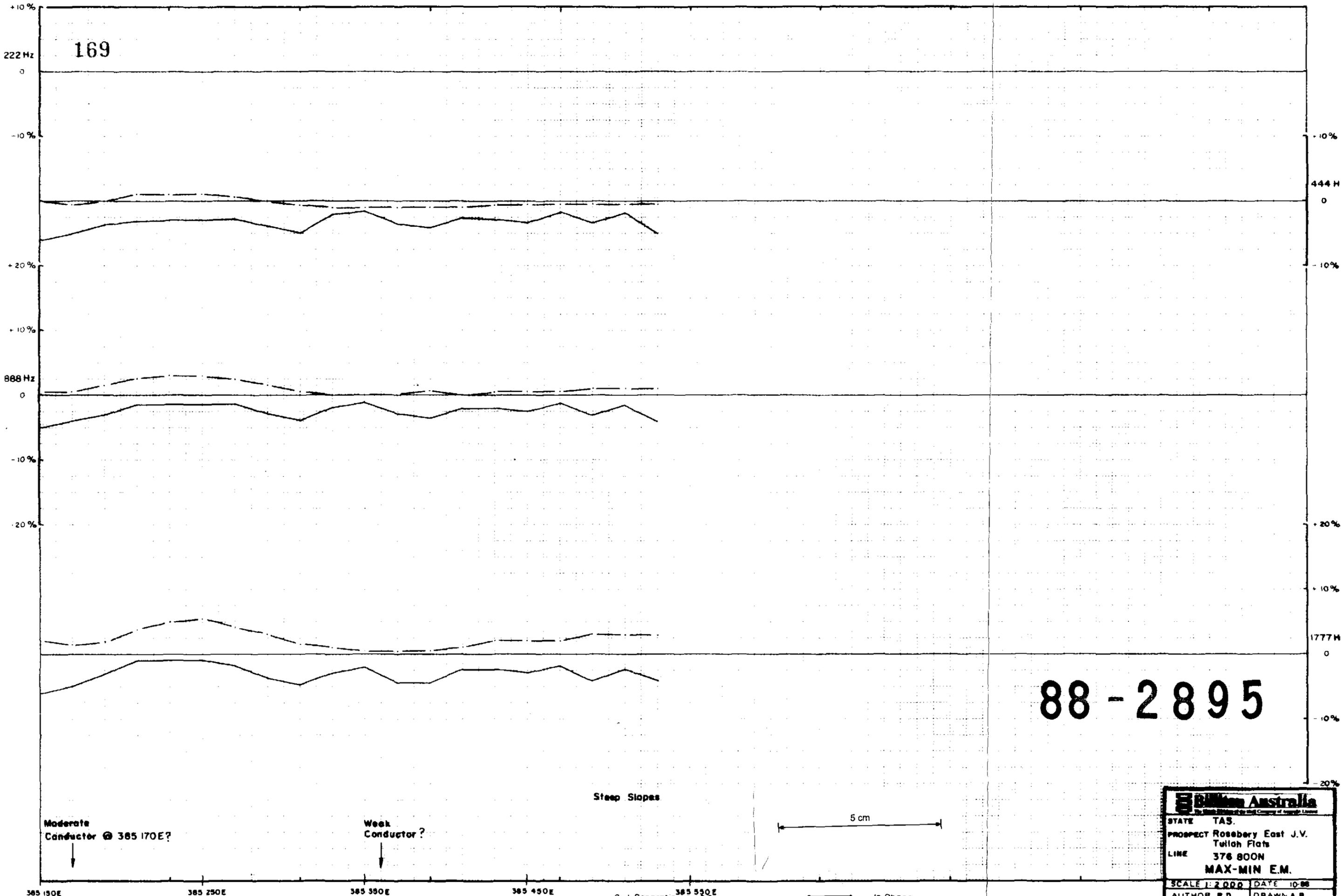
— In Phase

- - - Out of Phase

100metres

Geoscience Australia	
STATE TAS.	
PROSPECT Rosebery East J.V.	
Tullah Flats	
LINE 376 700N	
MAX-MIN E.M.	
SCALE 1:2000	DATE 1.11.88
AUTHOR S.R.D	DRAWN AS
OFFICE AHO	REP.No.
DRG.No L150/1138	FIG.No. 45

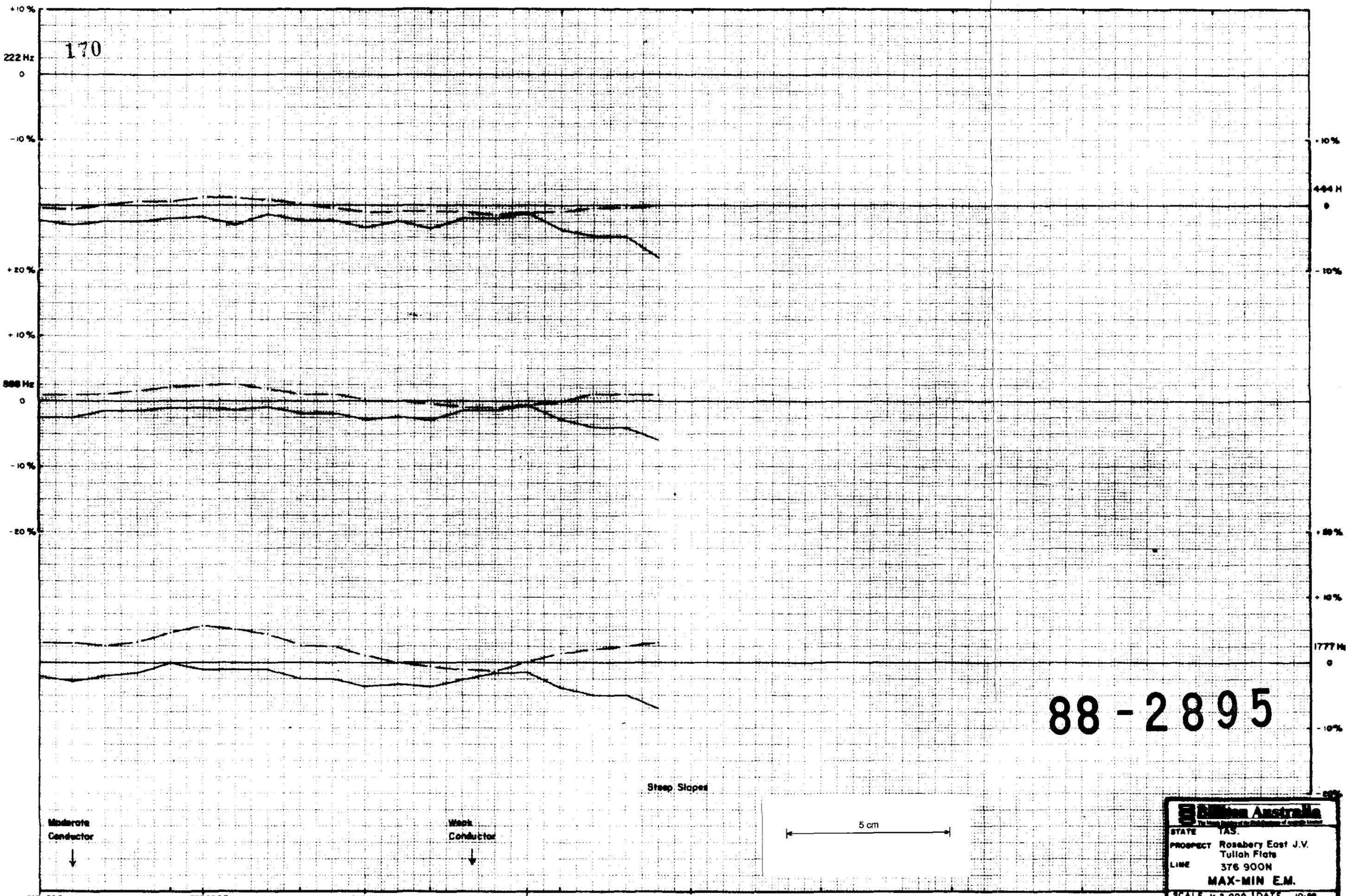
701177



88-2895

701178

Bilkon Australia <small>The State Electricity Board Company of Australia Limited</small>	
STATE	TAS.
PROSPECT	Rosebery East J.V. Tulloch Flats
LINE	376 800N MAX-MIN E.M.
SCALE	1:2000
DATE	10-88
AUTHOR	R.D.
DRAWN	A.B.
OFFICE	AHO
REP. No	
DRG No	LJ50/138
FIG No	46



170

222 Hz

888 Hz

1777 Hz

385 150 E 385 250 E 385 350 E 385 450 E 385 550 E
Coil Separation = 100m

Moderate
Conductor
↓

Weak
Conductor
↓

Steep Slopes

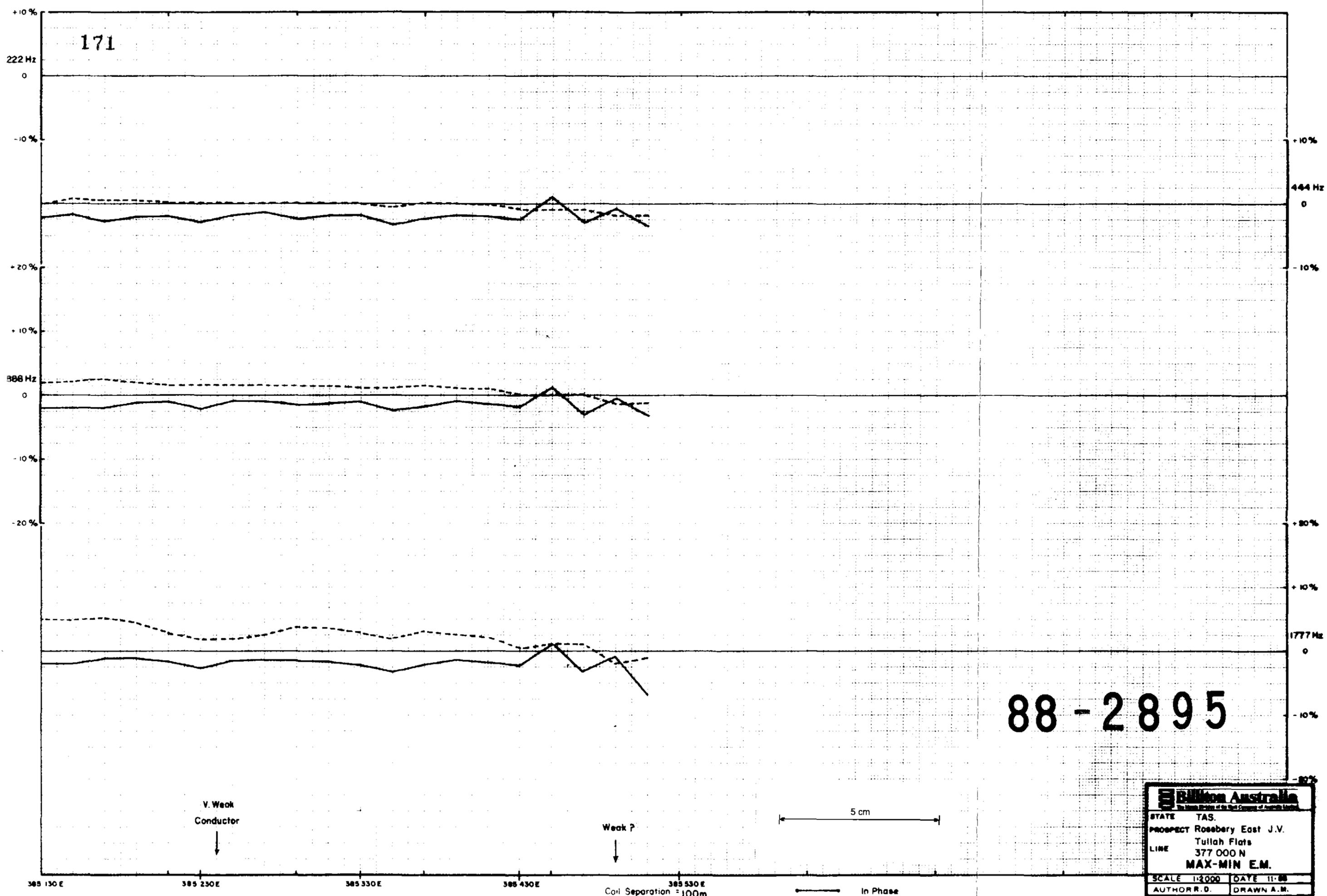
5 cm

— In Phase
- - - Out of Phase

88-2895

701179

Geophysical Australia <small>The Geophysical Institute of Australia</small>	
STATE	TAS.
PROSPECT	Rosebery East J.V. Tullah Flats
LINE	376 900N
MAX-MIN E.M.	
SCALE 1:2 000	DATE 10-88
AUTHOR R.D.	DRAWN A.B.
OFFICE AND	REP No.



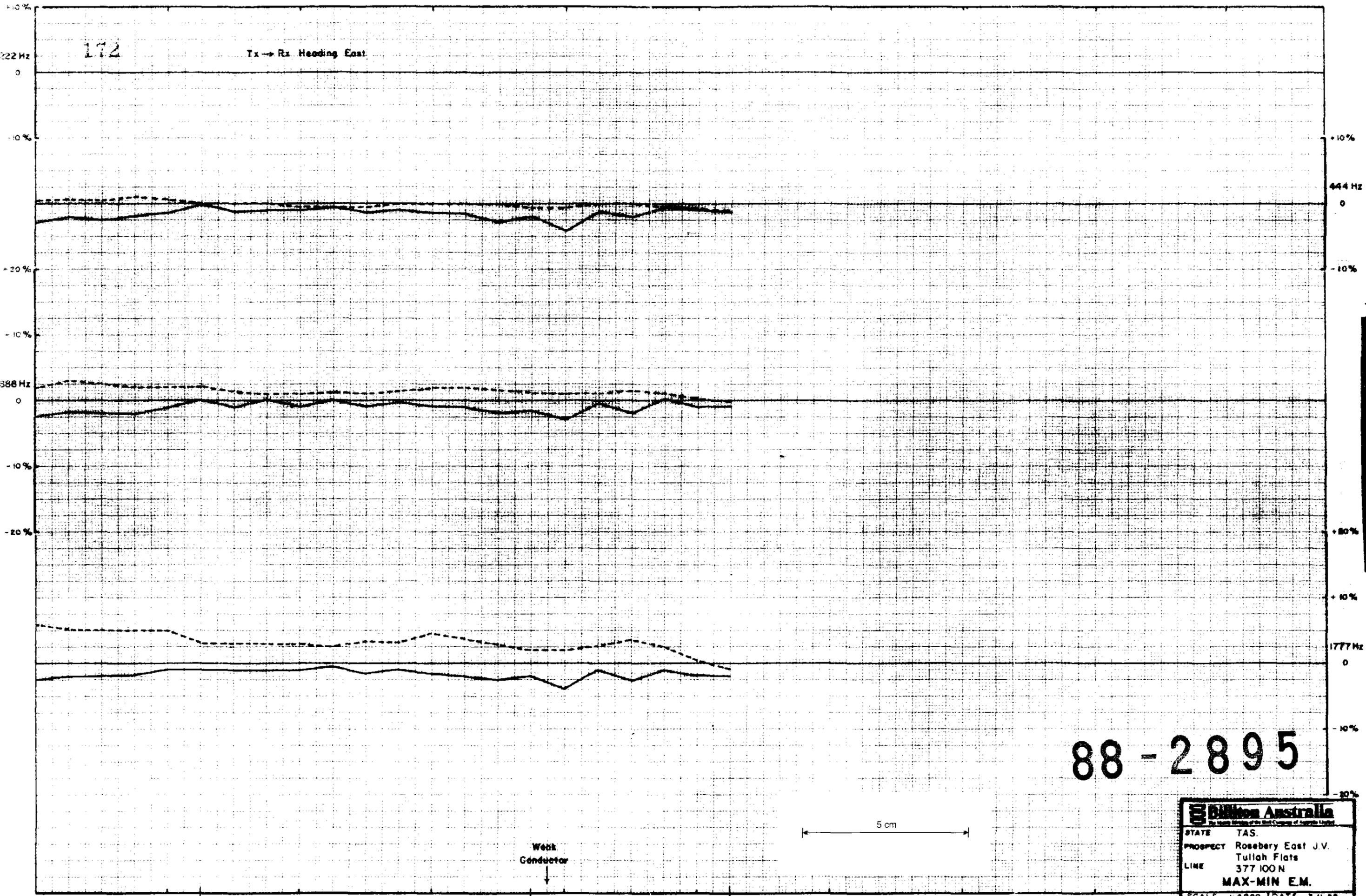
88 - 2895

701180

Biltron Australia <small>The Magnet Division of the Shell Company of Australia Limited</small>	
STATE TAS.	
PROSPECT Rosebery East J.V.	
LINE Tullah Flats	
377 000 N	
MAX-MIN E.M.	
SCALE 1:2000	DATE 11-88
AUTHOR R.D.	DRAWN A.M.
OFFICE AND	REP. No.
DRG No. LJ50/1141	FIG. No. 98

172

Tx → Rx Heading East



88-2895

Weak Conductor

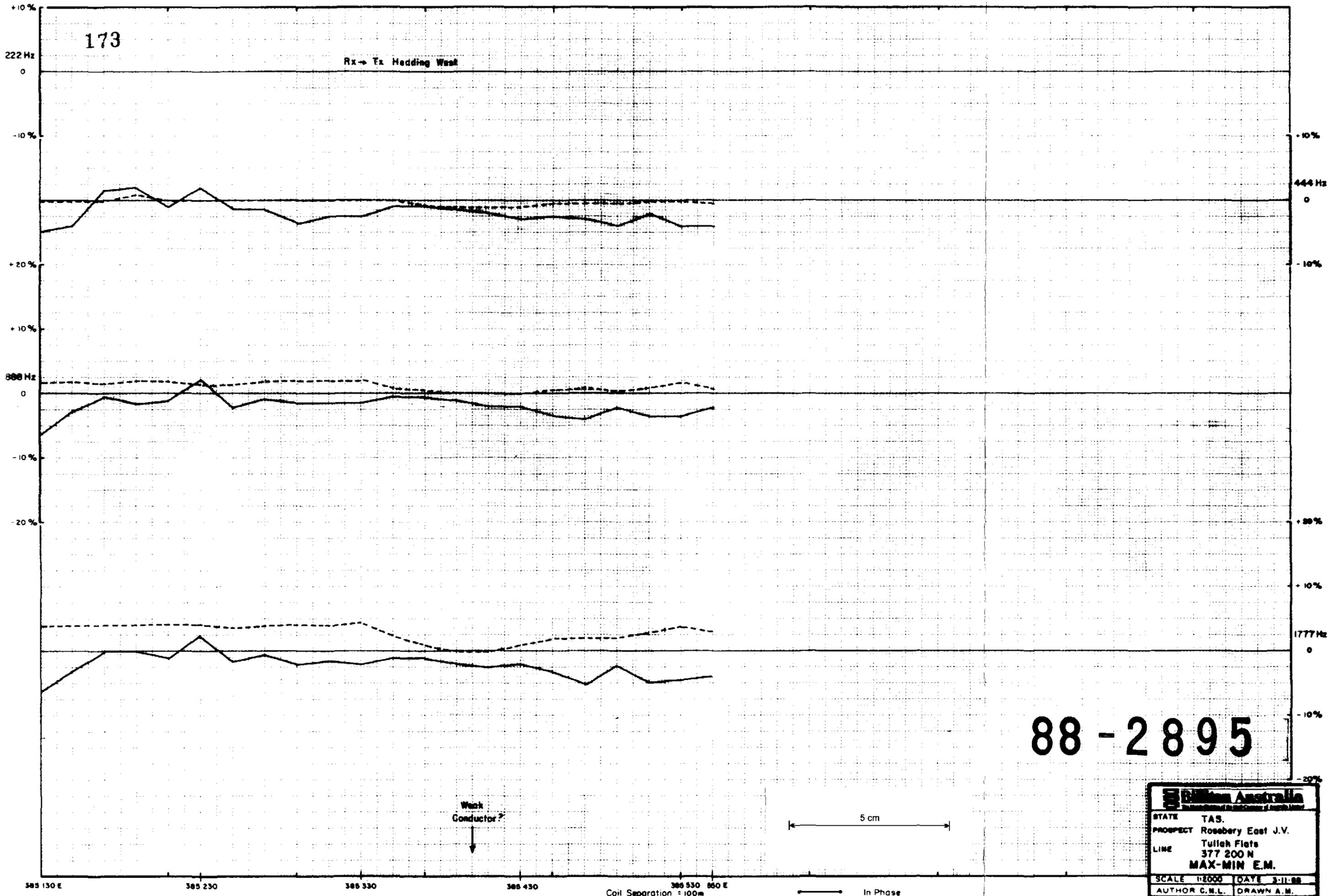
Coil Separation = 385 550 E

5 cm

— In Phase
 - - - Out of Phase

Billon Australia <small>The World's Leader in the Best Companies of Australia</small>	
STATE	TAS.
PROSPECT	Rosebery East J.V. Tullah Flats
LINE	377 100N MAX-MIN E.M.
SCALE	1:200
DATE	3-11-88
AUTHOR	G.M.L.
DRAWN	A.M.
OFFICE	AMC
REP. NO.	
DRG. No.	LJ50/143
FIG. No.	49

385 130 E
385 230 E
100 metres
385 430 E
385 550 E

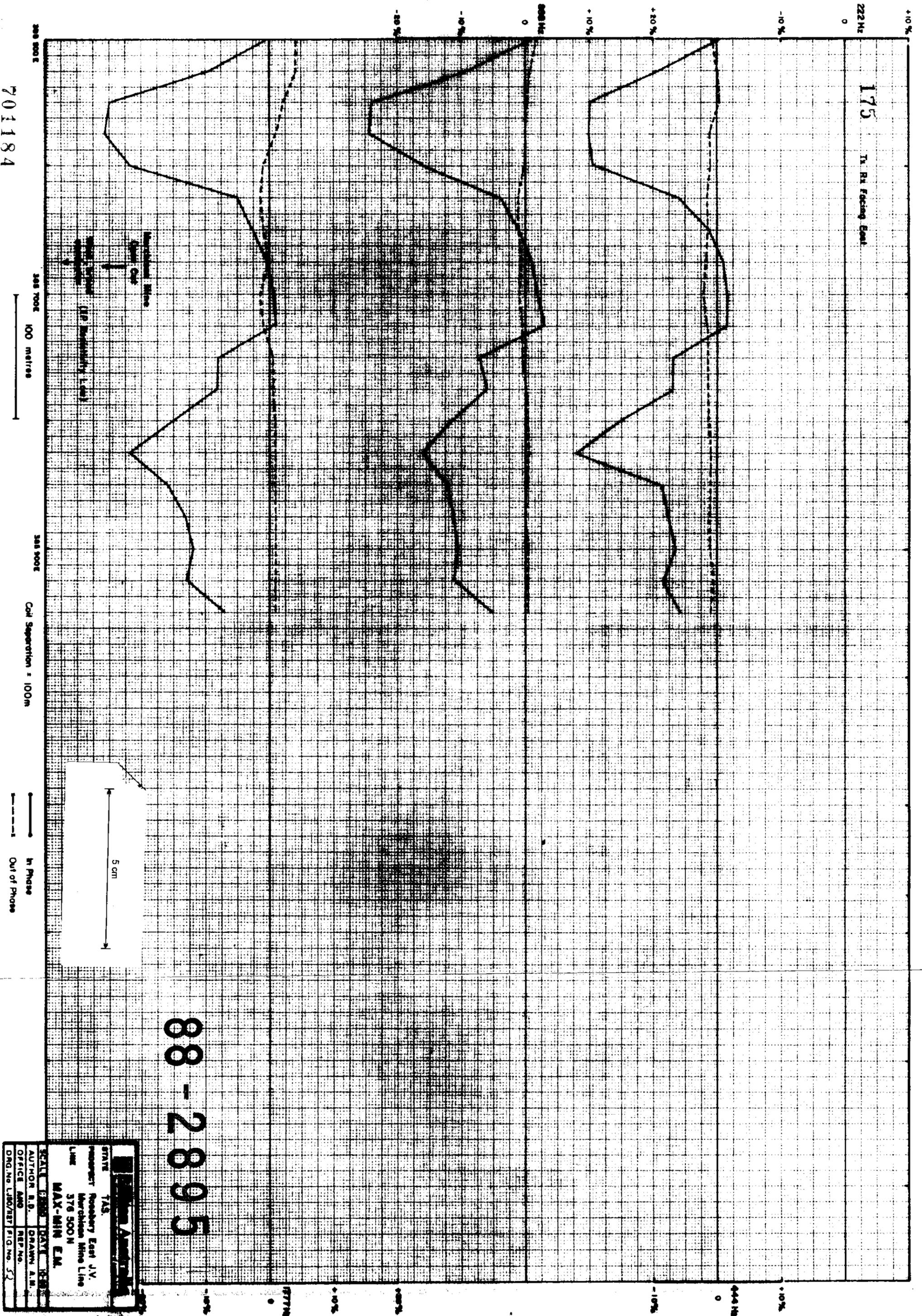


88-2895

Brimacombe Australia	
STATE	TAS.
PROSPECT	Rosebery East J.V.
LINE	Tulleh Flets 377 200 N MAX-MIN E.M.
SCALE	1:2000
DATE	3-11-88
AUTHOR	C.N.L.
DRAWN	A.M.
OFFICE	AWO
REP. No.	
ORG. No.	LJ80/144
FIG. No.	50

MD 109

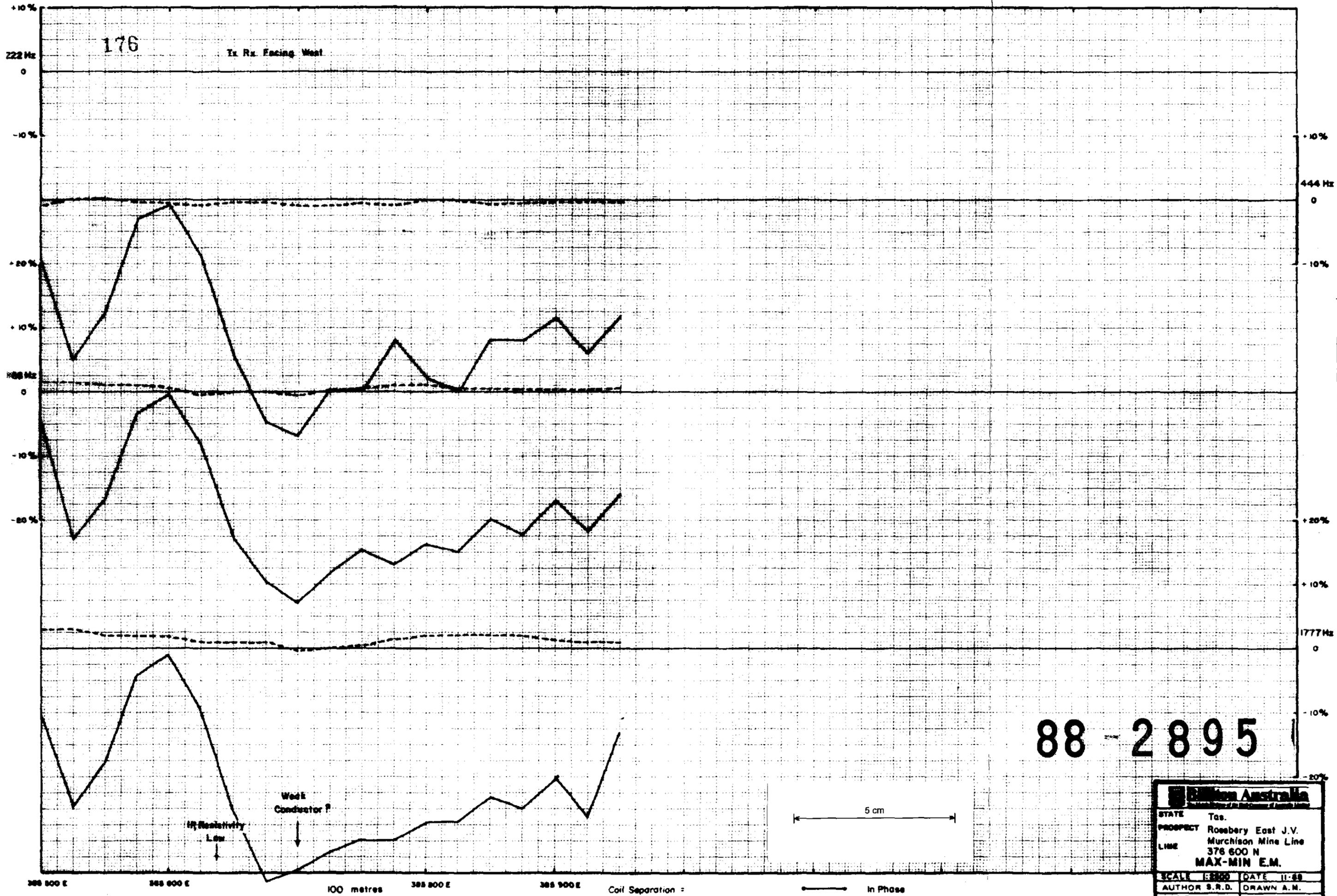
175 Tr. Rd Facing East
 222 Hz
 0



701184

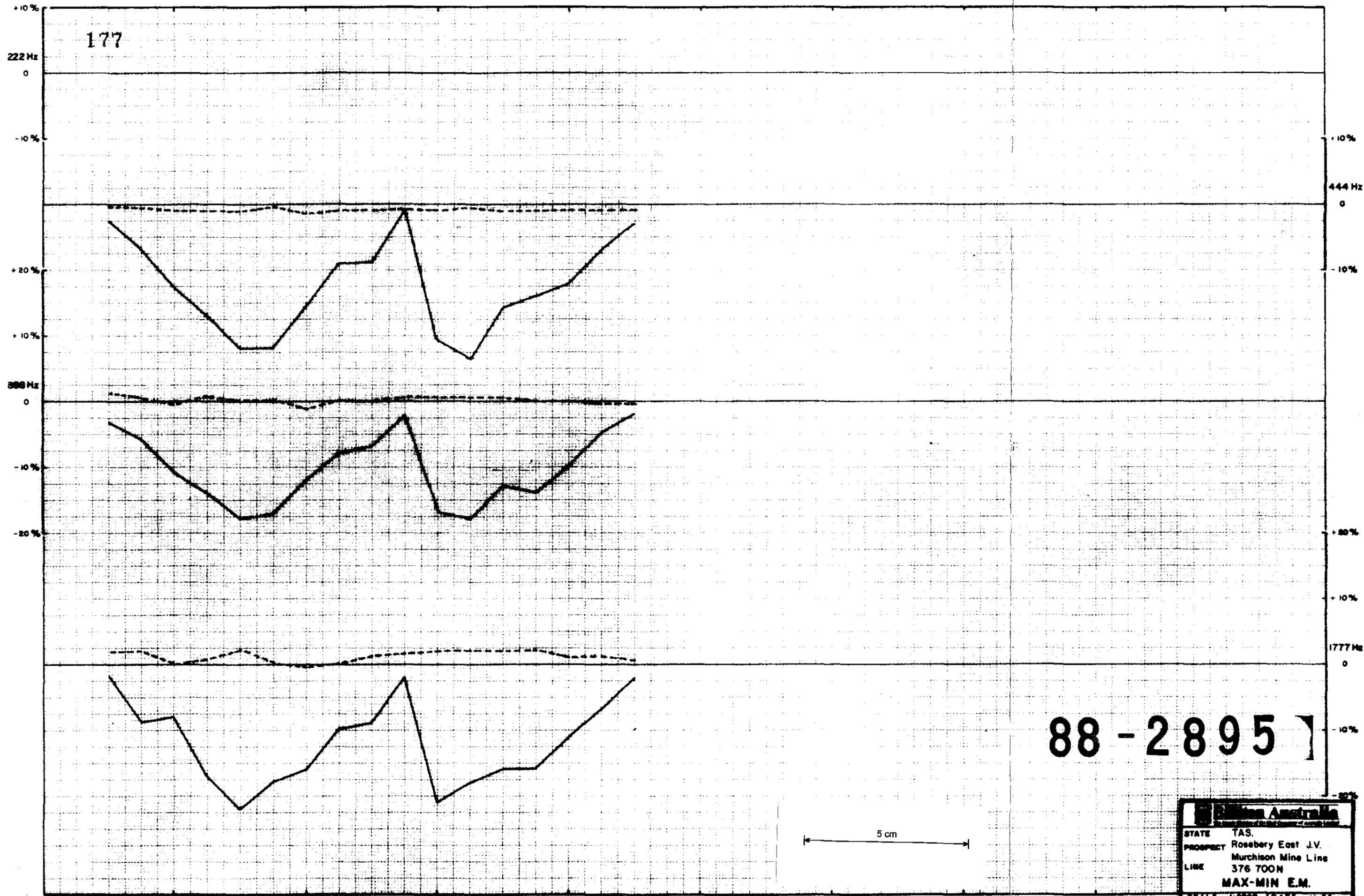
88-2895

STATE	TAS.
PROJECT	Prossery East J.V. Murchison Mine Line
LINE	376 500 N
SCALE	1:5000
AUTHOR	E.B.
OFFICE	AND
DWG. No.	LJ80/857 FIG. No. 52



504185

STATE	Tas.
PROSPECT	Rosebery East J.V.
LINSE	Murchison Mine Line
	376 600 N
	MAX-MIN E.M.
SCALE	1:500
DATE	11-88
AUTHOR	S.R.D.
DRAWN	A.M.
OFFICE	AMG
REP.No.	
DRG.No.	L180/132
FIG.No.	53



177

222 Hz

388 Hz

444 Hz

1777 Hz

88-2895

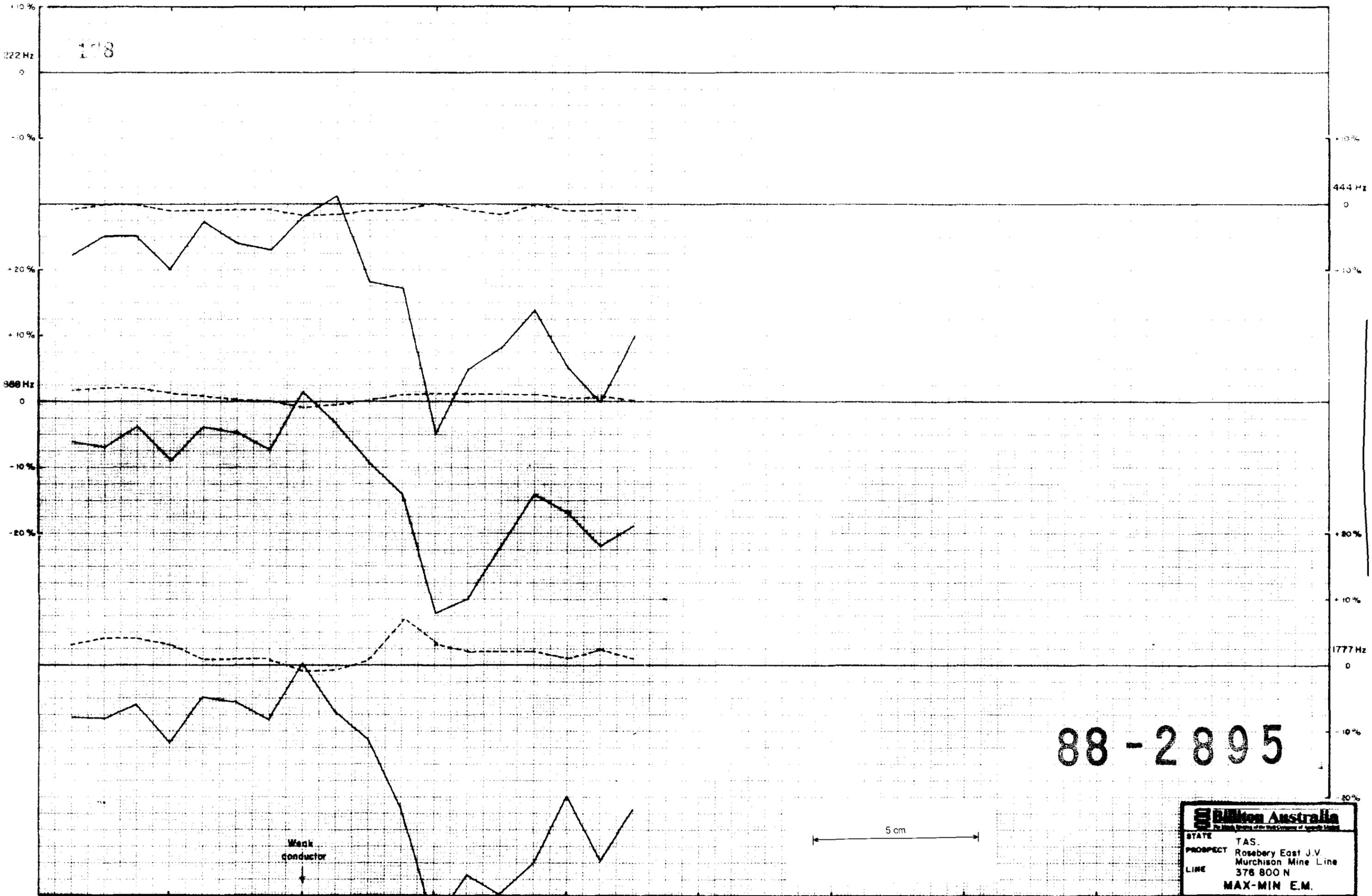
385 500 E 385 600 E 385 700 E 100 metres 385 800 E 385 900 E 386 000 E Coil Separation = 100m

5 cm

— In Phase
- - - Out of Phase

Palson Australia	
STATE	TAS.
PROSPECT	Rosebery East J.V.
	Murchison Mine Line
LINE	376 700N
MAX-MIN E.M.	
SCALE 1:5000	DATE 11-68
AUTHOR R.D.	DRAWN A.M.
OFFICE AMO	REP. No
DRG No LJ50/1128	FIG No 54

701186



178

88-2895

388 500 E 388 600 E 388 700 E 100 metres 388 800 E 388 900 E 389 000 E
 Coil Separation = 100m

5 cm

— In Phase
 - - - - - Out of Phase

701187

Bilken Australia The Best, From the Best Countries of the World	
STATE	TAS.
PROSPECT	Rosebery East J.V. Murchison Mine Line
LINE	378 800 N MAX-MIN EM.
SCALE 1:2 500	DATE 10-88
AUTHOR R.D.	DRAWN A.M.
OFFICE AND	REP. NO.
DRC No. LJS0/1129	

+10%

222 Hz

0

-10%

-20%

+10%

308 Hz

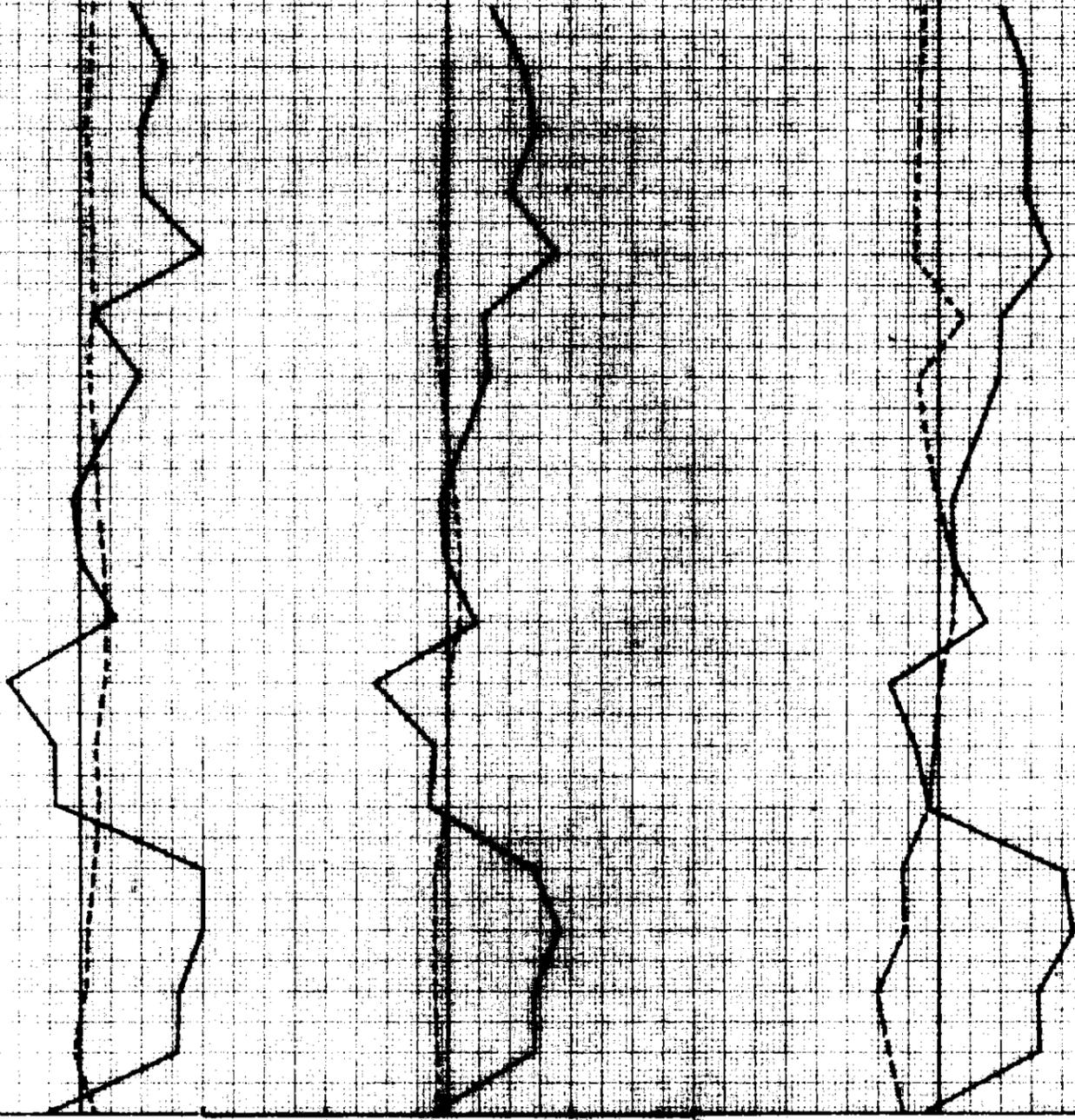
0

-10%

-20%

179

Rx Tx Heading East



Weak
Conductor

300 800E

300 600

300 700 100 metres

300 800

300 900

300 000 E
Coil Separation : 100m

5 cm

— In Phase
- - - Out of Phase

88-2895

Geological Australia
 STATE TAS.
 PROJECT Rosebery East J.V.
 Murchison Mine Line
 LINE 376 900 N
 MAX-MIN E.M.

SCALE 1:500	DATE 3.11.84
AUTHOR S.R.D.	DRAWN A.M.
OFFICE AND	REP. NO.
DRG. No. L180/1190	FIG. No. 56

+10%

444 Hz

0

-10%

+20%

+10%

1777 Hz

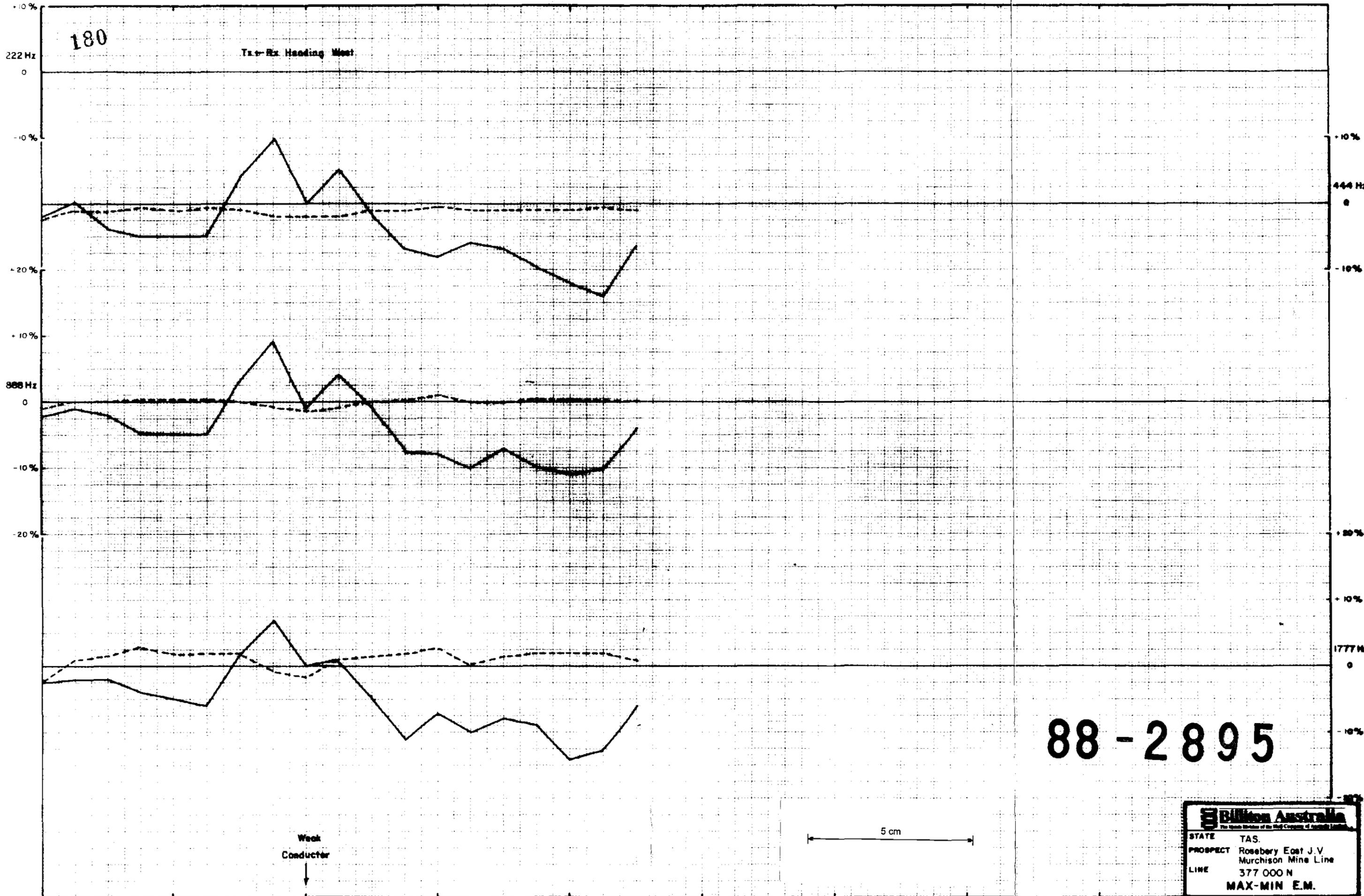
0

-10%

701188

180

Tx. ← Rx. Heading West



88-2895

Weak Conductor

100 metres

5 cm

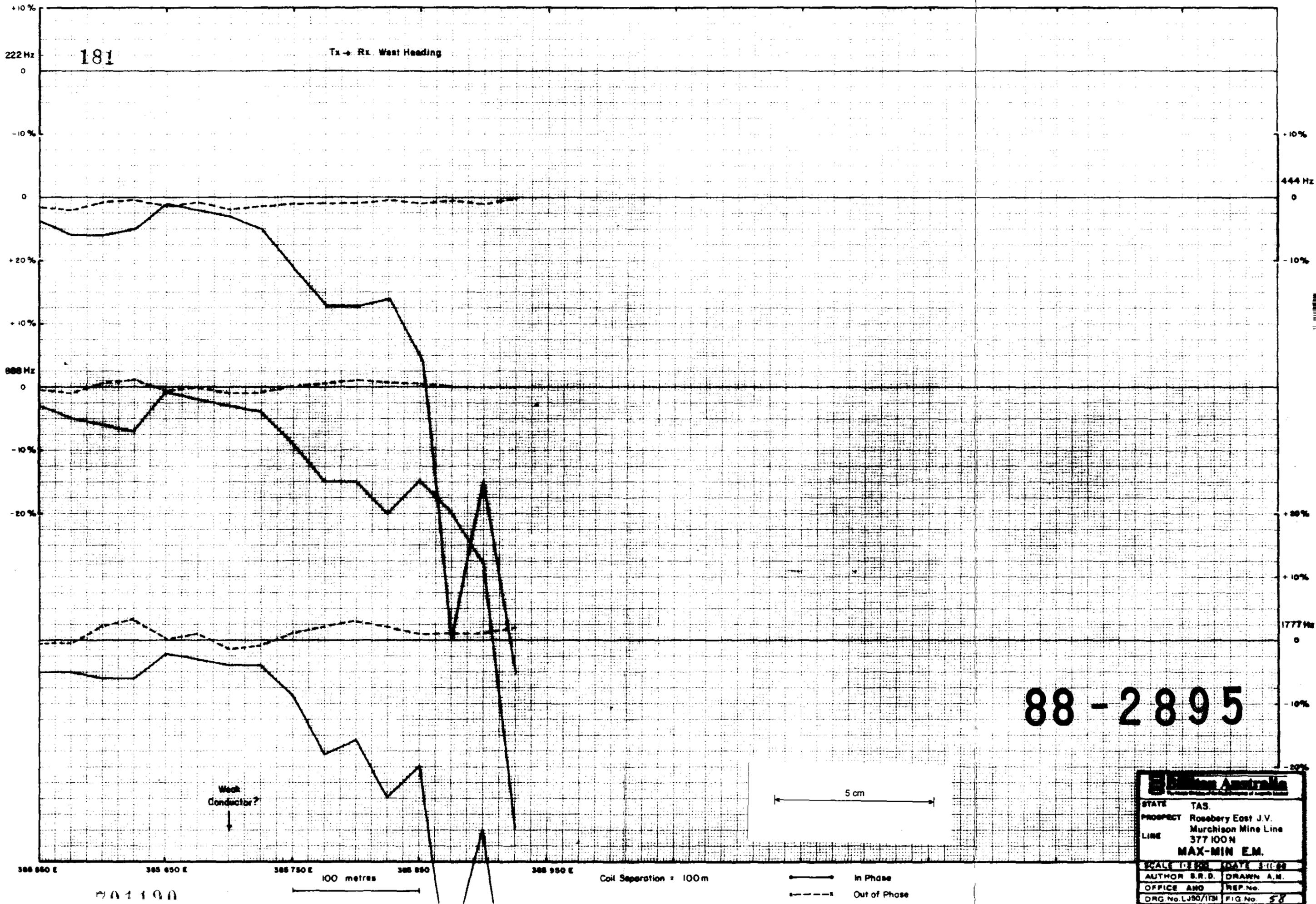
In Phase

385 500 E 385 600 E 385 700 E 385 800 E 385 900 E 386 000 E

Coil Separation =

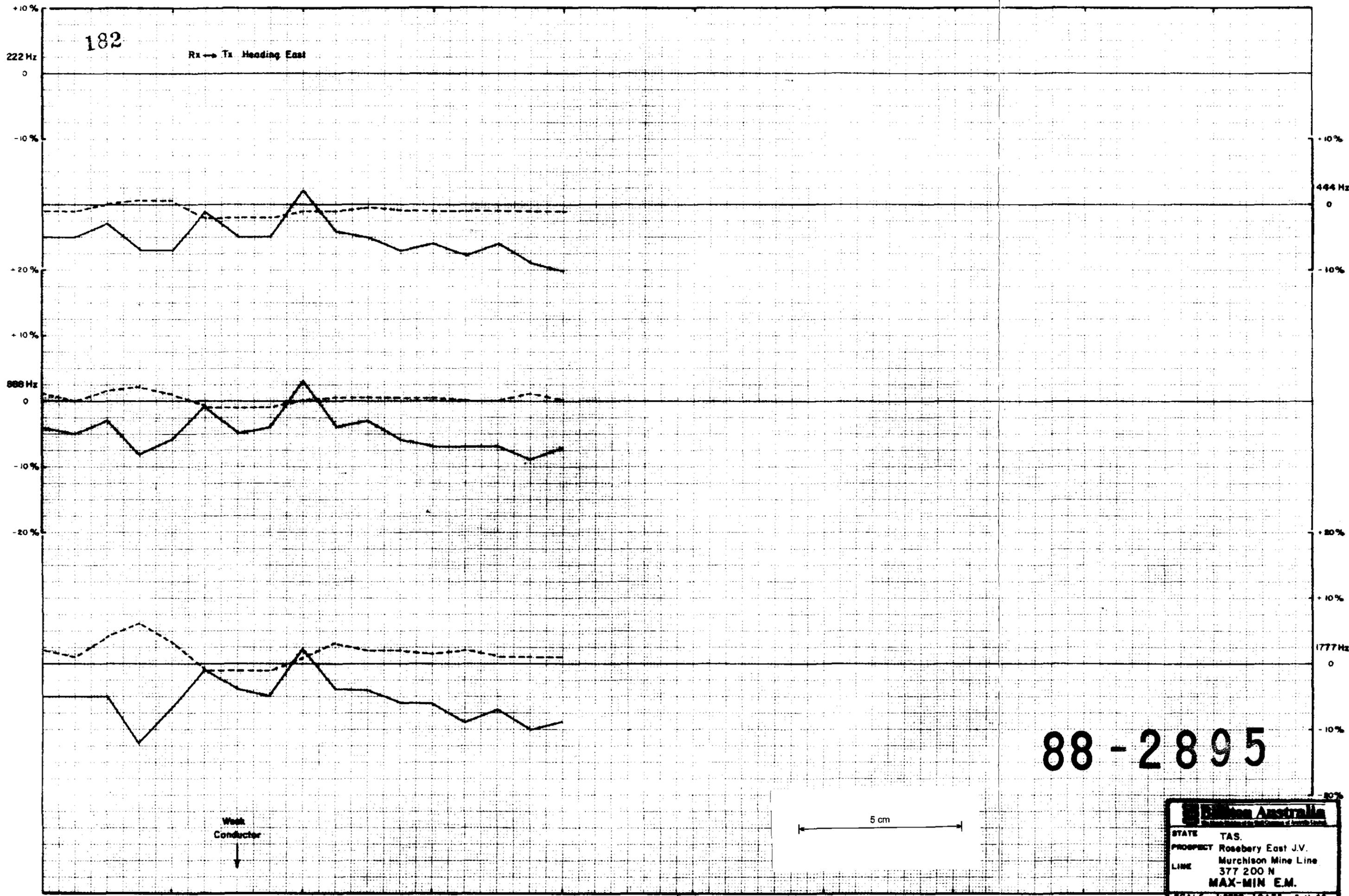
701189

Bilston Australia <small>The State Division of the West Coast of Australia</small>	
STATE	TAS.
PROSPECT	Rosebery East J.V. Murchison Mine Line
LINE	377 000 N MAX-MIN E.M.
SCALE	1:2500
AUTHOR	C.N.L.
OFFICE	AHD
DATE	3-11-68
DRAWN	A.M.
REP NO	57



88-2895

STATE	TAS.
PROSPECT	Rosebery East J.V.
LINE	Murchison Mine Line
	377 100 N
	MAX-MIN E.M.
SCALE 1:2500	DATE 3-11-88
AUTHOR S.R.D.	DRAWN A.M.
OFFICE AND	REP. No.
DRG No. L450/1134	FIG No. 58



182

Rx → Tx Heading East

222 Hz

444 Hz

888 Hz

385 500 E 385 650 E 385 750 E 385 850 E 385 950 E

100 metres

Coil Separation = 100m

— In Phase
- - - Out of Phase

5 cm

Weak
Conductor
↓

88-2895

Billiton Australia	
STATE	TAS.
PROSPECT	Rosebery East J.V.
LINE	Murchison Mine Line
	377 200 N
	MAX-MIN E.M.
SCALE 1:500	DATE 3-11-66
AUTHOR S.R.D.	DRAWN A.M.
OFFICE AMO	REP.No.

183

384000 E
(AMG)

384500 E
(AMG)

385000 E

375500 mN

STIRLING RIVER

LAKE ROSEBERY

AEROMAG

HIGHWAY

HENTY ROAD

MURCHISON

POWER LINE & ROAD

EL 1/62 375000 mN
EL 4/73 AMG

5 cm

- ⊕ SIROTEM ANOMALIES } STRONG
- ⊗ UTEM ANOMALIES } MODERATE
- DIGHEM ANOMALIES } WEAK

701192

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

ROSEBERY EAST, TAS
LAKESIDE PROSPECT

GEOPHYSICAL COMPILATION

Author: M.H. Date: 1/88 Scale: 1:5000

Drawn: Office Revised: Date:

Drawing No: LJ50/1109 Fig No: 60

234
'ARSENIC ZONE'

RED 07-8
RED 07-7
RED 08-1
MRP 218
RED 07-2
RED 07-3
MRP 212
RED 07-5
43B
RED 07-6
S-M

RED 08-2
MRP 219
M
M
W

⊕ W
⊕ W
⊕ W
⊕ W
⊕ W-M
⊕ W-M

MR-2
MR-1
S
S

deep?
W

374500 mN

88-2895