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MICROFILMED

EXPLORATION LICENCE 23/79

WYNYARD, TASMANIA

REPORT FOR THE YEAR ENDED 1ST DECEMBER, 1984.

OPEN FILE

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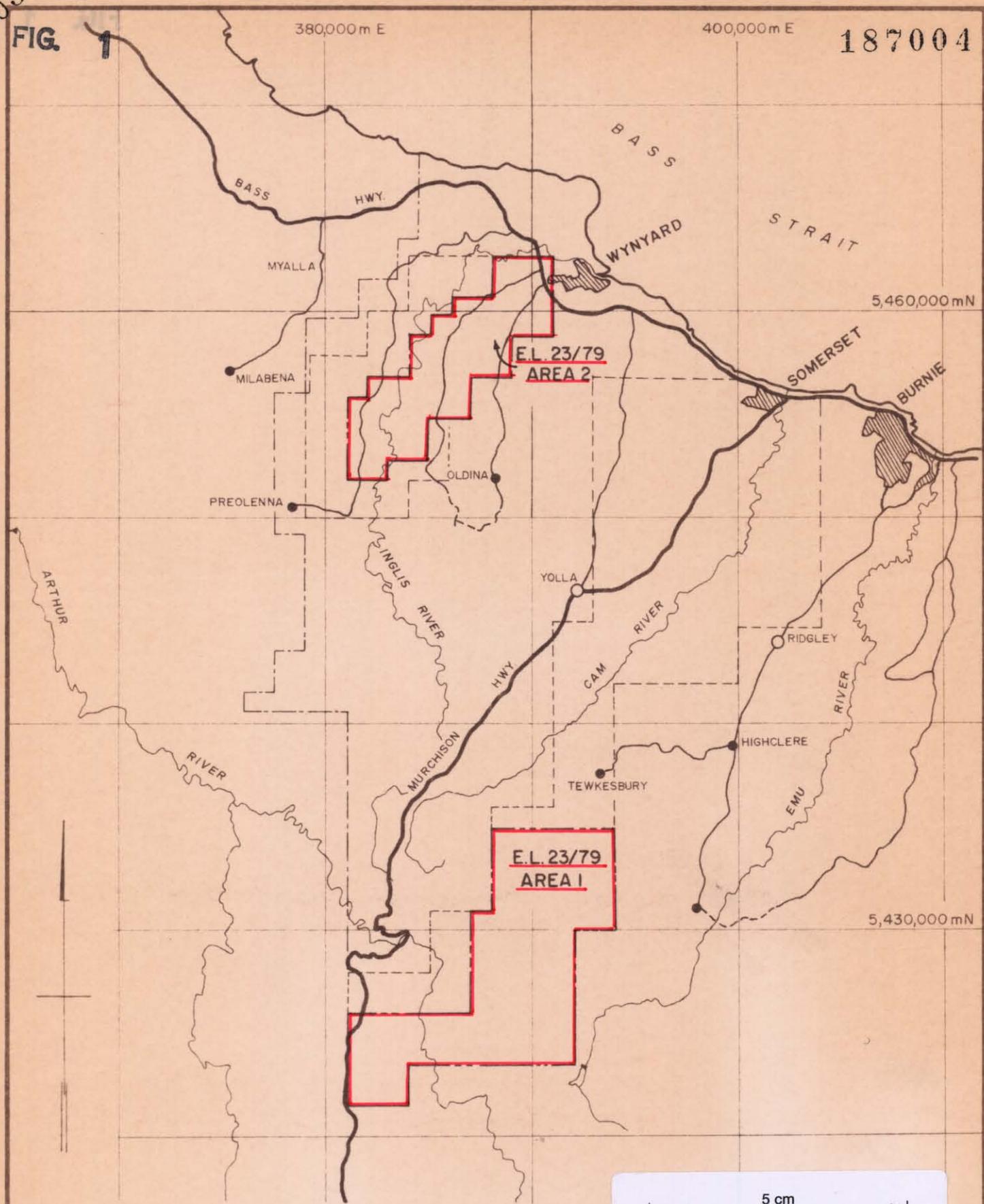
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Chemistry of Tertiary basalt and palynology of interbedded
sediments from BHP drillholes, EL 33/79.

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FIG. 1

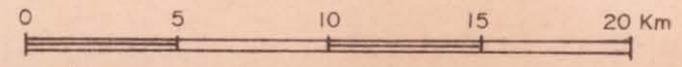
187004



- Original EL boundary.
- Area relinquished 1-12-84.
- EL 23/79, from 1-12-84.

AM.G ZONE 55

SCALE 1:250,000



Centre
Melbourne

Date
13.5.85

THE BROKEN HILL PROPRIETARY CO. LTD.
EL.23/79, WYNYARD, TASMANIA.
LOCATION MAP

Project N^o
T 64

Drawing N^o
A4-2473

1. GENERAL

Exploration Licence 23/79 of 715 square kilometres was granted to the Broken Hill Proprietary Company Limited on 14th December, 1979. The Licence area was reduced to 372 square kilometres on 1st December, 1983. A further area reduction to 132 square kilometres was applicable from the 1st December, 1984.

2. EXPLORATION PHILOSOPHY

The principal target is a massive sulphide hosted tin deposit of the Renison type. Such deposits may occur in Cambrian or Precambrian sediments, which in the licence area are often overlain by an extensive cover of Permian sediments, Jurassic dolerite and Tertiary basalt.

3. SUMMARY OF PREVIOUS WORK

Following initial literature surveys and various orientation surveys the most relevant previous work has comprised:-

1. A high-resolution aeromagnetic survey covering the total licence area, with eastwest lines spaced at 250 metres and a mean sensor terrain clearance of 90 metres. Interpretation of aeromagnetic data and selection of anomalies for further ground investigations.
2. Stream sediment and pan-concentrate geochemical sampling over areas of basement exposure.
3. Drilling of two boreholes for a total depth of 460 metres. Borehole WY1 was stopped in Tertiary basalt when the target geophysical anomaly had been explained. Borehole WY2 intersected Cambrian sediments below a very thick series of basalt flows.

4. GEOLOGY

Within the licence area extensive flows of Tertiary basalt and Permian sediments overlie a basement consisting largely of Precambrian and Cambrian rocks which form a major structural extension of sequences in the Mt. Bischoff, Cleveland area to the south west.

The oldest rocks present are the Precambrian Keith Metamorphics which occur in a belt 8-15km wide trending north east from Savage River to Wynyard. Rocks in this belt include pelitic schist, quartzite and minor amphibolite. Younger Precambrian rocks of the Burnie Quartzite and Slate Formation flank the Keith Metamorphics in the lower Cam River. Dolomite has not previously been recorded in the Precambrian rocks of the Wynyard area.

Cambrian sediments are exposed in a large window in Tertiary basalt, in the Helleyer River upstream from the Murchison Highway crossing. Rocks in the area include red-brown lithicwacke, red shale and pyrite bearing chert.

Ordovician sediments have not been located within the area. They flank a major anticline at Companion Hill to the east of the southern portion of the licence area.

Permian sediments, up to 300 metres thick, consist of a basal tillite unit, siltstone with thin oil shale and coal horizons, and sandstone.

5. GEOPHYSICS

Prior to the commencement of the 1983-84 summer field season further interpretation of the detailed aeromagnetic data was carried out and promising anomalies with probable basement sources were identified.

It was decided to apply a filtering technique to our exploration work, by doing preliminary EM37 geophysical surveys on cut lines in an attempt to define conductors that could be drill tested.

One anomaly in the southeast of the Wynyard licence area was gridded, and a survey was conducted by Geoterrex Pty. Ltd. using this transient EM system. In the event no indication of any sub-basalt conductor was obtained so no further work was warranted. Soundings gave an interpretative estimate of basalt thickness.

Details of the EM37 survey over anomaly 2 are presented in Appendix 1.

6. DRILLING

Borehole WY3 was sited to test a large aeromagnetic anomaly within the Arthur Lineament in an area where basalt cover is absent. Spectral modelling gave a source depth of approximately 150 metres. Anomalous tin values had been found in streams draining the area, although the source is problematical and derivation could be from the extensive Tertiary gravels.

An initial drillhole (WY3a) was abandoned at 30 metres as it was unable to penetrate an unexpectedly thick sequence of unconsolidated quartz sands and gravels. A second site was dozed on basement outcrop on the side of the dissected Inglis River valley.

Drillhole WY3 passed from quartz-muscovite-chlorite schist into an altered carbonate sequence, and was stopped at 207.2 metres in amphibolite. The drill log is presented in appendix 2, while figure 2 shows the graphic log and analytical results. Detailed petrological descriptions of selected samples are given in Appendix 3.

The sequence has been subject to prograde amphibolite facies metamorphism though extensive retrogressive effects are apparent. Dissemination and vein pyrite occurs in the carbonate rocks while the meta-volcanics contain disseminated pyrite and stockwork veins of quartz, carbonate, pyrite, magnetite and hematite. Minor chalcopyrite occurs between 175-190 metres. The mineral assemblage is similar to that found in similar rock types in the Savage River area, though the mode of occurrence is different. The presence of magnetite mineralisation within amphibolites explains the observed aeromagnetic anomaly.

Geochemistry

Within the non-cored section of the hole to 101.9 metres, 2 kg samples were taken from percussion chips bulked over six metre intervals. The diamond drill core was cut and selected one metre hard-core samples were taken.

Samples were sent to Analabs Pty. Ltd. (Burnie) for preparation and analysis. The percussion samples were analysed for copper, lead, zinc, silver and arsenic by AAS and for tin, tungsten and antimony by XRF. The hard-core samples were analysed for the above elements, plus iron and gold by AAS and uranium by XRF.

Copper shows minor anomalism consistent with observed chalcopyrite in the core. No other values of interest were obtained.

7. FUTURE PROGRAMME

A further detailed compilation and research phase is in progress, incorporating results from our exploration programme to date in Northwest Tasmania and making use of available data from surrounding areas. The most obvious aeromagnetic targets within E.L. 23/79 have now been tested. Future work will be dependent on positive conceptual ideas arising from on-going geological and geophysical research.

Some field mapping is also planned to check on the occurrence of carbonate lithologies in the Precambrian rocks of the Arthur Lineament. Dolomite was intersected in borehole WY3 and magnesite is known to occur at the same horizon in the Arthur River/Keith River area, some 15km to the southwest.

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Chlorite mica schist.
coarse quartz-albite veins

Dolomite - quartz/pyrite bearing
coarse grained

Amphibolite - quartz ± chlorite ±
albite ± carbonate
magnetite/haematite veins



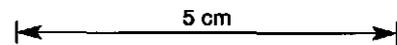
92.00m

134.50

TD 207.2m
vertical scale 1:500

Sample	Interval	Cu	Pb	Zn	Ag	Fe%	Au	As	U	W	Sn
BJ1401	2.0 8.0	105	5	20	X	-	-	X	-	X	X
BJ1402	8.0 14.0	75	X	30	X	-	-	X	-	X	X
BJ1403	14.0 20.0	50	X	25	X	-	-	X	-	X	X
BJ1404	20.0 26.0	30	X	30	X	-	-	X	-	X	X
BJ1405	26.0 32.0	10	X	20	X	-	-	X	-	X	X
BJ1406	32.0 38.0	5	X	20	X	-	-	X	-	X	X
BJ1407	38.0 44.0	15	X	25	X	-	-	X	-	X	X
BJ1408	44.0 50.0	65	X	30	X	-	-	X	-	X	X
BJ1409	50.0 56.0	60	X	20	X	-	-	X	-	X	X
BJ1410	56.0 62.0	15	X	20	X	-	-	X	-	X	X
BJ1411	62.0 68.0	10	X	20	X	-	-	X	-	X	X
BJ1412	68.0 74.0	10	X	15	X	-	-	X	-	X	X
BJ1413	74.0 80.0	10	X	15	X	-	-	X	-	X	X
BJ1414	80.0 86.0	10	X	20	X	-	-	X	-	X	X
BJ1415	86.0 92.0	10	X	65	X	-	-	X	-	X	X
BJ1416	92.0 98.0	10	X	30	X	-	-	X	-	X	X
BJ1417	98.0 101.9	95	X	60	X	-	-	X	-	X	X
BJ1801	107.0 108.0	10	10	70	X	2.20	X	X	X	X	X
BJ1802	112.6 113.6	20	15	65	X	3.55	X	X	X	X	X
BJ1803	115.0 116.0	10	10	105	X	4.60	X	50	X	X	X
BJ1804	120.0 121.0	10	10	65	X	5.25	X	X	X	X	X
BJ1805	121.0 122.0	10	15	75	X	5.25	X	X	X	X	X
BJ1806	122.0 123.0	5	10	60	X	3.65	X	X	X	X	X
BJ1807	127.0 128.0	15	10	35	X	6.25	X	X	4	X	X
BJ1808	133.2 134.2	10	5	30	X	3.40	X	X	3	X	X
BJ1809	141.0 142.0	10	10	50	X	4.60	X	X	X	X	X
BJ1810	142.0 143.0	15	10	35	X	3.65	X	X	3	X	X
BJ1811	159.0 160.0	10	5	90	X	6.80	X	X	X	X	X
BJ1812	161.5 162.5	19	5	60	X	5.80	X	X	X	X	X
BJ1813	178.0 179.0	365	15	50	X	11.00	X	X	X	X	X
BJ1814	186.4 187.4	380	5	90	X	8.20	X	X	X	X	X
BJ1815	188.4 189.4	65	5	40	X	6.15	X	X	X	X	X
BJ1816	195.5 196.5	70	10	45	X	5.85	X	X	X	X	7

- = not tested
X = below detection level



Centre
HOBART

THE BROKEN HILL PROPRIETARY CO. LTD.
EL 23/79 WYNYARD TASMANIA

Project No

Date
JUNE 84

WY3 GRAPHIC LOG AND GEOCHEMICAL RESULTS

Drawing No

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APPENDIX 1

EM37 Survey Data - Anomaly Q

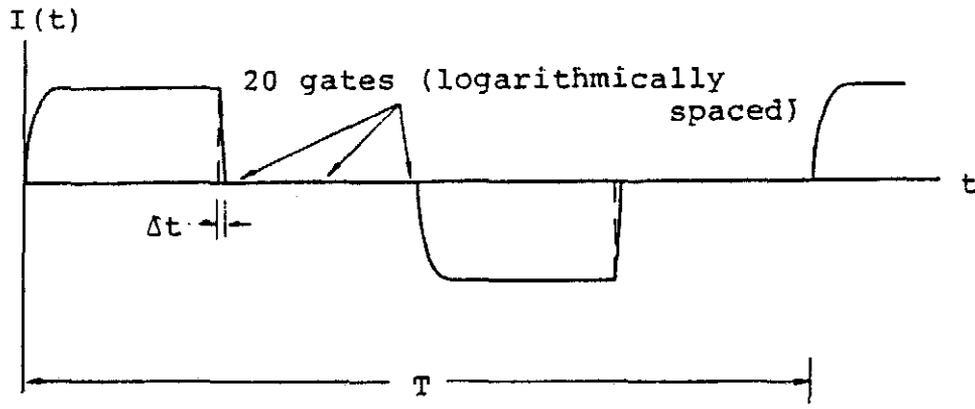
GEONICS LIMITEDEM37 Ground Transient Electromagnetic System
Technical SpecificationsTransmitter

- Current Waveform - See Fig. 1
- Repetition rate - 3Hz or 30Hz in countries using 60Hz power line frequency; 2.5Hz or 25Hz in countries using 50Hz power line frequency; all four base frequencies are switch selectable.
- Turn-off time (Δt) - fast linear turn-off of maximum 300 μ sec. at 20 amps into 300x600m loop. Decreases proportionally with current and (loop area)^{1/2} to minimum of 20 μ sec. Actual value of Δt read on front panel meter.
- Transmitter loop - any dimensions from 40x40m to 300x600m maximum at 20 amps. Larger dimensions at reduced current. Transmitter output voltage switch adjustable for smaller loops. Value of loop resistance read from front panel meter; resistance must be greater than 1 ohm on lowest voltage setting to prevent overload.
- Transmitter protection - circuit breaker protection against input over-voltage; instantaneous solid state protection against output short circuit; automatically resets on removal of short circuit. Input voltage, output voltage and current indicated on front panel meter.
- Transmitter output voltage - 150 volts (zero to peak) maximum;
20 volts (zero to peak) minimum
- Transmitter output power - 2.8 kw maximum
- Transmitter wire supplied - 1800m. #10 copper wire PVC insulated with nylon jacket; transmitter wire contained on 6 reels (supplied); 2 reel winders supplied.
- Transmitter motor generator - 5 HP Honda gasoline engine coupled to 120 volt, 3 phase, 400Hz alternator. Approximately 8 hours continuous operation from full (built-in) fuel tank.

012

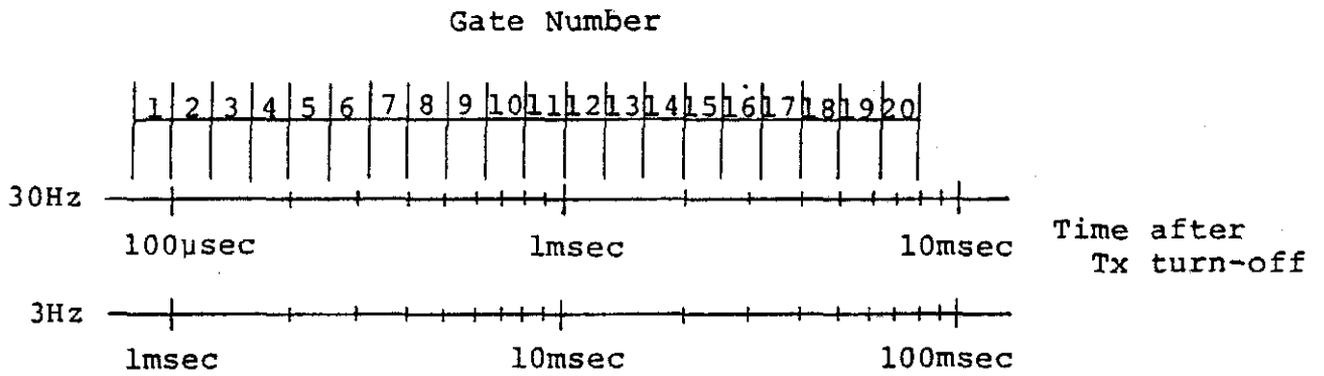
Receiver

- Measured quantity - time rate of decay of magnetic flux along 3 axes.
- Sensor - air-cored coil of bandwidth 40 kHz; 100cm dia. by 7x5cm cross-section. Coil holder supplied to facilitate measurement along 3 axes.
- Time channels - 20 time channels with locations and widths as shown in Fig. 2. Successive operation at 30Hz, then 3Hz, effectively gives 30 channels covering range from 80 μ sec. to 80 msec.
- Output display - 4 digit plus sign LED display; display also shows channel number and gain.
- Integration time - 2^n cycles at 30Hz; n=4,6,8,10,12,14 (switch selectable); similar integration times at other base frequencies.
- Receiver output noise referred to input - typically 1.5×10^{-10} volt/m² at last gate at 30Hz with integration time of 34 seconds. Noise will be higher during intense local spherics activity.
- Output connector - all 20 channels in analogue format and house-keeping functions in digital format available from output connector.
- Synchronization to Tx - any of the following (switch selectable)
 - (1) reference cable
 - (2) primary pulse
 - (3) 27 MHz radio link (40 channels)
 - (4) high stability (oven controlled) quartz crystals.
- Noise rejection circuitry - Selective clipping of atmospheric noise pulses at all times. Audio output of Rx coil (transmitter pulse blanked out) is available on built-in loud speaker for ready identification of interference.
- Receiver batteries - 12 volt rechargeable Gel-cell; 9 hours continuous operating time at 17°C. Two batteries and a battery charger supplied to permit charging of second battery from transmitter motor-generator during survey.



Transmitter Current Waveform

FIG. 1



Gate Location and Widths (30 and 3Hz)

FIG. 2

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BANDWIDTH OF EM-37 SYSTEM

25 4 MAY 1982

~~30~~ Hz Repetition Rate

<u>CHANNEL</u>	<u>BEGINNING</u>	<u>END</u>	<u>GATE WIDTH</u>	<u>MID-GATE</u>
1	.080	.097	.017	.0885
2	.097	.121	.024	.109
3	.121	.158	.037	.140
4	.158	.195	.037	.177
5	.195	.244	.049	.220
6	.244	.316	.072	.280
7	.316	.393	.077	.355
8	.393	.492	.099	.443
9	.492	.634	.142	.563
10	.634	.790	.156	.712
11	.790	.962	.172	.876
12	.962	1.212	.250	1.087
13	1.212	1.587	.378	1.400
14	1.587	1.957	.367	1.772
15	1.957	2.457	.400	2.21
16	2.457	3.177	.720	2.82
17	3.177	3.957	.780	3.57
18	3.957	4.957	1.000	4.46
19	4.957	6.377	1.420	5.667
20	6.377	7.937	1.560	7.16

ALL TIMES ARE IN MILLISECONDS FROM END OF RAMP.

187016

EM-37 PLOTTING AND
INTERPRETATION CONVENTIONS

The Geotrex fixed-loop time-domain convention system has been designed with consistency in mind. Given the great diversity of grid and loop orientations, it is most important that anomalies are of a predictable shape.

To fully understand the convention, four basic rules must be laid down:

- 1) The vertical primary field (Z component) is positive within any loop. To be consistent with a Cartesian co-ordinate system, the Z^+ direction is defined as 'up', i.e. the field vectors point up within the loop and down when outside the loop.
- 2) The X component is defined as that which points along the grid lines. Depending upon which direction the lines run, W or S is defined as X^+ .
- 3) Using a right hand orientation where X^+ is direction of the middle finger, and Z^+ is the direction of the thumb, then Y^+ is the direction defined by the index finger.
- 4) North or East is always plotted to the right on the page.

With these four rules, the shapes of the half space responses for late times for all three components are uniquely defined as shown in Figures 1, 2, 3a and 3b.

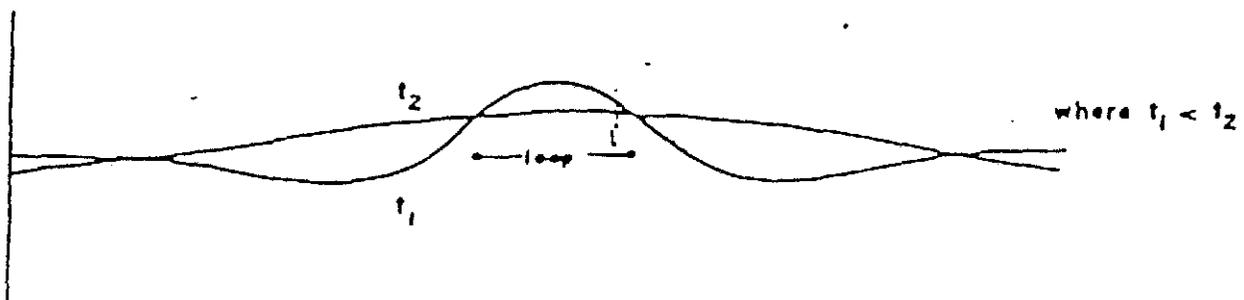


Fig. 1 Half-space response : Z component

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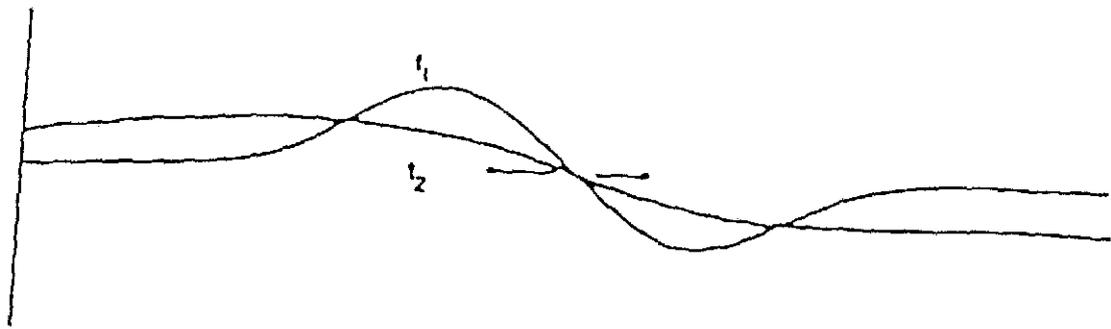


Fig. 2 Half-space response : X Component

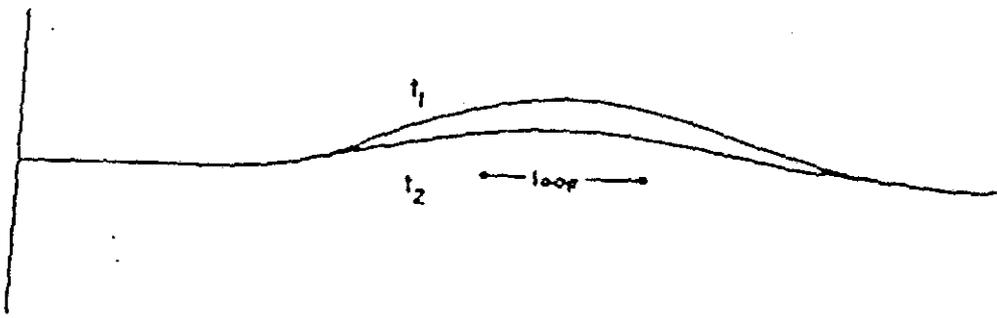


Fig. 3(a) Half-space response : Y component (Positive half of loop)

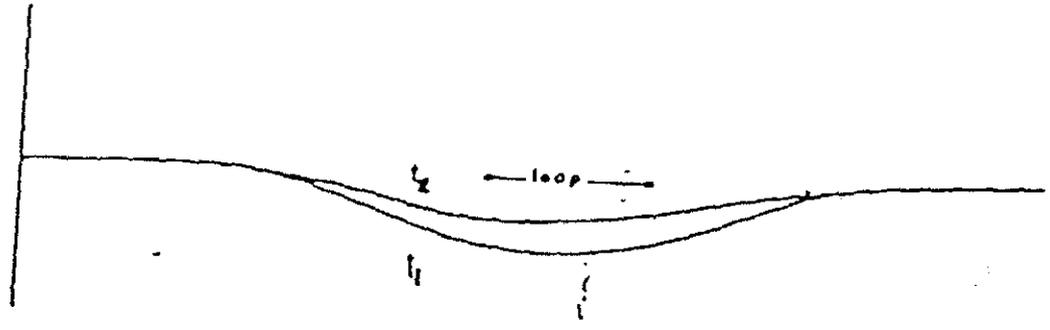
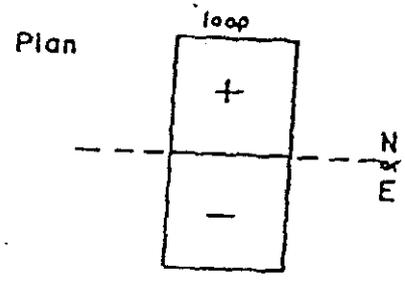


Fig. 3(b) Half-space response : Y component (Negative half of loop)

Note: Unlike the Z component, there is only one maximum or minimum for the Y component for a homogeneous half-space.

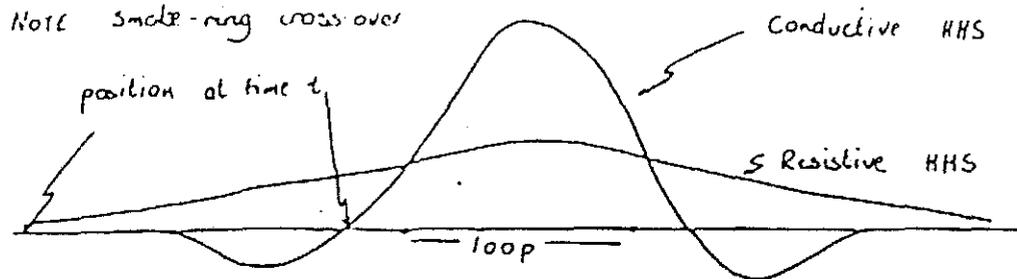


Fig 4. Comparison of conductive and resistive homogeneous half-space responses for Z-component.

A conductive homogeneous half-space is characterised by an early channel high amplitude response with a slow migration of the smoke-ring crossover from the loop.

By comparison, a resistive HHS will exhibit a lower early channel amplitude response and a rapid migration of the smoke-ring.

Note that the rate of decay of the channel amplitude responses for both conductive and resistive HHS is the same, and is proportional to $t \cdot \exp(-5/2)$.

The migration of the smoke-ring determines the detection of a conductor with respect to time and space. For example, a conductor located beyond the smoke-ring in a relatively conductive environment will not be energised by intermediate times but may be evident at late times if the smoke-ring has passed beyond it. In short, only conductors within the limits of the smoke-ring at a given time can possibly be detected.

Confined Conductor Responses

The response due to a confined conductor is closely related to the aforementioned half-space responses and to the conductor's position with relation to the loop. Figures 5, 6, 7a and 7b show the responses for a vertical plate.

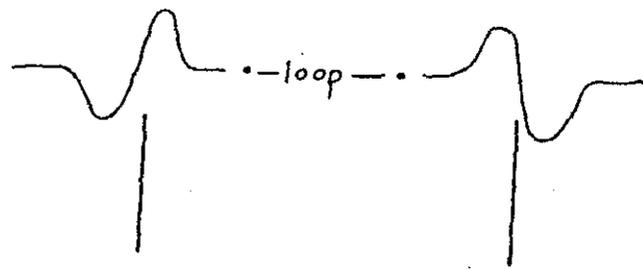


Fig. 5 Vertical conductor: Z component

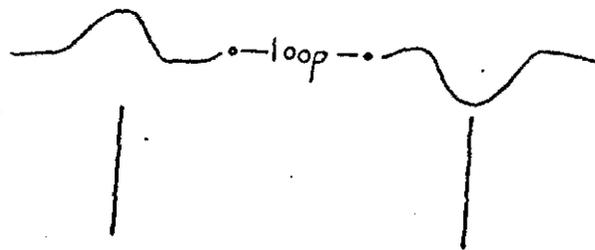
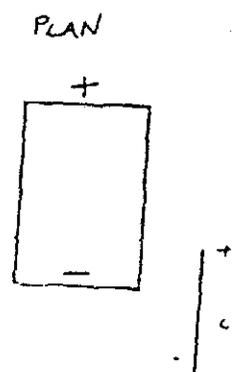
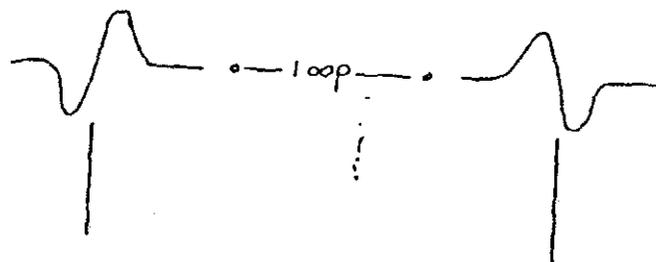


Fig. 6. Vertical conductor: X component



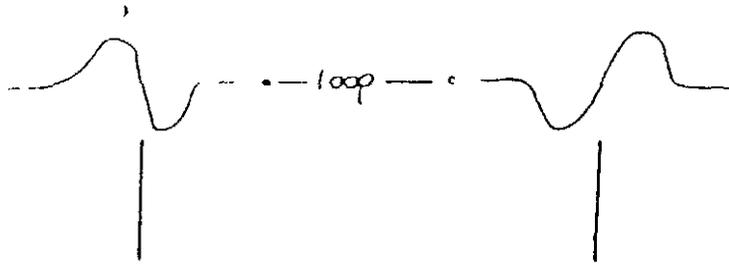


Fig. 7b Vertical conductor : Y component
(Negative side of conductor)

When the dip of the conductor is allowed to vary, the responses become more complicated. Figures 8 through to 12 show how the dip effects the vertical and horizontal components.

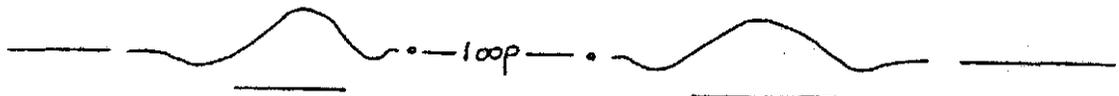


Fig. 8 Horizontal conductor : Z component

NOTE: Late-time response character both inside and outside loop the same.

NOTE: difference of amplitude

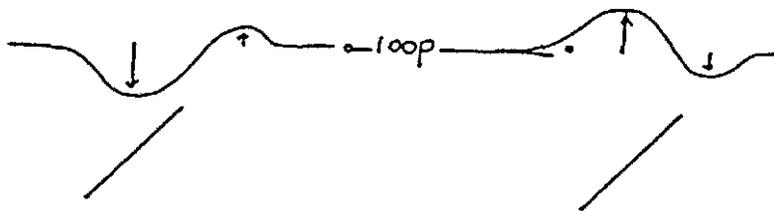


Fig. 9. Dipping conductor : Z component

NOTE: That the positive shoulders in Fig 9. are on the loop side of the anomaly.

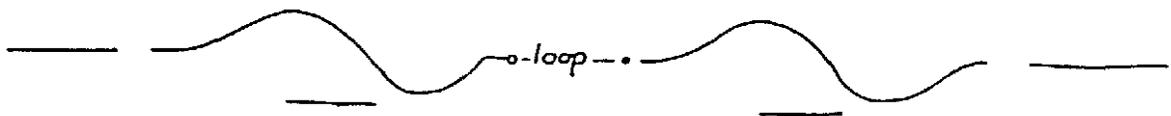
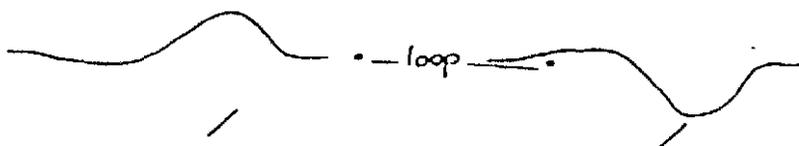


Fig. 10. Horizontal conductor : X component



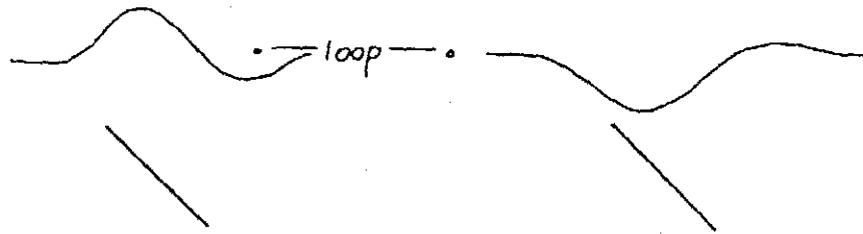


Fig. 12 Dipping conductor : X component

By remembering the shapes of the responses for these few simple geometrics, the identification of false anomalies can be avoided.

In conclusion, by identifying features which appear to have stable (non-diffusing) responses with respect to an appreciable length of time one can isolate confined targets from the half-space. After these interesting features have been identified, the geometry of the situation can be ascertained.

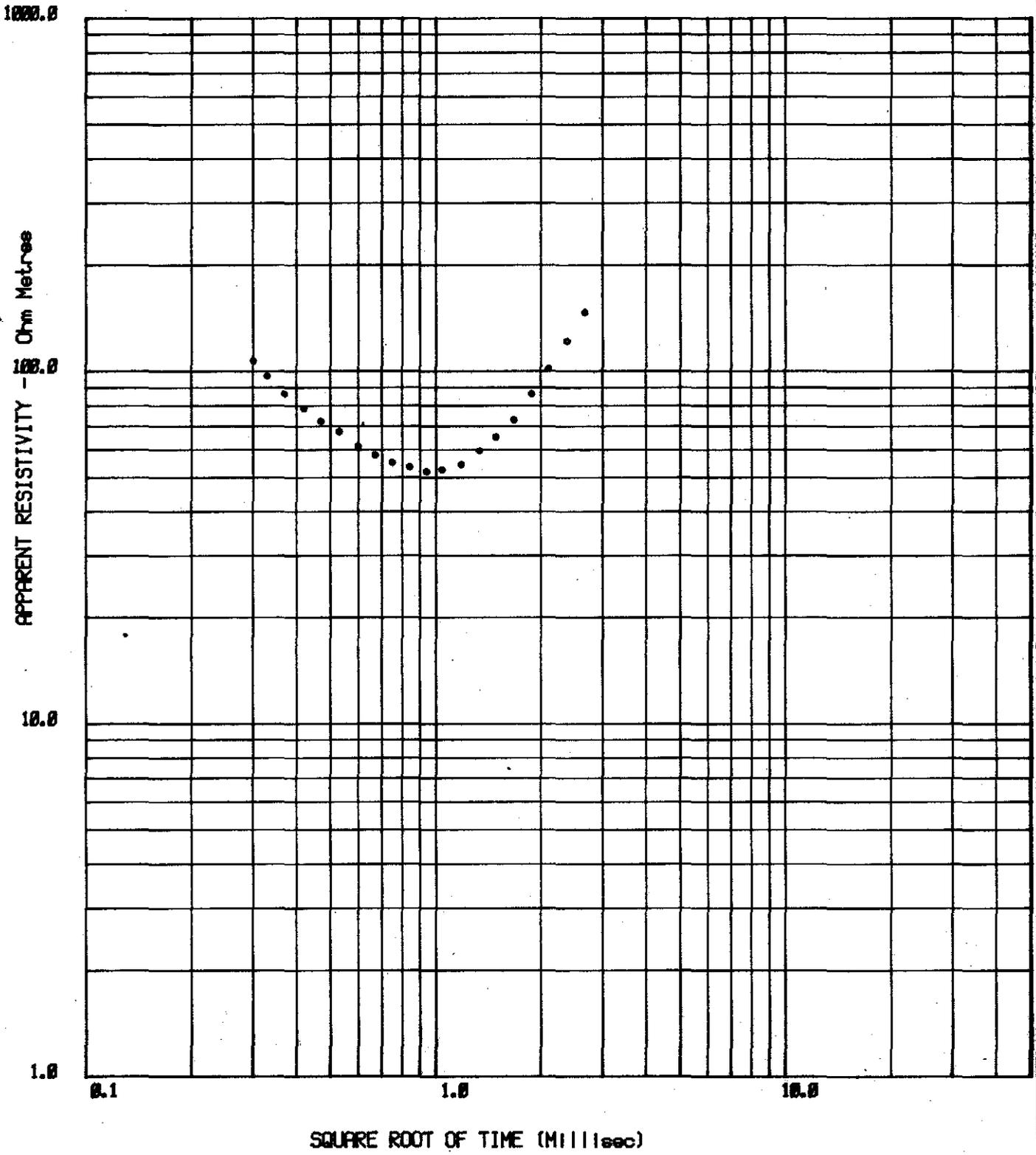
EM-37 SOUNDING

187023

VERTICAL COMPONENT B (Z)

RX POSITION : 10750E
 : 10350N
TX LOOP SIZE : 300 metres
 : 300 metres
TX CURRENT : 17.0 amps
TX TURNOFF : 320 microsecs
FREQUENCY : 25 Hz

CLIENT : The BHP Co. Ltd.
PROJECT : AREA Q
AREA : Waratah Tasmania.
JOB No. : 85-1499
SURVEYED BY : JP,RL
DATE : 30-NOV,1983
SOUNDING No.: Q2



VERTICAL COMPONENT B (Z)

RX POSITION : 10750E
 : 10650N
 TX LOOP SIZE : 300 metres
 : 300 metres
 TX CURRENT : 18.5 amps
 TX TURNOFF : 330 microseconds
 FREQUENCY : 25 Hz

CLIENT : The BHP Co. Ltd.
 PROJECT : AREA Q
 AREA : Waratah Tasmania.
 JOB No. : 85-1499
 SURVEYED BY : JP,RL
 DATE : 21-NOV,1983
 SOUNDING No. : Q1

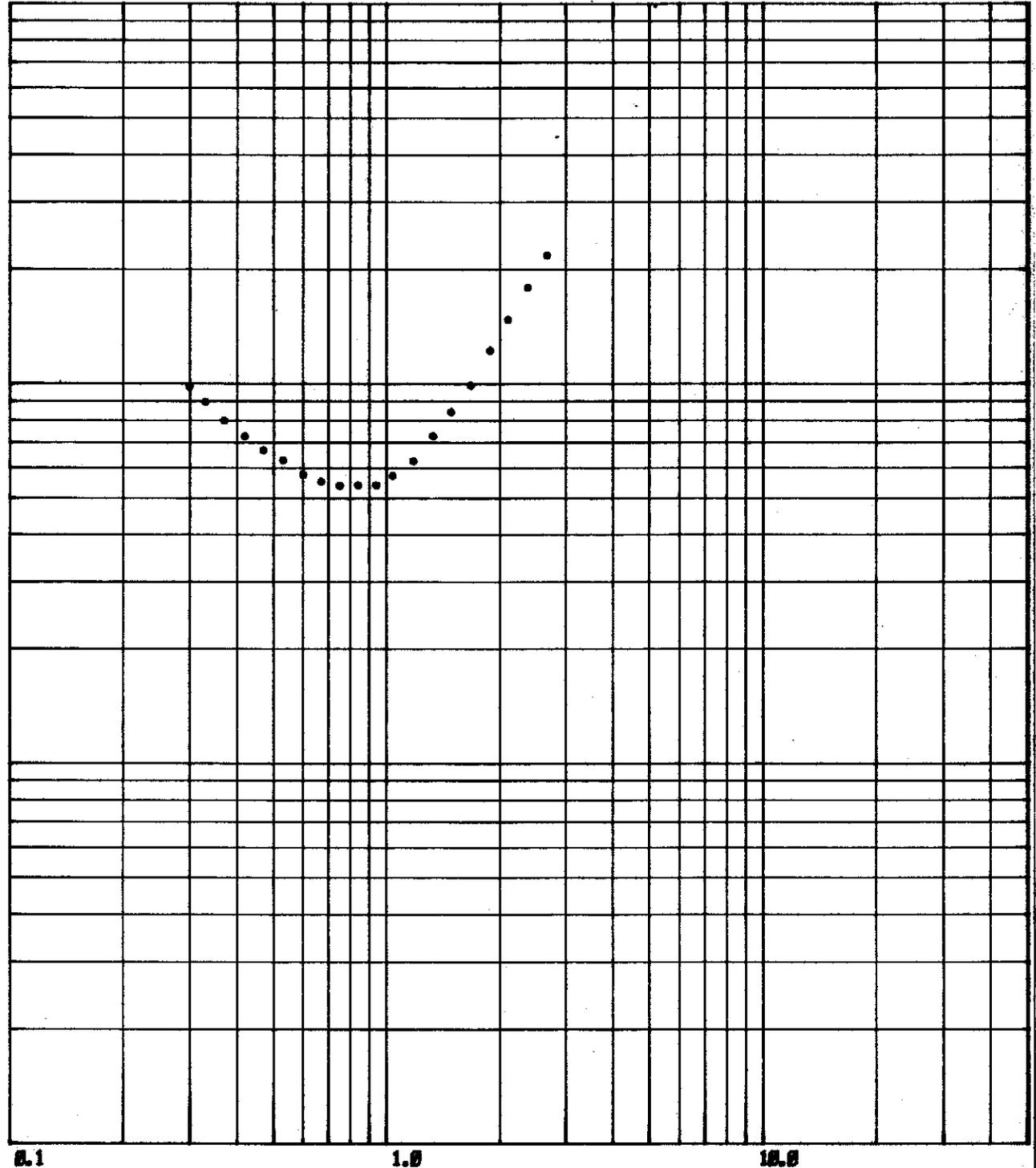
1000.0

APPARENT RESISTIVITY - Ohm Metres

100.0

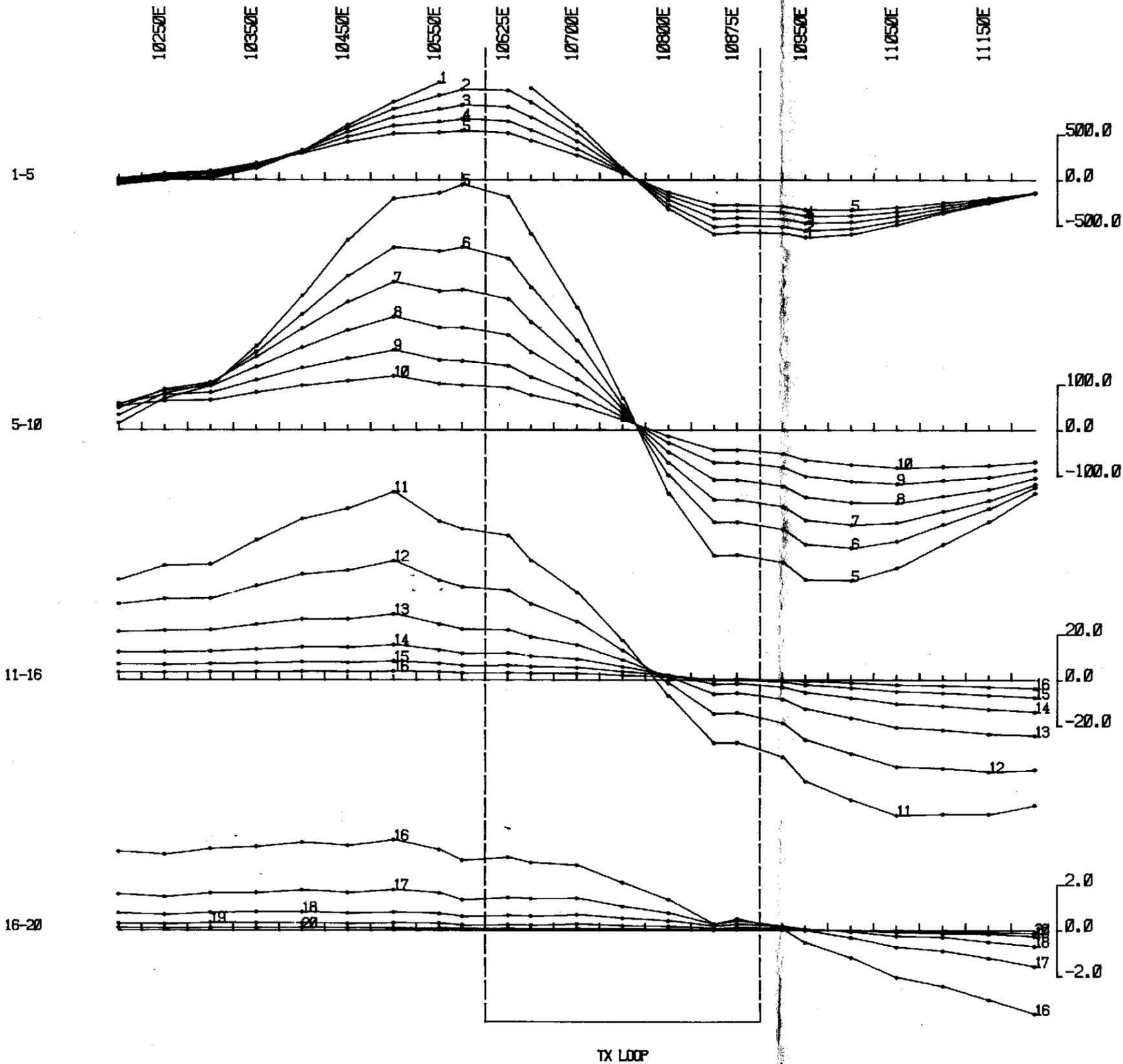
10.0

1.0



SQUARE ROOT OF TIME (MilliSec)

HORIZONTAL COMPONENT B (X)

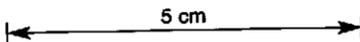


EM-37

FIXED TRANSMITTER SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD
TIME DERIVATIVE OF FLUX DENSITY (B)

nanovolts per amp. metre squared



TX LOOP SIDES : 10200N 10600E
 : 10800N 10900E

TX LOOP SIZE : 300m X 600m

TX TURN OFF TIME : 374 microseconds

CURRENT : 16.0 amps

FREQUENCY : 25 Hz

INTEGRATION TIME : 256 cycles

SYNC MODE : CRYSTAL

HORIZONTAL SCALE : 1:5000

SURVEYED BY : JP,RL

DATE : 20-NOV-1983



SURVEYED AND COMPILED BY
GEOTREX PTY. LTD.

PROJECT NO.
85-1499

CLIENT : The BHP Co. Ltd.

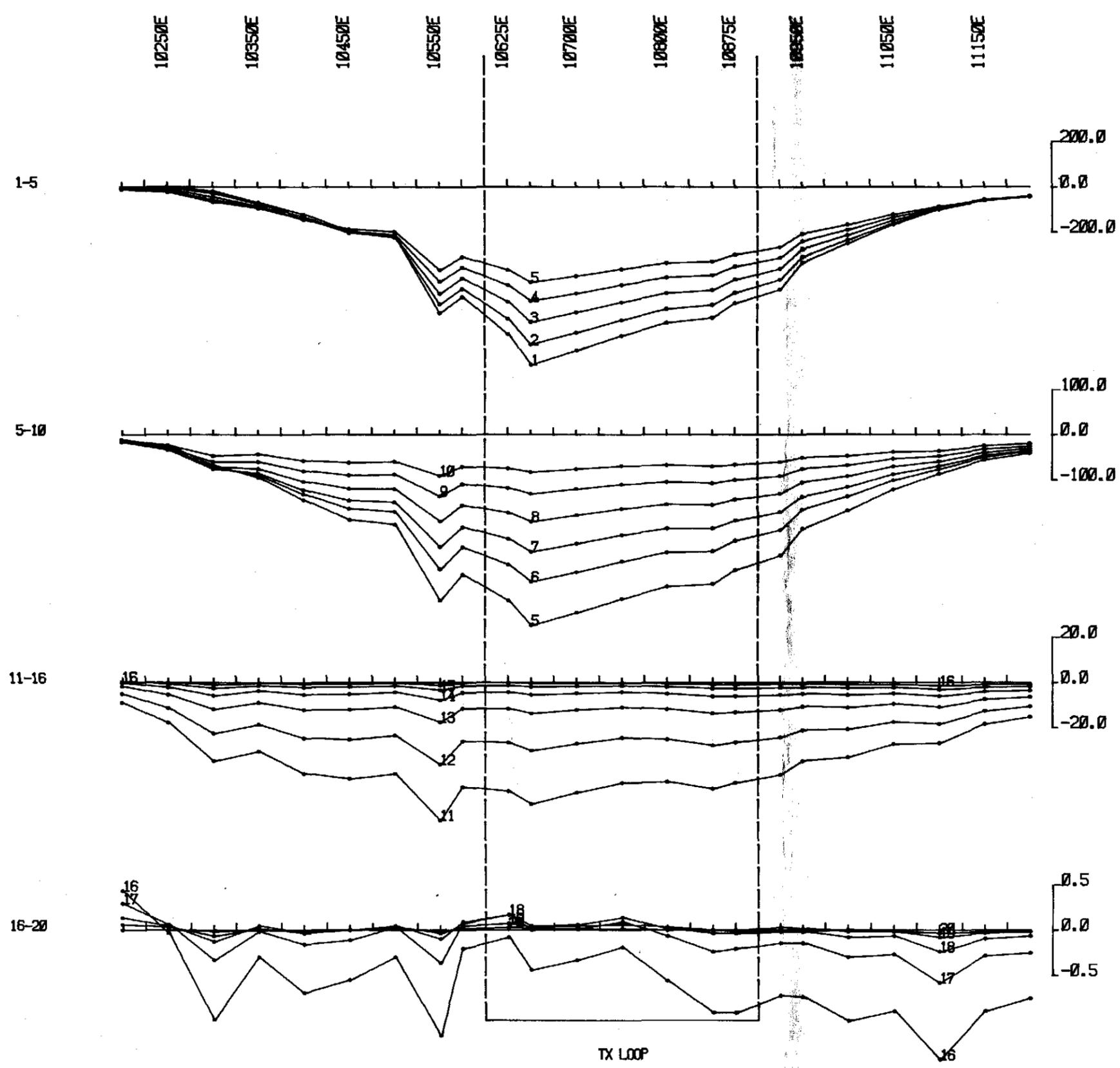
PROJECT : AREA Q

AREA : Waratah Tasmania.

LINE : 10300N X

TX LOOP : 1

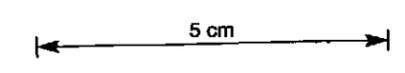
HORIZONTAL COMPONENT B (Y)



nanovolts per amp-metre squared

EM-37
FIXED
TRANSMITTER
SURVEY

ELECTROMOTIVE FORCE INDUCED BY
SECONDARY FIELD
TIME DERIVATIVE OF FLUX DENSITY (B)



TX LOOP SIDES : 10200N 10600E
 : 10600N 10900E
TX LOOP SIZE : 300m X 600m
TX TURN OFF TIME : 374 microseconds
CURRENT : 16.0 amps
FREQUENCY : 25 Hz
INTEGRATION TIME : 256 cycles
SYNC MODE : CRYSTAL
HORIZONTAL SCALE : 1:5000
SURVEYED BY : JP,RL
DATE : 20-NOV,1963

	SURVEYED AND COMPILED BY	PROJECT NO.
	GEOTREX PTY. LTD.	85-1499

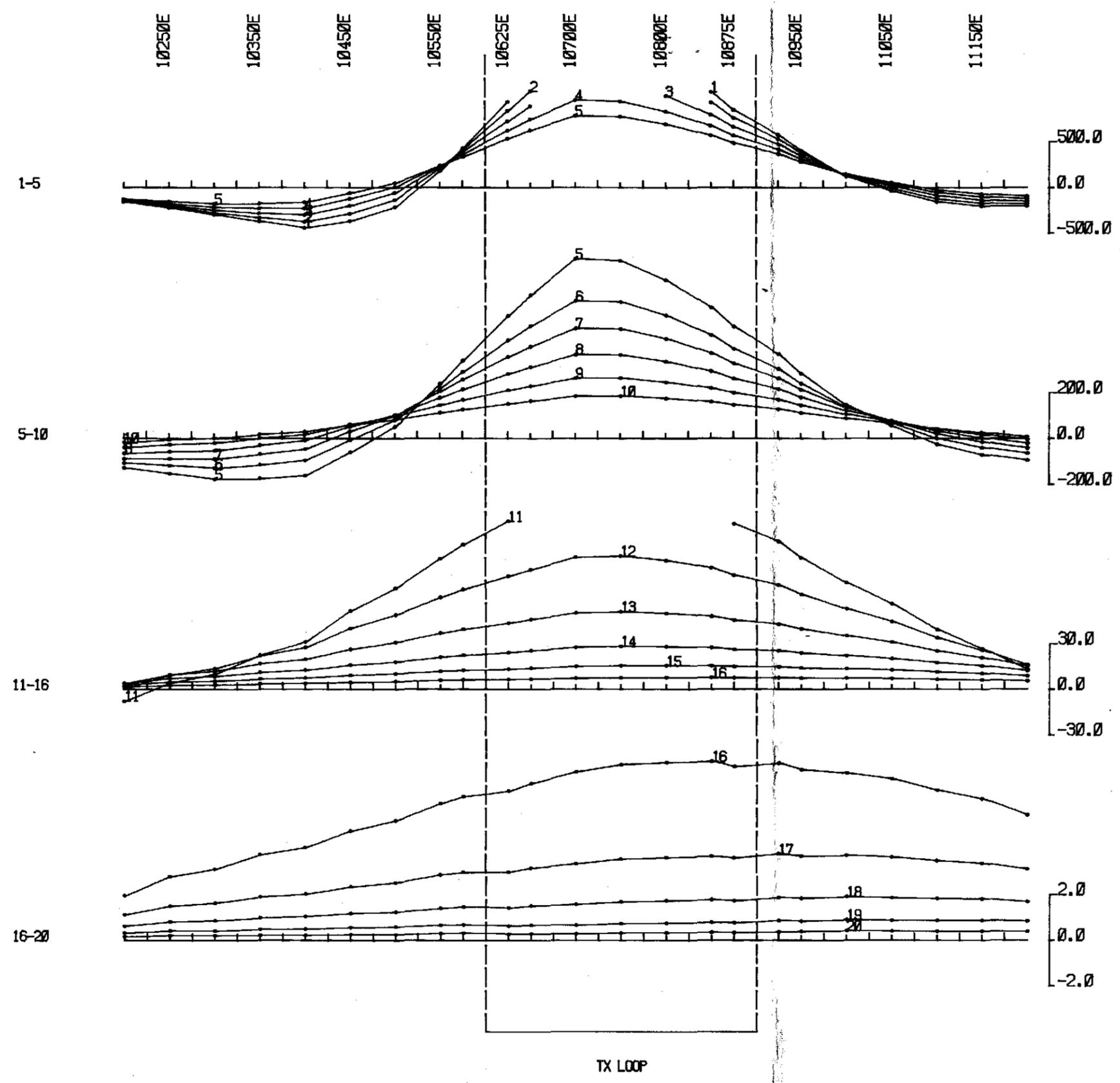
CLIENT : The BHP Co. Ltd.
PROJECT : AREA Q
AREA : Waratah Tasmania.
LINE : 10300N Y
TX LOOP : 1

025

026

187027

VERTICAL COMPONENT B (Z)

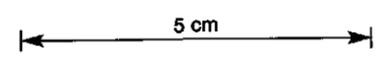


nanovolts per amp. metre squared

EM-37

FIXED TRANSMITTER SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD
TIME DERIVATIVE OF FLUX DENSITY (B)



TX LOOP SIDES : 10200N 10600E
: 10600N 10900E
TX LOOP SIZE : 300m X 600m
TX TURN OFF TIME : 374 microseconds
CURRENT : 16.0 amps
FREQUENCY : 25 Hz
INTEGRATION TIME : 256 cycles
SYNC MODE : CRYSTAL
HORIZONTAL SCALE : 1:5000
SURVEYED BY : JP,RL
DATE : 20-NOV,1983

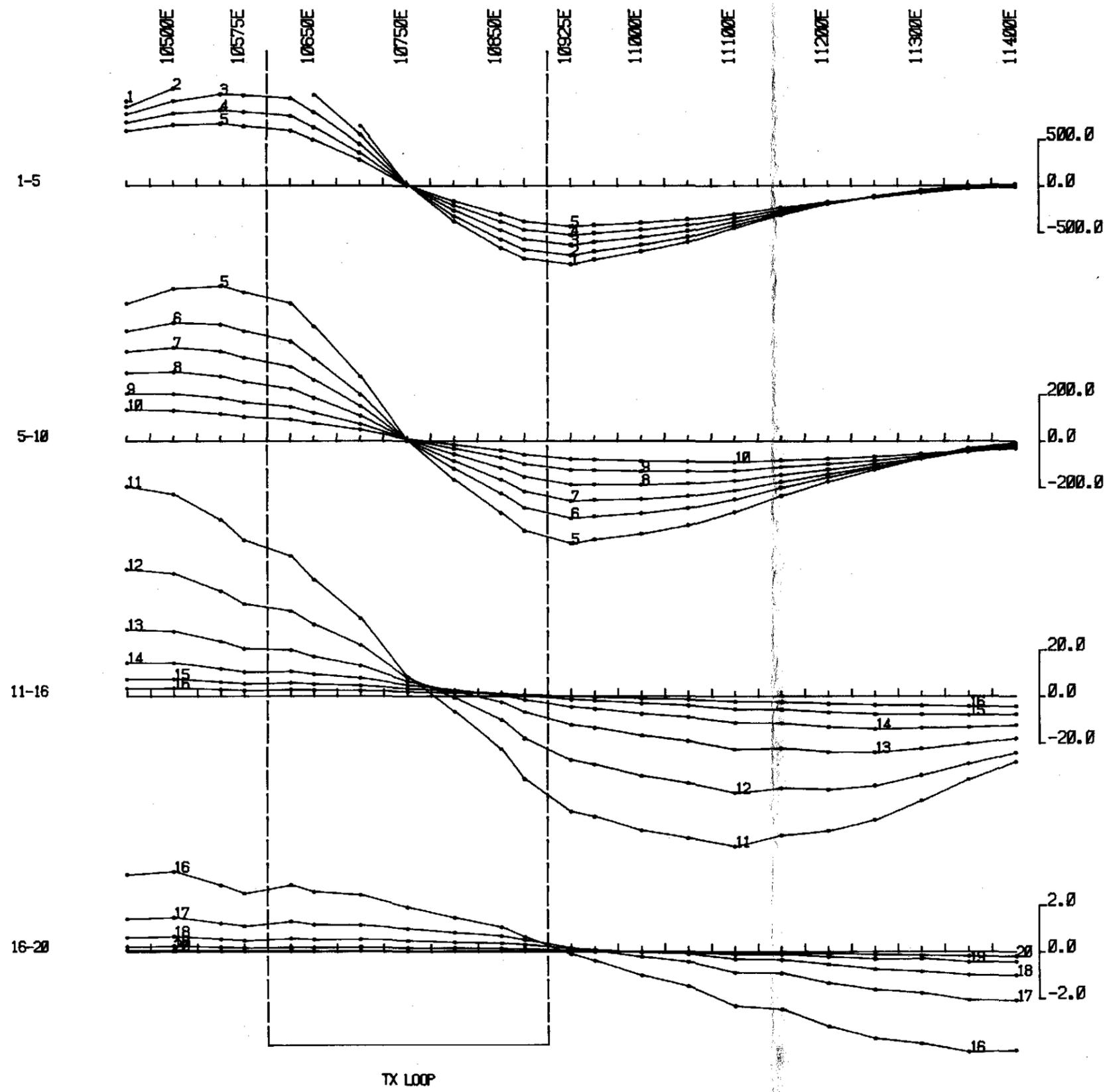
	SURVEYED AND COMPILED BY GEOTREX PTY. LTD.	PROJECT NO. 85-1489
	CLIENT : The BHP Co. Ltd.	

PROJECT : ARER Q
ARER : Waratah Tasmania.
LINE : 10300N Z
TX LOOP : 1

027

187028

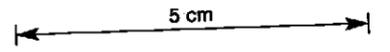
HORIZONTAL COMPONENT B (X)



nanovolts per amp-metre squared

EM-37
FIXED TRANSMITTER SURVEY

ELECTROMOTIVE FORCE INDUCED BY
SECONDARY FIELD
TIME DERIVATIVE OF FLUX DENSITY (B)



TX LOOP SIDES : 10200N 10600E
 : 10800N 10900E
TX LOOP SIZE : 300m X 600m
TX TURN OFF TIME : 374 microseconds
CURRENT : 16.0 amps
FREQUENCY : 25 Hz
INTEGRATION TIME : 256 cycles
SYNC MODE : CRYSTAL
HORIZONTAL SCALE : 1:5000
SURVEYED BY : JP,RL
DATE : 19-NOV,1983

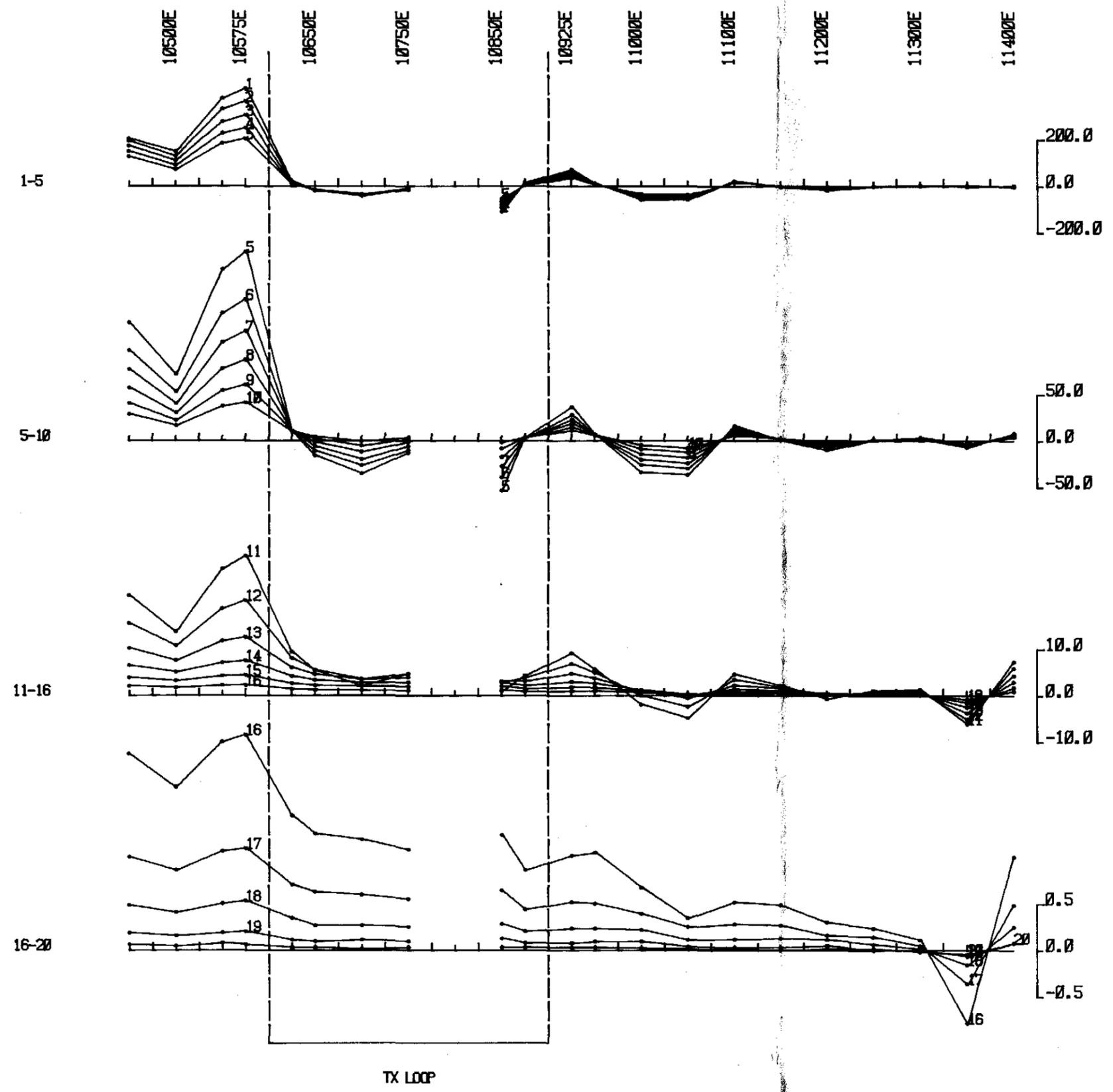
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	GEOTREX PTY. LTD.	85-1498

CLIENT : The BHP Co. Ltd.
PROJECT : AREA G
AREA : Waratah Tasmania.
LINE : 10500N X
TX LOOP : 1

U28

187029

HORIZONTAL COMPONENT B (Y)

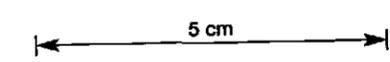


EM-37

FIXED TRANSMITTER SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD
TIME DERIVATIVE OF FLUX DENSITY (B)

nanovolts per amp-metre squared



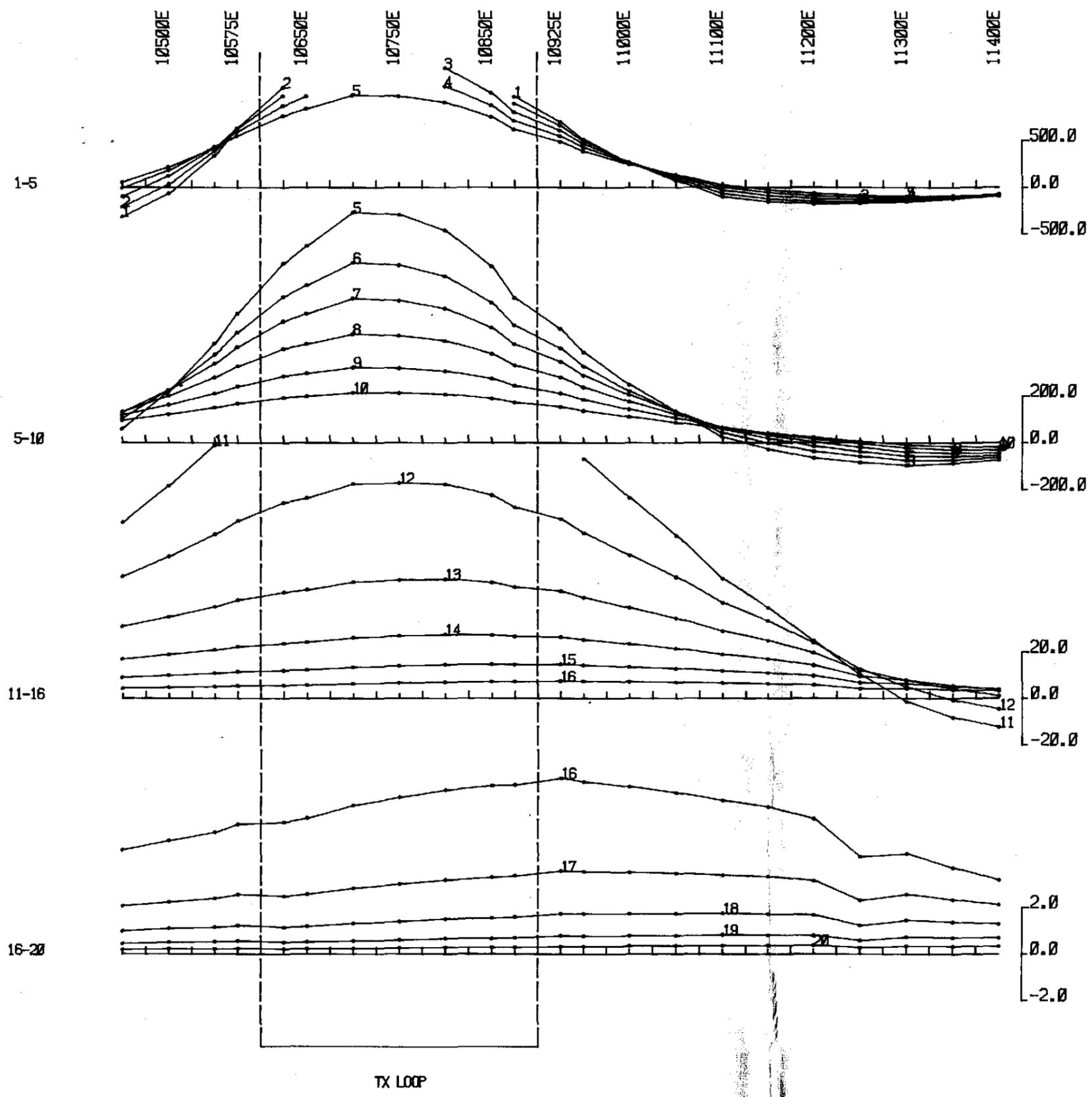
TX LOOP SIDES : 10200N 10600E
 : 10800N 10900E
TX LOOP SIZE : 300m X 600m
TX TURN OFF TIME : 374 microseconds
CURRENT : 16.0 amps
FREQUENCY : 25 Hz
INTEGRATION TIME : 256 cycles
SYNC MODE : CRYSTAL
HORIZONTAL SCALE : 1:5000
SURVEYED BY : JP,RL
DATE : 19-NOV,1983



SURVEYED AND COMPILED BY
GEOTREX PTY. LTD. PROJECT NO.
65-1499

CLIENT : The BHP Co. Ltd.
PROJECT : AREA Q
AREA : Waratah Tasmania.
LINE : 10500N Y
TX LOOP : 1

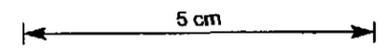
VERTICAL COMPONENT B (Z)



nanovolts per amp-metre squared

EM-37
FIXED
TRANSMITTER
SURVEY

ELECTROMOTIVE FORCE INDUCED BY
SECONDARY FIELD
TIME DERIVATIVE OF FLUX DENSITY (B)



TX LOOP SIDES : 10200N 10600E
 : 10800N 10900E
TX LOOP SIZE : 300m X 600m
TX TURN OFF TIME : 374 microseconds
CURRENT : 16.0 ampe
FREQUENCY : 25 Hz
INTEGRATION TIME : 256 cycles
SYNC MODE : CRYSTAL
HORIZONTAL SCALE : 1:5000
SURVEYED BY : J.P.R.L
DATE : 19-NOV, 1983

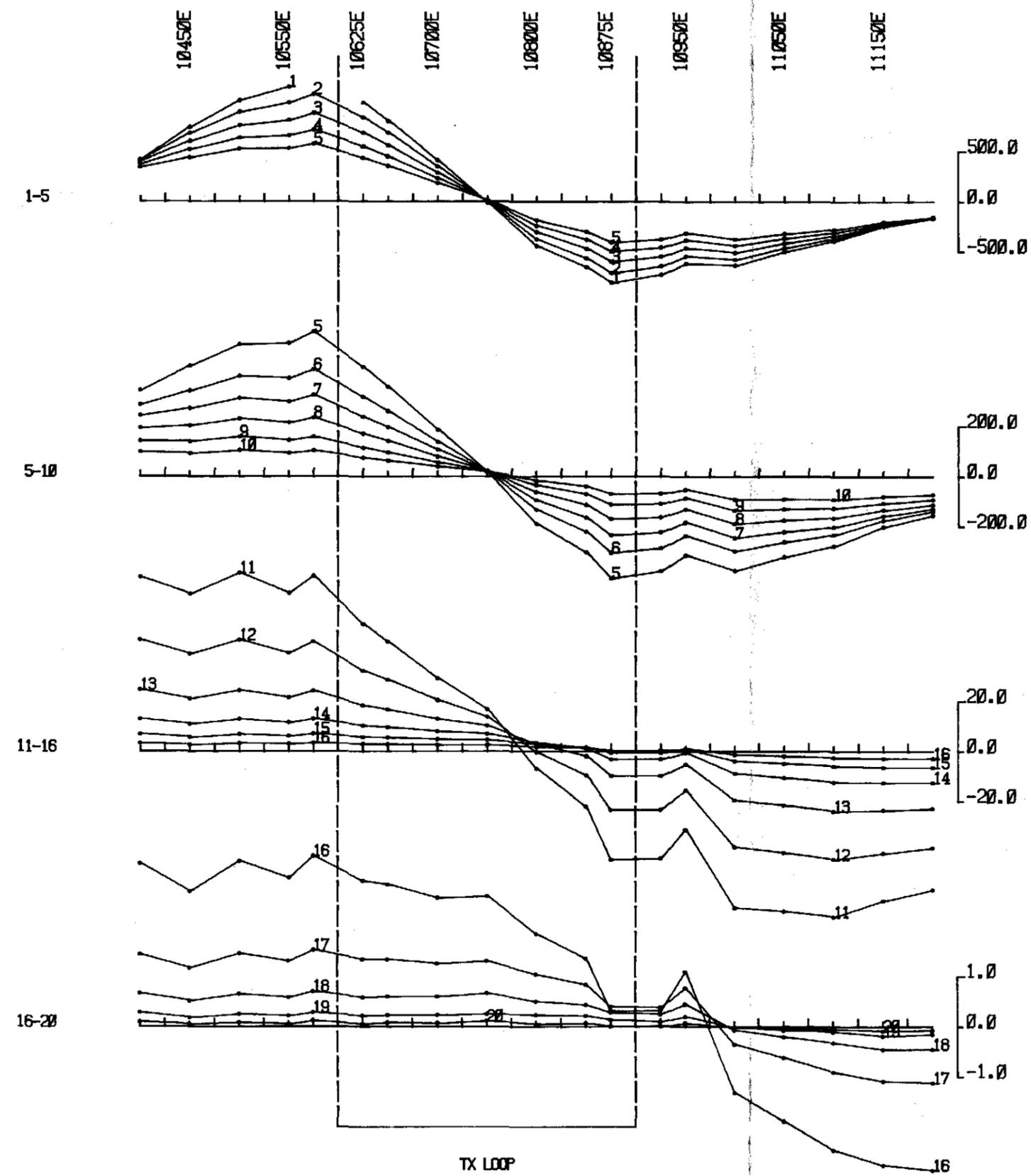
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	CLIENT : The BHP Co. Ltd.	

PROJECT : ARER Q	
AREA : Maratoh Tasmania.	
LINE : 10500N	Z
TX LOOP : 1	

030

187031

HORIZONTAL COMPONENT B (X)

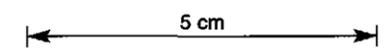


nanovolts per amp-metre squared

EM-37

FIXED TRANSMITTER SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD
TIME DERIVATIVE OF FLUX DENSITY (B)



TX LOOP SIDES : 10200N 10600E
 : 10800N 10900E
TX LOOP SIZE : 300m X 600m
TX TURN OFF TIME : 374 microseconds
CURRENT : 15.0 amps
FREQUENCY : 25 Hz
INTEGRATION TIME : 256 cycles
SYNC MODE : CRYSTAL
HORIZONTAL SCALE : 1:5000
SURVEYED BY : JP,RL
DATE : 18-NOV,1983



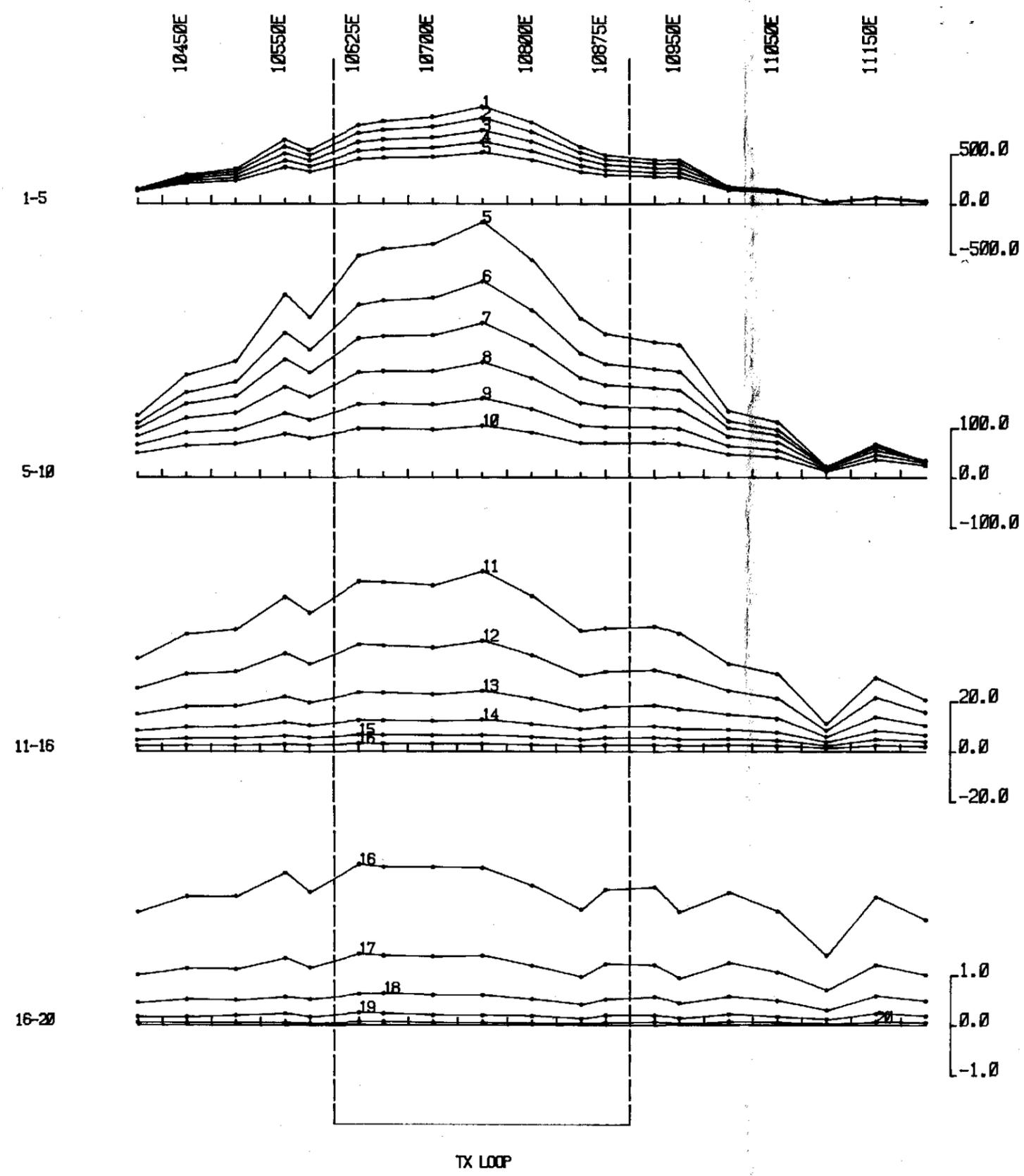
SURVEYED AND COMPILED BY : GEOTREX PTY. LTD.
PROJECT NO. : 85-1499

CLIENT : The BHP Co. Ltd.
PROJECT : AREA Q
AREA : Waratah Tasmania.
LINE : 10700N X
TX LOOP : 1

031

187032

HORIZONTAL COMPONENT B (Y)

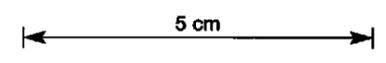


nanotesla per amp. metre squared

EM-37

FIXED TRANSMITTER SURVEY

ELECTROMOTIVE FORCE INDUCED BY SECONDARY FIELD
TIME DERIVATIVE OF FLUX DENSITY (B)



TX LOOP SIDES : 10200N 10600E
 : 10800N 10900E
TX LOOP SIZE : 300m X 600m
TX TURN OFF TIME : 374 microseconds
CURRENT : 15.0 amps
FREQUENCY : 25 Hz
INTEGRATION TIME : 256 cycles
SYNC MODE : CRYSTAL
HORIZONTAL SCALE : 1:5000
SURVEYED BY : JP,RL
DATE : 18-NOV.1968

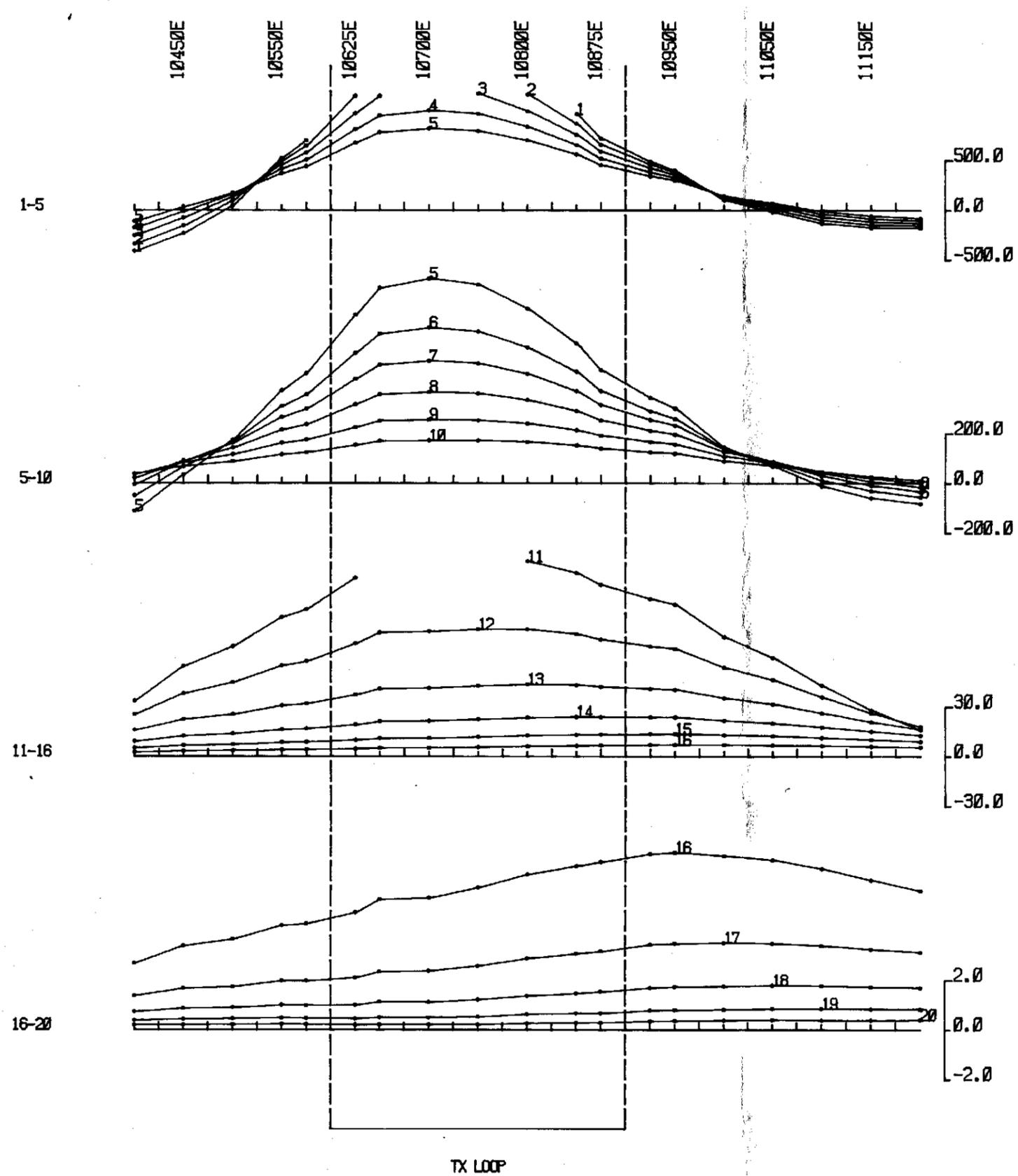
	SURVEYED AND COMPILED BY	PROJECT NO.
	GEOTREX PTY. LTD.	85-1499

CLIENT : The BHP Co. Ltd.
PROJECT : AREA Q
AREA : Waratah Tasmania.
LINE : 10700N Y
TX LOOP : 1

032

187033

VERTICAL COMPONENT B (Z)

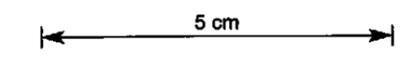


nanovolts per amp.metre squared

EM-37

FIXED
TRANSMITTER
SURVEY

ELECTROMOTIVE FORCE INDUCED BY
SECONDARY FIELD
TIME DERIVATIVE OF FLUX DENSITY (B)



TX LOOP SIDES : 10200N 10600E
 : 10800N 10900E
TX LOOP SIZE : 300m X 600m
TX TURN OFF TIME : 374 microseconds
CURRENT : 15.0 amps
FREQUENCY : 25 Hz
INTEGRATION TIME : 256 cycles
SYNC MODE : CRYSTAL
HORIZONTAL SCALE : 1:5000
SURVEYED BY : JP,RL
DATE : 18-NOV,1983



SURVEYED AND COMPILED BY
GEOTREX PTY. LTD.

PROJECT NO.
85-1489

CLIENT : The BHP Co. Ltd.
PROJECT : AREA Q
AREA : Maratoh Tomania.
LINE : 10700N Z
TX LOOP : 1

033

187034

APPENDIX 2

Borehole WY3 - Drill Log and Geochemical Analyses

BROKEN HILL PROPRIETARY CO. LTD.

DRILL LOG HEADER SHEET.

Project: WYNYARD

Hole No: WY 3a

Prospect: INGLIS RIVER (ANDHALLY V)

Total depth: 30m

Local Grid co-ords.

Bearing:

AMG co-ords 383200 E 5454900 N

Depression 90°

Drilling Co: OVERLAND

R.L. Collar: 100m

Drill type: WACHAN 500

Commenced: 2nd APRIL 1984

Driller: T. HARPER

Completed: 2nd APRIL 1984

R. WADDLE

Logged by:

Sampled by:

Hole Size	From	To	Total
Non-core	0	30	30
Core			
Casing			
Casing left.	0	30	30

Core storage:	—
No. of trays:	—
Sample storage	—
Geochem. Lab.	—
Analytical reports	—
Min. and Pet. Lab.	—
Min and Pet report	—

Hole Survey Data:

Summary Log:

0-30m of quartz gravel and sand

Comments: UNABLE TO PROCEED AS HOLE KEPT CAVING IN.
SHIFTED HOLE TO NEW SITE.
NO SAMPLE OBTAINED.

035

187036

BROKEN HILL PROPRIETARY CO. LTD.

DRILL LOG HEADER SHEET.

Project: WYN YARD

Hole No: WY 3

Prospect: INGLIS RIVER (ANOMALY V)

Total depth: 207.2 m

Local Grid co-ords.

Bearing:

AMG co-ords 383200E 5455000 N.

Depression 90°

Drilling Co: OVERLAND

R.L. Collar: ± 80 m

Drill type: WARMAN 500

Commenced: 3rd APRIL 1984

Driller: P. HALPER

Completed: 9th APRIL 1984

R. WADDLE

Logged by: R. M. HORTON

Sampled by: R. M. HORTON

Hole Size	From	To	Total		
Non-core	0	101.9	101.9	Core storage:	HOBART
				No. of trays:	19
Core	101.9	207.2	105.3	Sample storage	
NQ				Geochem. Lab.	ANALABS
				Analytical reports	14.4 08 2472
					14.4 08 2453
Casing				Min. and Pet. Lab.	MRL
				Min and Pet report	
Casing left. 6" PVC	0	12 m	12 m		

Hole Survey Data:

Summary Log: 0 - 92 QUARTZ - MUSCOVITE - CHLORITE SCHIST

92 - 134.5 DOLOMITE AND 'ALBITE-QUARTZ - CARBONATE ROCK'

134.5 - 207.2 'AMPHIBOLITE'

See also additional notes - p2 of log.

SOME SIMILARITIES TO
 Comments: SAVAGE RIVER-TYPE MINERALISATION

Core size	DRILLING			Loss			DESCRIPTIVE			LOG			INTERSECTION ANGLE LCA				Box No
	From m	To m	Inter-sected	Recover-ered	% Recover	From m	To m	LITHOLOGY	MINERALISATION	Sample No	Bedding	Veins	Other Features	Petrology etc.			
						0	92.0	CHLORITE MUSCOVITE SCHIST	fine disseminated	BJ 1401				MRL 15365	1		
CORING								Quartz - albite - dolomite veins	pyrite - trace magnetite	↓					2		
								samples BJ 1401 → BJ 1416 at 6m intervals	haematite, apatite, zircon	BJ 1417					3		
								sample BJ 1417 3.9m interval	rutile, tourmaline						4		
NON						92	134.5	'DOLOMITE' (see additional notes, also petrology)									
								clean and cloudy coarse dolomite with	as above								
NG	101.90	102.4	0.5	0.5				quartz-rich patches. Chlorite/albite						MRL 15366	5		
	102.4	103.6	1.2	1.2				alteration									
	103.6	106.7	3.1	3.1				samples BJ 1801 from 107.0 to 108.0 metres									
	106.7	109.8	3.1	2.95	98			1802 " 112.6 " 113.6 "		BJ 1801	10° 20'				6		
	109.8	112.9	3.1	3.1				1803 " 115.0 " 116.0 "			10° 20'			MRL 15367			
	112.9	116.0	3.1	3.1				1804 " 120.0 " 121.0 "		BJ 1802 BJ 1803	85°	10° 20'					
	116.0	119.1	3.1	3.1				1805 " 121.0 " 122.0 "	Intense chloritic			10° 20'		MRL 15368	7		
	119.1	122.2	3.1	3.1				1806 " 122.0 " 123.0 "	alteration	BJ 1804 BJ 1805	20° 5'						
	122.2	125.3	3.1	3.1				1807 " 127.0 " 128.0 "		BJ 1806	20° 30'				8		
	125.3	128.4	3.1	3.1				1808 " 133.2 " 134.2 "		BJ 1807							
	128.4	132.5	4.1	4.1											9		
	132.5	134.4	1.9	1.9					Intense albification	BJ 1808				MRL 15369			
	134.4	136.3	1.9	1.85	98	134.5	207.2	AMPHIBOLITE	of boundary			135.0	45°				
	136.3	138.4	2.1	2.1				Quartz - albite ± magnetite ± chlorite ±	magnetite haematite		20° 30'	138.5	38°		10		
	138.4	141.4	3.0	3.0				? glaucophane	chalcopyrite, pyrite	BJ 1809	50° 10'	140.3	39°	MRL 15370			
	141.4	144.4	3.0	3.0				Dark green crystalline, locally weakly foliated. Many veins		BJ 1810	40° 20'	146.0	47°				
	144.4	147.4	3.0	3.0				directions → with vein mapping.			50° 10'	149.5	48°		11		
	147.4	150.4	3.0	3.0				small scale faulting			20° 80'	153.3	38°				
	150.4	153.0	3.0	3.0							20° 70'	159.5	35°		12		
	153.0	156.4	3.4	3.4				samples BJ 1809 from 141.0 to 142.0 metres					161.0	39°			
	156.4	159.4	3.0	3.0				1810 142.0 143.0			30° 70'	167.1	30°				
	159.4	162.4	3.0	3.0				1811 159.0 160.0		BJ 1811 BJ 1812					13		
	162.4	165.4	3.0	3.0				1812 161.5 162.5			20° 80°						
	165.4	168.4	3.0	3.0				1813 178.0 179.0					168.7	30°	14		
	168.4	171.4	3.0	3.0				1814 186.4 187.4			20° 60°	171.4	42°				
	171.4	174.4	3.0	3.0				1815 188.4 189.4					174.6	43°			
	174.4	177.4	3.0	3.0				1816 195.5 196.5			40° 60°	176.3	50°		15		
	177.4	180.4	3.0	3.0						BJ 1813			177.2	48°	MRL 15371		

DRILLING						100 WHOLESS RECOVERED		DESCRIPTIVE		LOG		INTERSECTION ANGLE LCA				Box No
Core size	From m	To m	Inter-sected	Recov. %	% Recovery	From m	To m	LITHOLOGY	MINERALISATION	Sample No	Bedding	Veins	Other Foliation	Petrology etc	Box No	
N9	180.4	183.4	3.0	3.0								70°	20°		16	
	183.4	186.4	3.0	3.0						BJ 1814			185°	42°		
	186.4	189.4	3.0	3.0						BJ 1815	20°	40°	182°	52°	MRL IS 372	
	189.4	192.4	3.0	3.0											17	
	192.4	195.2	2.8	2.8									137°	45°		
	195.2	197.8	2.6	2.6						BJ 1816	20°	40°				
	197.8	201.0	3.2	3.2									192°	53°	18	
	201.0	204.1	3.1	3.1								60°	204°	50°		
	204.1	207.2	3.1	3.1									206°	50°	19	
<p><u>Additional notes - w/s/ly</u></p> <p>Foliation measurements added - after visible in amphibole</p> <p>0-9750 Quartz-muscovite-chlorite schist, amount of dolomite ? vein material increasing towards base</p> <p>9750-10385 Amphibolite - dark green, fine grained, magnetite-rich lower contact non-planar, lat L = 20°</p> <p>10385-11450 Dolomite and dolomitic breccia / breccia conglomerate</p> <p>At 1050 dolomitic siltstone, good foliation</p> <p>1127-1132 pure fine-grained carbonate, white, ? vein material - contacts irregular, upper lat L 25°, lower 65°</p> <p>1132-1134 very finely laminated buff-colored siltstone, lat L bedding 85°</p> <p>1136 bedding 10-20° lat L in dolomitic gneiss / phyllite rock type ? foliation</p> <p>From 115 material is brecciated with no consistent structure - clasts sometimes sub-rounded, grades into calcareous conglomerate, with lead</p> <p>13450-20720 Amphibolite - very variable texture, locally fractured and brecciated. Stockwork veins especially above</p> <p>Weak foliation commonly seen - Measurements are of the dominant foliation, locally a secondary foliation is visible ? associated with small-scale shears / associated veining</p>																

038

187039

ANALABS

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ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

14.4 08 2453

17.4.84

005607

1 OF 3

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	As	Sn	W	Sb	
----------	------------	----	----	----	----	----	----	---	----	--

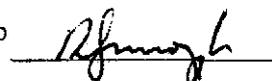
11	1401	105	5	20	X	X	X	X	X	
12	1402	75	X	30	X	X	X	X	X	
13	1403	50	X	25	X	X	X	X	X	
14	1404	30	X	30	X	X	X	X	X	
15	1405	10	X	20	X	X	X	X	X	
16	1406	5	X	20	X	X	X	X	X	
17	1407	15	X	25	X	X	X	X	X	
18	1408	65	X	30	X	X	X	X	X	
19	1409	60	X	20	X	X	X	X	X	
20	1410	15	X	20	X	X	X	X	X	
21	1411	10	X	20	X	X	X	X	X	
22	1412	10	X	15	X	X	X	X	X	
23	1413	10	X	15	X	X	X	X	X	
24	1414	10	X	20	X	X	X	X	X	
25	1415	10	X	65	X	X	X	X	X	

Results in ppm unless otherwise specified

T = element present; but concentration too low to measure

X = element concentration is below detection limit

- = element not determined

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039

187040

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ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

14.4 08 2453

17.4.84

005607

2 OF 3

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	As	Sn	W	Sb
1	1416	10	X	30	X	X	X	X	X
2	1417	95	X	60	X	X	X	X	X
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									

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

AUTHORISED OFFICER 

040

187041

ANALABS

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ANALYTICAL DATA

SAMPLE PREFIX REPORT NUMBER REPORT DATE CLIENT ORDER No. PAGE

		14.4 00 2472			22.6.84				1 OF 2	
TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Fe%	Au	As		
1	BJ 1801	10	10	70	X	2.20	X	X		
2	BJ 1802	20	15	65	X	3.55	X	X		
3	BJ 1803	10	10	105	X	4.60	T	50		
4	BJ 1804	10	10	65	X	5.25	X	X		
5	BJ 1805	10	15	75	X	5.25	X	X		
6	BJ 1806	5	10	60	X	3.65	X	X		
7	BJ 1807	15	10	35	X	6.25	X	X		
8	BJ 1808	10	5	30	X	3.40	T	X		
9	BJ 1809	10	10	50	X	4.60	X	X		
10	BJ 1810	15	10	35	X	3.65	X	X		
11	BJ 1811	10	5	90	X	6.80	X	X		
12	BJ 1812	15	5	60	X	5.80	X	X		
13	BJ 1813	365	15	50	X	11.0	X	X		
14	BJ 1814	380	5	90	X	8.20	T	X		
15	BJ 1815	65	5	40	X	6.15	X	X		
16	BJ 1816	70	10	45	X	5.85	X	X		
17										
18										
19										
20										
21										
22										
23										
24										
25										

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

AUTHORISED OFFICER

041

187042

ANALABS

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

ANALYTICAL DATA

SAMPLE PREFIX REPORT NUMBER REPORT DATE CLIENT ORDER No. PAGE

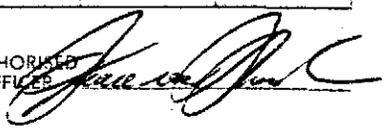
14.4 08 2472

22.6.84

2 OF 2

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Fe%	Au	As
1	Std FS4	300	100	765	0.5	6.40	-	X
2	Rpt BJ 1881	10	10	70	X	2.10	-	X
3								
4								
5								
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21								
22								
23	DETECTION	5	5	5	0.5	0.5	0.008	50
24	DIGESTION							
25	METHOD	101	101	101	101	101	304	102

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

AUTHORIZED OFFICER 

042

187043

ANALABS

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

ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

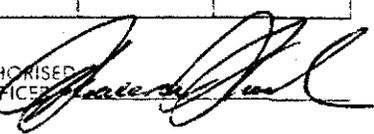
14.4 08 2472B

22.6.84

1 OF 1

TUBE No.	SAMPLE No.	U	W	Sn						
1	BJ 1801	X	X	X						
2	BJ 1802	X	X	X						
3	BJ 1803	X	X	X						
4	BJ 1804	X	X	X						
5	BJ 1805	X	X	X						
6	BJ 1806	X	X	X						
7	BJ 1807	4	X	X						
8	BJ 1808	3	X	X						
9	BJ 1809	X	X	X						
10	BJ 1810	3	X	X						
11	BJ 1811	X	X	X						
12	BJ 1812	X	X	X						
13	BJ 1813	X	X	X						
14	BJ 1814	X	X	X						
15	BJ 1815	X	X	X						
16	BJ 1816	X	X	7						
17										
18										
19										
20										
21										
22										
23	DETECTION	3	10	3						
24	DIGESTION									
25	METHOD	401	401	402						

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

 AUTHORISED
 OFFICER
 

043

187044

APPENDIX 3

Petrology

Memo to: MR. M. HORTON, EXPLORATION, CAMBERWELL OFFICE.

Date

Our Ref:

Your Ref: WHR:DK

Subject: E9/22/5-Q: Petrography of core samples from drill holes
WY3 and WA7, Waratah-Wynyard Area, Tasmania (MRL 15362-72)

File: M717

Date:

Introduction

Eleven (11) specimens from drilling in the Waratah and Wynyard areas, Tasmania, comprising ten core samples and one percussion chip sample, were submitted for petrographic description, rock classification and sulphide mineral identification.

The observations are summarised in the memorandum and details of individual samples are given in the attached Appendix.

WA7 MRL 15362-643 core samples

The three samples consist of a black coaly substance (MRL 15362, WA7 169.5m), a basalt containing vein sulphides (MRL 15363, WA7 183.90 - 183.93m) and a brecciated-looking vein containing white and orange-brown material in a chloritic schist (MRL 15364, WA7 198.25 - 198.26m).

MRL 15362 comprises dominantly black, X-ray amorphous, carbon, minor quartz and smectite and traces of plagioclase, calcite, dolomite and chalcedony. Distinct carbonised plant stems are occasionally present. The rock was found at the Tertiary/PreCambrian unconformity underlying basalt. The sample was identified as a silty coal and may be baked vegetable matter, possibly forest litter, overwhelmed by a basalt flow.

MRL 15363 is an alkali basalt comprising randomly oriented plagioclase laths, granular diopside and partly altered (to siderite) magnetite grains. The interstitial material is largely chlorite. A vein of cataclastic pyrite, coarse chlorite with traces of marcasite, sparry dolomite and calcite cuts the section. Chalcopyrite and galena (intergrown with pyrite) occur in trace quantities adjacent to this vein.

The vein cutting the chlorite schist (?chloritised metatuff), MRL 15364, comprises mainly analcite with minor interstitial to replacive albite. Multiple veins of sparry calcite and veins of chlorite cut across the analcite and albite giving the impression of brecciation. Traces of pyrite, chalcopyrite, sphalerite and galena are mainly restricted to albitic areas and calcite veins.

WY3 MRL 15365-727 core samples, 1 percussion chip sample

Samples from drill hole WY3 include chips of quartz-muscovite-chlorite schist and quartz-albite-dolomite-chlorite veins (MRL 15365, WY3 48-50m), quartz-pyrite bearing dolomite (MRL 15367, WY3, 109.76 - 109.78m) and possible metavolcanics (MRL 15366, MRL 15368-72).

- 2 -

The percussion drilling chips which make up sample MRL 15365 are dominantly quartz-muscovite-chlorite schists with well foliated schistose structure. Pyrite dominates the assemblage of opaque minerals. Magnetite, hematite, rutile, apatite, ?zircon and tourmaline are present in trace quantities. Coarse grained, non-foliate chips of quartz, albite, dolomite and chlorite are probably samples of vein material.

Sample MRL 15367 is a coarse grained quartz-pyrite bearing dolomite comprising zoned polygonal dolomite grains up to 3mm in diameter, disseminated pyrite and disseminated and patchy quartz. Traces of tourmaline, clay, chlorite, rutile, hematite and ?tremolite are also present. Quartz-rich patches contain more pyrite than quartz-poor areas. The dolomite grains frequently show a clear rounded relatively inclusion-free core surrounded by overgrowths clouded by numerous submicroscopic inclusions (some of which are fluid inclusions). In hand specimen the rock is mottled red, white and grey, and appears brecciated. Microscopic examination shows no obvious brecciation. The mottling is due to red iron oxide stain on quartz-rich patches and the distribution of clear (grey, transparent in hand specimen) and white (inclusion-bearing) dolomite.

Samples MRL 15366 and MRL 15368-72 are non-foliate, metamorphosed rocks which are rich in albite + quartz + chlorite + biotite + carbonate + opaques. They comprise largely polygonal-granular albite, sometimes intergrown with significant quartz and euhedral magnetite. Large patches of opaques (rutile + fine hematite) appear to be altered ilmenites.

Green patches comprising largely chlorite and opaques, and minor plagioclase, biotite, + quartz, and carbonate are found in most of the specimens. In sample MRL 15370 these chloritic patches frequently contain remnants of pleochroic, yellow to pale violet to sky blue amphibole (?glaucophane or similar; SEM required). Pleochroic yellow to blue-green/green amphibole occasionally is found towards the margin of the chloritic patches, implying the amphibole megacrysts had greenish rims. MRL 15366 contains very rare, blue and green acicular amphiboles which included in subhedral, medium grained albite. Minute acicular carbonate bodies also included in the same albite grains appear to be replaced amphiboles. The micas (green biotite and colourless muscovite) and the chlorite in these samples is random and along with the carbonate, appears to be the product of retrogressive metamorphism. Traces of apatite and tourmaline are found in most of these rocks.

Sample MRL 15366 contains a rounded, fine grained ?xenolith with metamorphic texture, in a coarser grained albite-magnetite-chlorite matrix, comprising mainly subhedral to interlocking, frequently deformed albite. The texture appears to be syenitic. Textures in the other rocks are typically granoblastic metamorphic.

Pyrite is disseminated throughout most of the samples in trace quantities, but is more concentrated in, and adjacent to carbonate and/or chlorite rich veins.

Two distinct phases of veining are visible in some thin sections. The earlier veins comprise mainly decussate to granular, clear, medium to coarse grained albite. Later veins are dominated by various combinations of chlorite, carbonates, quartz and albite. These contain minor and variable quantities of apatite, hematite, magnetite, pyrite, chalcopryrite and actinolite.

Several mineral phases require confirmation by SEM: These include the fine sulphides in MRL 15364 and the blue amphibole in MRL 15370.

An updated memo will be circulated as soon as these analyses have been completed.

W.H. Ringenbergs,
Petrologist.

Circulate to:

Dr. A. Clarke
Dr. A.D.T. Goode,
then: Library, Camberwell.

Atts.

047
MRL No.: MRL 15365

Field No.: WY3 - 48-50m.

Rock type: (Chips of) Quartz-muscovite-chlorite schists and
Quartz-albite-dolomite-chlorite vein.

Mineralogy: (D) Quartz; (SD) Muscovite; (M) Chlorite, plagioclase,
dolomite; (T) Rutile, magnetite, hematite, ?zircon,
apatite, tourmaline, pyrite.

Description:

Mixture of mainly schist chips and less frequent, coarse vein-type
quartz-albite dolomite chips.

Schist chips are well foliated and comprise granoblastic quartz, well
aligned, foliated, sometimes crenulated muscovite layers, less well
aligned chlorite, minor subhedral plagioclase, minor anhedral to
rhombohedral dolomite and trace constituents as above. Fine
disseminated pyrite dominates the opaque mineral assemblage in these
schists. Magnetite and hematite grains are rare.

The vein derived chips are coarser grained (400 μ m+) and comprise
various combinations of clear, strained, anhedral quartz, cloudy brownish
plagioclase (?albite), coarse books of chlorite and subhedral dolomite.
The vein material is generally free from opaques.

MRL No.: MRL 15366

Field No.: WY3 - 102.40-102.43m.

Rock type: Coarse grained carbonated albite, magnetite-chlorite
?ayenite with fine grained ?xenolith.

Mineralogy: (D) Albite; (M) Rutile, chlorite, magnetite, dolomite,
calcite; (T) Tourmaline, apatite, chalcopryrite, pyrite,
blue ?amphibole, green amphibole.

Description:

In hand specimen the rock comprises two distinct textural areas. (1) A fine grained rounded ?xenolith, and (2) a surrounding coarse grained matrix. The contact between them is sharp. In thin section the mineralogy of both areas is generally similar, comprising mainly albite, and accessory patches of intergrown fibrous calcite and dolomite, opaques (large irregular patches (to 5mm) of magnetite in coarse area, smaller patches of magnetite and of leucoxene ± rutile (<1mm) in finer area) along with traces of apatite and tourmaline. The chlorite content of the coarse grained area is much lower than that of the ?xenolith. The fibrous nature of the carbonate is unusual. The carbonate appears to be replacing an earlier mineral, probably amphibole. Traces of fine (<50µm) acicular blue amphibole are included in clear coarse albite adjacent to the clast. This amphibole appears to be a member of the glaucophane-reibeckite group but is too fine to identify with confidence. Replacement of this amphibole by carbonate is observed.

The fine grained area has a typically even grained metamorphic texture comprising dominantly interlocking, granular, inclusion-laden albite. The coarse-grained area has a rather igneous looking texture with medium to coarse (1-2mm), subhedral to interlocking plagioclase crystals. These are frequently deformed (bent twinning) or broken.

Traces of chalcopryrite and disseminated pyrite were found in the coarse grained area. Traces of calcite-dolomite in veins.

Note to M. Horton: There is no evidence of well developed brecciation. The black coarse grained patches are magnetite (not tourmalinised breccia fragments as suggested). Carbonate is late stage and replacive. Quartz is either absent or very minor - none was identified optically.

049
MRL No.: MRL 15367

Field No.: WY3 - 109.71-109.78m.

Rock type: Coarse grained quartz-pyrite bearing dolomite.

Mineralogy: (D) Dolomite; (M) Quartz, pyrite; (T) Tourmaline, clay, chlorite, rutile, hematite, colourless acicular mineral (?tremolite).

Description:

Dominantly composed of coarse polygonal zoned dolomite to 3mm in diameter. Disseminated and patchy, strained quartz. Disseminated pyrite is more concentrated in vicinity of quartz-rich patch where dolomite is finer grained. Dolomite zoning is of two types, (1) growth zoning, and (2) clear rounded core surrounded by submicroscopic inclusion clouded overgrowth. Inclusions of tourmaline (colourless to pale orange-brown pleochroism) and colourless acicular mineral (?tremolite) in dolomite and in quartz. Scattered books and patches of chlorite. Rare clay patches. Red hematitic iron-oxide stained patches. Hand specimen shows mottled effect of grey coloured areas surrounded by white vein-like structures. White areas correspond to clouded areas in thin section, while grey (actually transparent) areas are relatively inclusion free.

050

187051

MRL No.: MRL 15368

Field No.: WY3 - 117.6m.

Rock type: Quartz-chlorite-illite rock ?metavolcanic.

Mineralogy: (D) Quartz; (SD) Chlorite; (M) Sericite/illite hematite, TiO_2 (rutile and ?anatase); (T) Tourmaline, dolomite, calcite, pyrite, magnetite, apatite, dolomite, calcite.

Description:

Specimen comprises fine random shreddy chlorite and sericite in silicifying quartz, traces of apatite clay, dolomite and tourmaline. Disseminated opaque and semi-opaque patches to 1.6mm in diameter comprise hematite replacing magnetite (some magnetite cores are preserved), patches of rutile + ?anatase and traces of very fine, earthy hematite. Quartz occurs as medium to coarse grained (200 μ m to 1.6mm), highly strained veins (sometimes discontinuous). These veins contain occasional, lathy sericite bodies (apparently pseudomorphed feldspars). K feldspar is largely restricted to one sutured, partly sericitised vein. Scattered pyrite subhedra (to 300 μ m) as fine inclusions in silicifying quartz and quartz veins, and as intergrowths with Ti-oxides.

The rock is extensively altered and silicified and the original texture has been virtually completely obliterated. Slickensided greenish clay coating fractures is illite.

051.

187052

MRL No.: MRL 15369

Field No.: WY3 - 134.1-134.14m

Rock type: Albite-quartz-dolomite rock with chloritised band
(albite-rich ?metavolcanic).

Mineralogy: (D) Albite; (Ab) Quartz, dolomite; (M) Chlorite, apatite;
(T) K-feldspar, calcite, tourmaline, hematite, rutile,
magnetite, pyrite (very rare).

Description:

Locally chloritised albite rock. Fine grained (<250µm), allotriomorphic granular albite, irregular apatite, tourmaline and corroded opaques. Irregular patches, aligned to branching veinlets and lenses of rhombohedral granular to saccharoided dolomite, minor calcite, clear quartz and platy hematite. Chloritised (dark) area contains veins with coarse sheaves of chlorite, granular quartz and dolomite. Patches of very fine (<50µm) quartz, fine opaques, chlorite and dolomite are developed throughout the chloritised area. K-feldspar, in trace quantities, is restricted to this area. Disseminated euhedral magnetite with traces of hematite alteration. Large irregular patches of rutile intergrown with hematite. Several scattered grains of pyrite up to 250µm in diameter. No schistosity or well developed gneissosity observed.

052
MRL No.: MRL 15370

Field No.: WY3 - 141-141.03m

Rock type: Chloritised albite-glaucophane-quartz rock (?metavolcanic).

Mineralogy: (D) Albite; (SD) Chlorite; (Ab) Quartz; (M) Magnetite, rutile, hematite, blue amphibole (?glaucophane), muscovite, biotite; (T) Pyrite, green amphibole, epidote, apatite, calcite, dolomite.

Description:

Disseminated coarse opaques, rutile and chloritised patches (containing remnant blue and green amphiboles) in an inclusion-rich, medium grained, metamorphic textured, groundmass of plagioclase, minor quartz, euhedral opaques, fine random muscovite, random green biotite, apatite and traces of epidote. Relict amphiboles appear to have a pleochroic violet to blue to pale yellow core and a pleochroic green to yellow fibrous rim. The amphiboles are replaced mainly by hematite and chlorite, and also by quartz, plagioclase and carbonates. The blue amphibole appears to be glaucophane. Heavily chloritised veins, some with albite cores, cut the section. Accessory minerals in the veins include apatite, pyrite, dolomite and calcite. The chlorite is fine grained but forms decussate structures which are apparently pseudomorphous of a previous mineral. Chloritised euhedral pseudomorphs after this mineral, impinge upon the albitic vein cores, vein carbonates and apatite. These euhedra appear to be chloritic pseudomorphs after blue and/or green amphibole. Chlorite + opaque patches with blue amphibole remnants up to 3 x 1mm in size are scattered throughout the matrix and suggest megacrystic amphiboles were originally present. Matrix opaques are mainly euhedral magnetite with minor hematite alteration surrounded by secondary hematite. The large opaques are mainly rutile, intergrown with secondary hematite (?pseudomorphs after ilmenite). Pyrite is concentrated in the chloritic veins and adjacent areas.

053
MRL No.: MRL 15371

Field No.: WY3 - 177.85-177.87m

Rock type: Pyrite bearing albite-quartz-magnetite rock (?metavolcanic).

Mineralogy: (D) Albite; (SD) Quartz; (M) Magnetite, chlorite, calcite, dolomite; (T) Actinolite, pyrite, chalcopyrite, ilmenite, hematite, rutile, apatite.

Description:

Comprises granoblastic (<500 μ m) plagioclase (albite) with patchy distribution of fine grained <50 μ m quartz, disseminated shreddy chlorite and olive green, fine biotite, fibrous to patchy carbonate (intergrown calcite and dolomite), fine disseminated and coarse patchy opaques, traces of apatite, light green amphibole (?actinolite). Amphibole appears to be replaced by plagioclase and carbonate and chlorite.

Cross-cutting veins contain coarse quartz, albite, sheafs of chlorite, carbonate, opaques and traces of fibrous ?actinolite.

Scattered magnetite patches show slight alteration to hematite. Traces of lathy ilmenite partly altered to rutile. Euhedral large pyrite (to 2mm) in host rock adjacent to vein. Veins contain large (several mm) patches of magnetite with slight platy hematite alteration and traces of included ?chalcopyrite (submitted for SEM). Magnetite frequently surrounds pyrite euhedra. Secondary hematite surrounds magnetite patches, is interleaved with chlorite, surrounds pyrite grains and is disseminated throughout the host rock.

Texture is metamorphic and considerable alteration and replacement appears to have occurred. The rocks appear to be metavolcanics.

054
MRL No.: MRL 15372

Field No.: WY3 - 186.4-186.44m

Rock type: Quartz-biotite-albite rock with calcite dolomite vein.

Mineralogy: (D) Albite; (SD) Green biotite, calcite; (M) Quartz, dolomite, chlorite; (T) Apatite, rutile, hematite, pyrite, chalcopryrite, magnetite, tourmaline.

Description:

Rock comprises fine (<200µm) granular, polygonal albite, intergrown with highly strained quartz and disseminated to patchy, random, olive green biotite. Disseminated to patchy opaques, patches of chlorite, clusters of euhedral rutile.

Vein of decussate albite cuts section and is in turn cut by thick vein of sparry calcite with edge dominated by zoned rhombohedral dolomite. Calcite appears partly to replace the dolomite but preserves shape and zoning. Trace constituents of vein include quartz, platy hematite and interstitial chlorite. Occasional pyrite and 2-4mm patches of chalcopryrite occur in this vein.

Some of biotite rich and chlorite rich patches show shapes reminiscent of amphibole. ?Amphibole replaced by chlorite + biotite + opaques ± albite ± quartz.

055

187056

MEMO TO: DR. A. CLARKE - HOBART EXPLORATION OFFICE

DATE: 3/10/84

FILE: M731

SUBJECT: E9/22/5-Q S. E. M. ANALYSIS AND IDENTIFICATION OF VARIOUS MINERAL PHASES FROM THE WARATAH - WYNYARD AREA, TASMANIA.

S. E. M. analysis of various mineral phases in a batch of samples from the Waratah - Wynyard area of Tasmania, has been completed. Petrographic descriptions of these samples have previously been reported in MRL memo M717.

Results of the S. E. M. analyses are tabulated below.

TABLE 1. RESULTS OF S. E. M. ANALYSIS

MRL No. FIELD No.	MINERAL SUSPECTED	S. E. M. IDENTIFICATION	DESCRIPTION
MRL15363 WA7, 183.90 - 183.93m. 183.93m.	Galena Chalcopyrite Siderite	Galena Chalcopyrite Mixture of phases. Contains major Mg, Al, Si, Fe, trace Mn.	Intergrown with pyrite. Contains traces of Ag, Se. Brownish lenses in chlorite vein. Not siderite. Apparent mixture of probable chlorite + calcite +- Fe oxides.
	Siderite	Sphene	Fine grained. Replaces magnetite.
MRL15364 WA7, 198.25 to 198.26m.	Galena Sphalerite	Galena, contains trace Ag. Sphalerite, contains trace Cd.	Inclusions in calcite and albite. Small patch with chalcopyrite in albite - calcite vein.
MRL15370 WY3, 141.0 to 141.03m.	Glaucophane	Glaucophane	Blue amphibole. See analytical results attached.
MRL15371 WY3, 177.85 to 177.87m.	Chalcopyrite	Chalcopyrite	Inclusions in magnetite.

X-ray diffraction analysis of MRL15367 (WY3, 109.71 to 109.78m.) has confirmed the dominance of dolomite in this sample. No magnesite was detected.

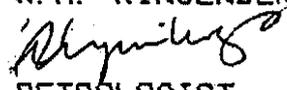
056
187027
Magnesite rock in the Savage River area is described as containing parallel layers of silica (?quartz) and disseminated pyrite and is believed to be altered limestone or dolomite (Threader 1976). In the Arthur River area, near the "Old Victory" mine dolomite and magnesite outcrop together. Sample MRL15367 contains both disseminated pyrite and patchy quartz and in this respect, appears similar to the magnesite described by Threader (1976).

The widespread distribution of magnesite in northwest Tasmania, the apparent similarity of magnesite rock to the dolomite MRL15367, and the close association of dolomite and magnesite in the Arthur River area, suggests magnesite may also be present in the vicinity of drill hole WY3. I therefore recommend that any carbonate-rich rocks encountered in this area in future drilling or surface exploration programs be submitted for X-ray diffraction analysis.

REFERENCES: Ringenbergs W. H., Petrography of Core Samples from Drill Holes WY3 and WY7, Waratah - Wynyard Area, Tasmania. (MRL15362 - 15372). MRL MEMO M717, JULY 1984.

Threader V.M., Magnesite - Tasmania. In Economic Geology of Australia and Papua New Guinea. Vol. 4, Industrial Minerals and Rocks. A. I. M. M. Monograph Series No. 8, 1976. Edited by C. L. KNIGHT.

Copies to: Dr. A. Coode
Then Camberwell Library.

W. H. RINGENBERGS

PETROLOGIST

057

187058

SAMPLE : MRL15370/C1-P2 blue amphibole [ENERGY DISPERSIVE 9-AUG-

NBS-FRAME ZAF [15.0 KV , 1.5 NA , 4 ITERATIO

LINE	INTENS	FZ	FA	FF	CONC.	ATOM.	[COMPOUND - WEIGHT %]	N
NA-KA	0.0217	1.0613	1.9610	0.9928	0.0449	0.0410	NA2O 6.06 +- 0.22	
Mg-KA	0.0259	1.0073	1.6018	0.9885	0.0414	0.0357	MgO 6.86 +- 0.21	
AL-KA	0.0398	1.0406	1.3978	0.9826	0.0569	0.0442	AL2O3 10.76 +- 0.22	
SI-KA	0.1769	1.0150	1.2941	0.9997	0.2323	0.1734	SiO2 49.70 +- 0.35	
K-KA	0.0009	1.0694	1.0641	0.9943	0.0010	0.0006	K2O 0.13 +- 0.09	
CA-KA	0.0108	1.0472	1.0400	0.9945	0.0117	0.0061	CaO 1.64 +- 0.11	
TI-KA	0.0004	1.1507	1.0152	0.9837	0.0004	0.0002	TiO2 0.07 +- 0.14	
FE-KA	0.0942	1.1624	0.9971	1.0000	0.1091	0.0410	FeO 14.04 +- 0.42	
O-KA		(DIFFERENCE)			0.5021	0.6579		
							TOTAL = 89.25 +- 1.78 %	

SAMPLE : MRL15370/C2-P1 blue amphibole [ENERGY DISPERSIVE 9-AUG-

NBS-FRAME ZAF [15.0 KV , 1.5 NA , 4 ITERATIO

LINE	INTENS	FZ	FA	FF	CONC.	ATOM.	[COMPOUND - WEIGHT %]	N
NA-KA	0.0220	1.0688	1.9903	0.9928	0.0464	0.0430	NA2O 6.25 +- 0.21	
Mg-KA	0.0292	1.0064	1.6219	0.9889	0.0471	0.0413	MgO 7.81 +- 0.20	
AL-KA	0.0315	1.0381	1.4184	0.9821	0.0455	0.0360	AL2O3 8.60 +- 0.20	
SI-KA	0.1842	1.0123	1.2948	0.9997	0.2413	0.1830	SiO2 51.62 +- 0.33	
K-KA	0.0013	1.0668	1.0663	0.9940	0.0015	0.0008	K2O 0.18 +- 0.08	
CA-KA	0.0101	1.0446	1.0417	0.9937	0.0109	0.0058	CaO 1.52 +- 0.11	
TI-KA	0.0013	1.1479	1.0160	0.9819	0.0015	0.0006	TiO2 0.24 +- 0.14	
FE-KA	0.1067	1.1593	0.9975	1.0000	0.1234	0.0471	FeO 15.87 +- 0.42	
O-KA		(DIFFERENCE)			0.4825	0.6424		
							TOTAL = 92.10 +- 1.69 %	

APPENDIX 4

TMD Unpubl. Report 1984/39, A.V. Brown and S.M. Forsyth
Chemistry of Tertiary basalt and palynology of interbedded
sediments from BHP drillholes, EL 33/79.

1984/39. Chemistry of Tertiary basalt and palynology of interbedded sediments from B.H.P. drill holes, E.L. 33/79.

A.V. Brown
S.M. Forsyth

Abstract

The following study was undertaken, in co-operation with B.H.P. Exploration who provided the drill core, to get an understanding of the time-framework of the basalt flows, from palynology studies, and the chemical evolution of the basalts up the sequence, so that future exploration programmes, looking for mineralised horizons below the Tertiary basalt cover in the Burnie-Waratah area, can gauge the thickness of basalt cover before determining future drilling targets. An interpretative geological cross-section is included.

INTRODUCTION

As part of B.H.P.'s exploration programme over E.L. 33/79, numerous diamond-drill holes were drilled through the Tertiary basalt plateau to the east of Waratah.

After the 1981-82 summer season the authors were given access to the core of eight of these drill holes. The purpose of obtaining core samples was two-fold:

- (1) to get an idea of the chemical variation within the Tertiary basalt;
- (2) to obtain an age for the lava flows based on palynological data.

This preliminary report includes the chemical analyses of basalt samples collected (Table 1, 2) and a summary of the palynology. A schematic geological cross-section (fig. 2) is also included. This section is based on a combination of drill log data and surface mapping from the St Valentines Quadrangle.

PALYNOLOGY

Preliminary palynological investigation suggests two microfloras of different ages are present. The older microflora was recorded only from DDH WA1 at 224.0 m, but the younger microflora was found in sediments from DDH WA2, WA3, WA4, WY1, and WY2. The sediments in which the younger microflora occurs lie within a limited topographic interval and may form a continuous sedimentary deposit.

OLDER MICROFLORA - WA1, 224.0 m

Significant species occurring in this microflora include:

Nothofagidites falcatus (Cookson) Stover and Evans, 1973
Proteacidites tuberculatus Cookson, 1950
cf. *Ischyosporites gremius* Stover, 1973
Stereisporites (Tripunctisporis) sp.

In the Gippsland Basin *N. falcatus* appears first at the base of the

Lower *Nothofagidites asperus* Zone (middle Eocene) (Stover and Partridge, 1973), whereas in the Bass Basin the first occurrence of *N. falcatus* is at a slightly younger horizon (Partridge, 1973). *P. tuberculatus* first appears in the Upper *N. asperus* Zone of the Gippsland Basin and in the Middle *N. asperus* Zone of the Bass Basin close to the middle/late Eocene boundary. *I. gremius* does not range above the Upper *N. asperus* Zone. *S. (Tripunctisporis)* sp. similarly is not found above the Upper *N. asperus* Zone of the Gippsland Basin, but in the Bass Basin it ceases to be common at the top of the Middle *N. asperus* Zone, but ranges up into the *P. tuberculatus* Zone. The microflora therefore probably belongs to the Middle or Upper *N. asperus* Zones and an age of late Eocene into earliest Oligocene is indicated. This is supported by the absence of *Cyatheacidites annulatus* Cookson, 1947 from the microflora.

Of the samples collected for palynological study only three others were considered to be stratigraphically low enough to contain the older microflora. Unfortunately each of the three samples proved to be barren.

YOUNGER MICROFLORA

This microflora is characterised by the presence of *C. annulatus*. To test the significance of the absence of this species from the older microflora a large number of samples thought to contain the younger microflora was routinely prepared but not thoroughly scanned. Of 34 samples prepared, 29 contained *C. annulatus*. Of the remaining five samples, two were barren, one almost barren, one contained wood fragments but very few palynomorphs, and only one contained a diverse microflora from which *C. annulatus* was absent.

Some other palynomorphs present included:

- Foveosporites palaequetrus* Partridge, 1973
- Foveosporites* sp. nov.
- Verrucosporites kopukuensis* (Couper) Stover, 1973
- Verrucosporites cristatus* Partridge, 1973
- Beaupreaidites verrucosus* Cookson, 1950
- Nothofagidites falcatus*
- Nothofagidites flemingii* (Couper) Potonié, 1960
- Triporopollenites chnosus* Partridge, 1973
- Periporopollenites vesicus* Partridge, 1973

C. annulatus indicates the microflora is no older than the *P. tuberculatus* Zone and based on the Gippsland and Bass Basin sequences *F. palaequetrus*, *N. flemingii*, *B. verrucosus* and *P. vesicus* indicate the microflora is no younger than the *P. tuberculatus* Zone. Further, *N. flemingii* and *P. vesicus* suggest an upper age limit of the middle division of the *P. tuberculatus* Zone, and *B. verrucosus* an upper age limit of the lower division of the *P. tuberculatus* Zone (Stover and Partridge, 1973). The extent to which the zonal scheme developed by Stover and Partridge for the Gippsland Basin is applicable to Tasmania is not known, particularly for upland areas, however correlation with the Gippsland Basin suggests an Oligocene or early Oligocene age (based on *B. verrucosus*).

There are indications that in sub-alpine areas *N. flemingii* may have continued into the upper division of the *P. tuberculatus* Zone (early Miocene) or perhaps younger horizons (S.M. Forsyth, unpublished data) and it should be noted that *Nothofagus gunnii* Hooker, also a producer of *Nothofagus fusca* type pollen, still grows in Tasmania.

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Although only preliminary studies have been undertaken on the samples no species were recorded that first appear in the middle or upper division of the *P. tuberculatus* Zone of the Gippsland Basin. This is in contrast to the presence of such species in the near-shore marine early Miocene rocks at Fossil Bluff, Wynyard.

Other features of the younger microflora include the presence of fern sporangia in one sample and the presence of palynomorphs reworked from the Lower Parmeener Super-Group, including the first record of *Dulhuntyispora dulhuntyi* Potonié amend. (WY2, 119.5 m) from Tasmania. *Dulhuntyispora* indicates the Lower Parmeener Super-Group upper marine rocks as a contributor to the sediment supply, whereas *Tasmanites* sp. and other palynomorphs are consistent with, although do not conclusively show, Lower Parmeener lower marine rocks forming part of the provenance.

CONCLUSIONS REGARDING AGE OF MICROFLORAS

The older microflora from 224.0 m, hole WA1, is pre *P. tuberculatus* Zone and probably late Eocene or earliest Oligocene in age. The younger microflora belongs to the *P. tuberculatus* Zone (early Oligocene - early Miocene) and is probably Oligocene, most likely early Oligocene in age.

REFERENCES

- PARTRIDGE, A.D. 1973. Revision of the spore-pollen zonations in the Bass Basin. *Unpubl. palaeont. Rep. Ezzo Aust. Ltd.* 1973/4.
- STOVER, L.E.; PARTRIDGE, A.D. 1973. Tertiary and Late Cretaceous spores and pollen from the Gippsland Basin, southeastern Australia. *Proc. R. Soc. Vict.* 85:237-286.

[10 July 1984]

Table 1. LIST OF SAMPLES COLLECTED

Analysis no.	Drill Hole	Depth (m)	Field no.	Rock type
830755	WA4	140.0	C1724	Tertiary tholeiitic basalt
756	WA4	195.7	C1725	Tertiary tholeiitic basalt
757	WA4	105.0	C1716	Tertiary tholeiitic basalt
758	WA3	163.5	C1727	Tertiary transitional basalt (alkali/tholeiitic)
759	WA3	196.0	C1728	Tertiary alkali olivine basalt
760	WA3	278.7	C1729	Cambrian picritic lava
761	WA3	284.2	C1730	Cambrian picritic lava
762	WA6	150.0	C1731	Tertiary tholeiitic basalt
763	WA6	197.5	C1733	Tertiary transitional basalt
764	WY2	175.0	C1734	Tertiary tholeiitic basalt
765	WY2	218.0	C1735	Tertiary tholeiitic basalt
766	WY2	272.0	C1736	Tertiary alkali olivine basalt
767	WA2	113.0	C1737	Tertiary tholeiitic basalt
768	WA2	154.0	C1738	Tertiary tholeiitic basalt
769	WA2	186.0	C1739	Tertiary tholeiitic basalt
770	WY1	137.5	C1740	Tertiary tholeiitic basalt
771	WA1	221.0	C1741	Tertiary alkali olivine basalt
772	WA1	179.0	C1742	Tertiary tholeiitic basalt
773	WA1	144.0	C1743	Tertiary transitional basalt
774	WA1	96.0	C1744	Tertiary tholeiitic basalt

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Table 2. CHEMICAL ANALYSES OF BASALT SAMPLES. Analyses by Department of Mines Laboratories, Launceston

Reg. No.	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	TiO ₂	MnO	CaO	MgO	K ₂ O	Na ₂ O	P ₂ O ₅	SO ₃	CO ₂	H ₂ O ⁻	H ₂ O ⁺	NiO	Cr ₂ O ₃
830755	48.01	13.17	3.76	6.49	1.49	0.13	8.09	8.77	0.34	2.10	0.25	0.10	0.17	3.18	3.22	0.02	0.03
756	49.85	13.64	1.77	8.43	1.45	0.14	8.59	7.74	0.57	2.76	0.28	0.11	0.87	1.45	1.88	0.02	0.04
757	47.06	13.27	3.28	7.85	1.38	0.16	7.56	9.81	0.39	1.85	0.24	0.07	0.18	2.59	3.53	0.02	0.04
758	49.21	13.54	2.98	7.43	1.75	0.13	8.57	7.39	1.11	2.65	0.32	0.07	1.03	1.39	2.16	0.01	0.04
759	45.72	13.36	1.09	10.21	1.73	0.16	9.07	7.47	0.83	2.96	0.38	0.14	5.32	0.23	1.11	0.02	0.03
760	36.84	7.30	1.93	5.60	0.27	0.13	7.43	22.58	0.00	0.42	0.05	0.10	3.50	5.18	8.52	0.17	0.41
761	39.97	8.75	2.01	6.49	0.40	0.16	5.43	23.51	0.06	0.23	0.05	0.13	0.34	4.28	8.27	0.15	0.41
762	47.10	13.22	3.31	7.77	1.52	0.14	7.01	9.50	0.72	1.83	0.25	0.18	0.15	2.24	4.49	0.02	0.03
763	48.62	13.53	3.14	7.79	1.55	0.14	7.85	8.47	0.86	2.53	0.40	<0.05	0.23	1.32	3.17	0.02	0.03
764	48.33	13.31	1.68	8.72	1.50	0.17	9.94	6.88	0.30	2.15	0.23	1.05	2.70	1.50	2.14	0.02	0.03
765	43.96	13.20	0.79	10.38	1.62	0.16	7.97	9.26	0.97	2.13	0.32	4.03	2.38	1.30	2.11	0.02	0.03
766	47.08	13.11	1.65	8.87	1.91	0.16	8.41	10.84	1.29	2.44	0.44	0.17	0.21	0.78	2.36	0.03	0.04
767	48.84	13.68	2.54	7.94	1.45	0.15	8.81	7.65	0.17	2.26	0.20	<0.05	0.11	3.24	2.17	0.02	0.03
768	49.39	13.26	1.00	9.79	1.62	0.15	8.92	7.50	0.82	2.51	0.25	<0.05	1.59	0.91	1.26	0.02	0.03
769	47.01	12.88	0.68	9.59	1.38	0.15	8.91	6.48	0.47	2.11	0.19	<0.05	7.16	0.50	1.57	0.02	0.03
770	46.53	13.05	3.43	7.51	1.56	0.15	8.62	8.55	0.36	1.91	0.26	<0.05	0.20	3.81	3.54	0.03	0.03
771	46.63	12.62	3.05	7.84	1.79	0.15	9.04	8.86	1.06	2.49	0.38	<0.05	1.05	1.17	3.03	0.03	0.04
772	49.05	13.64	3.42	6.75	1.55	0.16	9.32	6.47	0.33	2.56	0.29	<0.05	0.73	2.95	2.14	0.02	0.03
773	46.71	13.38	4.15	6.65	1.51	0.20	8.17	7.65	0.77	2.03	0.30	<0.05	0.70	3.29	3.63	0.02	0.04
774	50.56	14.04	1.23	9.37	1.73	0.15	8.86	7.80	0.96	2.86	0.31	0.09	0.07	0.68	0.94	0.01	0.04

Reg. No.	Sr	Rb	Y	Zr	Nb	Ni*	Ba	Cr	V	Sc	Pb	As	Zn	Cu	Co
830755	330	10	20	95	13	140	145	230	125	17	23	<10	110	54	38
756	340	21	19	96	13	145	160	250	130	17	15	<10	110	38	40
757	250	12	16	93	8	190	110	240	130	16	10	<10	110	25	47
758	370	25	17	125	15	115	200	250	145	16	<4	<10	105	29	39
759	420	13	19	105	13	175	180	210	140	18	5	<10	125	51	46
760	51	6	8	10	<3	1300	25	2800	105	20	<4	<10	55	31	66
761	31	5	13	16	<3	1150	27	2800	145	28	<4	<10	63	58	69
762	240	20	17	92	11	165	115	210	125	13	<4	<10	115	40	43
763	350	19	20	110	17	180	180	240	140	18	<4	<10	115	47	45
764	270	12	18	87	6	155	83	210	130	18	<4	<10	115	41	43
765	570	16	18	110	14	190	105	230	140	15	<4	<10	110	40	46
766	470	26	20	145	29	210	220	270	160	18	<4	<10	100	39	49
767	250	7	19	84	4	160	60	240	130	18	<4	<10	110	47	38
768	280	20	21	105	9	155	110	230	145	19	<4	<10	115	43	46
769	230	15	17	80	4	155	105	230	130	18	<4	<10	105	38	39
770	260	11	20	96	9	200	120	230	150	17	<4	<10	110	44	47
771	470	25	19	120	25	230	280	270	155	15	<4	<10	99	43	42
772	350	10	19	92	12	125	105	230	135	18	<4	<10	105	36	43
773	280	21	20	100	13	160	125	250	135	16	<4	<10	105	29	41
774	360	22	19	120	14	115	180	260	150	19	<4	<10	105	36	43

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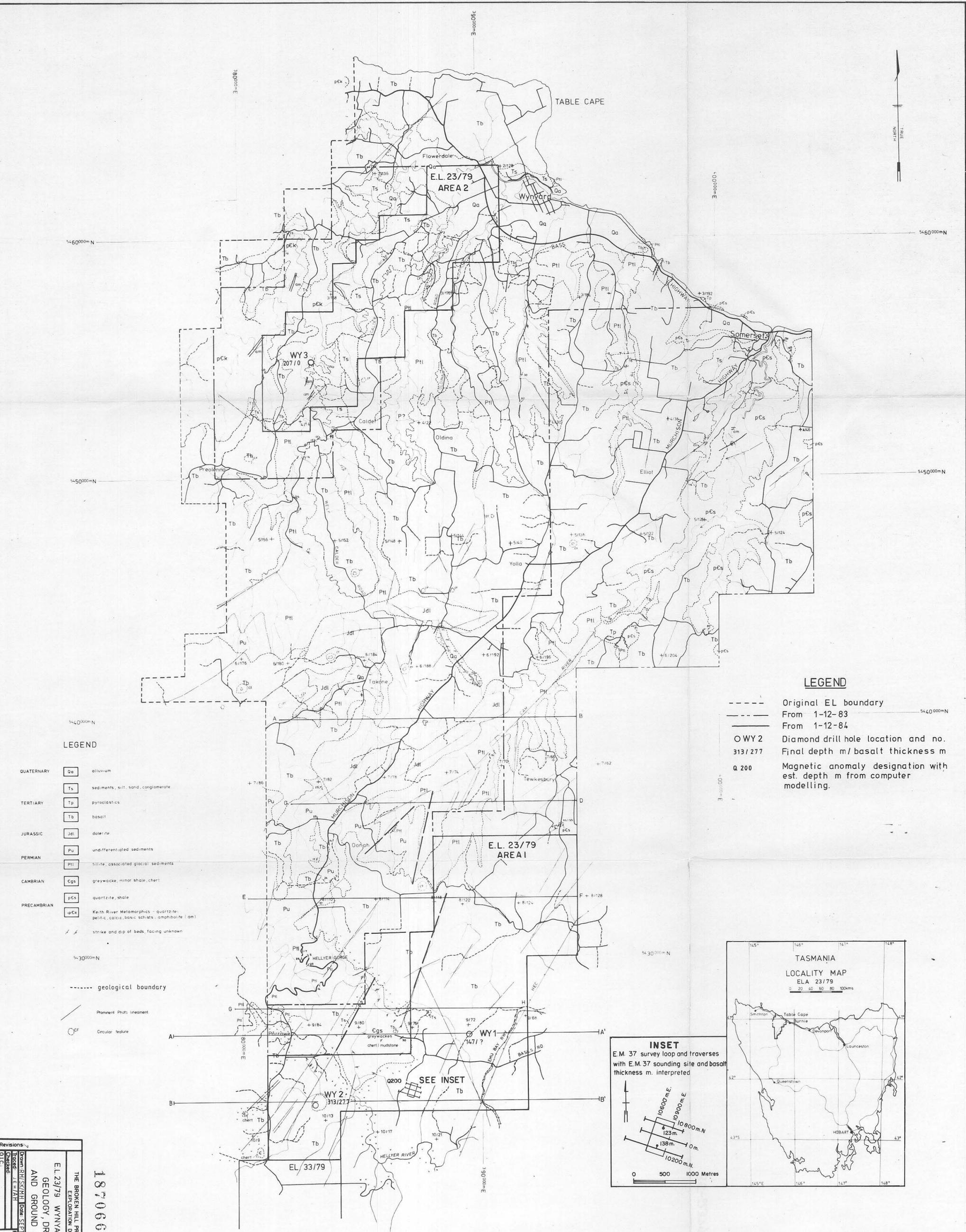
Table 3. LIST OF SAMPLES FOR PALYNOLOGICAL EXAMINATION

Sample no.	Drill hole	Depth (m)	Microflora*
P439	WA1	224.0	O
P440	WA1	224.9	B
P441	WA2	134.4	Y
P442	WA2	135.3	Y
P443	WA2	135.5	Y
P444	WA2	137.45	Y
P445	WA2	139.4	Y
P446	WA2	142.5	Y
P447	WA2	146.6	Y
P448	WA2	163.8	Y
P449	WA3	150.4	Y
P450	WA3	151.4	Y
P451	WA3	151.8	Y
P452	WA4	144.55	Y
P453	WA4	149.2	Y
P454	WA4	149.4	Y
P455	WA4	150.0	Y
P456	WA4	166.4	Y
P457	WA4	167.4	Y
P458	WA4	168.4	Y
P459	WA4	169.4	Y
P460	WA4	170.4	Y
P461	WA4	171.4	B
P462	WY1	87.5	Y
P463	WY1	95.7	Y
P464	WY1	101.4	Y
P465	WY1	102.1	Y
P466	WY1	111.6	Y
P467	WY1	113.5	Rare Palynomorphs
P468	WY2	119.5	
P469	WY2	124.2	Y
P470	WY2	127.7	Y
P471	WY2	129.7	Y
P472	WY2	131.0	Y
P473	WY2	136.3	B
P474	WY2	137.1	Wood fragments, rare palyno- morphs
P475	WY2	238.3	B
P476	WY2	143.1	B
P477	WY2	242.4	B
P33†	V66	Surface sample	Y
P34†	V91	Surface sample	Y
P47†		Surface sample	Y
P48†		Surface sample	Y

* O = older microflora, Y = younger microflora, B = barren

† Samples P33 and P34 collected by P. Lennox, Tasmania Department of Mines, 1979.

Samples P47 and P48 collected by P. Williams, Tasmania Department of Mines, 1979.

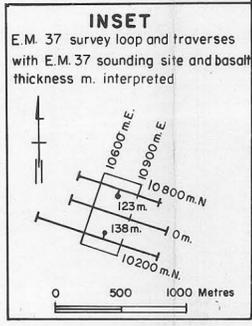
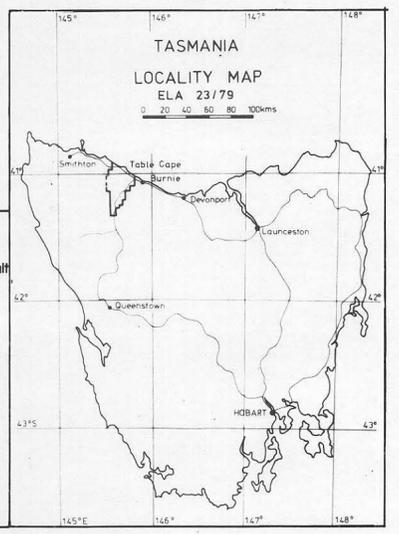


LEGEND

- QUATERNARY
 - Qa alluvium
 - Ts sediments, silt, sand, conglomerate
 - TERTIARY
 - Tp pyroclastics
 - Tb basalt
 - JURASSIC
 - Jdl dolerite
 - PERMIAN
 - Pu undifferentiated sediments
 - Ptl tillite, associated glacial sediments
 - CAMBRIAN
 - Cgs greywacke, minor shale, chert
 - PRECAMBRIAN
 - pCs quartzite, shale
 - pCk Keith River Metamorphics - quartzite, pelitic, calcic, basic schists, amphibolite (am)
- / / strike and dip of beds, facing unknown
 - - - - geological boundary
 ——— prominent photo lineament
 ○ circular feature

LEGEND

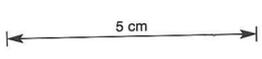
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- - - - From 1-12-83
- From 1-12-84
- WY 2 Diamond drill hole location and no. 313/277
- Final depth m / basalt thickness m
- Q 200 Magnetic anomaly designation with est. depth m from computer modelling.



Revisions
 Drawn: R.H.S./M.H. Date: SEPT 84
 Checked: J.E.W./A.H.
 Project No: T64
 Drawing No: AO-23/79-1
 Centre: ROBERT

187066

SCALE 1:100,000



Geology — R.Hine, R.Lockwood, A.Ojakic
 with compilation from Tas Mines
 Dept 1:53,360 Burnie sheet
 and unpublished maps (Hellyer
 area) by P.Williams & P.Lennox

145° 30' E

145° 45' E

41° 00' S

41° 00' S

41° 15' S

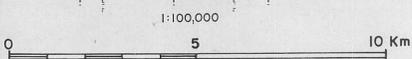
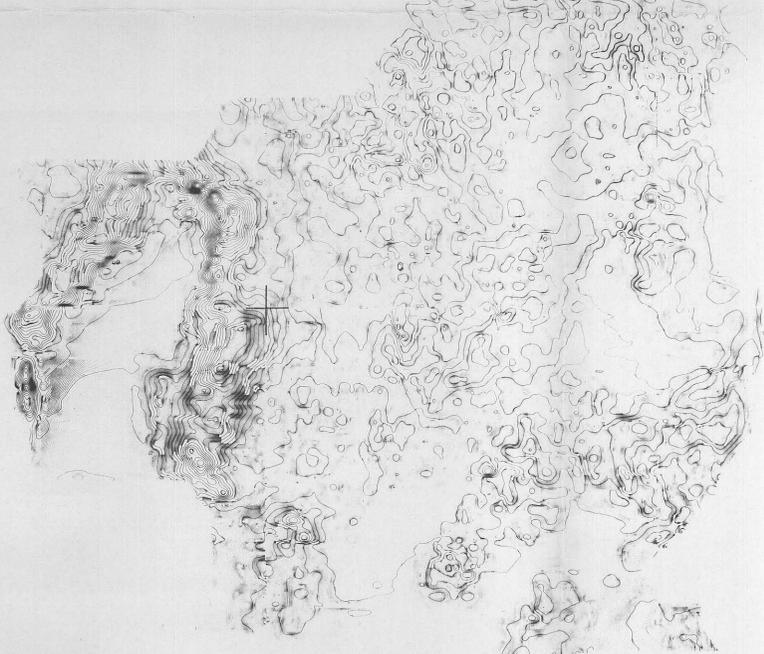
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145° 30' E

145° 45' E

41° 30' S

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 _____ From 1-12-84

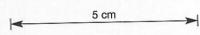


E.L.s 33/79, 23/79 WARATAH, WYNYARD TAS
 TOTAL MAGNETIC INTENSITY CONTOURS

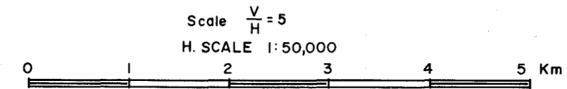
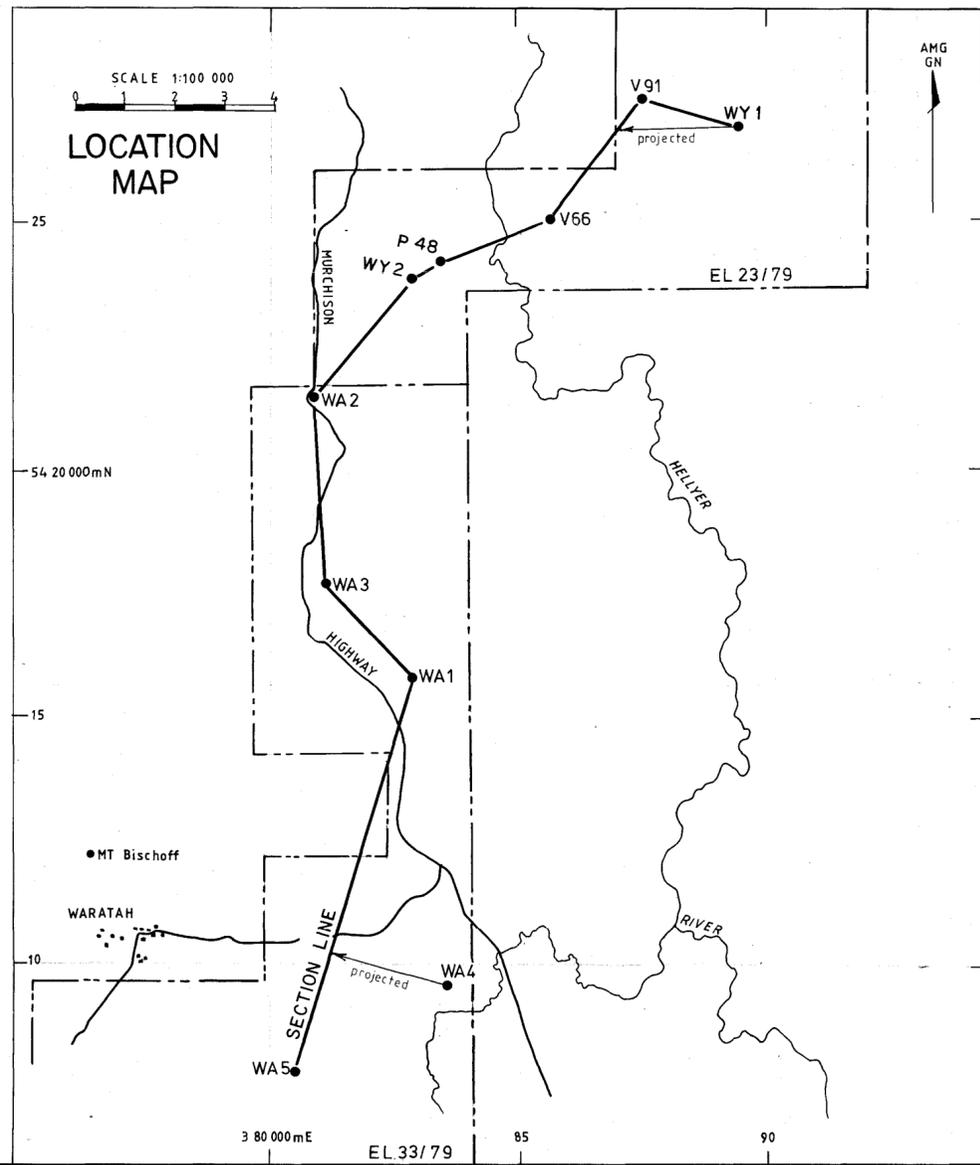
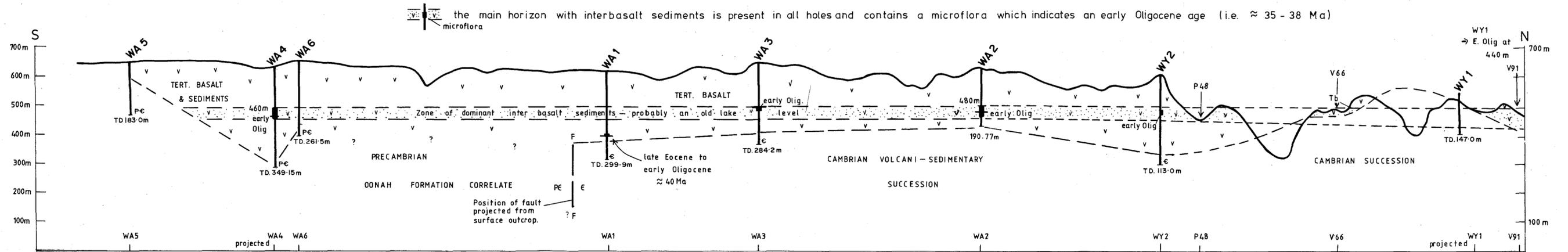
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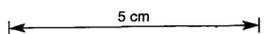


SCHMATIC GEOLOGICAL CROSS-SECTION FOR BHP DIAMOND DRILL HOLES AND DEPT. OF MINES SPORE SAMPLE SITES



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Tas. Mines Dept. Unpubl. Report 1984/39

187068



THE BROKEN HILL PROPRIETARY CO. LTD. EXPLORATION DEPARTMENT		
EL 33/79, 23/79, WARATAH WYNARD, TAS. WARATAH - HELLYER GORGE AREA		
GEOLOGICAL CROSS SECTION		
Drawn:	Date: Sept 84	Centre: Hobart
Traced: A. Hansen	Project N°:	Drawing N°:
Checked:	T65, T64	A2-