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EXPLORATION LICENCE 22/74

MARIONOAK

TASMANIA

FINAL REPORT ON EXPLORATION ACTIVITY

TO JANUARY 1988

MISCELLANEOUS

88-2773

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FEBRUARY 1988.

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1. SUMMARY

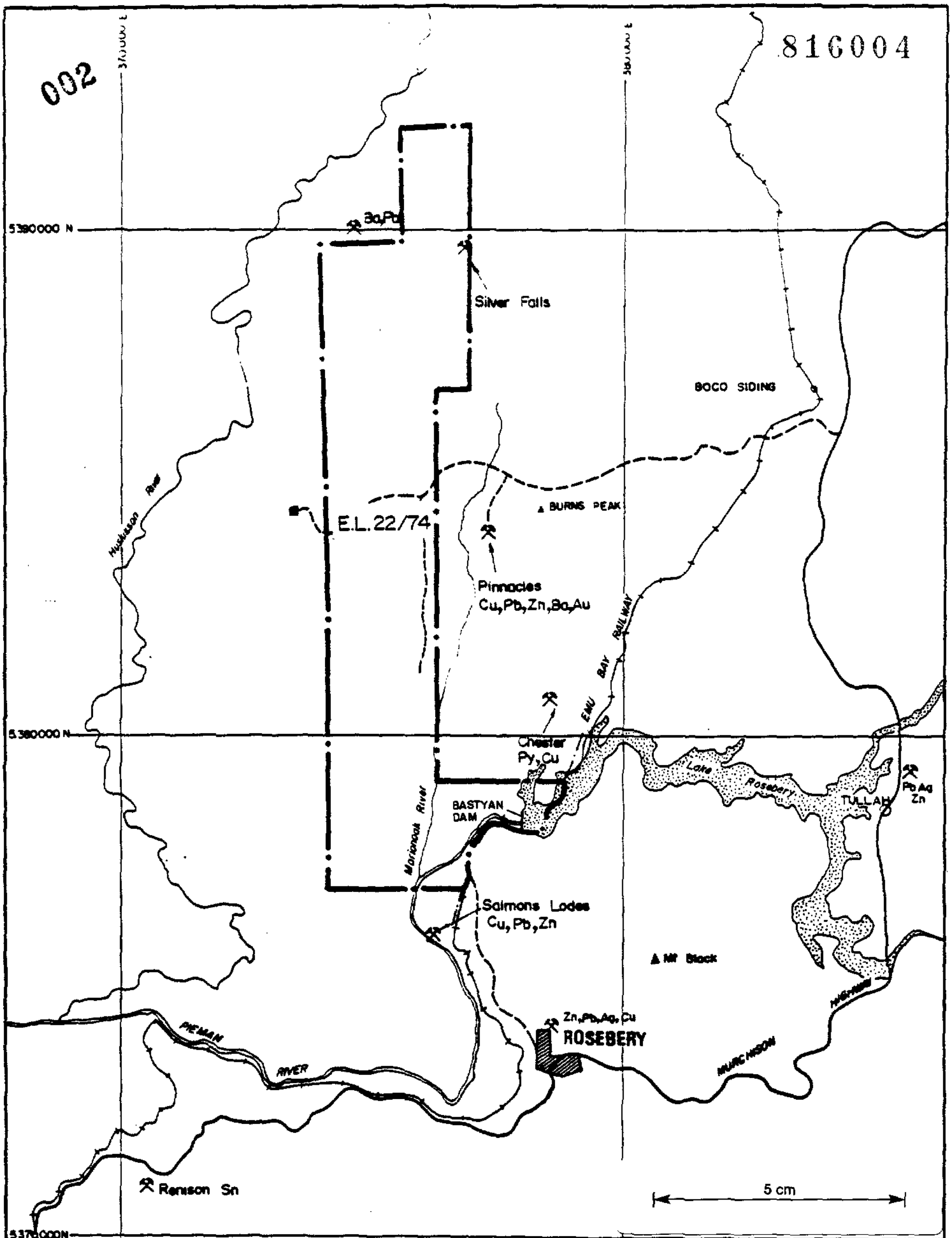
This report summarises exploration activity on EL 22/74 (Marionoak) due for relinquishment on 26 February, 1988. A brief resume of activity in the period 1975-1986 and detailed results for the period January 1987 to January 1988 are presented.

During the latter period a review of geophysical data from the Bastyan Dam grid indicated a deep conductive source 200-300m east of the previously interpreted position. This target was drilled but no significant mineralisation was intersected. Reconnaissance mapping and sampling in the Bastyan Dam area, to assess its potential for Rosebery style mineralisation, was completed.

2. INTRODUCTION

Exploration licence 22/74 (Marionoak) of 32 square kilometres is situated north-west of Rosebery in Western Tasmania (Figure 1). Since 1980 the licence has been explored under the terms of the Marionoak joint venture between Billiton Australia and Aberfoyle Resources Limited.

Current activity is concentrated in the southern part of the licence, around the Bastyan Dam grid and the Bastyan damsite.



Aberfoyle Resources Limited

EXPLORATION DIVISION

Drawn: R.K.Y	NORTH WEST TASMANIA	Location code: K55/5-6
Traced:	MARIONOAK RIVER E.L. 22/74	Scale: 1:100,00
Checked:	LOCATION PLAN	Date: January, 1988
Revised: — Date: —		Plate Nº MOC 1

3. EXPLORATION HISTORY

3.1 Pre 1975

McIntosh-Reid (1918) reported on two (Pb-Zn-Ba) prospects, Lynch Creek and Silver Falls, but concluded that the latter of these was of sub-economic grade. Both Comstaff, as part of EL 5/63, and Asarco, EL 5/73, have explored areas which included the current Marionoak licence.

2. 1975-1986

A summary of exploration activity is presented below. For more detailed summaries refer to individual progress reports (Freytag [1976, 1977, 1978], Taylor [1979], Smyth [1982, 1983, 1984], Sise [1985, 1986, 1987]).

1975/76

4 areas of anomalous Pb, Cu, Zn were defined by -80# stream sediment sampling (Silver Falls, Lynch Creek, Higgins Creek, South Central). Reconnaissance mapping undertaken in conjunction with stream sediment sampling.

Airborne geophysics indicated no significant anomalies.

1976/77

Further stream sediment sampling and follow up of the Lynch Creek anomaly by gridding, costeaning and soil geochemistry.

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1977/78

After further sampling it was concluded that the Lynch Creek anomaly was related to veins in massive pyritic shale.

Silver Falls prospect investigated - a strong Pb anomaly but lacking other metals.

1978/79

Silver Falls - gridding, soil geochemistry, I.P. and compilation of mapping and E.Z. Co. DDH PP62, and PP63 logs. Concluded that mineralisation is sub-economic.

1980/82

Dighem survey detected low order anomalies. No follow-up work conducted. Low order stream sediment anomalies were retested by -80# and panned concentrate and followed-up by rock chip and soil geochemistry. Two anomalies A and C (I) recommended for further work. Gridding completed near the Bastyan Dam to investigate B.M.S. occurrence in the Pieman Road. Mapping, soil geochemistry, ground magnetics, I.P. and gravity undertaken. I.P. and gravity anomalies defined.

1982/83

Bastyan Dam grid - follow-up gravity and I.P.

DDH SBD-1 (221m) drilled to test gravity and I.P. anomalies. No significant mineralisation intersected. Pb isotope study of quartz-sphalerite-galena veins indicate that metals were not derived from remobilisation of Rosebery style mineralisation.

A major UTEM anomaly was found to cross-cut gravity and I.P. anomaly trends.

<u>1983/84</u>

Bastyan Dam grid - UTEM survey defined 1200m strike length of conductor, but suggested that it is a lithological unit or contact rather than base metal mineralisation.

<u>1984</u>

Previous work reviewed.

Bastyan Dam grid - UTEM data modelled and DDH M01 (454.1) drilled with this conductor as a target. No significant mineralisation was intersected and SIROTEM failed to indicate an off hole conductor.

<u>1984/85</u>

Bastyan Dam grid - CSAMT confirmed presence of a conductor.

Geophysics reviewed - concluded that CSAMT, UTEM and down hole EM all indicate a south plunging conductor at 5-600m depth.

1985/86

Cutting of north Bastyan grid. Soil geochemistry indicated no base metal anomalies but defined an inlier of Oonah Formation. A CSAMT survey confirmed trend of conductor (328°). Mapping indicated that CSAMT/UTEM anomaly may coincide with the Dundas Group - Crimson Creek Formation boundary.

4. EXPLORATION ACTIVITY 1987-1988

4.1 Bastyan Dam

Introduction

Central Volcanic Complex lithologies in the Bastyan Dam area have not previously been explored in any detail. Following the conclusions of Anderson (in Sise 1986), that this area may be prospective for Rosebery style mineralisation, on the basis of :

a) Proximity to Rosebery and Chester.

b) Reported BMS boulders in volcaniclastics

c) Possible stratigraphic mis-interpretation of the Rosebery ore position i.e. it continues through the licence area rather than intersecting the Rosebery Fault to the south.

A reconnaissance mapping and rock-chip sampling programme was undertaken over two days in January 1988.

Previous work has included reconnaissance mapping (Freytag, 1976), and detailed regional mapping (Corbett and McNeill, 1986). Stream sediments from east of the Bastyan Dam (Freytag, 1976), and two rock-chip samples from the Pieman Road (Anderson in Sise 1986) were not anomalous in base metals.

Geology (refer to Plates MOC 22 and MOC 23)

The sequence in this area is dominated by rhyodacitic to rhyolitic (based on Ti/Zr ratio) feldspar-minor quartz-phyric

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lava. These pink-green massive lithologies may be highly leached, with feldspar completely weathered out, and are in some cases brecciated. Typical examples are 427306, 427310, 427313.

Two major volcaniclastic types were recorded. A massive, light pink, glassy feldspar-quartz-phyric lithology with Sericitic "fiamme", a pumiceous volcaniclastic (ignimbrite?), containing scattered cherty lithic clasts, crops out north of Bastyan Dam and continues to the Pieman Road.

Quartz and feldspar crystal rich volcaniclastic crops out from the Rosebery Fault east to the Bastyan power station and appears to be abruptly terminated to the north by lava. This mottled light to dark green lithology varies from quartz-rich, with crystal fragments upto 0.7 cm diameter, to feldspar rich. Other components are wispy chloritic feldspar rich "fiamme", and massive black shale rafts from 5cm to 8m in length. Shale is common in the eastern part of this unit where massive black shale lenses have irregular boundaries and are interdigitated with enclosing volcaniclastics.

Near the Bastyan power station a shale unit forms the boundary between volcaniclastic and lava while a shale raft occurs 25m to the east within the lava.

At 78690mN, 78480mE a 0.1-0.7m thick dyke of fine grained dark green, vesicular in part, basalt intrudes altered lava. It is similar in appearance to dykes common on the Pieman Road (Corbett and McNeill, 1986).

Bedding data is sparse but the two readings taken, both with a moderate east dip, are concordant with those reported by Corbett and McNeill (1986). Two interpretations may account for this data and the abrupt termination of the crystal rich volcaniclastics :

a) Caused by rapid lateral facies variation in an east dipping sequence.

b) The volcaniclastic plunges north under the lava, forming the core of an anticline. Bedding occurs on the eastern limb of this structure, while the sub-horizontal orientation of shale rafts near the Pieman Bridge suggest they occur in the hinge of this fold. Similar north plunging folds, with a wavelength of 1-1.5km, have been suggested to occur, to the east, on the Pieman Road (McNeill, 1986) and at the Pinnacles (Corbett and McNeill, 1986).

Alteration

A zone of moderately strong sericite-silica-pyrite (up to 4-5%) alteration, with minor chlorite was found from

79050mN, 77600mE south to the Pieman Road. Low base metal values (sample 427315) associated with this alteration indicate that it probably forms part of the footwall alteration zone to the Chester deposit, 2 km to the N.E., previously described by Collins et al (1981). Elsewhere, especially east of the Bastyan Dam, moderate to weak chlorite-sericite-silica alteration with trace disseminated pyrite affect the lavas. In the immediate vicinity of the Bastyan Dam lithologies appear to be less altered but have moderate to strong quartz, red weathering carbonate and trace sphalerite veining, with trace disseminated pyrite. Slightly elevated Ba values for samples from this area probably reflect minor barite as noted in float of lava with sphalerite-carbonate-barite veining.

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4.2 Bastyan Dam Grid

Drilling - DDH MO2

Geology

DDH MO2 was designed to test the deep conductor detected by UTEM and CSAMT surveys and that DDH MO1 failed to intersect. The drill hole location was chosen after further geophysical modelling (Appendix 2).

A detailed log (Appendix 3), petrographic descriptions, core grind geochemistry (Appendix 4) and a section of the hole (plate MOC24) are included. A summary log is as follows (logged by J. R. Sise) :

0-59.6m	:	Dominantly laminated grey siltstone-sandstone, minor intraformational conglomerate.
59.6-432.2m	:	Mauve-cream siltstone, sandstone. Minor conglomerate. Minor infaulted (?) zones of black shale.
432.2m-643.2m	:	Black graphitic shale - grey siltstone sequence, subordinate sandstone with zones of heterolithic open framework breccia and thick amalgamated sandstone beds.

Contacts between major lithologies are stongly sheared. Shear zones exist within particular units.

This stratigraphy may be divided into two units, separated by a fault at 432.2m. The upper unit faces uphole and is correlated with the Dundas (or Rosebery) Group; while below 432.2m, lithologies face downhole and are considered to be Oonah Formation correlates. Mapping has indicated a faulted inlier of Oonah Formation, between the Dundas Group and Crimson Creek Formation, 1 km to the N.W. and a similar situation is envisaged here.

Extrapolation of the major fault to approximate surface position, as indicated by mapping of the north Bastyan Dam grid (Purvis in Sise 1987), indicates a moderate (55^o) easterly dip, and as such it may be related to the Rosebery Fault, also a moderately east dipping structure.

No major mineralisation was intersected. Trace pyrite and occasional chalcopyrite occur throughout the section and pyrite, with minor sphalerite and galena are associated with the fault at 432m.

Geochemistry

The complete length of MO2 was core ground and samples analysed for Cu, Pb, Zn and Ag. Samples were taken from nominal 10m intervals or selected on lithological boundaries.

Two anomalous intervals were recorded. From 432.2 to 454.2 a maximum of 2550 ppm Zn and 1.0 ppm Ag probably result from veining associated with faulting. From 43.2 to 54.8 a maximum of 2050 ppm Zn, 1300 ppm Cu and 2.0 ppm Ag have no obvious source.

Geophysics

A down hole EM Survey (SIROTEM) detected an obvious response associated with the graphitic shales below the fault. Profiles are presented in Appendix 4.

Rehabilitation

The M01 and SBD1 drill sites require no work, apart from spreading fertilisers, as natural revegetation is satisfactory. The M02 drill site will be tidied and all rubbish removed. The access track is revegetating naturally, fertiliser will be spread to assist. The entrance to this track will be blocked to prevent further access.

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5. CONCLUSIONS

1. The UTEM anomaly on the Bastyan Dam grid has been drilled (DDH MO2) and appears to be related to graphitic Oonah Formation shales and their faulted contact with Dundas Group sediments. No significant mineralisation was intersected.

2. Alteration in the Central Complex volcanics at Bastyan Dam is dominantly "Chester" type i.e. barren of base metals. There may be potential for mineralisation at depth, as the Rosebery hangingwall volcaniclastics plunge under the rhyodacite lavas, however the presence of HEC works preclude drilling and geophysics from all but a small part of this area.

3. EL 22/74 is now considered to have been adequately explored and no further expenditure is warranted.

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APPENDIX 1

Sample Locations - Bastyan Dam Area

Sample No.	Location (A.M.G. Coordinates)		Description
427301	5379020mN	378330mE	Rhyodacitic lava
302	5378930mN	378260mE	leached lava with dissem. pyrite
303	5378820mN	378470mE	Chl.+py. alt. lava
304	5378690mN	378480mE	Alt. lava
305	5378630mN	377990mE	Rhyodacitic lava
306	5378730mN	377950mE	Dacitic lava
307	5378780mN	377930mE	Rhyodacitic lava
308	5378870mN	377950mE	?Ignimbrite
309	5378520mN	377780mE	?brecciated lava
310	5378310mN	377890mE	Dacite lava
311	5378470mN	377660mE	Crystal Volcaniclastic
312	5378440mN	377940mE	Shale
313	5378340mN	377950mE	Rhyodacitic lava
314	5378100mN	377570mE	Brecciated lava
315	5379050mN	377660mE	Highly altered volcanic

Petrographic Descriptions (A. W. McNeill)

427306 A green-grey glassy lithology with obvious brown carbonate on joints and weathered surfaces. Feldspar phenocrysts, up to 1mm diameter, are altered to sericite and chlorite. Weak devitrification textures in groundmass and disseminated pyrite up to 0.5 mm diameter. In thin section a coarsely devitrified, weakly snowflake textured, groundmass of sericite feldspar and quartz supports glomerocrysts and phenocrysts of plagioclase feldspar, (chlorite (minor) and sericite altered), and minor K-feldspar and quartz, as anhedral to embayed subhedral grains. Pyrite, <1%, and subhedral to euhedral carbonate are minor components. Quartz and carbonate veining was noted.

This sample is a crystal rich, devitrified rhyodacitic lava.

427308 A massive, glassy, light pink-green lithology with sericitic, feldspar-phyric "Fiamme" and rounded cream coloured clots up to 1 cm diameter. Minor, <1%, disseminated fine grained pyrite. Groundmass has a weak flow foliation and scattered pink-cream feldspar phenocrysts. In thin section a sericitic felsitic groundmass, with no obvious shard textures, has patches of flow foliation defined by concentrations of sericite. Sparse phenocrysts and glomerocrysts of carbonate and sericite altered plagioclase and K-feldspar, and subhedral to auhedral quartz were noted with subrounded patches of coarse grained carbonate and minor sericite. Quartz + carbonate veins are rare. This sample is probably a pumiceous volcaniclastic (?ignimbrite).

427310 A light green, with minor green-grey patches, glassy, massive lithology with one coarse, 0.6 cm, quartz phenocryst and disseminated pyrite (1-2%). In thin section a medium grained recrystallised sericitic felsite groundmass, spherulitic in parts, contains some irregular shaped quartz + carbonate vesicles and quartz + carbonate + albite veins. Phenocrysts of strongly sericite altered plagioclose are dominant over fractured quartz and subhedral apatite. Both pyrite and ?pyrrhotite were noted. This sample is a feldspar-phyric dacitic lava.

427313 A massive, glassy, light green lithology with no obvious phenocrysts but, approx. 1% of <0.5 mm diameter pyrite. Moderately veined with quartz + carbonate and chlorite+ sericite veins. In thin section the sample appears to be strongly brecciated with rounded fragments of crystal rich, plagioclose-quartz-phyric lava, with a recrystallised felsitic matrix and possible vesicles, in a network of veinlets, as described above. Pyrite, carbonate and apatite all occur in the lava groundmass. Brecciation is considered to be hydrothermal (c.f. autobreccia). This sample is a brecciated feldspar-quartz-phyric rhyodacitic lava.

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ANALABS

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

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ANALYTICAL REPORT No. 23.3.08.05037

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ORDER No.	PROJECT
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DATE RECEIVED	RESULTS REQUIRED
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No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
2	18/01/88	1	15

STATE OF SAMPLES REFER BELOW	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	ANALYSIS REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	427301/315	RC Prep: 005,009,011,012,013,016							Cu,Pb,Zn,Ag,Ni/101,As/114		
	427301/315	RC							Ba,Cr,Zr,Ti/401		
	427301/315	RC							Au/309		

RESULTS TO

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Tasmania 7320

RESULTS TO

REMARKS

STATE OF SAMPLES	
whole core	WC
split core	SC
cutting	CU
rock	Ro
soil	SO
pulp	PU
water	WA
tissue	TI
stream sediment	SS
heavy mineral	HM

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

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

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ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	23.3.08.05057	18/01/88	2664	1 OF 2

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	Ba	As	Cr	Ni
1	427301	<5	35	60	<0.5	<0.008	770	3	<5	<5
2	427302	<5	5	30	<0.5	<0.008	1000	2	<5	10
3	427303	<5	15	70	<0.5	<0.008	370	2	<5	<5
4	427304	<5	15	125	<0.5	<0.008	740	2	<5	<5
5	427305	5	5	50	<0.5	<0.008	750	6	<5	<5
6	427306	5	5	40	<0.5	<0.008	450	4	<5	5
7	427307	<5	10	45	<0.5	<0.008	600	5	<5	<5
8	427308	<5	15	45	<0.5	<0.008	690	4	<5	10
9	427309	5	50	75	<0.5	<0.008	440	6	<5	10
10	427310	5	20	75	<0.5	<0.008	720	7	<5	10
11	427311	5	15	60	<0.5	<0.008	2750	5	<5	10
12	427312	5	30	655	<0.5	<0.008	2500	220	120	80
13	427313	5	20	30	<0.5	<0.008	2600	15	<5	5
14	427314	<5	15	75	<0.5	<0.008	2250	4	<5	5
15	427315	5	20	60	<0.5	<0.008	1450	5	<5	<5
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	5	5	5	0.5	0.008	10	1	5	5
24	UNITS	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
25	METHOD	101	101	101	101	309	401	114	401	101

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

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ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	23.3.08.05057	18/01/88	2664	2 OF 2

TUBE No.	SAMPLE No.	Zr	Ti							
1	427301	200	2200							
2	427302	550	2750							
3	427303	230	1500							
4	427304	240	1650							
5	427305	180	2150							
6	427306	180	2150							
7	427307	210	2600							
8	427308	250	1400							
9	427309	240	2200							
10	427310	280	2450							
11	427311	260	2750							
12	427312	120	2500							
13	427313	280	2600							
14	427314	210	2250							
15	427315	220	1450							
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	5	50							
24	UNITS	PPM	PPM							
25	METHOD	401	401							

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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APPENDIX 2

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19 JAN REC'D

REVIEW OF GEOPHYSICS AT MARIONOAK
BASTYAN DAM GRID

DISTRIBUTION

Billiton Australia

Aberfoyle Resources - Burnie

Aberfoyle Resources - Hawthorn (2)

PREPARED BY:

J Silic

Senior Geophysicist

January 1987

ISSUED BY:

J Silic

January 1987

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APPENDIX

INTRODUCTION

The previous geophysical work done on the Marionoak/Bastyan Dam property is described in a report by Hungerford and Eadie, 1985.

At the time a drill hole, MO1, failed to intersect any anomalous conductivity that would explain the surface UTEM results. It was then reasoned that the original UTEM interpretation produced a depth estimate much too shallow, however the downhole EM data from Mo1 was confirming the existence of a deep conductive source which was not intersected by the hole.

It was also recognised that the anomalous body was plunging to the south and that there may be exploration potential at a reasonable depth to the north.

Therefore it was recommended that the northernmost lines be covered by CSAMT. It was reasoned that the CSAMT system is more easily interpretable for very large, deep conductors than UTEM and because with CSAMT, line preparation is kept to a minimum.

The purpose of this report is to comment on the newly acquired CSAMT and UTEM data, to review the previous interpretations and to recommend future work.

SUMMARY

The 1983 - 1986 IP, UTEM, DOWNHOLE EM and CSAMT data sets have been reviewed and incorporated into a single interpretation scheme. This has resulted in a new interpretation, which places a deep moderately conductive, southerly plunging source, 200 - 300 metres to the east of the 1985 interpreted position.

It is now interpreted that a deep moderate conductor is positioned at about 100W and is located at a resistivity (lithological) contact in the Rosebery group. All the available geophysical data set do (can) support this conclusion, including the 1986 UTEM.

It is also concluded that the 1985 drill hole MO1 has most likely drilled over the top of the deep conductor, and as such a new 670 metre drill hole is recommended on line 600N, where it is interpreted that the conductor is shallowest (on the available data sets) with a depth to top between 300 - 400 metres.

UTEM INTERPRETATION OF DEEP CONDUCTOR

The problem of interpreting depths and locations of deep features is very much tied in with correctly "interpreting" or "guessing" the causative sources geometry, which may or may not be obvious in the data. It then follows that interpreting or "guessing" the wrong geometry of the causative source, invariably leads to erroneous estimates of depths and locations.

Generally it is extremely difficult from one or even two loops of data to interpret an approximate geometry of a deep source. A large flat lying source at depth can give similar looking anomalies as a large vertically dipping source at depth. Both give rise to what is known as a cross-over anomaly ie the response changes from being positive to negative, the zero point being known as the cross-over point, this point being directly over the position of a vertically dipping source but not so for a flat-lying source (see Figures 1 and 2). However, in contrast to the response over a vertically dipping conductor, the flat conductor response is assymmetrical about the cross-over point (Silic J, 1984, see Figs 1 and 2).

Identifying the geometry of the deep source from limited data, is of course very much tied in with the need the account for the "background" effect on the anomaly. Although, this background problem is inherent in every EM interpretation, it can be particularly serious when interpreting the effects from a deep source, since it is normal for the effects of a deep source not to dominate over the background response and therefore the separation between the two effects may not be so clear. This can invariably lead to erroneous estimates of cross-over points and the geometry of the source.

To illustrate this important point, following example is used.

Figure 1, shows the expected responses from a vertically dipping conductor, at a depth of about 500 metres.

The "A" plot represents the expected response over the conductor when the EM interaction between it and the surrounding geology is not taken into account. It is to be noted that the zero or cross-over point in this situation occurs exactly over the conductor while the distance between the maxima and minima an indication of depth to top in this case equals to about 1.6 depth (ie 800 metres).

When the effect of the background is taken into account, the previously described simple situation changes somewhat.

Firstly the background response is added to the response of the conductor and the response from the conductor is somewhat modified. To keep this discussion simple, the latter effect will not be discussed, since it is a very complex subject and not particularly pertinent to our discussion.

From Figure 1 it is then evident, that the addition of the background to the conductor's response results in:

1° - assymmetrization of the response curve.
2° - shifting of the cross-over point away from the conductor.
3° - flattening of the anomaly curve.

The effects of 2° and 3° could lead (depending on the ratio of background to conductor's response) in erroneously locating the "true" cross-over points and thereby the conductors location, while 1° can lead to an erroneous interpretation of conductors geometry eg flat-lying vs vertically dipping.

It is to be noted that in the situation described the cross-over points from two loops placed symmetrically about the conductor will be separated by about 300 metres.

This of course leads to a further complication, since the geometry of the causative source is usually interpreted by observing the shifting of the cross-over points with the shifting of the loops.

Once again it is obvious that "erroneous" accounting for the background effects can (and generally will) lead to incorrect interpretation of the causative sources geometry or location.

To summarise:

1. The positioning of the deep conductive source is tied in with correctly "guessing" or interpreting the causative sources geometry.

2. The depth to top estimate for the source is also geometry dependent.

3. The geometry of the causative source is usually interpreted from more than one or two loops of data.

4. Background effects need to be considered, when interpreting the effects from a deep source. Incorrect accounting of these effects, can (will) generally lead to erroneous interpretations of the causative sources geometry.

CONTROLLED SOURCE AUDIO MAGNETO-TELLURICS (CSAMT)

CSAMT is an electromagnetic technique which measures at a number of different frequencies, both the electric and the magnetic fields on the surface of the earth. From these measurements, an apparent resistivity number is produced, which is meant to be an indication of the true resistivity of the ground at different depths, with lower frequencies supposedly providing the depth and the "quality" of a conductor information.

This supposedly simple way of viewing the CSAMT data, seriously breaks down in areas of relatively steeply dipping geology with contrasts in resistivity (conductivity) occurring with variations in lithology.

To show the "unexpected" complexity over such situations two examples are used.

First, the apparent resistivity section over a width limited lithology, shows over the anomalous lithology a decrease in the apparent resistivities with decreasing frequencies, while the opposite holds over the surrounding sections (Fig. 3). These "undershoot" and "overshoot" effects in the apparent resistivities, which are not due to any decrease or increase in the resistivities at depth, will of course complicate any simplistic attempts at interpretation over any genuine resistivity (conductivity) variations with depth, in the vicinity of lithological contacts.

Similar situation holds over a major contact (Fig. 4).

To summarise:

1. The simplistic interpretation of the CSAMT data over a conductor near a major lithological contact (which also needs to have a resistivity contrast) seriously breaks down.

2. The presence of resistivity/lithological variations can assymmetrize the CSAMT profile over the conductor, resulting in the lowest apparent resistivity values not being centered on the conductor.

3. In the absence of sophisticated (and maybe expensive) modelling techniques the "artifacts" in the apparent resistivity data caused by lithological resistivity variations, may not be properly accounted for.

INTERPRETATION OF UTEM, CSAMT, AND DOWNHOLE EM DATA

1. Review of 1983 - 1985 UTEM and Downhole EM Data

The interpretation of the conductors shape (Hungerford and Eadie, 1985) was based on an attempt to reconcile the 300 metre separation in the cross overs points from the Loop 1 and Loop 2 (Fig. 5) data. This was done on the assumption that the background effect is negligible in comparison to the anomaly from the conductor at depth. The latter conclusion (or assumption) was based on the fact that the cross-overs (at late times) are occurring at the same position. (Note: generally it is expected but not necessarily so, that the cross-over points when the background effect is significant will be different for different times, with a systematic transition in the cross-over position from early to late times).

Once it was assumed (or postulated) that the background effects are negligible in comparison to the effects from a source at depth, then it was not possible to arrive at an interpretation for a source with a simple geometry eg relatively flat-lying or vertically dipping source. (Note: the discussion on UTEM interpretation regarding positioning of cross-overs).

For that reason a source consisting of a flat-(flattish) top with a vertical side was postulated as being the cause of the surface UTEM anomaly.

Following this interpretation M01 was drilled, resulting in a failure to intersect any anomalous conductivity that would explain the surface UTEM results.

Subsequent downhole EM collected on the two loops provided further information on the nature of the conductive source at depth.

In particular Downhole Loop 2 (Fig. 5) data (Eadie and Hungerford), which is characterised by a very broad negative indicated a deep conductor beyond or below the hole. Loop 1 data on the other hand on careful analyses shows a very distinct anomaly of opposite sign. These effects can only be interpreted as being due to the two loops exciting currents of opposite polarity within the conductor.

In a case of a vertical conductor, this would indicate that the conductor is between the two loops, while a large flat-lying conductor in close lateral proximity to the loops will not duplicate such an effect.

Following the M01 drill hole and the down hole EM data, the 1985 interpretation was reviewed.

The conductor flat-top postulate

As stated previously the existence of a flat-top with a vertical side, conductor was postulated in an attempt to reconcile the differences in the cross-over positions from the two loops (UTEM Loop 1 and Loop 2) of UTEM data (Hungerford and Eadie, 1985).

However in reviewing the data it became apparent that while from the Loop 1 data the positive magnetic field is stronger than the negative by a factor of about 2-2.5 to 1 (which could support the existence of a source with a flattish-top underneath the loop) the same is also true for the loop from the other side of the Loop 1 cross-overs. Such data would suggest that the two loops have been placed more or less symmetrically, about a symmetrical source. Note: a non-symmetrical source such as was suggested by Hungerford and Eadie interpretation is expected to produce significantly different results for the two loops that are placed on either side of it.

Therefore it was suspected that the source may indeed be vertical (or symmetrical about a centre point) and that the discrepency between the cross-over points from the two loops is due to the addition of a significant background response to the anomaly [this may be half space effects, or other conductors radiating] and not due to the variations in the coupling of the loops magnetic field with the body (see previous discussion in the interpretation). The position of the conductive source then would have to be somewhere between 100-200W ie approximately half-way between the cross-over points from Loop 1 and Loop 2.

To check that this indeed may be so, the horizontal magnetic field data was reviewed. It then became apparent that this data (point normed) is peaking at around about 100W (see data sections Hungerford and Eadie, 1985). This peak in the case of a vertically dipping conductor marks its position, and as such does confirm the interpretation based on the cross-over in the vertical magnetic field from the two loops (UTEM Loop 1 and Loop 2).

Following these conclusions, down hole EM from M01 was reviewed. As stated previously the anomaly from the downhole loops changed from being positive for the Downhole Loop 1 data to negative in the Downhole Loop 2 data. Postulating the existence of a vertical conductor at a depth and at about 100W completely supports this. From Figure 7, it is evident that the two loops would indeed have given rise to currents of opposite polarity in the conductor, since their respective magnetic fields cut the conductor in opposite directions.

Therefore it is concluded that taking into the account the presence of significant background effect, the observed data could be explained by the existence of a vertical conductor at about 100W, about 200 - 300 metres to the east of previously interpreted position. As such it is concluded that M01 drilled over the conductor. The downhole EM data from the two loops, supports this assertion.

However as a test of this interpretation it was recommended that a UTEM loop be centred on the interpreted position for a vertical conductor and that in loop data be collected. It was reasoned that if the conductor was indeed vertical and positioned at approximately 100W then no conductor response should be observed in this particular situation, since the magnetic field from the loop would not cut the conductor (see Figure 6).

This indeed was the outcome and shall be discussed in the latter section.

2. Review and Interpretation of CSAMT Data.

Two sets of CSAMT data have been collected between February 1985 - February 1986. The interpretation of this data has been reported on by the Zonge organisation (see Zonge 1985 and Zonge 1986).

The data from the first one line survey was interpreted by the Zonge organisation to be reflecting lithological resistivity changes, and not the existence of a deep conductive source. Aberfoyle's personnel (ETE) expressed considerable doubt on the validity of these conclusions and consequently Zonge organisation changed their point of view. It was on the basis of unusually high phase data at low frequencies, Zonge organisation was prepared to accept the existence of a deep conductive source in the area, this being consistent with the conclusions drawn from the UTEM data.

The second and more extensive CSAMT data set was collected in February 1986 with coverage on lines 0, 800, 1200 and 1600N (see Zonge 1986). In contrast to the first survey the energising source was oriented in the E-W direction, across the geological strike. Such a mode of operation, in simple geological environments would lead to sharper definitions of the causative sources location and boundaries, should the dimensions of the body be such that its lateral boundaries would in fact be resolvable.

The most striking feature of the February 1986 data set is that it shows clear evidence of a resistivity (and thereby a lithological) contact at about 100W, with low apparent resistivities at low frequencies to the west of the contact (see Figure 8 Note: For a more complete CSAMT data set see Zonge 1986). These low apparent resistivities at low frequencies are interpreted as indicating a conductive source at depth, although as was pointed out in the earlier section on interpretation, because of lateral resistivity changes occuring across the lithologies, the position of the conductor does not necessarily have to coincide with the lowest apparent resistivity. (This point will be cleared up in latter sections).

The unusually high and increasing phase values (see Figure 9) at low frequencies are also indicative of a conductive (and inductive) source at depth, although the phase values are exceedingly high (theoretical maximum for single bodies is ~ 1600 milliradians, the values on the property are twice that!). The explanation for the exceedingly high phase values can be manyfold, however the preferred one is that they may be due to the existence of another large conductive source in the area which is acting as a competing transmitter and therefore in the absence of a conductive source at depth on the Bastyan licence the "background" phase values would be higher than the expected "normal" value of 785 milliradians. The presence of a deep conductive source of course makes these phases even higher.

3. HLEM Data

The HLEM data (see Figures 10-13) was collected on lines 800N - 1600N, with coil separations varying from 100 - 150 metres. As is clearly evident in the figures no good inphase conductors have been detected.

In fact only out-of-phase anomalies are evident, indicating the presence of moderate resistivity variations which are interpreted to be outcropping and are extending to at least 75 metres down.

4. 1986 Interpretation of the Bastyan Dam Geophysical Data Set

Because of the expected complexities in the CSAMT data (see discussion on interpretation and comments on the CSAMT data) the CSAMT data was not initially used to interpret the position of the deep source. However, the CSAMT data relevant to the interpretation of the near surface features such as lithological resistivity contacts was used. The latter was also interpreted from the limited amount of IP data, HLEM data and the early time UTEM.

The interpretation of the deep source however was based solely on the UTEM data and the downhole EM data.

The interpretation of the deep source was based on the premise that it is indeed vertically dipping (see discussion on the UTEM), and that the difference between the cross-over positions from UTEM Loop 1 and 2, was not due to a source assymmetrically positioned with respect to the two loops but rather due to the addition of a significant background effect to the anomaly from the deep source. Such an interpretation placed the conductor 200 - 300 metres to the east of previously interpreted position.

Combining all the four data sets (IP, HLEM, UTEM and CSAMT) in a single interpretation scene led to an interpretation which is summarised in Fig 14.

Essentially, it is interpreted that a deep southerly plunging moderate conductor is located at a resistivity contact in the Rosebery group (Fig 15, for geological summary see Purvis J.G. 1986). This resistivity contact and the subsequent resistivity variation is also evident as a gravity high in the Shell's data (see Hungerford and Eadie, 1985).

The deep conductor has not been closed off to the south, nor to the north. The southern limits are not known because of the expected great depths to top in the southern part of the grid may make the target too deep to be detected, and alternatively from a limited data set, it is not possible to know whether to the south of 400S, the effects from the conductor are off-end effects or are indeed due to the effects from a conductor below the data lines (ie when a plunging conductor is at a depth much greater than the line separations, it is not possible to know whether the attenuation of the anomaly from line to line due to the conductor becoming deeper or alternatively due to an increasing off-end effect).

The northern extension of the conductor is not precisely known because of lack of extensive UTEM or CSAMT data to the north of 800N. However it is interpreted that the conductor extends to at least 800N, giving it a minimum known strike length of 1000 - 1200 metres.

Interpreted depths to top vary from 500 - 700 metres on line 0N to 300 - 400 metres on line 600N. Considering that it is interpreted that the body is plunging to the south, it is expected that it is even shallower on 800N.

The southerly plunge is interpreted entirely on the UTEM data where it is evident in the decreasing depth to top estimates to the north and the very obvious decrease in the amplitude (but not the decay) of the anomaly from northern to southern lines (see data sections in Eadie and Hungerford).

The northern resistivity low, evident on line 1600N CSAMT data and the northerly lines HLEM data set is now interpreted to be due to a fault related resistivity low, (Figs 14 and 15) and is not related to the unit of low resistivity to the south as was originally interpreted using "tram-line" geological concepts on a sparse data set, by this author.

Whether the deep conductor swings to the NE or is in fact cut off with the northerly fault is not known, since no geophysical data to the east of the northern fault has been collected.

As a final test of the 1986 interpretation, which, as was previously stated was based on the interpretation that the deep source may be entirely vertically dipping, a third and final loop of UTEM data was collected.

This loop, Loop 3 (Fig. 5), was so placed so that it would be minimally coupled with a vertically dipping conductor positioned at about 100W (see Fig 6). It was expected that if the interpretation was correct, that no late time UTEM anomaly will be evident in the UTEM Loop 3 data. However the wider and shallower lithological units were expected to be evident in the early time data.

This indeed proved to be the case.

UTEM Data Sections 1 - 6, clearly show no evidence of a cross-over at late times, only a uniform (slightly sloping) background effect is observed. However the early time data (up to Ch 6) clearly shows the lithological contacts to the west of 100W. Note: the sudden rise followed by cross-overs or apparent cross-overs in the response, to the west of 100W on lines 0N, 200N and 200S.

This loop 3 data together with the downhole EM data and UTEM Loop 1 and 2 data (see discussion on UTEM review) then completely supports the interpretation as shown in Fig 14.

It is therefore recommended that it is this interpretation that be drill tested on line 600N where it is interpreted that the deep conductor is shallowest. Note: although it is believed that the conductor may be another 50 metres shallower on 800N drilling on this line is not recommended since we have insufficient data for an accurate location of the conductor.

Following the interpretation of the deep conductive source, which excluded the use of the CSAMT data, Zonge organisation was asked if they could assist in taking out some of the "artifacts" in the CSAMT data which are due to the lateral resistivity changes. Their simplistic and only an approximate approach (STATIC CORRECTED RESISTIVITY) nevertheless produced useful results.

Figure 16, the "corrected" data, in contrast to the raw data (Fig 8) does indeed appear to be in substantial agreement with the UTEM interpretation (ie a deep conductive source located close to the major resistivity contact). Note the peaking of low resistivities on most frequencies below 200W. Similar conclusions can be drawn from the 800N CSAMT data set.

However, no reliable depth estimates are quoted from this data set.

Cominco (American) have at various stages of the CSAMT project been involved with the inversion of the CSAMT data. It is the opinion of the author however, that considering we are dealing with steeply dipping lithologies, their approach which was based on the assumption that the stratigraphy and the conductive target are flat-lying cannot produce very accurate (useful) depth and position estimates for the conductor.

Nevertheless, the CSAMT interpretation is finally consistent with the other data sets, at least in a qualitative sense.

RECOMMENDATIONS FOR DRILLING

Interpretation of UTEM Line 600N

1. Position of Conductor

For a vertically (relatively) dipping conductor the position of the conductor is marked by the cross-over point of the vertical secondary magnetic field. The conductor position however, also coincides with the maximum slope in the vertical secondary field.

In the presence of a significant background effect (may included effects of other conductors), determining the point of maximum slope is the more reliable method (particularly when used in conjunction with the horizontal secondary field data), in estimating the lateral location of the conductor.

Using the maximum slope technique in conjunction with the horizontal field data, the conductors position is estimated to be at 125W (see Figure 17).

The lower and upper bounds for this position, which take into account inaccuracies in the data and the fact that the data was collected on 50 metre station spacing are 75W and 150W.

2. Depth to Top

Determining the depth to top, depends very much on the interpreters estimate of the conductors down dip extent. For vertical conductors, this estimate is not readily evident in the observed data, apart from general observations on whether the down dip extent is large or small in comparison to the loop size and the depth of burial. Nevertheless for all these models the depth to top is related to distances between the characteristic points on the response curve. These distances however are not a simple function of depth, but rather are model dependent (eg for a small depth extent source peak - peak distance in the vertical field =

1.0 depth while for a large depth extent source it is equal to 2.5 depth).

To determine a depth to top estimate, a number of characteristic points of the response curve can be used (eg peak to peak distance, 0.5 width, 2/3 peak to peak distance etc). However, for this particular interpretation considering that "background" effects are significant and therefore estimation of peak - peak distances is difficult (Note, the very subtle peaking of the curve), it was decided to use the following parameters as a depth estimate.

$$D = \frac{\text{Peak - Peak Amplitude}}{\text{Maximum Slope}}$$

Using this parameter gives the following depth to top estimates for the "large" down dip and "small" down dip extent models (large means, down dip extent >> depth to top, "small" means, down dip extent <0.2 depth to top).

"Large" Down Dip Extent	"Small" Down Dip Extent
D = 1.3 depth	D = 0.65 depth

Between these two extremes, are estimates for intermediate down dip extent eg for the example in Fig. 4, D = 0.85 depth where the down dip extent is approximately equal to 300 - 400 metres.

From Figure 17 we estimate D on line 600N to be between 325-350 m.

Therefore the following depth estimates apply.

Large Down Dip Extent	Intermediate Down Dip Extent	Small Down Dip Extent
Depth = 250-280m	Depth = 380-410m	Depth = 500-540m

However from the continuously normalised data it is apparent that we are not dealing with a "small" down dip extent type body (Note: the increasing continuously normalised secondary fields towards the end of the line). Therefore, it is estimated that the bodies down dip extent is either large or intermediate, and as such the depth to top estimate has to be taken to be between 300 - 400 metres.

3. The conductivity thickness product

Considering that we are dealing with a conductor with a strike length greater than 1200 metres, and a depth extent of at least 300 metres, the conductivity thickness product of the body cannot be "excessively" high, for it to have produced an anomaly with a time constant about 3.5 - 4.0 milliseconds (for time constant see Hungerford and Eadie, 1985).

In fact an estimate for the conductivity - thickness product of about 20 - 30 mhos is obtained for bidies with "large" down dip extents. In other words it is a moderate conductor, but good enough to be due to sulphide accumulations. (Note: intermediate depth extents estimate will result in high conductivity thickness estimates).

4. Dip Estimate

Because of a significant background effect, no accurate dip estimate is possible. However there is no suggestion in the data that it is not relatively vertical.

5. Comparisons with Modelling Results

Fig. 18, shows the predicted response on line 600N of a southerly plunging conductor at varying depths and down-dip extents, where no "background" effects are included. The response is at an "arbitrary" late time UTEM channel and conductivity thickness product, since ranging these two parameters simultaneously or independently will mainly change the amplitude of the curve and will have a minor effect on the shape of the profile. Therefore in order to compare Fig. 18 with Fig. 17, we should be mainly concerned with comparisons of the curves shapes (amplitude fitting can be done through varying the conductivity thickness product).

It is then apparent that when the "background" effect on line 600N is compensated for, the shapes of the predicted and observed profiles are indeed very similar in particular the characteristic parameter D, which was used to determine the depth to top.

The interpreted model response, can therefore be considered to be in quantitative agreement, with the observed data on line 600N.

Interpretation Summary for Line 600N

A moderate 20 - 30 mho conductor with a strike length of at least 1200 metre is located between 75W - 150W at a depth of 300 - 400 metres.

DRILLING RECOMMENDATIONS

The summary of the recommended drilling is shown in Figure 19.

A 670 metre hole collared at 185E, and drilled at an angle of 60° from the west is proposed. (Optimum angle is 61.2°, which would result in hole 669.2 metres!)

The hole is designed so that it intersects "conductors location area", 50 metres below the 400 metre depth estimate at the easternmost estimate for the conductors position ie 75W.

CONCLUSIONS

The 1983 - 1986 IP, UTEM, DOWNHOLE EM and CSAMT data sets have been reviewed and incorporated into a single interpretation scheme. This has resulted in a new interpretation which places a deep moderately conductive southerly plunging source 200 - 300 metres to the east of the 1985 interpreted position.

It is now interpreted that a deep moderate conductor is positioned at about 100W and is located at a resistivity (lithological) contact in the Rosebery group. All the available geophysical data set do (can) support this conclusion including the 1986 UTEM.

It is also concluded that the 1985 drill hole MO1 has most likely drilled over the top of the deep conductor, and as such a new 670 metre drill hole is recommended on line 600N, where it is interpreted that the conductor is the shallowest (on the available data sets) with a depth to top between 300 - 400 metres.

PREPARED BY:

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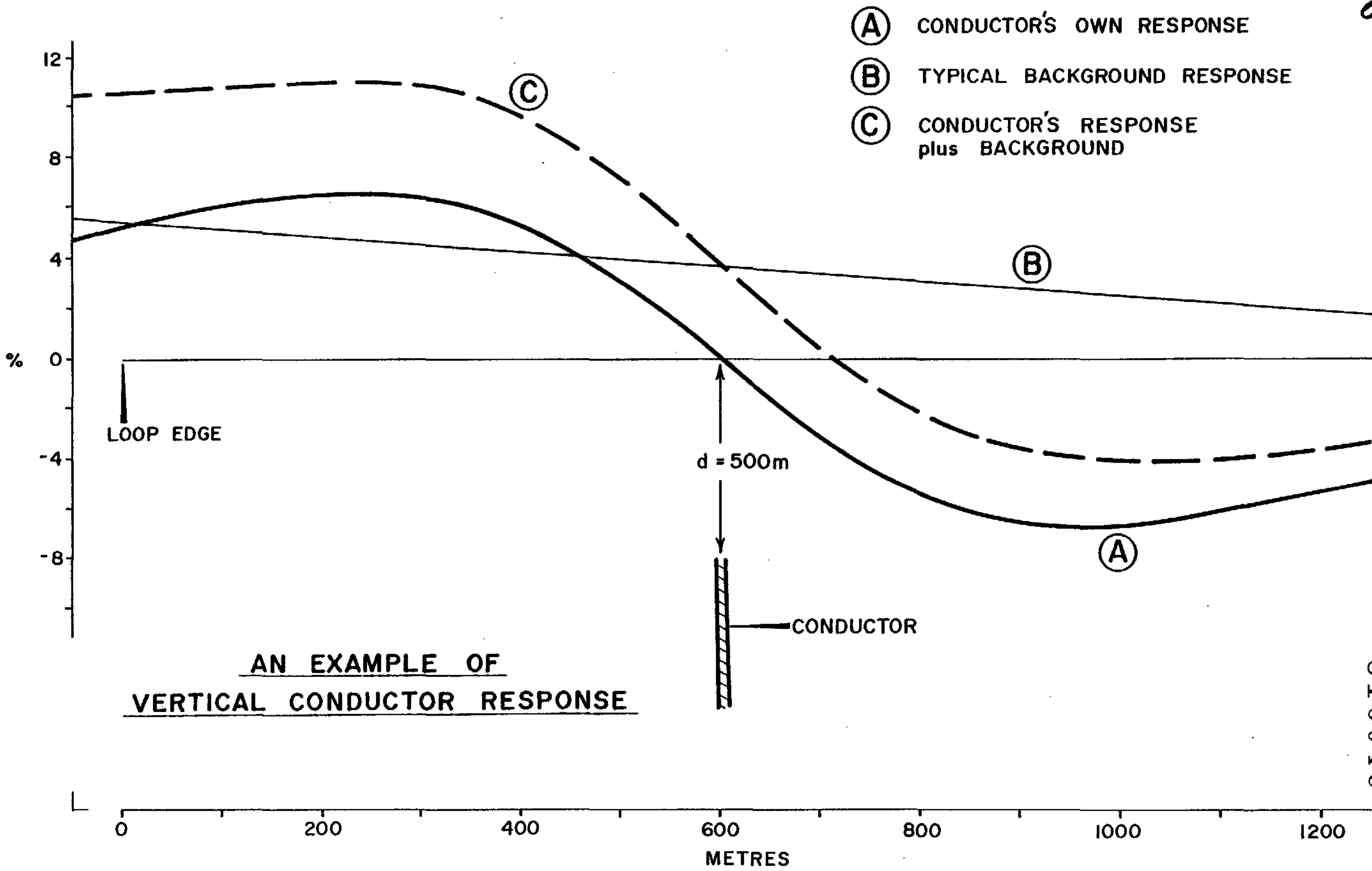
Zonge Engineering and Research Organisation 1986 CSAMT Survey, Final Report, Marionoak Project near Roseberry, Tasmania for Aberfoyle Resources Limited.



AN EXAMPLE OF VERTICAL CONDUCTOR RESPONSE

5 cm

FIG. 1

047

816049

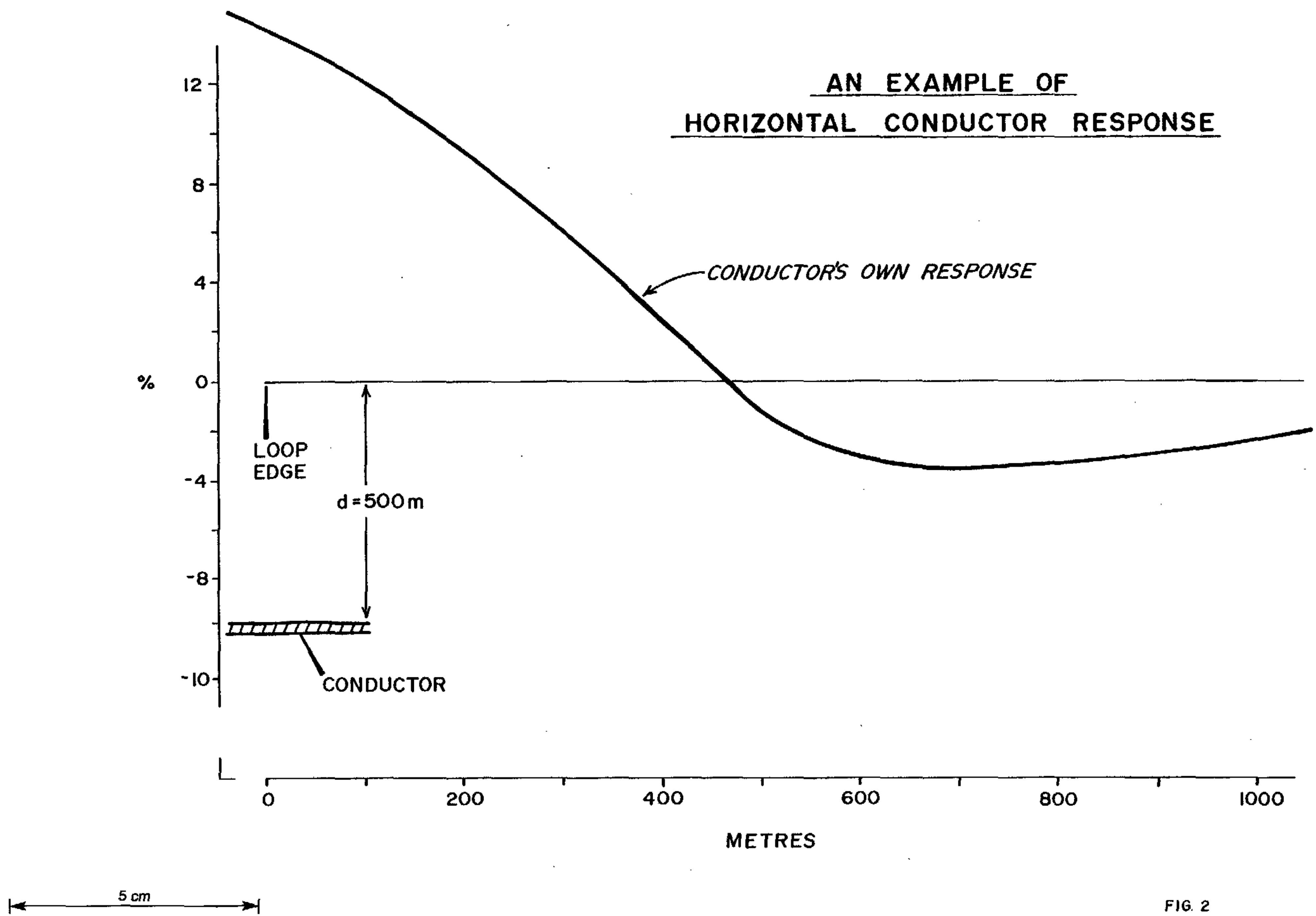
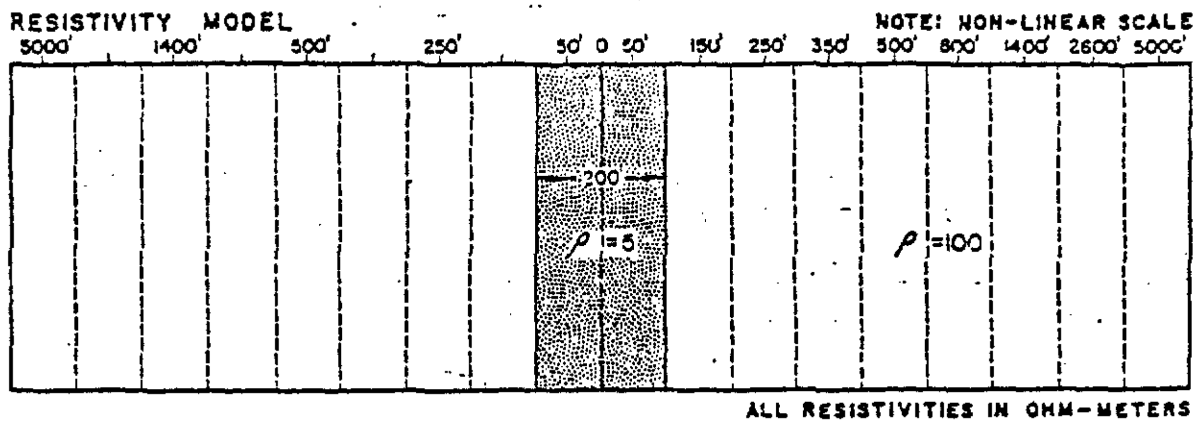


FIG. 2

048

816050


RESISTIVITY MODEL
NOTE: NON-LINEAR SCALE
5000' 1400' 500' 250' 50' 0 50' 150' 250' 350' 500' 800' 1400' 2600' 5000'
200
ρ=5
ρ=100
ALL RESISTIVITIES IN OHM-METERS

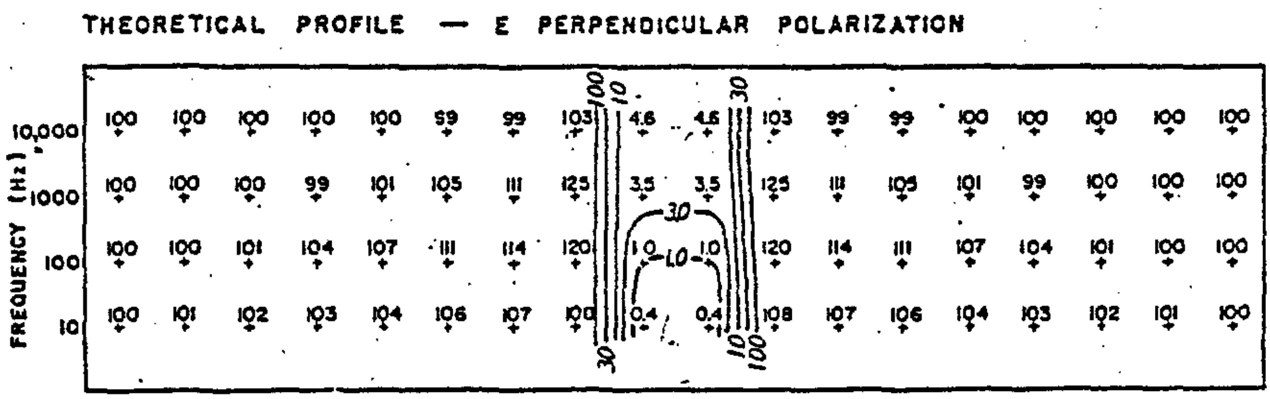

THEORETICAL PROFILE — E PERPENDICULAR POLARIZATION
FREQUENCY (Hz)
10,000
1000
100
10
100 100 100 100 100 59 99 103 4.6 4.6 103 99 99 100 100 100 100 100
100 100 100 99 101 105 111 125 3.5 3.5 125 111 105 101 99 100 100 100
100 100 101 104 107 111 114 120 1.0 1.0 120 114 111 107 104 101 100 100
100 101 102 103 104 106 107 100 0.4 0.4 108 107 106 104 103 102 101 100
100
10
30
1.0

FIG. 3

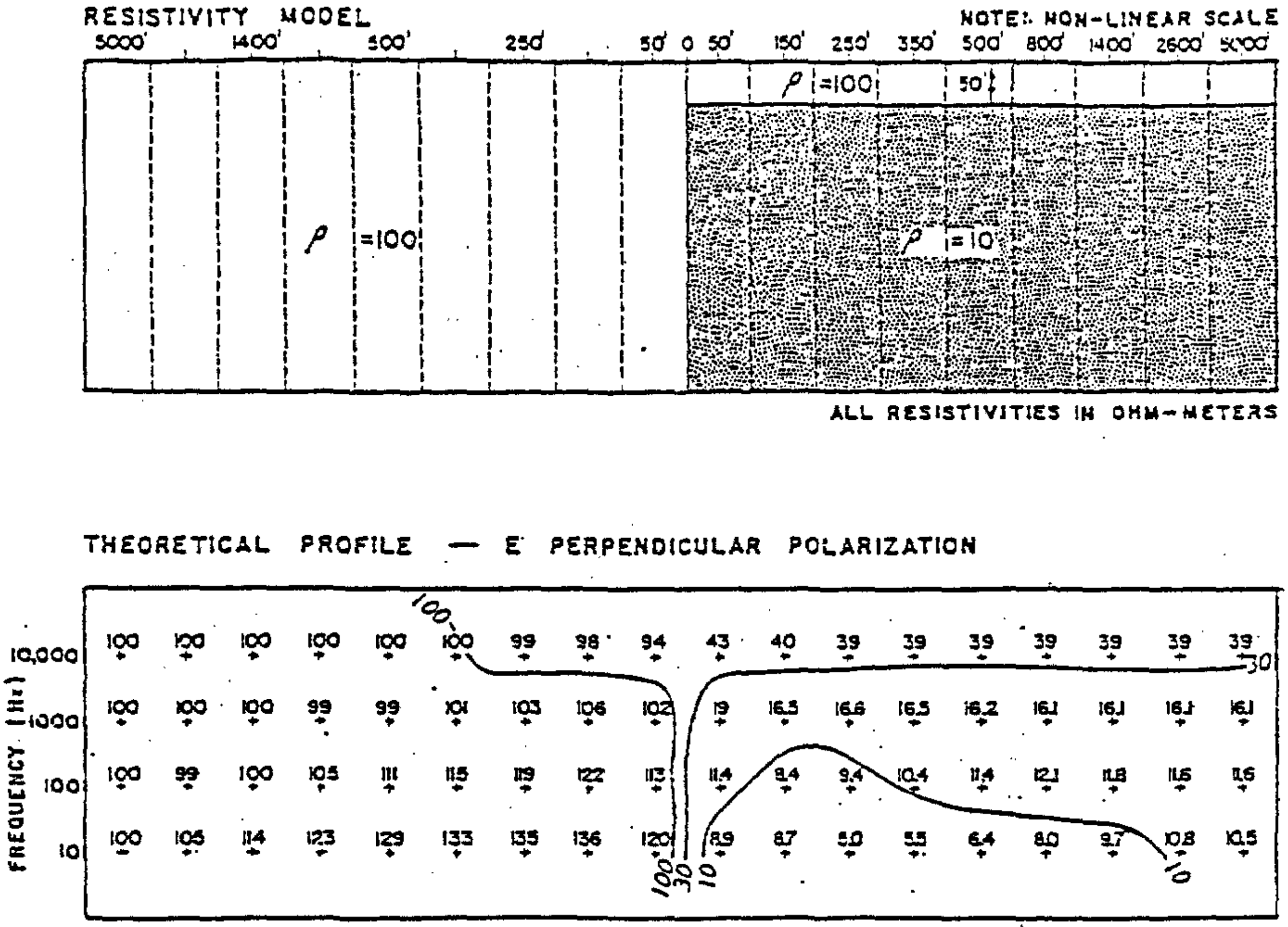
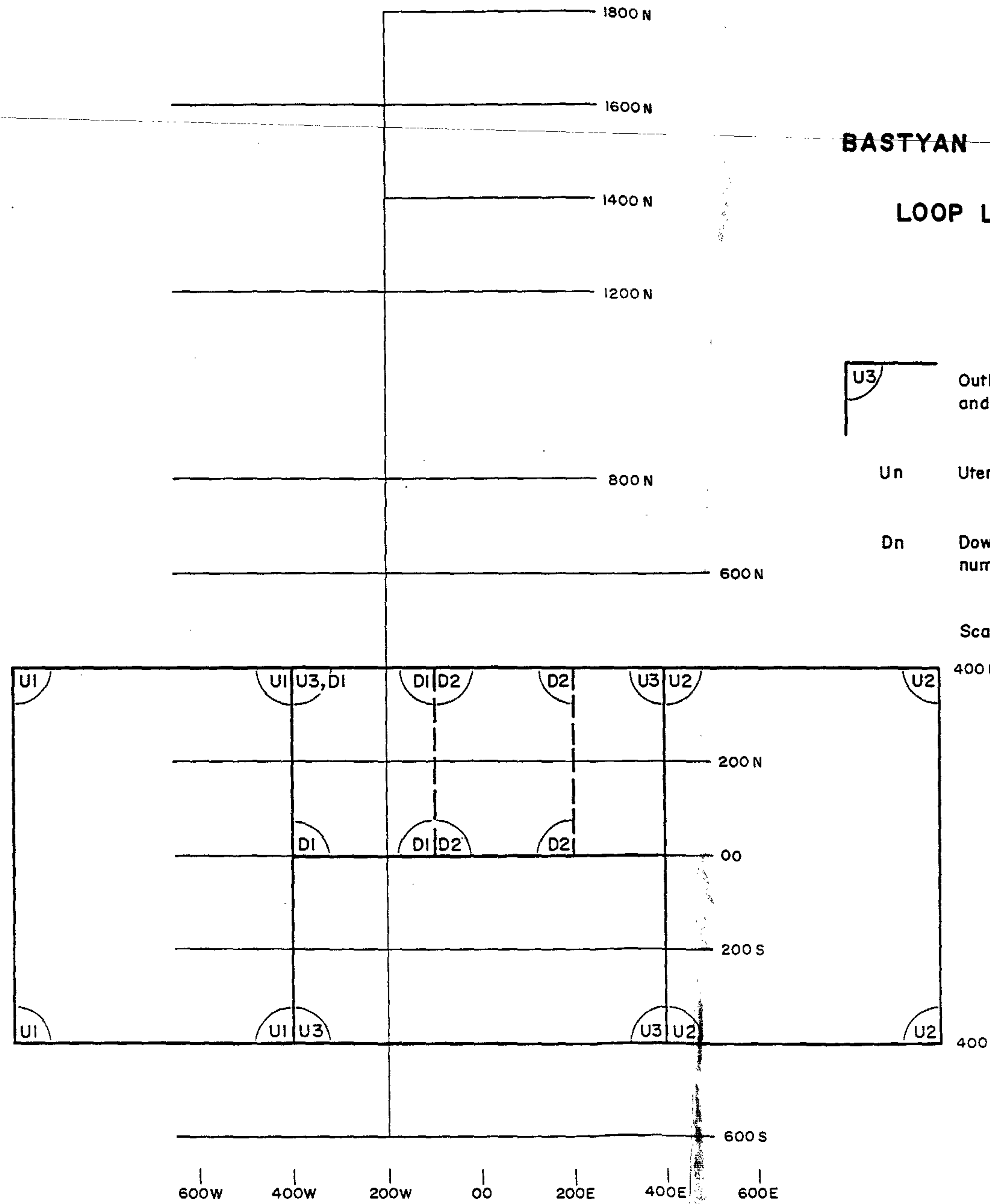

RESISTIVITY MODEL
NOTE: NON-LINEAR SCALE
5000' 1400' 500' 250' 50' 0 50' 150' 250' 350' 500' 800' 1400' 2600' 5000'
ρ =100
ρ =100
50'
ρ =10
ALL RESISTIVITIES IN OHM-METERS
THEORETICAL PROFILE — E PERPENDICULAR POLARIZATION
FREQUENCY (Hz)
10,000
1000
100
10
100 100 100 100 100 100 99 98 94 43 40 39 39 39 39 39 39 39
100 100 100 99 99 101 103 106 102 19 16.5 16.6 16.5 16.2 16.1 16.1 16.1 16.1
100 99 100 105 111 115 119 122 113 11.4 9.4 9.4 10.4 11.4 12.1 11.8 11.6 11.6
100 105 114 123 129 133 135 136 120 8.9 8.7 5.0 5.5 6.4 8.0 9.7 10.8 10.5
100
30
10
100
30
10
10

FIG. 4

816053

BASTYAN DAM GRID

LOOP LAYOUT



U3 — Outline of transmitter loop and loop number.

Un — Utem loop number n.

Dn — Downhole EM loop number n.

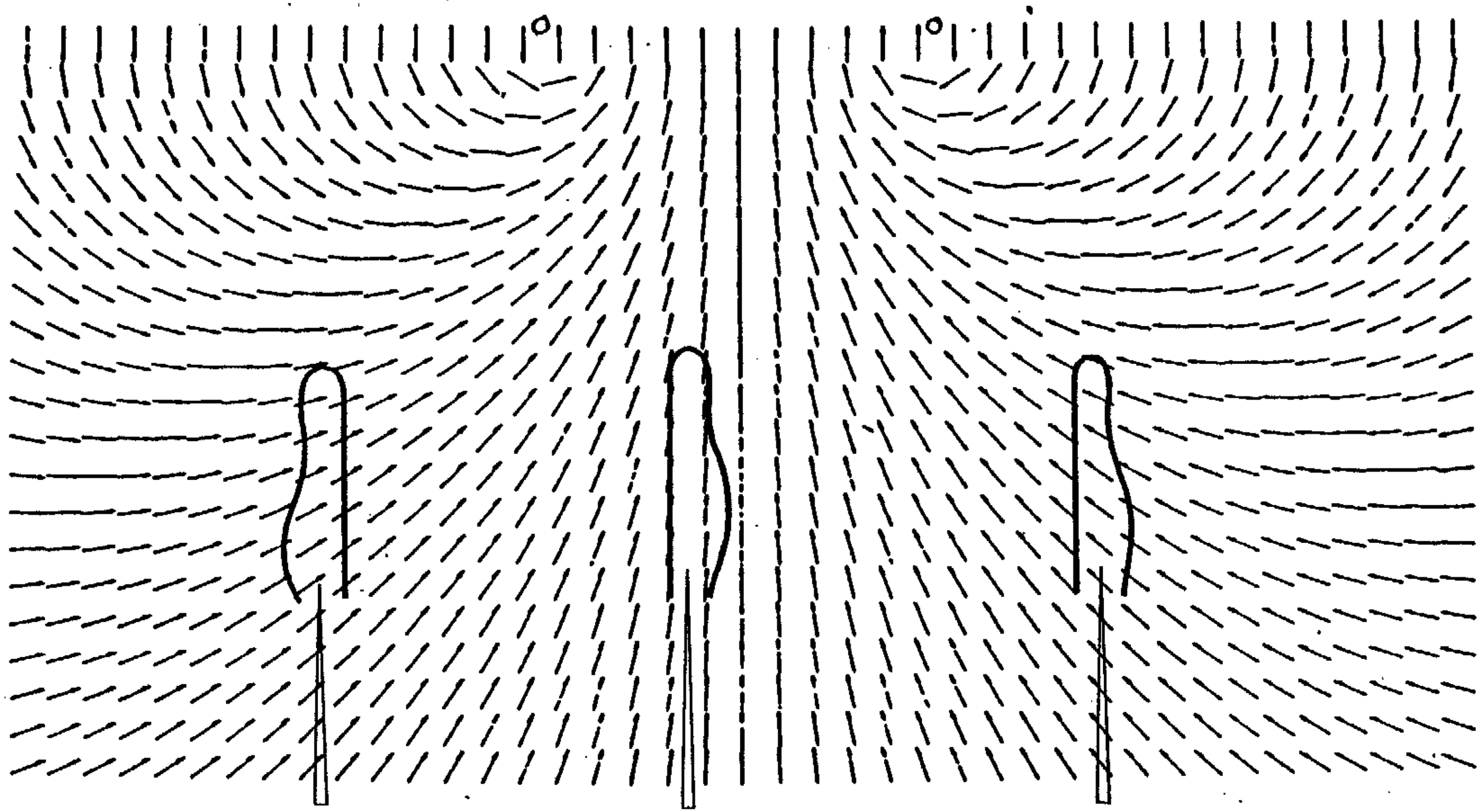
Scale 1:10 000

FIG. 5

UTEM LOOPS 1,2 & 3

PRIMARY FIELD DIRECTIONS

LINE OON



CONDUCTOR POSITION FOR LOOP 2

CONDUCTOR POSITION FOR LOOP 3

CONDUCTOR POSITION FOR LOOP 1

NOTE : SHAPE OF THE CONDUCTOR AS SHOWN IS COMPLETELY SCHEMATIC.

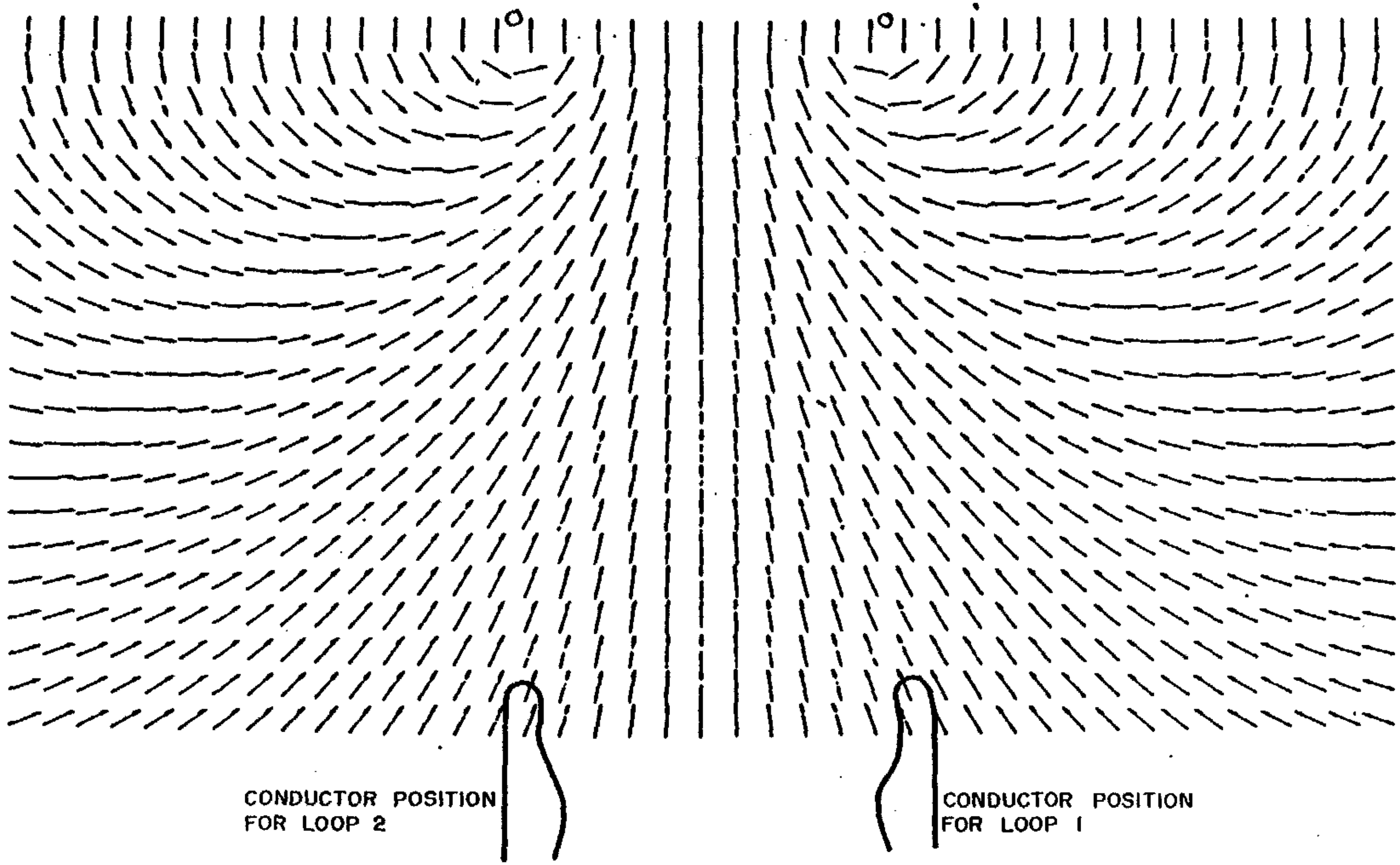
FIG. 6

052

816054

PRIMARY FIELD DIRECTIONS
DOWNHOLE EM

053



NOTE : SHAPE OF THE CONDUCTOR
AS SHOWN IS COMPLETELY
SCHEMATIC.

FIG. 7

816055

054

Line 0000N
Marionoak
for
ABERFOYLE EXPLORATION

CSAMT SURVEY DATA
CAGNIARD RESISTIVITY

values in ohm-meters
<RHO-C

[Plot limits] and LOGARITHMIC CONTOURS
(Interval: 0.20)

[8493]	398
6310	251
3981	158
2512	100
1585	63.1
1000	39.8
631	[32.5]

ZONGE # 578
PLOT BY CPLOT 4.01
PLOTTED 20 Nov 86

RECEIVER DATA
Length : 100.m Line : N 58 E
Spacing: 100.m DiPole: N 58 E

Surveyed: Feb 86

TRANSMITTER DATA
Length : 1.3 Km
Orient. : N 65 E
Distance: 6.0 Km
Rx to Tx: S-E

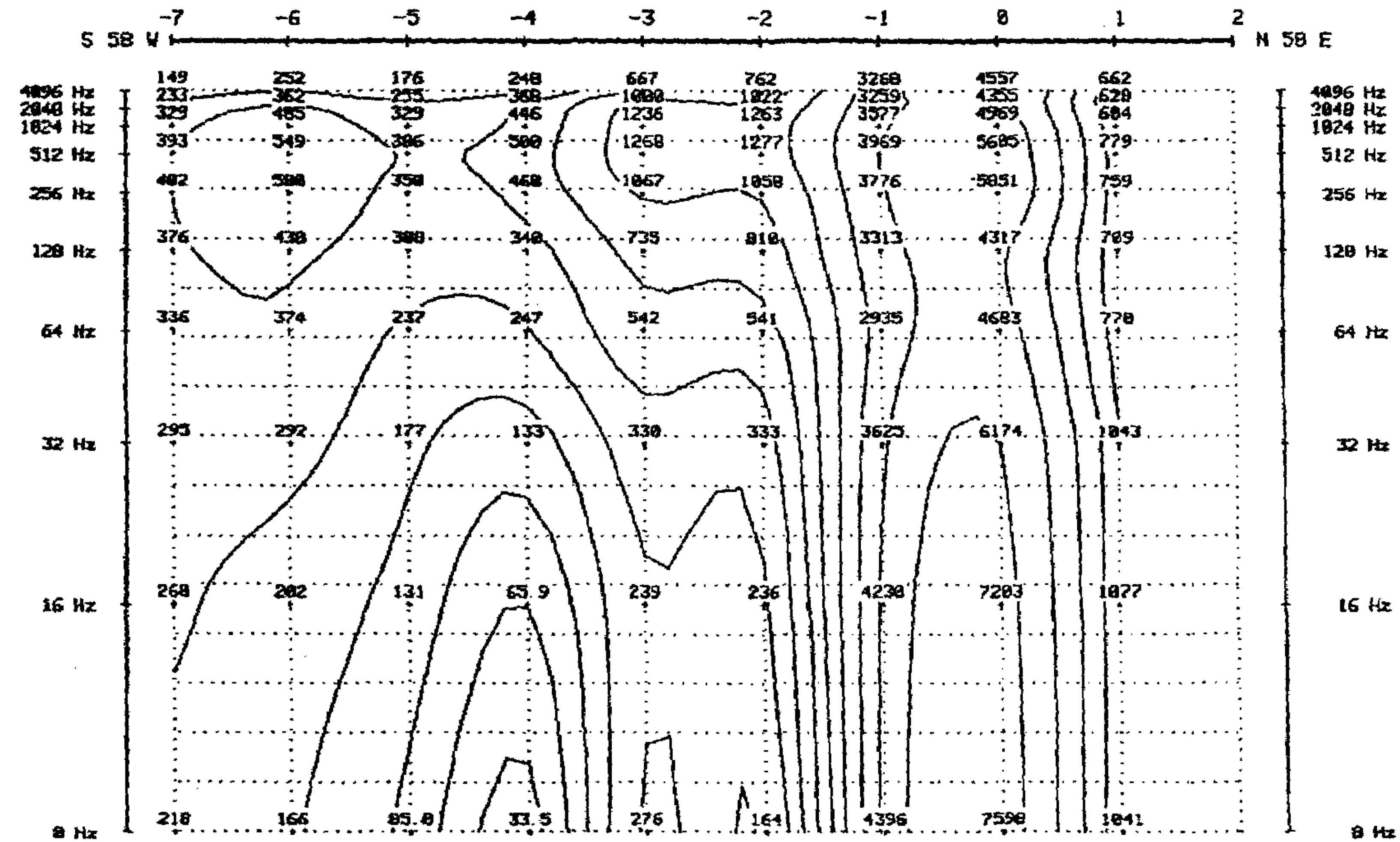


FIG. 8

81609

Line 0000N
Marianoak
for
ABERFOYLE EXPLORATION

ZONGE # 570
PLOT BY CPLOT 4.01
PLOTTED 20 Nov 86

CSAMT SURVEY DATA
PHASE DIFFERENCE (E - H)

values in milli-radians
(PDIFF

RECEIVER DATA
Length : 100. m Line : N 58 E
Spacing. 100. m DiPole: N 58 E

Surveyed: Feb 86

TRANSMITTER DATA
Length : 1.3 Km
Orient. : N 65 E
Distance: 6.8 Km
Rx to Tx: S-E

[Plot limits] and ARITHMETIC CONTOURS
(Interval: 100.00)

[3317]	2300	1200
3300	2200	1100
3200	2100	1000
3100	2000	900
3000	1900	800
2900	1800	700
2800	1700	600
2700	1600	500
2600	1500	400
2500	1400	[370]
2400	1300	

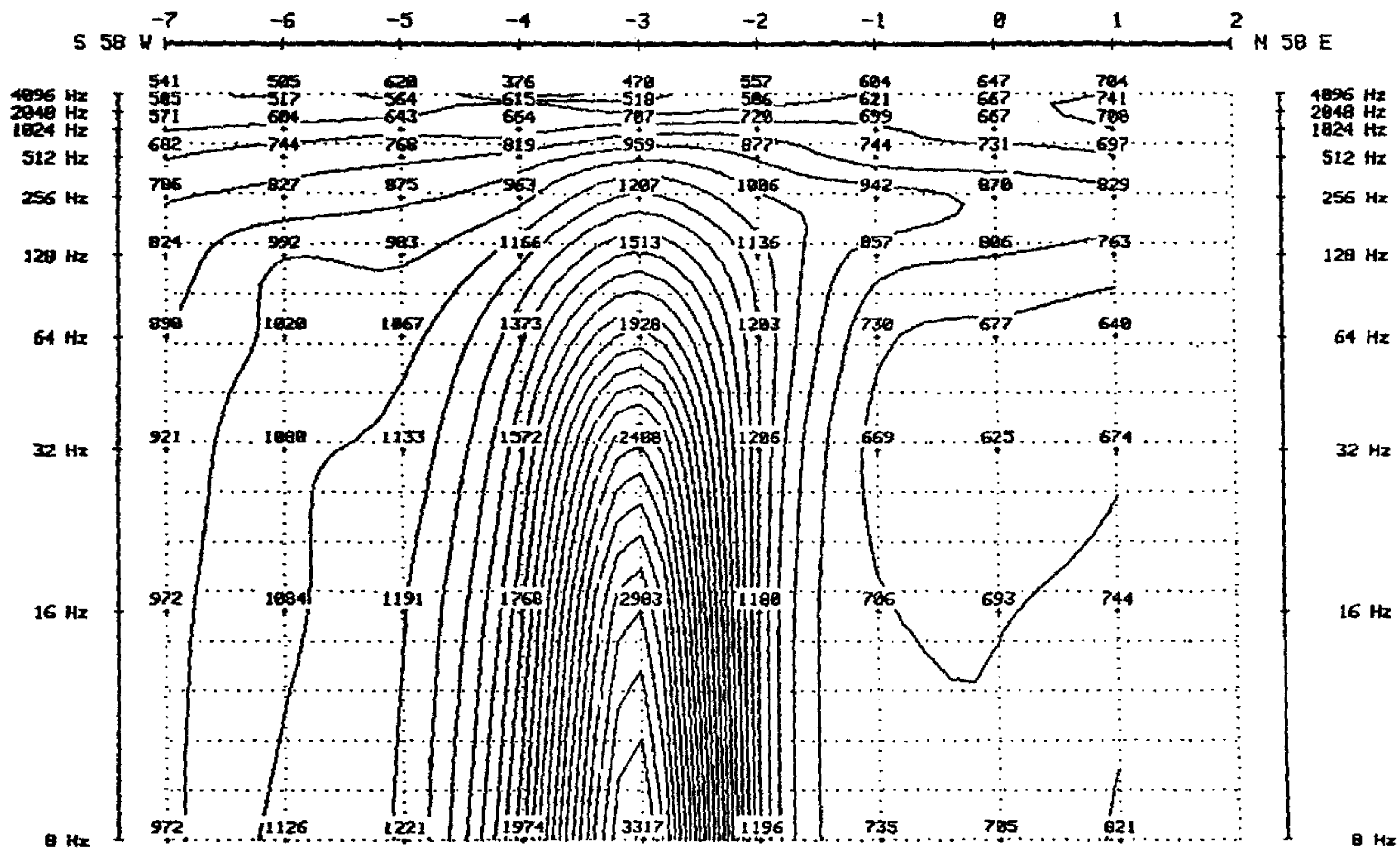
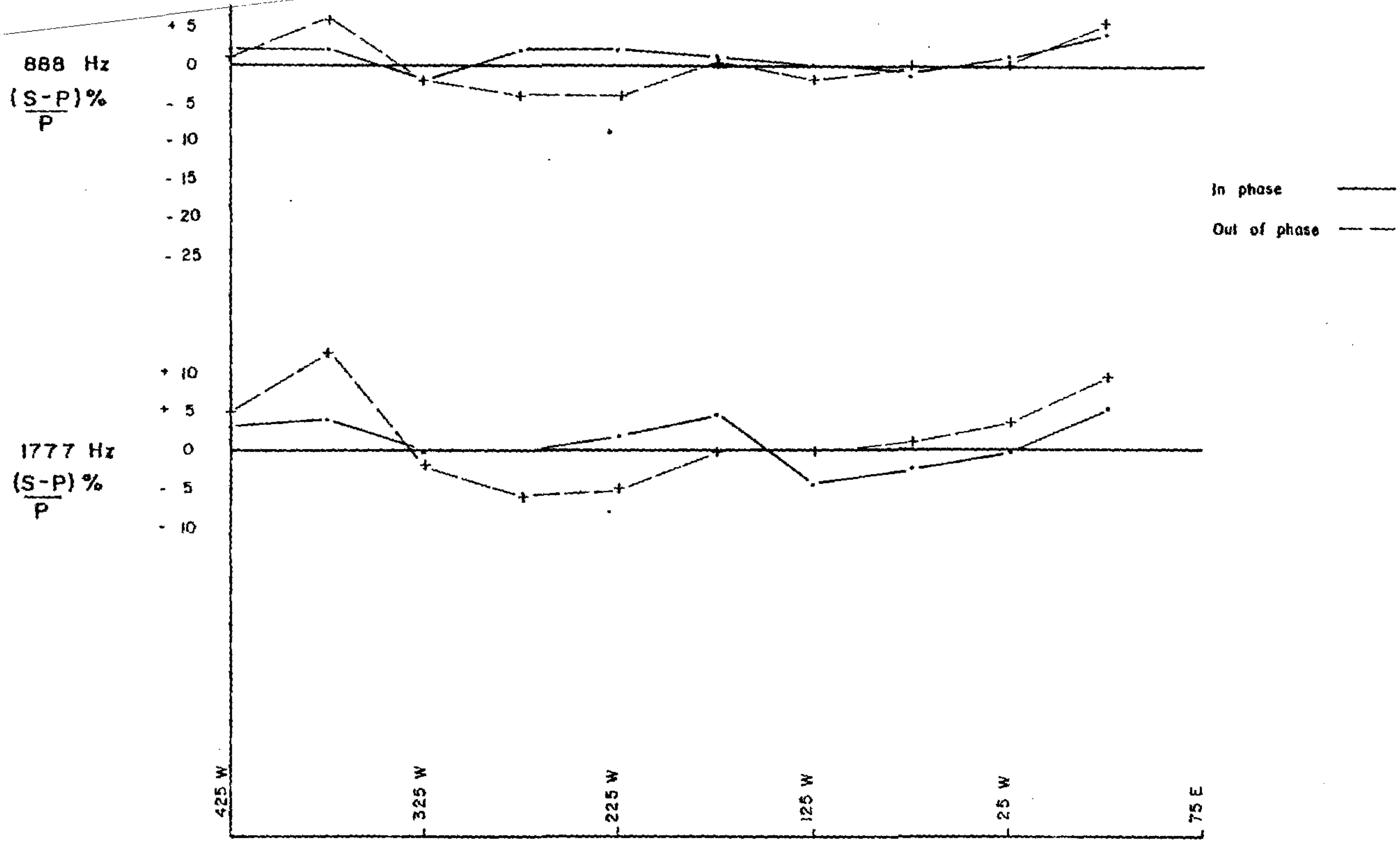


FIG. 9



HLEM

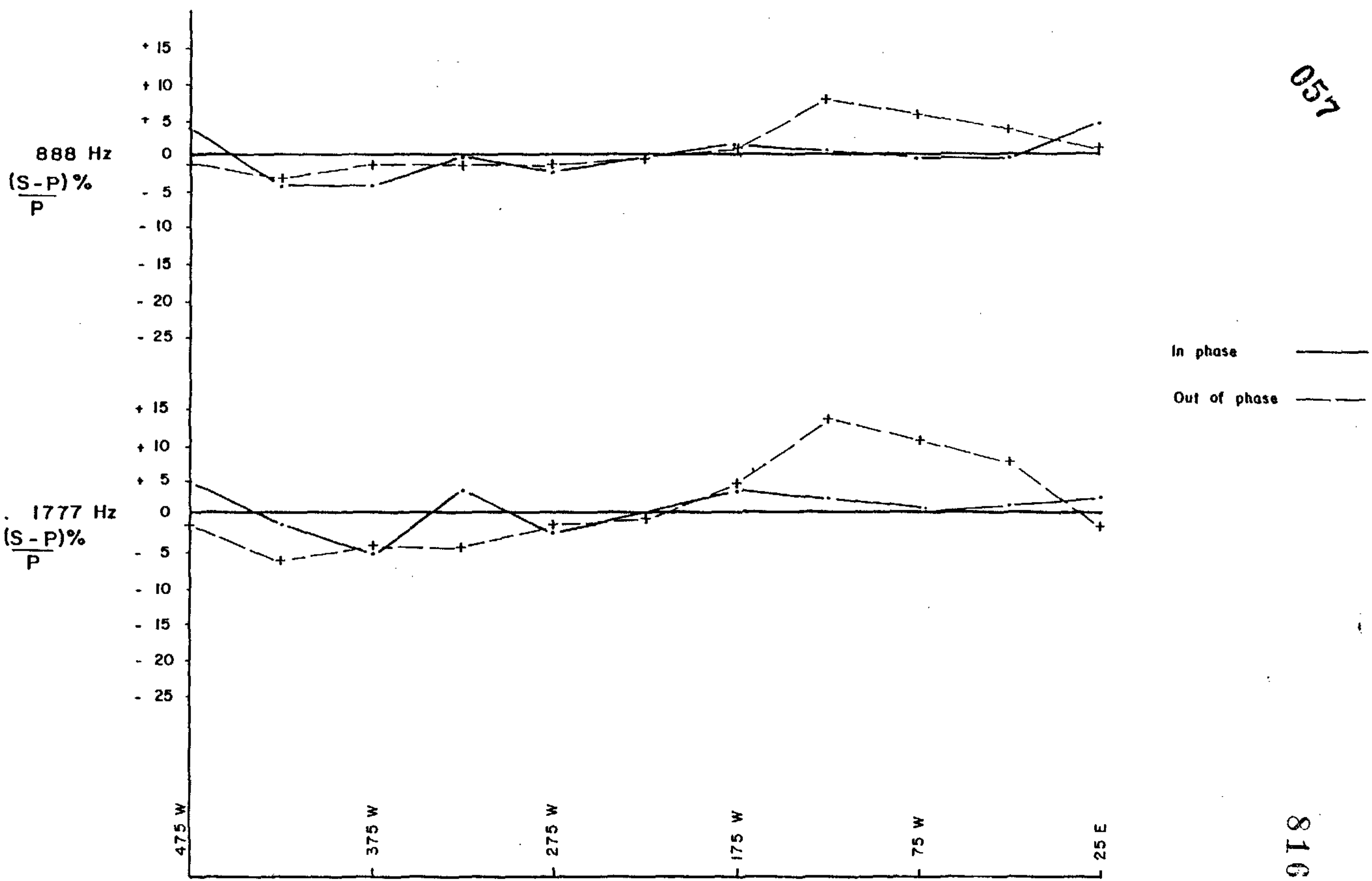
BASTYAN DAM PROSPECT

LINE: 800 N SEPARATION: 150 m

FIG 10

056

816058



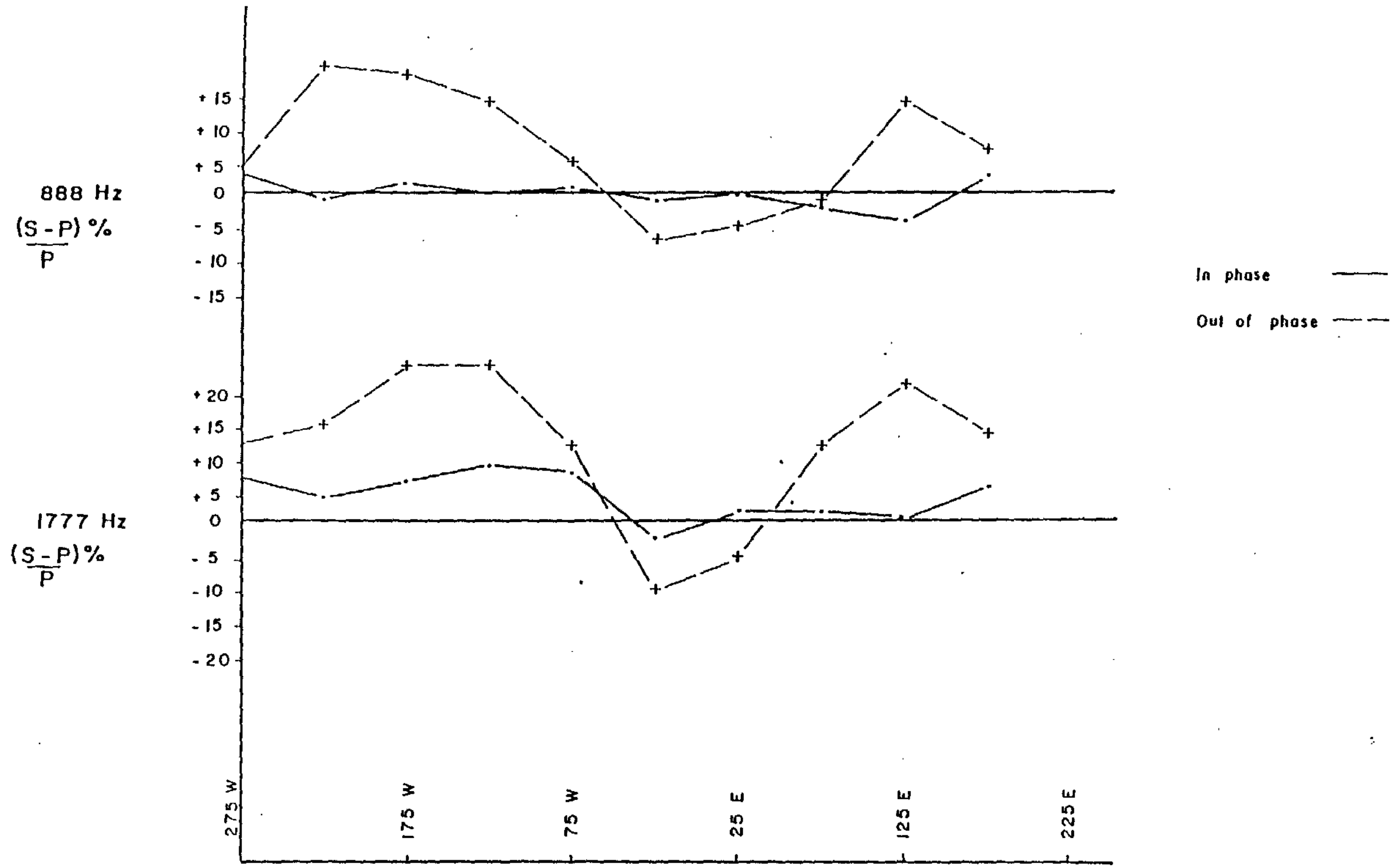
HLEM

BASTYAN DAM PROSPECT

057

816059

058



HLEM

BASTYAN DAM PROSPECT

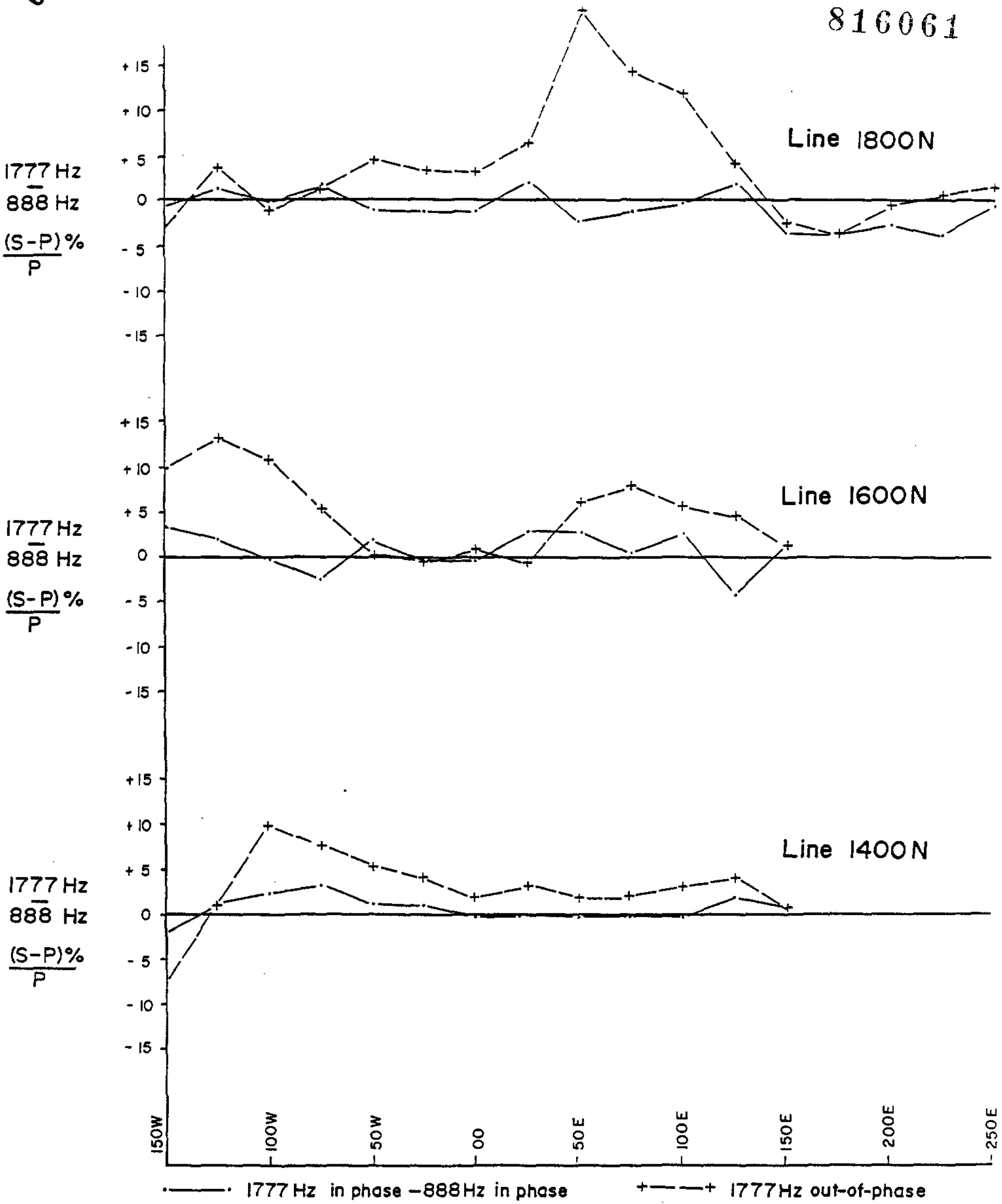
LINE: 1600 N SEPARATION: 150 m

FIG. 12

816060

059

816061



HLEM

BASTYAN DAM PROSPECT

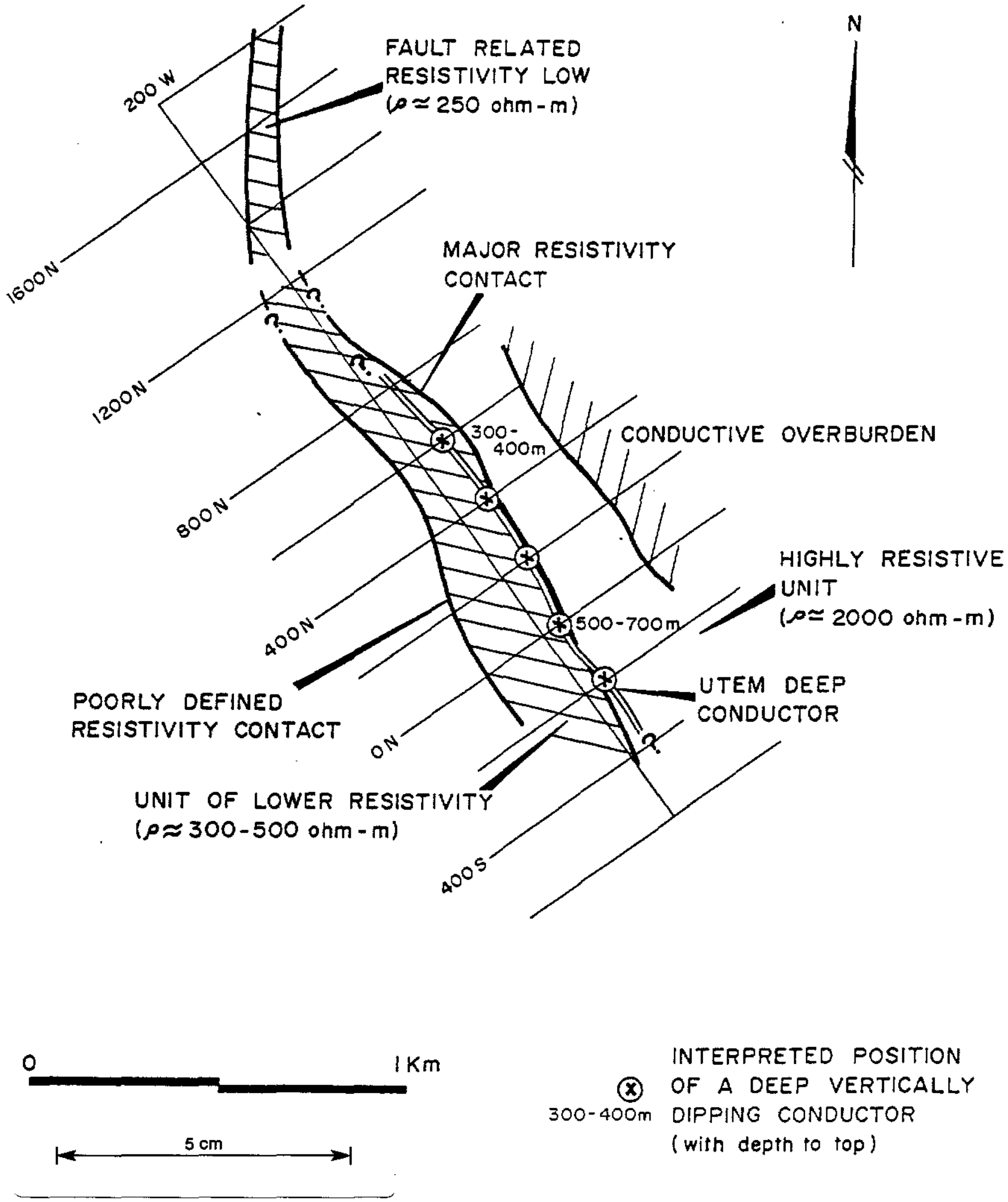
SEPARATION : 100m

SCALE 1:2500

FIG. 13

060

816062

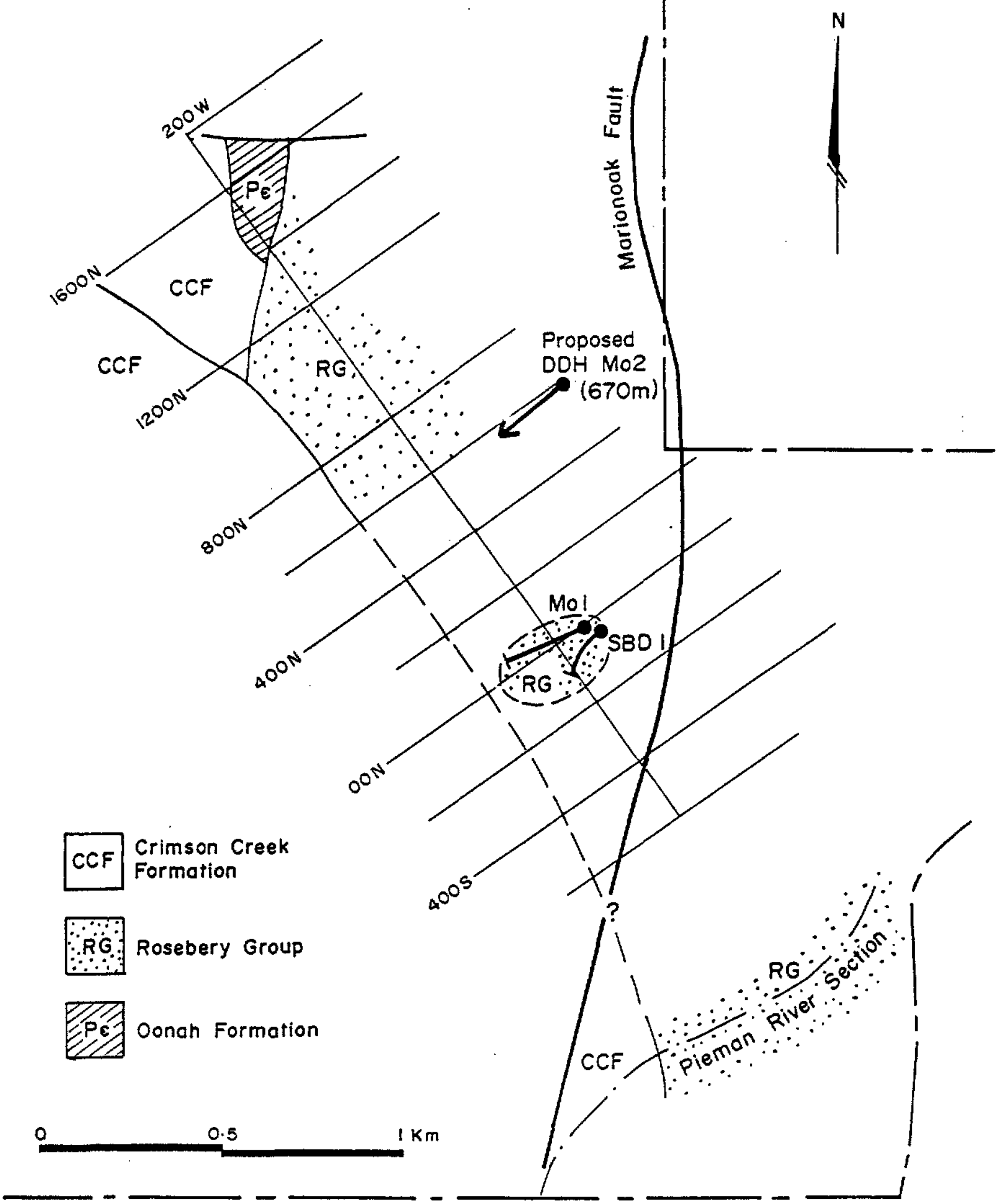


BASTYAN DAM GRID
GEOPHYSICAL INTERPRETATION

FIG. 14

061

816063



BASTYAN DAM GRID
GEOLOGY

After : J.G. Purvis Sept. '86

FIG. 15

5 cm

Line 0000N
Marionoak
for
ABERFOYLE EXPLORATION

ZONGE # 578
PLOT BY CPLOT 4.01
PLOTTED 21 Nov 86

CSAMT SURVEY DATA
STATIC CORRECTED RESISTIVITY

RHO. 250. PHZ. 541., FREQ 15. 4096.0 Hz
RHO. 1500. PHZ. 704., FREQ 15. 4096.0 Hz
<RHO-C>REDRHO

RECEIVER DATA
Length : 100.m Line : N 58 E
Spacing: 100.m DiPole: N 58 E

Surveyed: Feb 86

TRANSMITTER DATA
Length : 1.3 Km
Orient. : N 65 E
Distance: 6.8 Km
Rx to Tx: S-E

[Plot limits] and LOGARITHMIC CONTOURS
(Interval: 0.20)
[3373]
2512
1585
1000
631
398
251
158
100
63.1
[41.8]

062

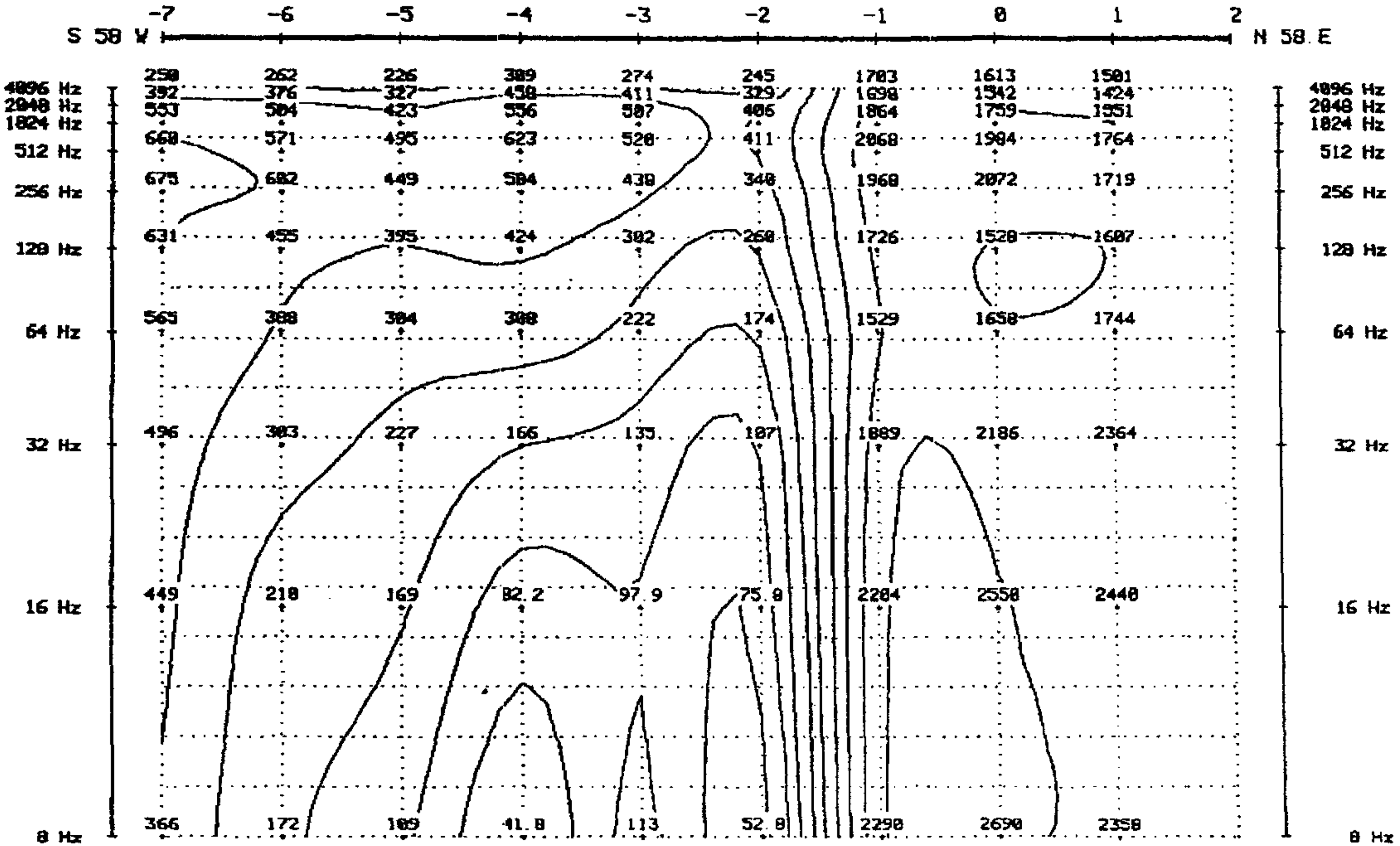


FIG. 16

816064

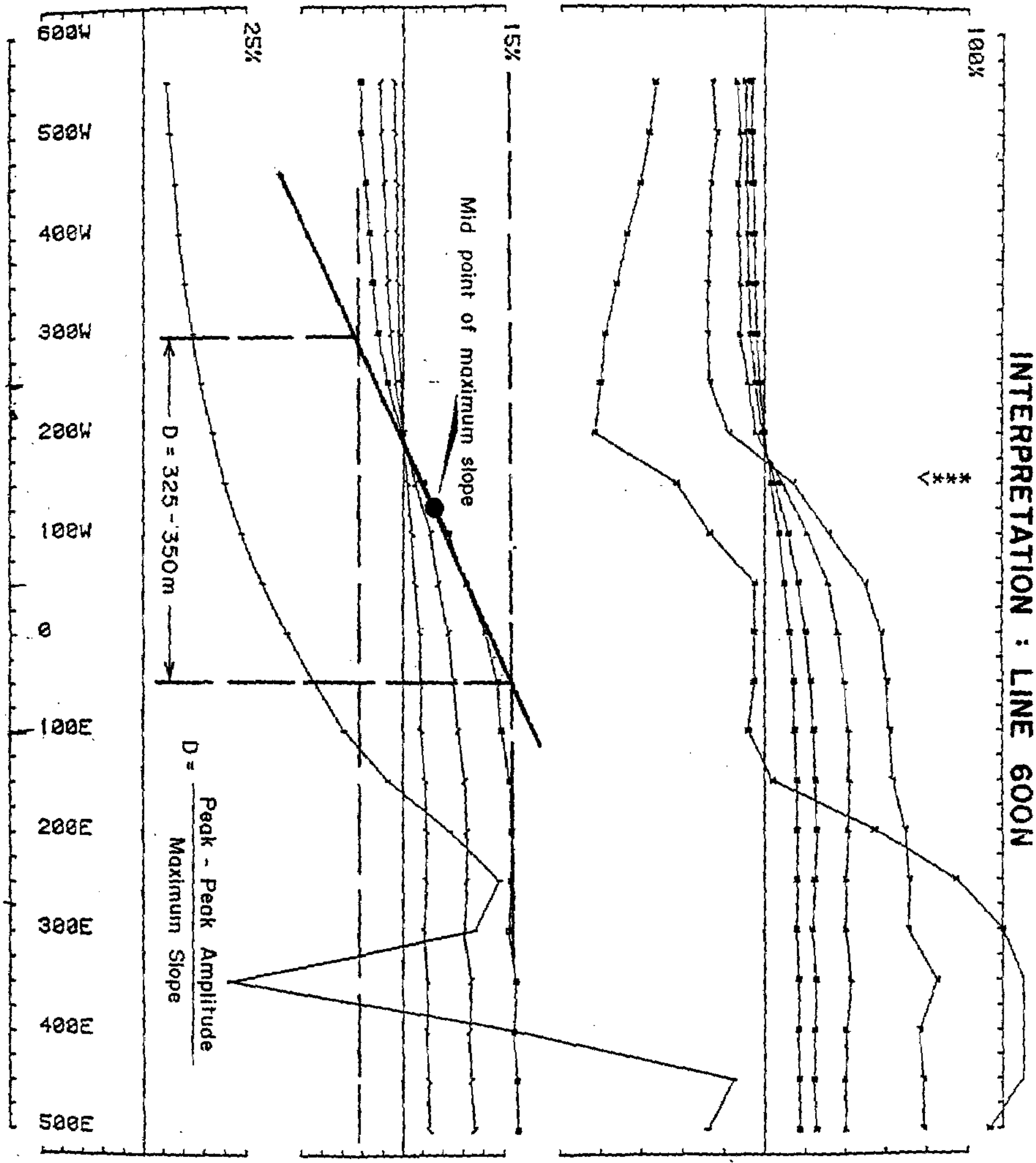
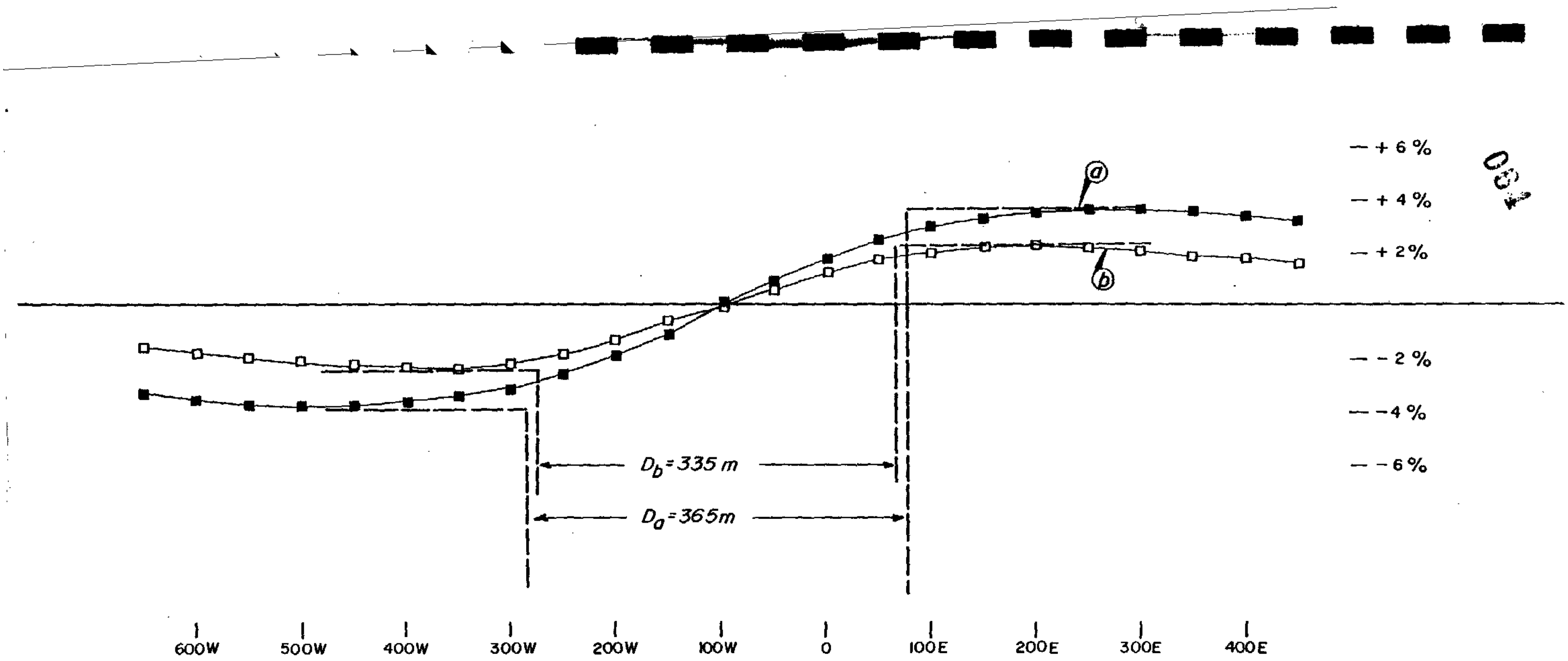


FIG 17

UTEM SURVEY conducted by ART Job 8333
Project Area BASTYAN DAM PROSPECT Survey for SHELL MINERALS freq(hz) 26.230
Loopno 0002 Line 600N component Hz secondary Ch 1



(a) ■——■ Down dip extent = 600m. Depth to top = 320m. on Line 600N

(b) □——□ Down-dip extent = 300m. Depth to top = 350m. on Line 600N

Conductor

Strike length = 1200 m.

Plunge = 21° to south

σ_t = "Arbitary"

Depth to top = variable

PREDICTED RESPONSE : LINE 600N

(AT ARBITARY LATE TIME UTEM CHANNEL)

FIG. 18

81C066

004

065

816067

DRILLING RECOMMENDATION
LINE 600N

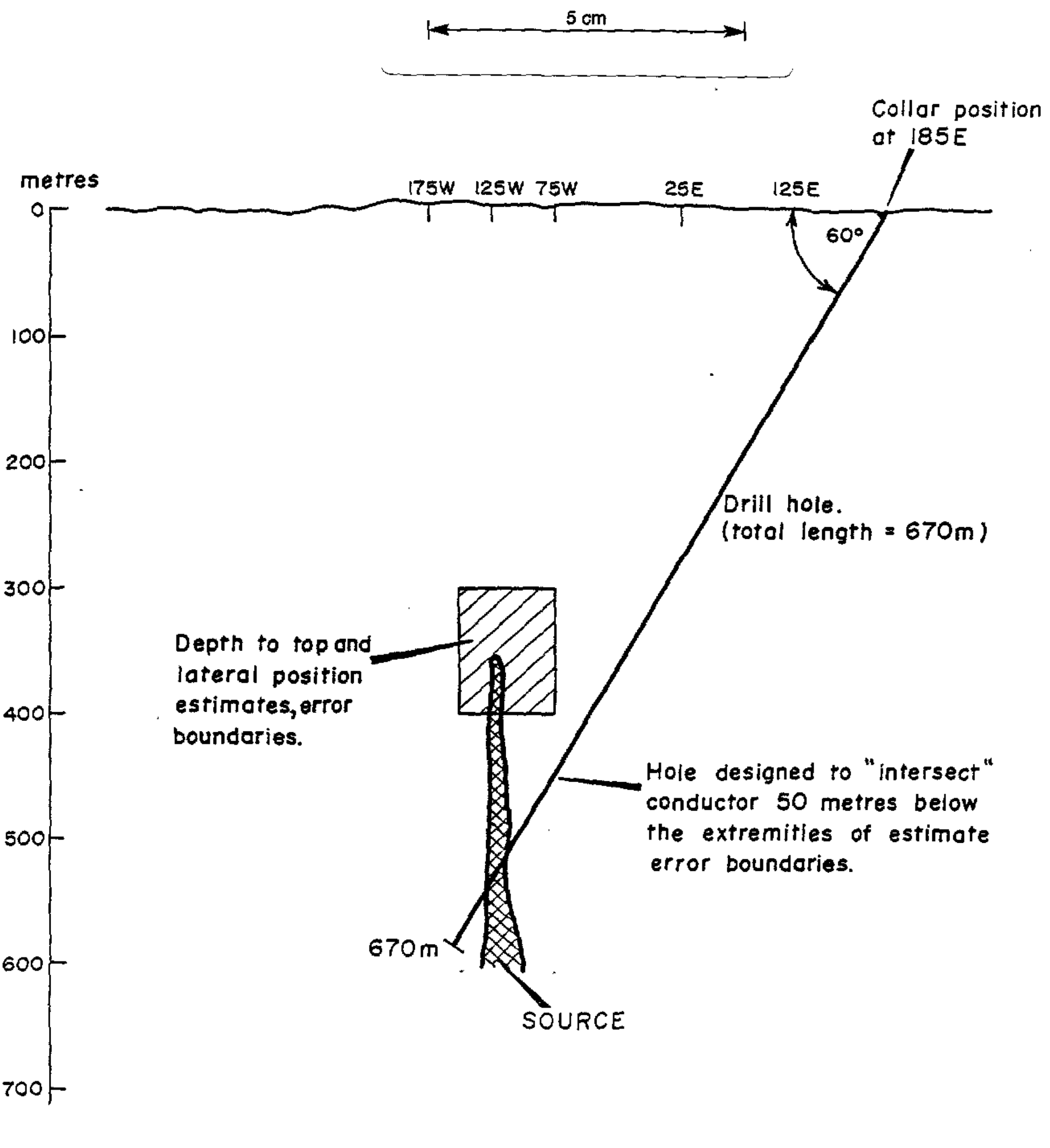


FIG. 19

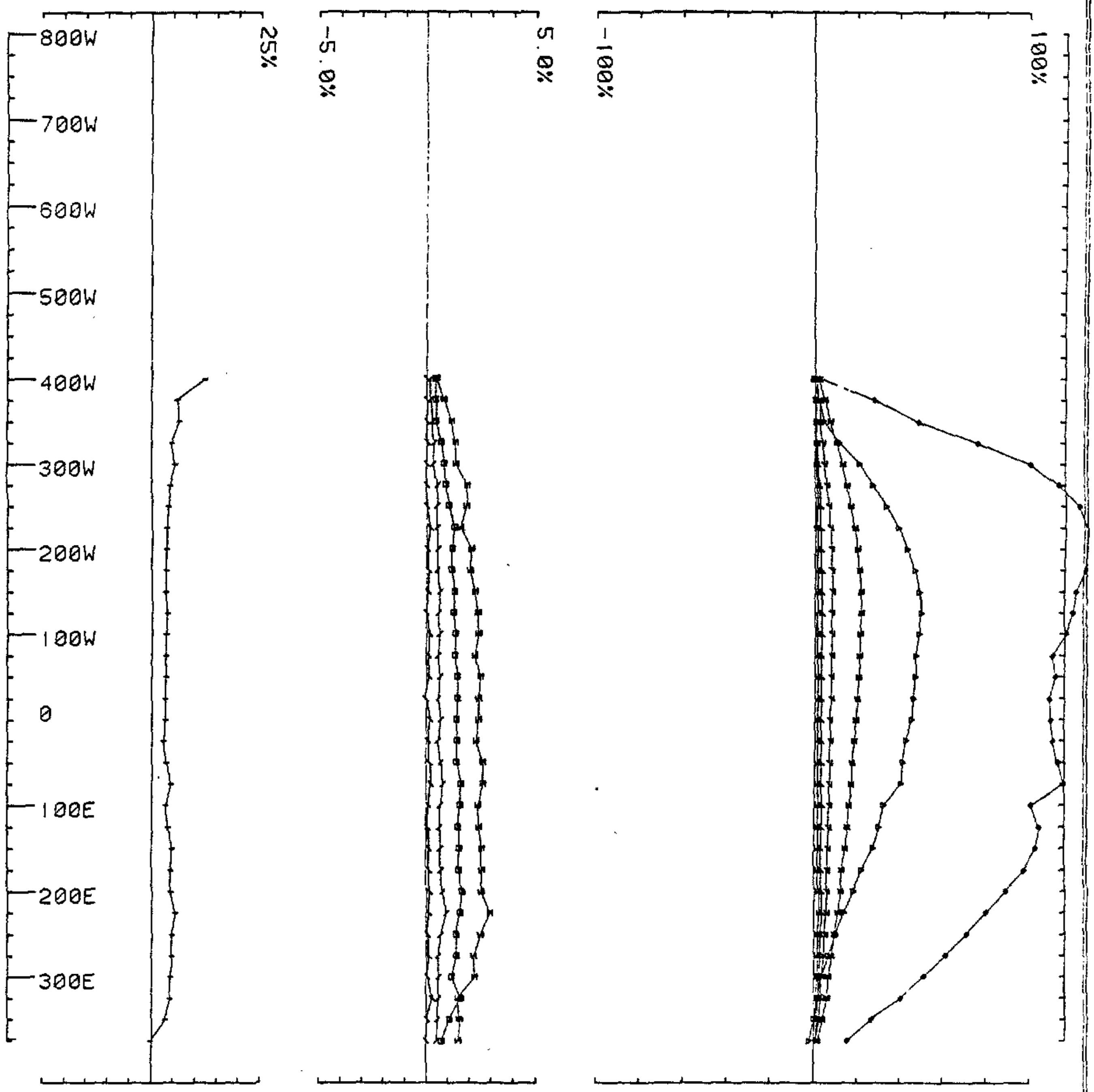
APPENDIX I

UTEM DATA SECTIONS (1-6)

190

DS 1

816069



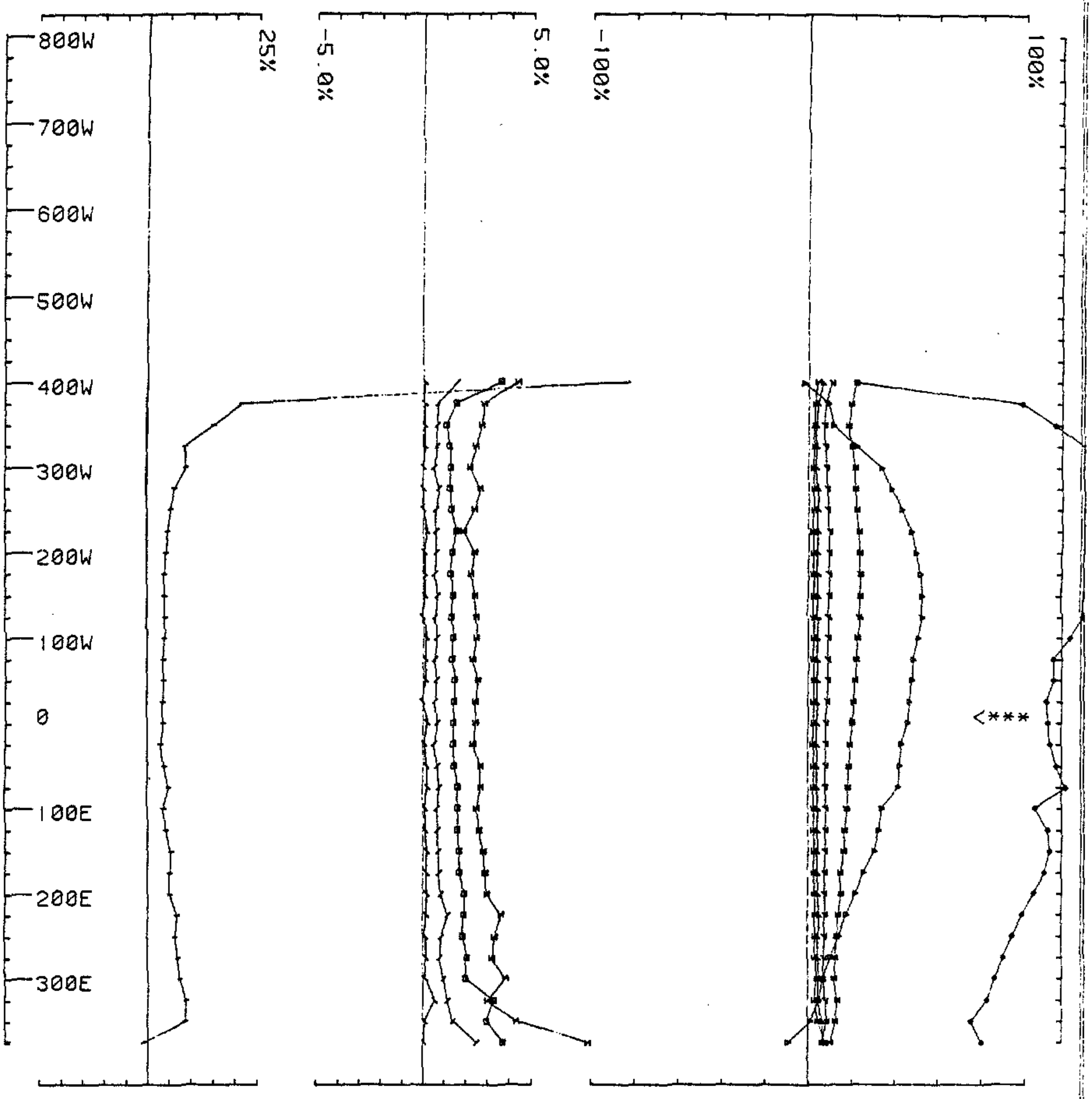
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- BASTYAN DAM
CLIENT :- ABERFOYLE CREW :- PMM HU
Line 200S Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

BASTYAN DAM
LOOP 0003
LINE 200S
Hz

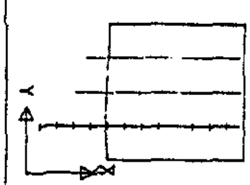
068

DS2

816070



LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- BASTYAN DAM
CLIENT :- ABERFOYLE CREW :- PMM HU
Line 200S Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD POINT Ch 1 NORMALIZATION

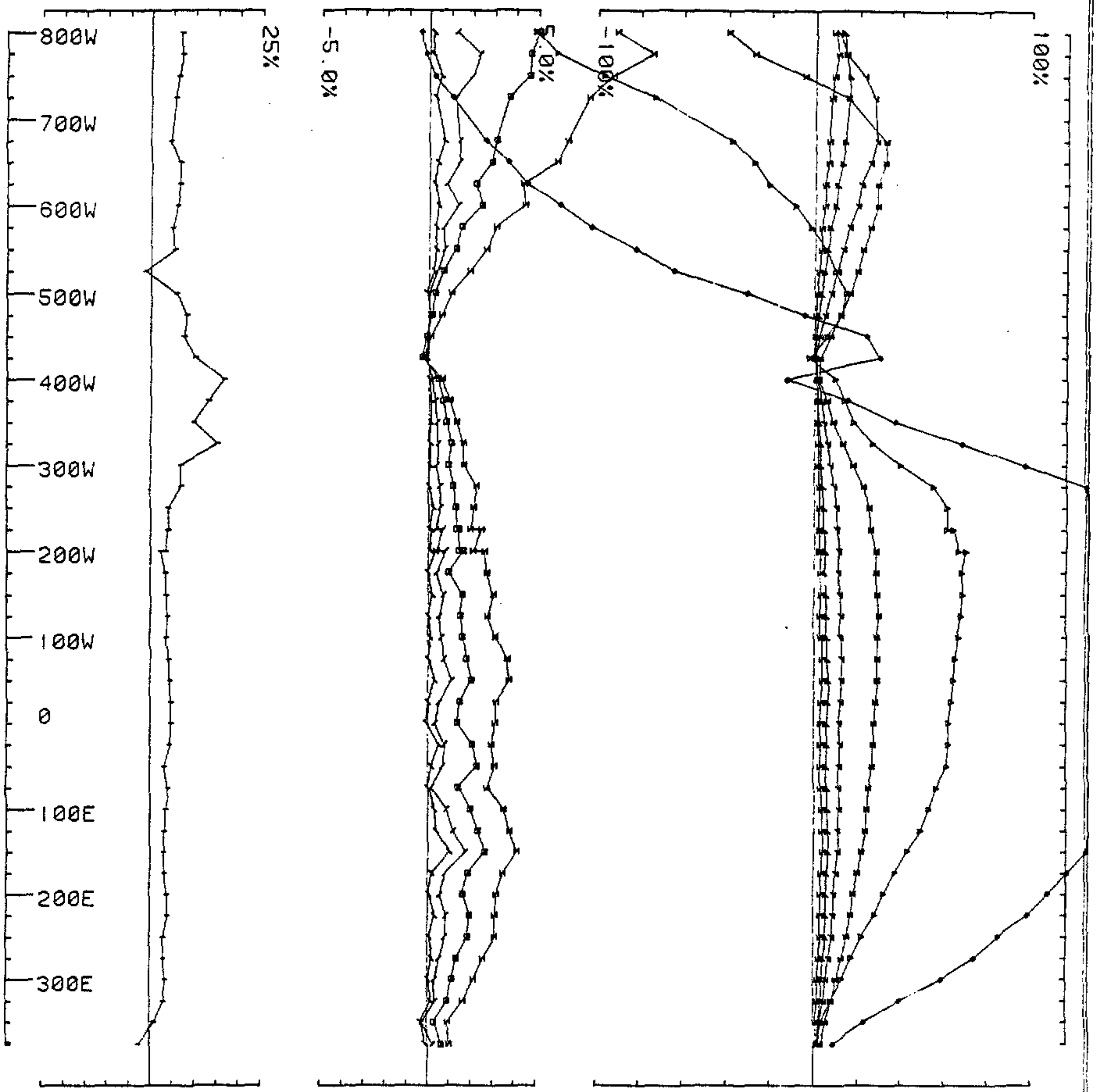


BASTYAN DAM
LOOP 0003
LINE 200S
Hz

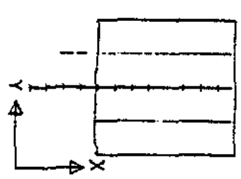
069

DS3

816071



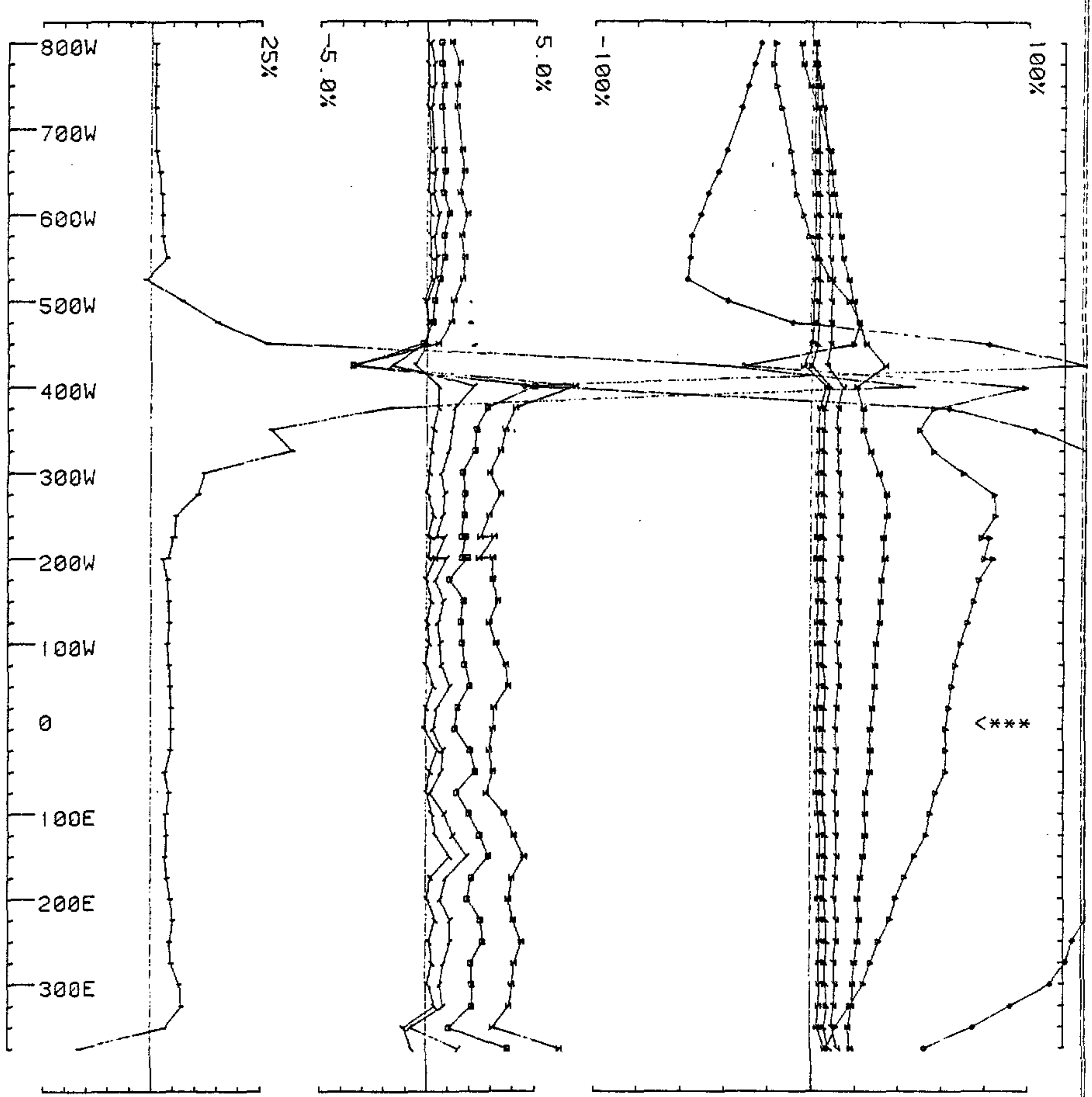
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- BASTYAN DAM
CLIENT :- ABERFOYLE CREW :- PMM HU
Line 0 Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



BASTYAN DAM
LOOP 0003
LINE 0
Hz

070

816072



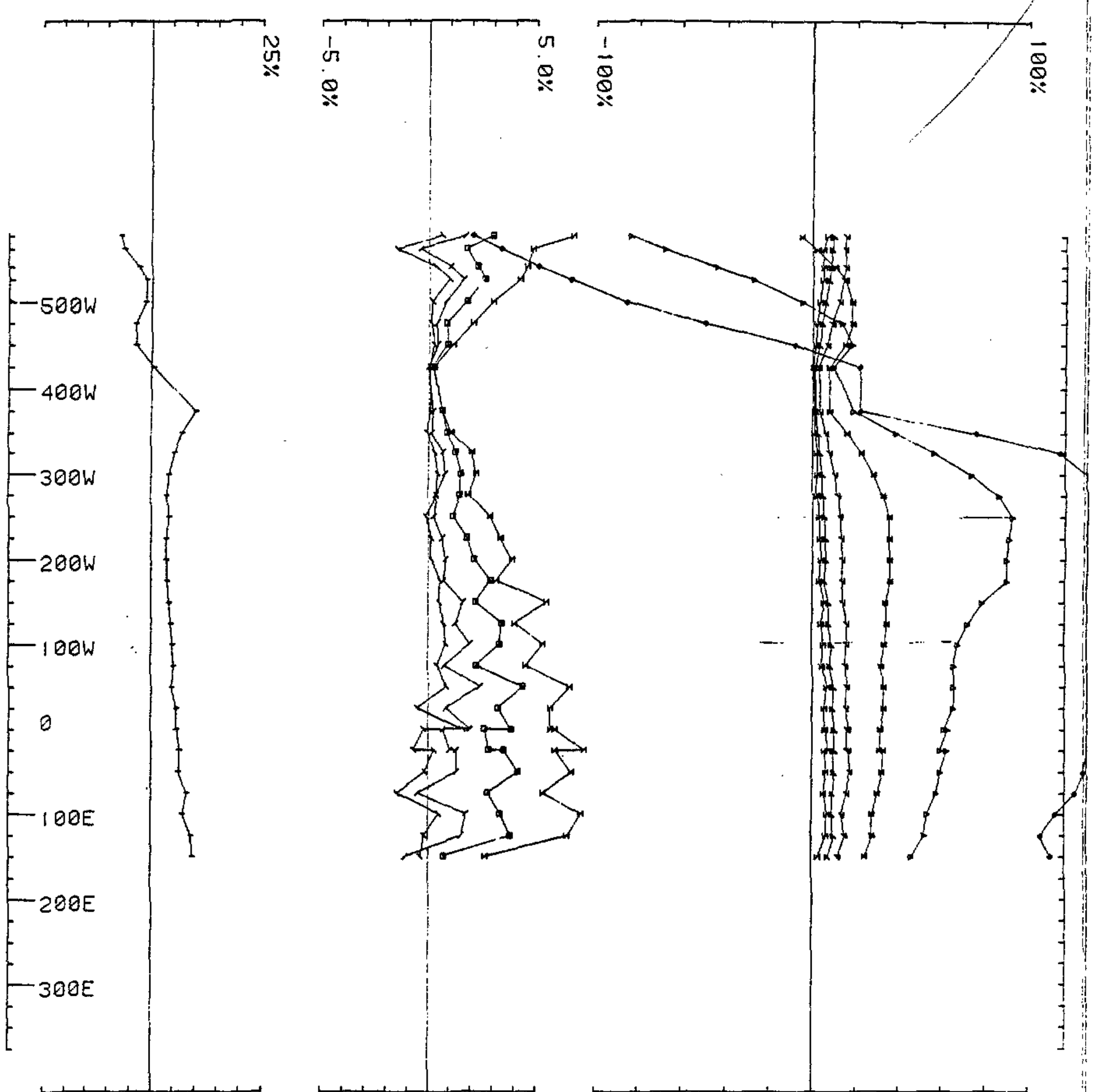
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- BASTYAN DAM
CLIENT :- ABERFOYLE CREW :- PMM HU
Line 0 Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD POINT Ch 1 NORMALIZATION

BASTYAN DAM
LOOP 0003
LINE 0
Hz

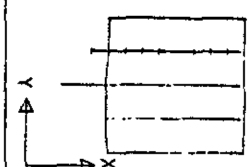
DS5

071

816073



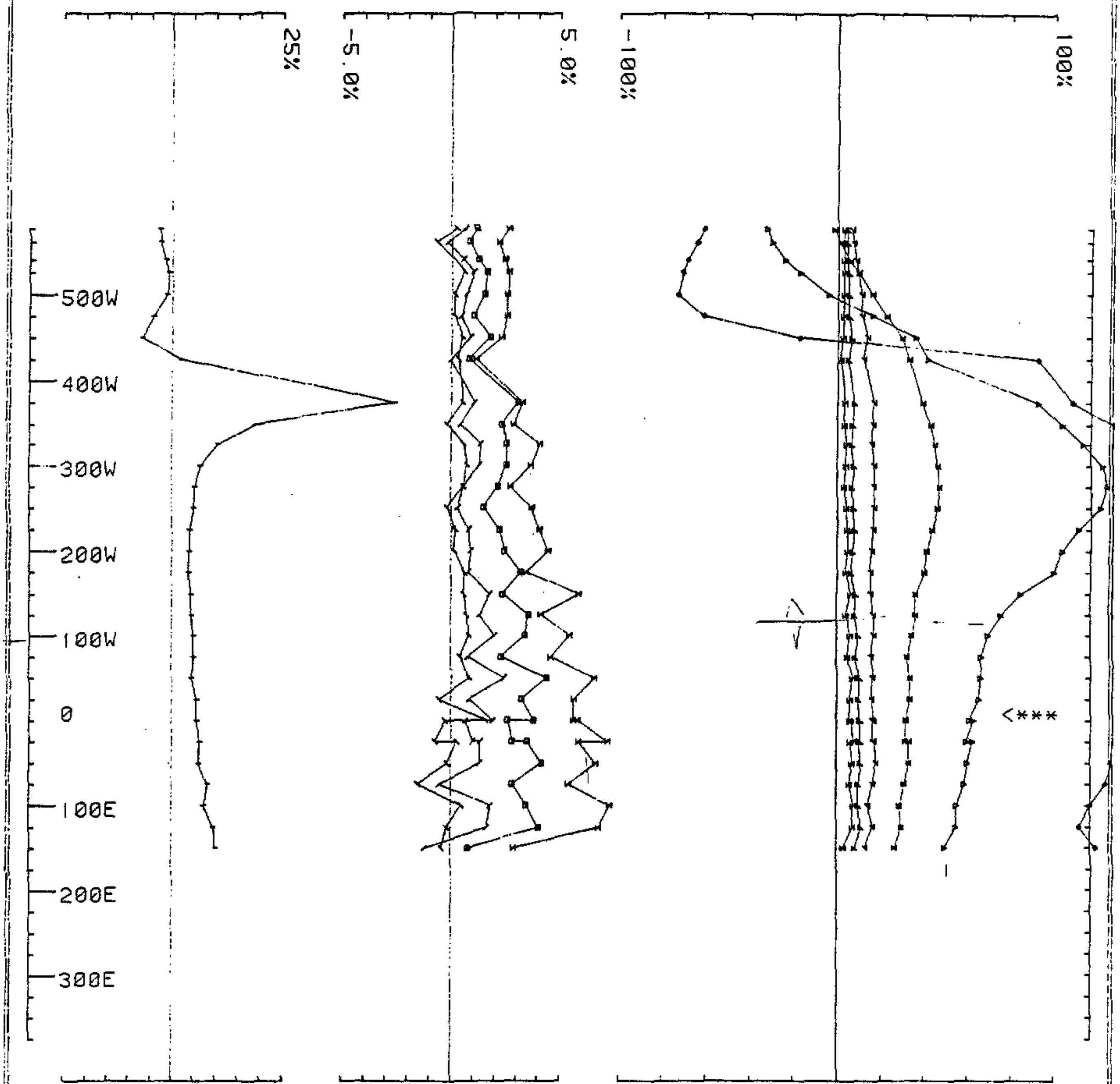
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- BASTYAN DAM
CLIENT :- ABERFOYLE CREW :- PMM HU
Line 200N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch I NORMALIZATION



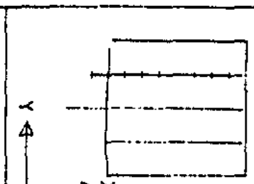
BASTYAN DAM
LOOP 0003
LINE 200N
Hz

072

816074



LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8652
AREA :- BASTYAN DAM
CLIENT :- ABERFOYLE CREW :- PMM HU
Line 200N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD POINT Ch 1 NORMALIZATION



BASTYAN DAM
LOOP 0003
LINE 200N
Hz

APPENDIX 3

074

816076

DRILL HOLE NAME MO 2

LOCATION MARIONOAK

TOTAL DEPTH 643.20

NUMBER SURVEYS (Incl. collar P.U.) 20

NUMBER ASSAY INTERVALS 62

COLLAR NORTHING AMG 5379237.6

COLLAR EASTING AMG 375881.4

COLLAR R.L. 200.5

COLLAR DEPTH 0

SECTION (To nearest 50m)

STATUS OF DATA NEW

DATE STARTED 18-2-87

DATE FINISHED 13-3-87

LOGGED BY JRS

FROM	TO	HOLE SIZE	CASING TYPE	CASING I.D.
0	9.00	TRICONE	HW	
9.00	312.00	HQ	HQ	
312.00	643.20	NQ	HQ	
0	643.20		PVC	36mm

COMMENTS (Casing lost etc.) 9.00m HW left in hole

MACKINTOSH / HATFIELD DATA BASE ENTRY FORM

DRILL HOLE NAME Mo - 2

DEPTH	DIP (- forD.H.)	AZIMUTH ~~(Grid)~~ °M
0	-60	~~[illegible]~~ 223.3
25	-60	~~[illegible]~~ 223.9
50	-59.8	~~[illegible]~~ 224.5
75	-59.1	224.7
100	-58.6	224.9
125	-58.2	225.1
150	-57.5	225.6
175	-57.4	225.6
200	-57.1	225.6
225	-56.6	225.6
250	-56.2	225.6
275	-55.8	225.8
300	-55.5	226.1
325	-55.5	225.5
350	-55.0	225
375	-55.0	225.3
400	-54.8	225.8
425	-54.2	226
450	-53.9	226.3
475	-54.0	226.6
500	-54.0	226.8
525	-53.2	226.9
550	-53.1	226.9
575	-53.0	226.8
600	-52.4	226.5
625	-51.7	225.9
643.2	-50.8	225.4

N.B. Results for E.O.H. must be included

MARIONOAK LICENCE - BASTYAN GRID

ABERFOYLE (J.R.S) DIAMOND DRILL LOG HOLE Nº MO-2 Page Nº 1 of 13

Feature
Bedding — Foliation — Fragment (size & shape) — Shearing — Fault — Vein (c carbonate, q quartz) — ↑ Facing

Mineralization
Trace 1-5%
Common 5-15%
Abundant 15-60%
Massive > 60%

CORE RECD	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	0								
		0-9m: HW TRICONE							
	5								
		9m: Start of HQ coring	55°						
9.0, 9.5									
10.5, 11.2	10	9.0 - 59.6m : Dominantly laminated grey Sandstone/siltstone unit with horizons a few mm to several cm thick of intraformational conglomerate with pale mudstone clasts elongated parallel to bedding.	↑						
12.5, 13.4, 13.9, 14.5									
15.6, 16.2	15	Some are well rounded, most clasts are in the range 1-3mm, but a few outsized to reach 30mm.							
17.8, 18.7		Several thicker beds of conglomerate between 18m - 20.6m. (petrological sample : 19m)							
19.8, 20.8	20	20.6 - 34.25 : subinterval of pale green-grey mudstone and cream gritty sandstone.							
22.2, 23.8		Sandstone is polymict containing angular clasts of cream and grey mudstone and chert, brecciated pyrite clasts and wispy green-grey siltstone clasts							Trace pyrite
25.0, 25.7, 26.0	25	Anastomosing cleavage and shear surfaces common afer 25m as is qtz-carbonate veining.	55°						
28.7		(petrological Sample : 25m)							
31.2	30	[Downhole facing 28.85 - grading in grit]							
34.2	35								
37.2		34.25 - 39.6 : Dominated by laminated siltstone with intense shearing and tectonic intraclasts of (succeeding) mudstone. Anastomosing green chlorite veinlets at 38.4 - 38.63 and 38.75 - 38.8							36.2 - 38.0 : Persistent fine disseminated sedimentary pyrite ≤ 1%, with rare coarse clots
40.2	40								38 - 44: Trace pyrite
43.2		39.6 - 42.3 : Better laminated interval							44 - 55 : Pyrite disseminations, veinlets and clots < 1%.
46.2	45	(petrological sample : 39m)							
48.6	50								

816078

ABERFOYLE (JRS) DIAMOND DRILL LOG HOLE Nº M0-2 Page No 2 of

Features 077

Bedding · Foliation · Fragment (size & shape) · Shearing · Fault · Vein (c carbonate, q quartz) · ↑ Facing

Mineralization: Trace 1-5% · Common 5-15% · Abundant 15-60% · Massive > 60%

CORE REC'D	DEPTH m	GEOLOGY	MINERALIZATION
51.7	50	54.3 - 59.6 : Better laminated interval. Majority of interval (34.25 - 59.6) is strongly qtz-carbonate veined and sheared. Most shears appear to post-date veining	
54.8	55		
57.9		[grading] ↑	
58.5		59.6 Strongly sheared contact.	
59.6	60	59.6 - 70.7 : Distinctive, massive and poorly bedded, light green-grey medium grained sandstone with minor well indurated mudstone partings. Numerous fine chloritic microfractures. Minor qtz veinlets. Local mauve pigmentation (68.3 - 69.4 : qtz veins to 5cm) (petrological sample : 64m)	No visible sulphides
61.2			
64.2	65		
67.2			
70.2	70	70.7 - 73.9 : Graphite coated shear at start of black shale unit with minor sandstone	
73.2		73.9 - 432.2m Pale green-grey, massive but locally graded and laminated, medium grained volcanic sandstone. Local mauve hematitic pigmentation. Cleaved and sheared black shale zones present. [grading] ↑	No visible sulphides
76.2	75		
79.2	80		
82.2		(petrological sample 85.1m)	
85.2	85		
88.2			
91.2	90		
94.2		[X-bedding grading] ↑	
97.2	95		
	100		

816079

Feature: Bedding, Foliation, Fragment (size & shape), Shearing, Fault, Vein (c carbonate, q quartz), facing

Mineralization: Trace 1-5%, Common 5-15%, Abundant 15-60%, Massive > 60%

078

CORE REC'D	DEPTH m	GEOLOGY	MINERALIZATION
100.2, 101.3, 103.5	100	Black shale + qtz + trace pyrite at 100.2 - 100.4m, 101.3m, 102.3 - 102.9m.	Trace pyrite; v.v. tr. sphalerite
106.2, 109.2	105		
112.2	110	Black shale laminae, minor pyritic chert 113.3 - 114.05	v.trace pyrite c qtz veins
115.2, 118.2	115	118.45 - 119.7 : Black shale	118.45 - 119.7 : pyrite ≤ 1%
121.2, 124.2	120		v.trace pyrite
127.2	125	(petrological sample 119.3m) mauve - cream pigmentation	
130.2, 133.2	130		
136.2	135		137.8 : Qtz vein with chalcopyrite
139.2, 142.2	140		
145.2, 148.2	145	144.3 - 146.45 : Brecciated black shale. [grading]	Trace pyrite
	150		

816080

079

Feature

Bedding, Foliation, Fragment (size & shape), Shearing, Fault, Vein (c carbonate, q quartz), Facing

Mineralization

Trace 1-5%
Common 5-15%
Abundant 15-60%
Massive > 60%

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
151.2	150	(as for 73.9-432.2): green, medium grained Volcanolithic sandstone with sections of mauve/cream Fe pigmentation. Occasional cleaved-sheared black shale intervals. Qtz veining - some with trace pyrite.)							
154.2	155								
157.2									
160.3	160								Qtz veins with trace py
163.2									
166.2	165								
169.2	170								
171.8		173.25 - 177.8 : intense microfracturing							
174.8	175								
177.9									
180.3	180								
181.3									
184.2	185								
187.2									
190.2	190								
193.2									
196.2	195	(up-hole facing - grading)							
199.2	200								199.42 - 199.8 : Qtz with tr. py.

816081

See Page 5

080

Feature: Bedding, Foliation, Fragment (size & shape), Shearing, Fault, Vein (± carbonate ± quartz), ↑ Facing

Mineralization: Trace 1–5%, Common 5–15%, Abundant 15–60%, Massive > 60%

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
202.2	200	199.8 – 205.8: Delicately laminated black - light grey siliceous shale with fine (mm) pyritic bands. Sheared boundaries - in faulted (?) (Petrological sample 202.3m)							1-2mm pyritic laminae
205.2	205								
208.2		205.8 - 211.0 : Cream - light green volcaniclastic sandstone.							qtz + cp.
211.2	210								
214.2	215	214.2 - 220.0: irregular contorted black shale intervals - all pyritic.							1% py + v. tr. cp.
217.2									
220.2	220								
223.2									
226.2	225								
229.2	230								
232.2		same volcanolithic sandstone - siltstone sequence.	50°						trace pyrite and v.v. trace cp with qtz-carb veins
235.2	235								
238.2									
241.2	240								
244.2	245								
247.2	250								

816082

ABERFOYLE (JRS) **DIAMOND DRILL LOG** HOLE No MO-2

083

Feature				
Bedding	Shearing	↑ Facing	**Mineralization**	Trace 1-5%
Foliation	Fault			Common 5-15%
Fragment (size & shape)	Vein (c carbonate, q quartz)			Abundant 15-60%
				Massive > 60%

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
250.2	250	'As before'							251.8: Qtz with trace cp.
253.2									
256.2	255								
259.2	260								
262.2		261.2 – 262.65, 267.75 – 268.60, 271.35 – 272.45 : polymict conglomeratic texture with mudstone, sandstone and rare chert clasts.							
265.2	265								
268.2		"Looks more like Dundas Group than Crimson Creek Fm". Geoff Green pers comm.							Qtz veining with tr. pyrite
271.2	270	(Petrological sample : 267.2 m)							
274.2	275								
277.2		grading ↑							
280.2	280								
283.2		X-bedding ↑							
286.2	285	(Petrological Sample 285.7 m)							
		graded & X-bedded. ↑							
289.2	290								
292.2		292.0 – 296.9 : Pale green fine sandstone / mudstone interval.							
294.8	295								
297.6	300								

816083

ABERFOYLE (JRS) **DIAMOND DRILL LOG** HOLE Nº MO-2 Page No 7 of 13

Feature Bedding, Foliation, Fragment (size & shape), Shearing, Fault, Vein (c carbonate, q quartz), ↑ Facing

Mineralization Trace 1-5%, Common 5-15%, Abundant 15-60%, Massive > 60%

082

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
300.7	300	'As before'							
303.8									
307.0	305	305.5 - 310.0 : mainly black contorted and qtz veined shale with minor volcanolithic sandstone partings.							Trace py with qtz carb. veins
310.0	310								
311.80		HQ / NQ							
316.2	315								
320.1	320								
326.6	325	325.6 - 339.6 : Zone of black shale partings and contorted, qtz veined intervals. Minor muddy siltstone laminae.							
331.2	330	petrological sample 337.75m							
337.2	335								
	340								
343.2		343.9 - 344.3 : Well laminated pyritic shale.							fine banded pyrite
	345								
349.2	350								

816084

083

Feature: Bedding, Foliation, Fragment (size & shape), Shearing, Fault, Vein (c carbonate, q quartz), ↑ Facing

Mineralization: Trace 1-5%, Common 5-15%, Abundant 15-60%, Massive > 60%

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
	350	'As before'	70°						
355.2	355								
	360	monotonous mauve volcanolithic sandstone - siltstone sequence. Minor qtz veining. Local fine graded laminae.							
361.6									Very rare pyrite grains and clots in some qtz veins
365.5	365								
370.2	370								
	375								
376.2									
	380	fine silt/sst laminae	60°						
381.5									
385.2	385								
	390								
391.1									
	395								
397.2									
	400								

816085

ABERFOYLE (JRS) **DIAMOND DRILL LOG** HOLE Nº MO-2 Page Nº 9 of 13

Features 084

Bedding, Foliation, Fragment (size & shape), Shearing, Fault, Vein (c carbonate, q quartz), Facing

Mineralization: Trace 1-5%, Common 5-15%, Abundant 15-60%, Massive > 60%

CORE REC'D	DEPTH m	GEOLOGY	DEPTH m	MINERALIZATION
403.2, 409.2, 412.14, 413.0	400–410	411.5 - 412.56 : Qtz + chl shears		nil pyrite
418.2	415	grading		
423.4	420–425	418.9 - 424.7 : Grey fine siltstone - sandstone petrological sample 418.0 m		Trace pyrite as disseminations, veinlets and clots.
426.1, 432.2	430	disrupted muddy laminae		
433.2, 435.2, 438.3, 442.2, 443.7, 444.4, 448.0	435–450	432.2 - 535.0 : Finely interbedded black shale, grey mudstone to sandstone sequence. Bedding from parallel laminated to strongly disrupted. Graphitic partings. 432.2 - 433 : highly deformed pug zone. 433 - 436 : Very strongly sheared with disrupted qtz - carbonate veins. (Petrological sample : 436.2 m)		432.2 to 437 : Qtz - carbonate veins with trace pyrite and very trace galena and pale brown sphalerite Very trace pyrite with qtz - carbonate veins

816086

ABERFOYLE (TES) **DIAMOND DRILL LOG** HOLE Nº MO-2 Page Nº 10-13

Feature 085

Bedding · Foliation · Fragment (size & shape) · Shearing · Fault · Vein (c carbonate, q quartz) · ↑ Facing

Mineralization: Trace 1-5% · Common 5-15% · Abundant 15-60% · Massive > 60%

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	MINERALIZATION
451.5	450	'As before'		Nil to v.v.tr. py.
454.2	455			
458.9				
460.4	460			
461.5			40°	
464.6	465			
467.6				
470.6	470			
473.7				
	475		grading ↓ 40°	
476.8				
477.9				
481.0	480			
484.1	485			
487.2				
490.2	490			
493.3				
	495			495.5 - 496.2. Trace disseminated and veinlets of pyrite with qtz-carb veins
496.2				
499.2	500			

816087

ABERFOYLE (FRS) **DIAMOND DRILL LOG** HOLE No MO-2 Page No 11-13

086

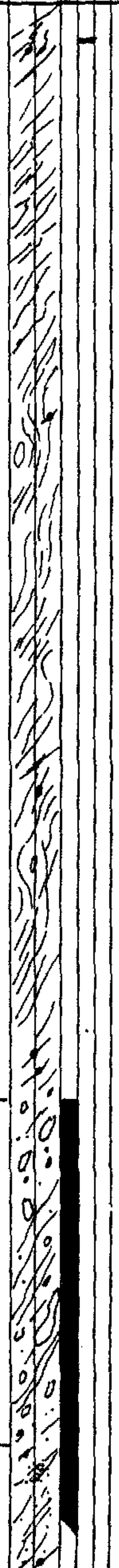
Feature: Bedding, Foliation, Fragment (size & shape), Shearing, Fault, Vein (c carbonate, q quartz), ↑ Facing

Mineralization: Trace 1-5%, Common 5-15%, Abundant 15-60%, Massive > 60%

Core rec'd: 502.2, 504.7, 507.8, 510.9, 514.0, 517.0, 519.7, 522.8, 525.9, 529, 532.1, 535.2, 538.2, 541.2, 544.2, 547.2, 550.2

DEPTH m	GEOLOGY	MINERALIZATION
500–535	'As before'	501.6 - 501.9 : V. tr. py in qtz. carb veinlets
535–546.1	535 - 546.1 : Dark grey to black heterolithic open framework breccia - probably a debris flow deposit. Contains rounded, angular and wispy clasts to 30cm diameter. Rounded clasts include altered (sericite-chlorite-carbonate-pyritic) - feldspar phyric intermediate volcanics and possible carbonate - chlorite altered basalt. Wispy clasts include lithic wacke, and angular dolomite and chert are present. (petrological sample: 540.4m)	Trace pyrite in clasts and matrix
546.1–550	546.1 - 563.7m : Dark grey massive micaceous sandstone intervals with wispy slump structures in intervening muddy units.	f.g. pyrite

VISUAL LOG:



816088

ABERFOYLE (TRS) DIAMOND DRILL LOG HOLE No Mo-2 Page No 12 of 13

087

Feature: Bedding, Foliation, Fragment (size & shape), Shearing, Fault, Vein (c carbonate, q quartz), Facing

Mineralization: Trace 1-5%, Common 5-15%, Abundant 15-60%, Massive > 60%

CORE RECD	DEPTH m	GEOLOGY	DEPTH m	MINERALIZATION
	550	'As before' predominantly sandstone		Nil to v.v.tr. pyrite
553.2				
556.1	555	grading and basal load casts.		
559.1				
562.2	560	45°		
565.2	565	563.7 - 643.2 m. Main lithology is black shale - grey mudstone and thinly laminated quartzose sandstone. Sequence is folded with much of the deformation taken up on shear surfaces (graphite) and fractures filled with dark mudstone. Deformation 'appears' to post-date sediment consolidation.		
568.2				
571.2	570			
574.2				
577.2	575	(Petrological sample 566.7m)		
580.2	580	grading		
583.2				
586.2	585			587.5 Tr. py.
589.2				
592.2	590			
595.2		592.15 - 599.6 m: Sandstone rich interval with several amalgamated sandstone beds or sandstone separated by thin mudstone partings. Trace qtz-carb veining. grading		
598.2	595			
	600	599.6 - 601.5 m: Dark grey - black sandstone		

816089

ABERFOYLE (JRS) **DIAMOND DRILL LOG** HOLE Nº Mo-2 Page No 3 of ?

088

Feature

- Bedding
- Foliation
- Fragment (size & shape)
- Shearing
- Fault
- Vein (c carbonate, q quartz)
- ↑ Facing

Mineralization

- Trace 1-5%
- Common 5-15%
- Abundant 15-60%
- Massive > 60%

CORE REC'D	DEPTH m	GEOLOGY	VISUAL LOG	TRACE	COMMON	ABUNDANT	MASSIVE	DEPTH m	MINERALIZATION
601.2	600	-supported, sheared conglomerate interval. Graphitic. Qtz-carb veined							
604.2	605	50°							
607.2									
610.2	610								
613.2									
616.2	615								
619.2	620								
622.2									
625.2	625	Graded bedding, flame structures, concentrations of rip up mud clasts towards tops of thick sst beds, all indicate down hole facings over intervals, as does cross laminations in a few of the thin sandy units							
628.2									
631.2	630	630.7-631.2 m: Disrupted zone with brecciated clasts of sandstone in cleaved black slate matrix.		■					Strongly pyritised sandstone clasts
634.2	635	631.2-640.2 m: Zone of numerous thick graded sandstone beds up to 50 cm thick, interspersed with laminated to thinly bedded sandstone - black slate units							
637.2									
640.2	640	(petrological sample at 631.0 m)							
643.2									
	645	EOH 643.2 m							
	650								

816090

APPENDIX 4

090

816092

Aberfoyle Resources Limited

Incorporated in Victoria

EXPLORATION DIVISION

ABERFOYLE RESOURCES LIMITED
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31st July, 1987

Mr. H. W. Fander,
Central Mineralogical Services,
39 Beulah Road,
NORWOOD. S.A. 5067

Dear Wally,

Re: Marionoak DDH MO-2

Please find enclosed 16 samples (271620-271635) from a 643.2m diamond drill hole recently completed on our Marionoak licence near Rosebery. We previously drilled in this area during 1985 and you provided petrological descriptions in CMS report 85/3/16. Some of the enclosed rocks appear similar.

I should like routine descriptions for each sample but particular comment on the following problem. From 0 to 432.2m (samples 271620 - 271630) the sequence is dominantly up-hole facing green-mauve siltstone, sandstone and minor conglomerate with infaulted zones of black shale. The sequence looks like regular Dundas Group (previously known as Rosebery Group in this area). At 432.2m there is a major fault followed by a down-hole facing black graphitic shale-grey siltstone sequence, subordinate sandstone with zones of heterolithic open framework breccia and thick amalgamated sandstone beds. The question is whether this interval is infaulted Precambrian Oonah Quartzite and Slate Formation or still part of the Cambrian Dundas Group. Microscopic examination may provide evidence of multiple cleavage which would confirm Precambrian age. In hand specimen the deformation is not convincingly Precambrian in character. Comparison with Oonah Formation sections from our Zeehan drilling days may be useful.

Yours sincerely,

J. R. Sise,
Regional Manager.

c.c. EHS/RGP

816093

091

Central Mineralogical Services

CMS

39 Beulah Road
Norwood, S.A. 5067
Telephone 42 5659
FAX. 08-363 1820

Mr. J.R. Sise
Regional Manager
Aberfoyle Resources Ltd.
Exploration Division
P.O. Box 952
BURNIE / TAS. 7320

9th September, 1987

REPORT CMS 87/8/2

YOUR REFERENCE:	Letter dated 31.7.1987
DATE RECEIVED:	3rd August, 1987
SAMPLE NOS.:	271620 - 271635
SUBMITTED BY:	J.R. Sise
WORK REQUESTED:	Petrology

H.W. Fander, M. Sc.

Copy to:
Mr. H. Skey
Exploration Manager
Aberfoyle Resources Ltd.
Exploration Division
123, Camberwell Road
HAWTHORN EAST / VIC. 3123

092

REPORT CMS 87/8/2

A suite of 16 drill core samples from DDH MO-2 in the Marionoak area were received for routine petrological description and comment. Representative thin-sections were prepared and examined together with respective offcuts, with carbonate stain tests performed as warranted. Attached tabulated descriptions summarise the microscopic data and include interpretative comments, notably with respect to alteration trends.

Summary

As indicated by J.R. Sise (letter of 31.7.1987), this suite may be subdivided into two distinct groups on petrological grounds:

Group 1 comprises samples 271620 to 271630 inclusive. These samples represent a sequence of labile turbiditic sandstones (greywackes) and variably dolomitic, variably carbonaceous pelites with associated quartzites. The greywacke facies is analogous to that previously noted in this area (CMS 85/3/16). The composite lithological assemblage, with detrital chromite-bearing turbidites and quartzites accompanied by clastic white mica-deficient pelites, may be considered typical of the Dundas Group.

This group exhibits a "regional" chloritic alteration assemblage complexed by vein- and mild metasomatic effects, and is variably syngenetic pyrite-mineralised.

Group 2 rocks include samples 271631 to 271635 inclusive. These samples comprise a distinctive suite of carbonaceous and variably pyritic psammopelites, including breccias with (altered) dolomite, impure dolomite, impure chert and minor intermediate-acid porphyry clasts. Psammopelites are devoid of clastic chromite and exhibit distinctly enhanced detrital quartz and muscovite contents in comparison with the Group 1 pelites.

These rocks exhibit compositional characteristics typical of, and reasonably correlated with, the Oonah Formation. The main alteration feature is Fe-metasomatism reflected in sideritic carbonate replacement of accessory dolomite. Minor base metal sulphide disseminations occur in association with sideritic carbonate veins. Syngenetic pyrite, recrystallized to varying degrees, is more or less ubiquitous.

D. Cowan, B. Sc.

Sample No.	Classification - Composition	Fabric	Accessories	Comments
271620 (T.S. 58499)	Carbonaceous Psammopelite. Loose framework of silt- to medium sand-sized quartz grains, sand- to pebble-sized lithic (sericitic-dolomitic pelite/impure dolomite, impure chert/cherty argillite, dolomitic, sericitic quartzose siltstone/fine sandstone) clasts. Matrix and interbands of sericitic, weakly dolomitic and weakly/pervasively carbonaceous quartzose-silty shale.	Massive to semi-lenticularly banded with random to semi-bedded angular to subround lithic "megaclasts". Concordantly sheared/phyllitic.	Disseminated to locally conspicuous fine "syngenetic" pyrite (partly clastic), minor detrital muscovite flakes, leucoxenic semi-opaques, ill-defined shard fragments.	Slumped-intraclastic carbonaceous, dolomitic, pyritic quartzose-micaceous silty pelite. Weakly tuffaceous with sparse volcanic quartz grains and poorly defined devitrified/silicified shard fragments. Finer detail obscured b weak but pervasive shearing effect
271621	Dolomitic Protoquartzite. Framework of weakly overgrown, subangular to subround fine sand-sized quartz grains, relatively minor sericitic pelite and impure chert clasts, sparse albite grains, felsitic acid lava clasts. Intergranular fine-grained dolomite cement with minor sericite and microgranular quartz.	Well-sorted, weakly bedded fine sandstone with sparse sericitic shaly partings. Incipiently stressed. Minor weakly dolomitic quartz veinlets.	Detrital leucoxene, chromite, carbonaceous shale clasts, minor muscovite flakes, detrital tourmaline, rare zircon. Minor traces of pyrite (in lithic clasts).	Well-sorted, fine-grained quartz sandstone, dolomite(-quartz-sericite)-cemented, weakly quartz-veined and very weakly stressed. Exhibits mild bleaching of carbonaceous matter, notably in the spar sericitic shale partings, but no other tangible "hydrothermal" effects.
271622	Dolomitic Carbonaceous Palite. Semi-sericitic white mica pervasively stained with carbonaceous matter, minor microcrystalline quartz, varying proportions of microcrystalline dolomite and fine to ultrafine pyrite. Semi-pervasive ankeritic carbonate veinlets.	Massive to micro-laminated, incipiently concordantly cleaved shale. Extensively brecciated/carbonate-healed; variably restressed to granulated.	Minor films, vugs of quartz in ankeritic breccia matrix. Sparse silt- to fine sand-sized detrital quartz grains.	Strongly carbonaceous, variably dolomitic, variably pyritic shale. Exhibits minor early ("diagenetic" dolomite veinlets. Extensively brecciated/ankeritic carbonate-veined and cemented. Subsequently restressed with partial recrystallization and locally granulation of the ankeritic vein/matrix.

Sample No.	Classification - Composition	Fabric	Accessories	Comments
271623	Altered Greywacke. Very fine chlorite with semi-pervasive microcrystalline ankeritic dolomite, minor sericite, pervasive leucoxenic TiO_2 stainings. Varying proportions of silt- to fine sand-sized relict detrital quartz, minor corroded relics of albite and (chloritised) poorly determinate basic-intermediate lava clasts. Frequent chloritic/microcrystalline cloudy carbonate-stained microfractures. Sporadic discontinuous sideritic carbonate veinlets and late displacive films of ankeritic carbonate, microcrystalline quartz.	Variable. Essentially a millimetric-scale alternation of turbiditic fine sandstone, fine silty pelite, and cherty argillite. Extensively microfractured to semi-brecciated, with multistage displacive veinlets.	Minor traces of detrital chromite.	Primarily a labile ("tuffaceou c basic-intermediate volcanomict) turbidite/pelite/cherty argillite intercalation. Chloritic assemblag is of sub- to low-greenschist facies metamorphic character, complexed by multistage brittle deformation effects, broadly analogous to those in 271622.
271624	Altered Greywacke. Chlorite aggregates with minor sericite and dolomitic carbonate, pervasive leucoxenic and subordinate hematitic stainings. Thinly disseminated silt- to fine-sandsized quartz grains, corroded relics of albite and of (chloritised) basic (basaltic-textured) lava clasts.	Weakly bedded, silty fine sandy, "turbiditic". Framework dominated by chloritised lithic clasts.	Minor chlorite-selvedged dolomite veinlets. Late calcite veins. *Minor traces of ultra-*fine pyrite, detrital chromite.	Close affinities with the coarser-grained labile turbiditic sandston units in 271623, and similarly altered. Main contrast is the presence of hematitic (degraded ?magnetite) in addition to leucoxenic clastic opaques. The late calcite veins are mildy stressed/partly recrystallized.
271625	Carbonaceous Pelite. Semi- to sericitic white mica with varying proportions of carbonaceous matter, minor microcrystalline quartz, disseminated to conspicuous fine to ultra-fine pyrite. Semi-pervasive network of ankeritic carbonate veinlets with disseminated clusters of pyrite. Frequent late carbonaceous microfractures.	Banded/incipiently cleaved, massive to microlenticular. Displacive semi-lustre-mottled carbonate veins and pervasive subsequent displacive carbonaceous microfractures.	Minor fine silt-sized clastic quartz grains and leucoxenic semi-opaques.	Similarities with 271622, but non-dolomitic. Strictly an intercalation of weakly carbonaceous cherty argillite and strongly carbonaceous shale, both facies exhibiting bedded pyrite. Extensively fractured (argillite) to boudinaged (pelite), brecciated carbonate-veined and refractured. Carbonate vein-hosted pyrite apparently remobilised-syngenetic.

Sample No.	Classification - Composition	Fabric	Accessories	Comments
271626	Carbonaceous Pelite. Semi- to sericitic white mica, varying proportions of carbonaceous matter, subordinate microcrystalline quartz, disseminated to conspicuous fine to ultrafine pyrite. Semi-pervasive network of ankeritic microscale carbonate veinlets.	Microlaminated cherty argillite with cyclic interunits of microlenticular pyritic carbonaceous pelite, unilaterally flanked with (pressure-shadowed) pyritic partings.	Sporadic siliceous semi-massive pyrite lenses in pelite units. Very minor fine silt-sized detrital quartz, leucoxenic semi-opaques.	Close affinities with, and essentially an unfractured variant of, 271625. Exhibits sparse "ptygmatic" diagenetic quartz-dolomite veinlets, crenulated by compaction and an incipient concordant slaty cleavage.
271627	Altered Greywacke. Leucoxenic/Fe-pigmented aggregates of chlorite and semi-sericitic white mica, with thinly disseminated clastic quartz grains, pervasive chlorite-sericite-altered lithic clasts; sporadic interbands of hematitic cherty argillite. Irregular chloritic quartz veins/veinlets and veins/impregnations of chlorite and sideritic carbonate.	Siltstone/cherty argillite-parted turbiditic silty fine to medium sandstone, irregularly quartz-chlorite-veined to locally brecciated. Restressed with chlorite-carbonate veinlets, late chloritic microfractures.	Disseminated and chloritic quartz vein-hosted clots, semi-massive films of pyrite. Minor detrital muscovite flakes.	Close affinities with 271623 and 271624; similarly altered, but relatively sericitic and complexly veined. Exhibits sporadic, apparently temporally early chlorite-sericite(-quartz) veinlet intermediate chloritic quartz and late, relatively unstressed chlorite-carbonate(-quartz) veins.
271628	Altered Pelite. Semi- to sericitic white mica with minor intergrown chlorite and microcrystalline quartz. Disseminated to conspicuous clots of calcite and chlorite.	Massive to microlaminated, with relatively calcitic slightly silty units to 1 cm +.	Minor fine silt-sized clastic quartz, muscovite flakes. Minor microscale chlorite-calcite veinlets.	Relatively massive shale with calcite-chlorite semi-pseudomorphe diagenetic carbonate (?dolomite) rhombs. Essentially unsheared. Non-carbonaceous.
271629	Altered Greywacke. Framework of chloritic "basaltic" lava clasts, albitised plagioclase grains, carbonaceous pelite clasts, subordinate dolomitic limestone, minor felsitic acid volcanic clasts, quartz grains. Dolomitic chlorite matrix. Disseminated to locally conspicuous fine to ultrafine pyrite.	Slumped/pelite-intraclastic silty fine to medium sandy clastic.	Sporadic discontinuous calcite veinlets. Late carbonaceous microfractures. Clastic leucoxenic semi-opaques, traces of chromite.	Slumped volcanomict turbiditic sandstone with conspicuous intraclasts of carbonaceous pelite. Includes sporadic clasts of (carbonaceous pelite-related) masssive pyrite. Chloritic alteration analogous to 271623 etc., less advanced.

Sample No.	Classification - Composition	Fabric	Accessories	Comments
271630	<u>Pyritic Pelite</u>. Semi-sericitic white mica with subordinate intergrown chlorite, minor microcrystalline quartz, varying proportions of fine to ultrafine pyrite.	Massive to micro-laminated (pyrite distribution). Broadly mesofolded/micro-crenulated.	Sparse, variably pyritic chlorite-quartz-ankerite veinlets. Fine silt-sized clastic leucoxene, minor quartz grains.	Chloritic quartz veinlets are dis- continuous, broadly axial plan to kink-like low amplitude mesofolds. Sectioned area include a chlorite pressure-shadowed pyritic parting analogous to thos in the similar but distinctly carbonaceous 271626 pelite.
271631	<u>Carbonaceous Psammopelite</u>. Semi-sericitic white mica with minor intergrown micro-crystalline quartz, varying proportions of carbonaceous matter, silt- to fine sand-sized detrital quartz, subordinate detrital muscovite and sericitic impure chert clasts.	Contorted to semi-brecciated silty pelite with inter-bands of quartz-mica siltstone/fine sandstone.	Frequent carbonaceous microfractures, sporadic quartz vein-lets with films of dolomite. Crosscutting vein of sideritic carbonate with dissem-inated sphalerite, galena, chalcopyrite.	Distinctly quartzose-micaceous in comparison with the above-described pelitic sediments. Includes minor ultrafine syngeneti pyrite and silt-sized detrital leucoxenic semi-opaques. Mineral-ised sideritic carbonate vein includes traces of quartz, is essentially unstressed, postdates the deformation.
271632	<u>Breccia</u>. Zones, clasts of quartzose silty to sandy/weakly micaceous, carbonaceous, weakly pyritic pelite with intraclasts of siderite (+ chlorite) altered impure dolomite/dolomitic pelite, pyritic-carbonaceous sandy pelite and sericite-carbonate-altered feldspar-biotite porphyry. Matrix of carbonaceous pelite with interspersed carbonaceous quartz veinlets and vugs.	Random, submilli-metric- to centi-metric-scale clasts; sheared pelitic matrix with cavity- and fracture-filling carbonaceous quartz aggregates.	Minor clastic leucoxenic semi-opaques.	Tectonic breccia with dominantly sedimentary/minor altered inter-mediate-acid igneous clasts. Reflects siderite-chlorite-sericit alteration of relatively labile clasts (dolomite, porphyry). Matri is a composite of sheared carbon-aceous pelite and carbonaceous vein-type quartz. No base metal sulphide disseminations in contras to 271631.

Sample No.	Classification - Composition	Fabric	Accessories	Comments
271633	Carbonaceous Pelite. Strongly carbonaceous, variably quartzose/weakly micaceous silty shale with interbands of sideritic carbonate-stained quartzose siltstone/ fine sandstone, sericite-quartz-cemented, with minor clastic muscovite, sericitic chert clasts.	Banded, siltstone-parted on a sub- to millimetric scale. Mildly contorted, with high-angle discordant carbonaceous micro fractures.	Minor but pervasive ultrafine syngenetic pyrite. Traces detrital leucoxene, tourmaline, rare zircons. Minor relics of dolomite in quartz siltstone units.	Pyritic quartzose-micaceous carbonaceous psammopelite with close affinities to 271631 and the sheared matrix pelite in 271632. Exhibits mild sideritic carbonate alteration as metasomatic replacement of dolomite in quartzose siltstone/fine sandstone interbeds.
271634	Altered Dolomitic Quartzite. Framework of fine to medium sand-sized subangular quartz grains, relatively minor sericitic pelite clasts, sporadic contorted carbonaceous sericitic shaly partings. Overgrowth quartz/ intergranular sericite-quartz cement with pervasive fine to microcrystalline sideritic carbonate impregnations.	Slumped, fine to medium sandy clastic. Mildly stressed.	Irregular quartz-siderite veins, discontinuous siderite veinlets. Minor detrital leucoxene, tourmaline, muscovite, weakly pyritic carbonaceous shale clasts.	Affinities with the quartzose siltstone/fine sandstone units in 271633 and similarly altered. Minor accessory pyrite restricted to pelite clasts. Sideritic carbonate apparently dolomite-replacive in absence of relics.
271635 (T.S. 58514)	Carbonaceous Psammopelite. Silt- to medium sand-sized subangular quartz, varying proportions of carbonaceous matter-stained semi-sericitic white mica, disseminated to semi-conspicuous detrital muscovite flakes and sericitic pelite, quartzose-sericitic siltstone clasts. Disseminated to semi-massive pyrite. Irregular/discontinuous sideritic carbonate veinlets.	Carbonaceous shale-parted quartz sandstone with silty carbonaceous shale interbeds carrying boudinaged/quartz-sericite pressure-shadowed massive pyrite aggregates. Semi-pervasive carbonaceous micro-fractures.	Minor detrital leucoxene, impure chert clasts, zircons, rare tourmaline.	Close affinities with, and essentially transitional between, 271633 and 271634. Reflects mild, partly vein-controlled sideritisation postdating bulk of heterogeneous shearing/deformation effects. Pyrite is clearly variably recrystallized syngenetic. Massive aggregates are uneven-grained/ crystalline, with relics of microcrystalline colloform/nodular pyrite.

098

5 cm

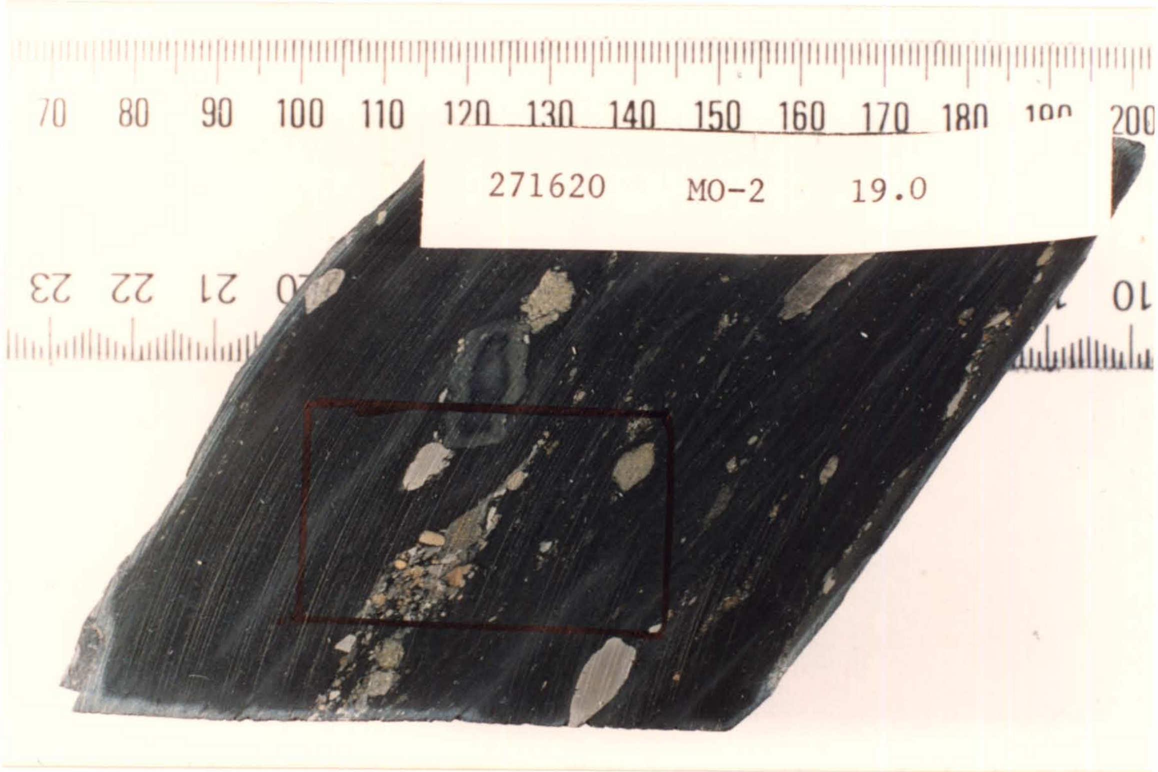
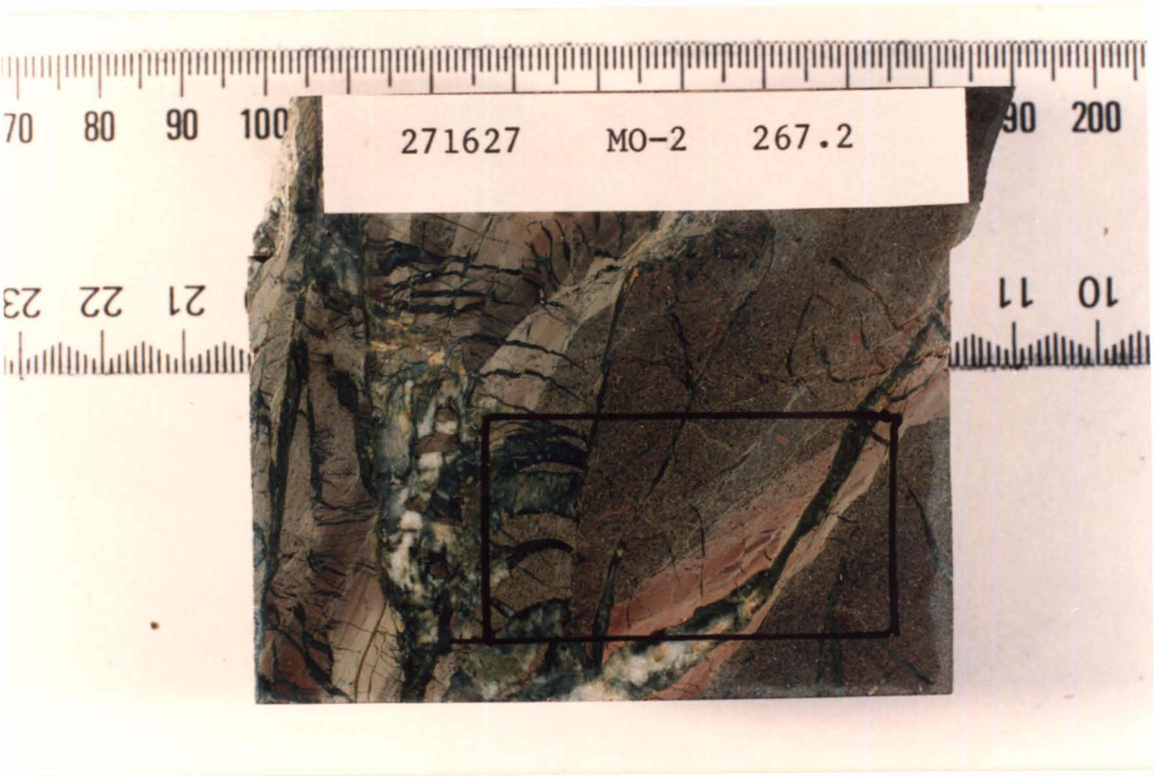


FIGURE 2 Dundas Group - SLumped, Carbonaceous, dolomitic Silty pelite with intraformational Conglomerate lense.

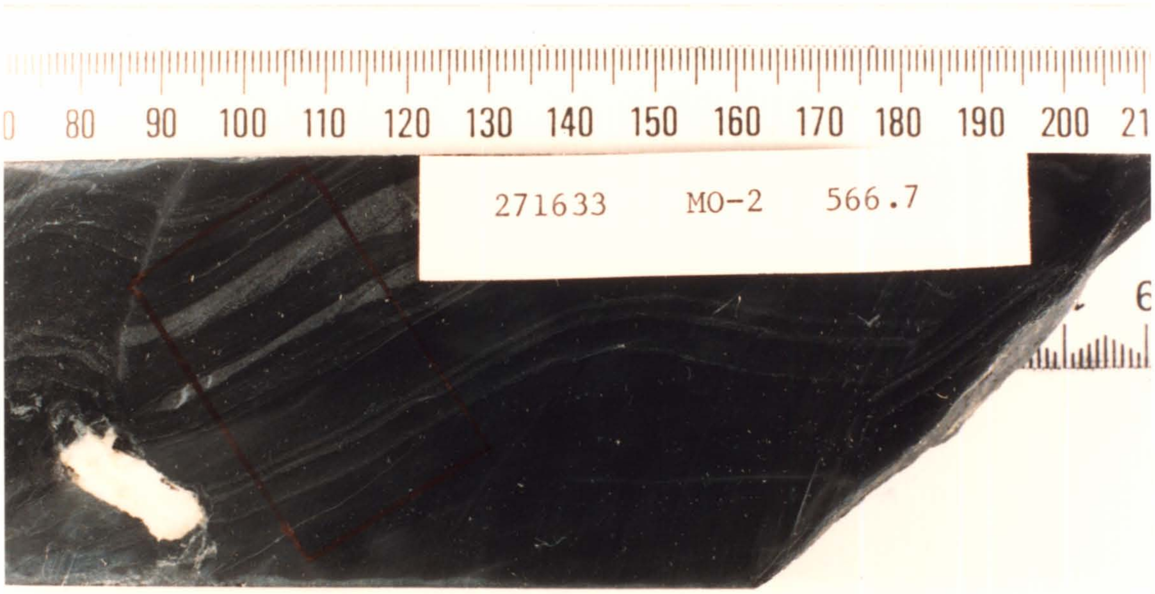
FIGURE 3 Dundas Group - Carbonaceous pelite with pyritic laminae.

5 cm

099



<u>FIGURE 4</u> Dundas Group - Mauve to green coloured altered greywacke.



<u>FIGURE 5</u> Oonah formation - Carbonaceous pelite.

MOZ CORE GRINDS.

Interval	Sample No.	Interval	Sample No.
9.0 - 20.20	395224	286.2 - 297.6	395254
20.20 - 34.2	" 225	297.6 - 307.0	" 255
34.2 - 43.2	" 226	307.0 - 316.2	" 256
43.2 - 54.8	" 227	316.2 - 326.60	" 257
54.8 - 59.60	" 228	326.60 - 337.2	" 258
59.60 - 70.20	" 229	337.2 - 349.2	" 259
70.2 - 74.0	" 230	349.2 - 355.2	" 260
74.0 - 85.2	" 231	355.2 - 365.5	" 261
85.2 - 94.2	" 232	365.5 - 376.2	" 262
94.2 - 103.5	" 233	376.2 - 391.0	" 263
103.5 - 112.2	" 234	391.0 - 403.2	" 264
112.2 - 118.5	" 235	403.2 - 413	" 265
118.5 - 123.2	" 236	413 - 423.4	" 266
123.2 - 133.2	" 237	423.4 - 432.2	" 267
133.2 - 144.3	" 238	432.2 - 442.2	" 268
144.3 - 148.1	" 239	442.2 - 454.2	" 269
148.1 - 160.2.	" 240	454.2 - 464.6	" 270
160.2 - 173.3	" 241	464.6 - 476.3	" 271
173.3 - 181.9	" 242	476.3 - 487.2	" 272
181.9 - 190.2	" 243	487.2 - 499.20	" 273
190.2 - 200.6	" 244	499.2 - 510.9	" 274
200.6 - 205.8	" 245	510.9 - 522.8	" 275
205.8 - 214.2	" 246	522.8 - 535	" 276
214.2 - 226.2	" 247	535 - 545.4	" 277
226.2 - 238.2	" 248	545.4 - 559.2	" 278
238.2 - 250.2	" 250	559.2 - 571.2	" 279
250.2 - 262.2	" 251	571.2 - 583.2	" 280
262.2 - 274.2	" 252	583.2 - 594.3	" 281
274.2 - 286.2	" 253	594.3 - 599.6	" 282

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INTERVAL	SAMPLE NO.	INTERVAL	SAMPLE NO.
599.6 - 610.2	395283		
610.2 - 622.2	" 284		
622.2 - 631.2	" 285		
631.2 - 643.2.	" 286		
EOH.			

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816104

ANALABS

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

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

ANALYTICAL REPORT No. 23.3.08.04393

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

Aberfolye Resources Exp. Division
P.O. Box 952
Burnie
Tasmania 7320

ORDER No.	PROJECT
2353	

DATE RECEIVED	RESULTS REQUIRED
07/04/87	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
3	16/04/87	1	63

STATE OF SAMPLES REFER BELOW	SAMPLE NUMBERS	PRE-TREATMENT DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	ANALYSIS REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	395224/86	CG Prep: 013,016							Cu,Pb,Zn,Ag/101		
	395224/86	CG Prep: 013,016							Cu,Pb,Zn,Ag/103		

RESULTS TO

R. de Bomford
Aberfoyle Resources Exp. Division
P.O. Box 952
Burnie
Tasmania 7320

RESULTS TO

REMARKS

Merwick
Mo-2
Core grinds.

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

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ANALABS

ANALYTICAL DATA

SAMPLE PREP	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	23.3.08.04393	16/04/87	2353	1 OF 3

No.	Sample	[illegible]	[illegible]	Pb	Pb	Zn	Zn	Ag	Ag
1	395224 9-[illegible]·2	130	–	30	–	220	–	<0.5	–
2	395225 [illegible]·2-34·2	145	–	10	–	185	–	<0.5	–
3	395226 34·2-43·2	175	–	65	–	175	–	<0.5	–
4	395227 43·2-54·8	–	1300	–	230	–	2050	–	2.0
5	395228 54·8-59·6	30	–	20	–	60	–	<0.5	–
6	395229 59·6-70·2	130	–	<5	–	80	–	<0.5	–
7	395230 70·2-76·0	50	–	<5	–	75	–	<0.5	–
8	395231 76·0-85·2	75	–	<5	–	145	–	<0.5	–
9	395232 85·2-94·2	105	–	<5	–	140	–	<0.5	–
10	395233 94·2-103·5	90	–	<5	–	115	–	<0.5	–
11	395234 103·5-112·2	95	–	55	–	250	–	<0.5	–
12	395235 112·2-118·5	90	–	5	–	115	–	<0.5	–
13	395236 119·5-123·2	130	–	40	–	115	–	<0.5	–
14	395237 123·2-133·2	105	–	<5	–	85	–	<0.5	–
15	395238 133·2-144·3	170	–	10	–	155	–	<0.5	–
16	395239 144·3-148·1	295	–	10	–	290	–	<0.5	–
17	395240 148·1-160·2	160	–	<5	–	150	–	<0.5	–
18	395241 160·2-173·3	265	–	<5	–	190	–	<0.5	–
19	395242 173·3-181·9	210	–	<5	–	195	–	<0.5	–
20	395243 181·9-190·2	120	–	<5	–	115	–	<0.5	–
21	395244 190·2-200·6	45	–	<5	–	75	–	<0.5	–
22	395245 200·6-205·8	100	–	25	–	210	–	<0.5	–
23	395246 205·8-214·2	250	–	<5	–	120	–	<0.5	–
24	395247 214·2-226·2	435	–	50	–	155	–	<0.5	–
25	395248 226·2-236·2	160	–	<5	–	140	–	<0.5	–

Results in ppm unless otherwise specified
T = element present; but concentration too [illegible]
x = element concentration is below detecti[illegible]
– = element not determined

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ANALABS

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	ORDER No.	PAGE
	23.3.08.04393	16/04/87	2353	2 OF 3

TUBE No.	SAMPLE No.	Cu	Cu	Pb	Pb	Zn	Zn	Ag	Ag
1	395249 *STD 3	–	130	–	260	–	2450	–	1.0
2	395250 238.2-250.2	135	–	<5	–	170	–	<0.5	–
3	395251 250.2-262.2	275	–	<5	–	285	–	<0.5	–
4	395252 262.2-274.2	85	–	<5	–	150	–	<0.5	–
5	395253 274.2-286.2	135	–	<5	–	190	–	<0.5	–
6	395254 286.2-297.6	160	–	<5	–	190	–	<0.5	–
7	395255 297.6-307	205	–	15	–	200	–	<0.5	–
8	395256 307-316.2	150	–	20	–	200	–	<0.5	–
9	395257 316.2-326.6	285	–	80	–	180	–	<0.5	–
10	395258 326.6-337.2	215	–	75	–	250	–	<0.5	–
11	395259 337.2-349.2	145	–	40	–	150	–	<0.5	–
12	395260 349.2-355.2	105	–	<5	–	210	–	<0.5	–
13	395261 355.2-365.5	110	–	15	–	240	–	<0.5	–
14	395262 365.5-376.2	60	–	<5	–	175	–	<0.5	–
15	395263 376.2-391.1	110	–	<5	–	320	–	<0.5	–
16	395264 391.1-403.2	60	–	5	–	235	–	<0.5	–
17	395265 403.2-413	85	–	10	–	205	–	<0.5	–
18	395266 413-423.4	125	–	90	–	255	–	<0.5	–
19	395267 423.4-432.2	200	–	65	–	170	–	<0.5	–
20	395268 432.2-442.2	–	605	–	810	–	2550	–	1.0
21	395269 442.2-454.2	–	360	–	620	–	580	–	1.0
22	395270 454.2-464.6	290	–	75	–	265	–	<0.5	–
23	395271 464.6-476.8	220	–	55	–	215	–	<0.5	–
24	395272 476.8-487.2	80	–	55	–	320	–	<0.5	–
25	395273 487.2-499.2	190	–	55	–	240	–	<0.5	–

Results in ppm unless otherwise specified
= element present, but concentration too low [illegible]
< = element concentration is below detection [illegible]
– = element not determined

AUTHORISED OFFICER [signature]

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ANALABS

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	23.3.08.04393	16/04/87	2353	3 OF 3

TUBE No.	SAMPLE No.	Cu	Cu	Pb	Pb	Zn	Zn	Ag	Ag	
1	395274 499.2-510.9	95	-	45	-	105	-	<0.5	-	
2	395275 510.9-522.8	85	-	50	-	115	-	<0.5	-	
3	395276 522.8-535	80	-	50	-	90	-	<0.5	-	
4	395277 535-545.4	100	-	30	-	145	-	<0.5	-	
5	395278 545.4-559.1	125	-	10	-	135	-	<0.5	-	
6	395279 559.1-571.2	130	-	<5	-	150	-	<0.5	-	
7	395280 571.2-583.2	85	-	10	-	90	-	<0.5	-	
8	395281 583.2-594.3	65	-	10	-	85	-	<0.5	-	
9	395282 594.3-599.6	225	-	<5	-	190	-	<0.5	-	
10	395283 599.6-610.2	250	-	40	-	210	-	<0.5	-	
11	395284 610.2-622.2	135	-	20	-	115	-	<0.5	-	
12	395285 622.2-631.2	90	-	10	-	80	-	<0.5	-	
13	395286 631.2-643.2	215	-	<5	-	270	-	<0.5	-	
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	5	5	5	5	5	5	0.5	0.5	
24	UNITS	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	
25	METHOD	101	103	101	103	101	103	101	103	

Results in ppm unless otherwise [illegible]
[illegible] = element present, but concentration too [illegible]
[illegible] = element concentration [illegible]
[illegible] = element not determined

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DHEM Loop Record

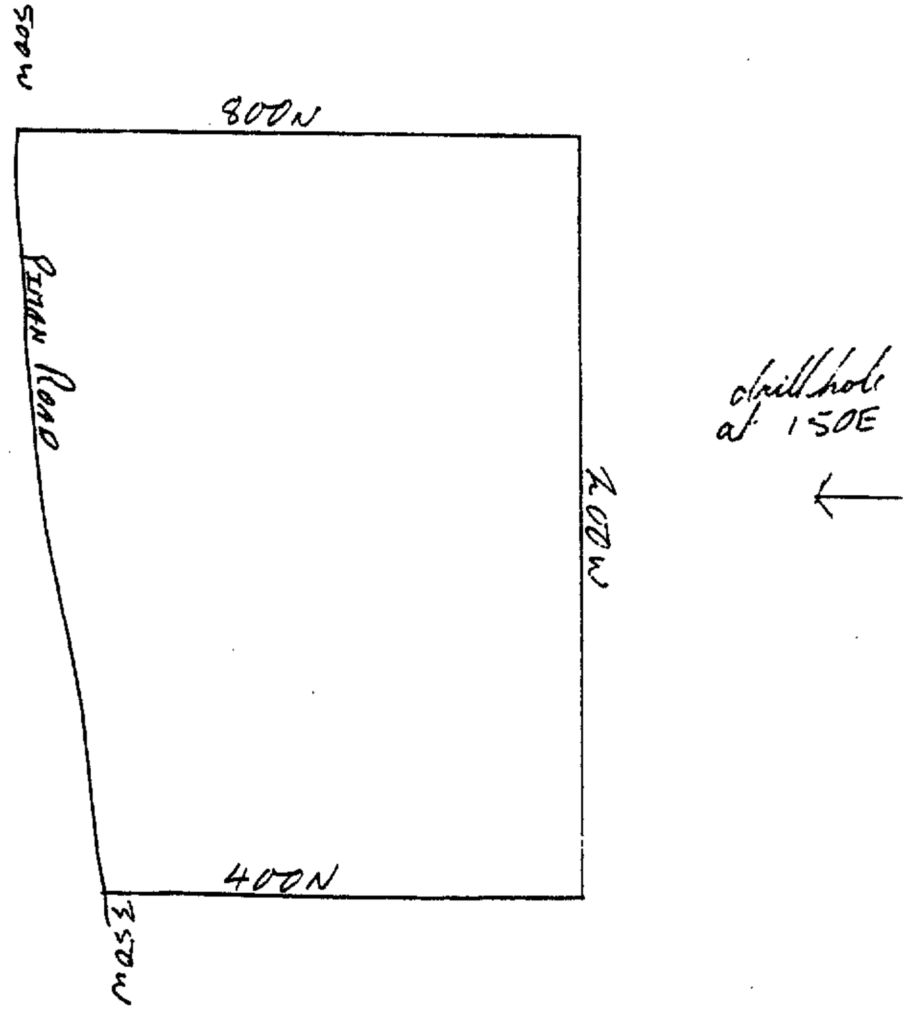
ODH

MO-2

Location Marionoak
date read 2-7-87
read by P. McSKIMMING
instrument SIROTEM 1287

Depth 650 m
Angle -55°
Bearing 270°

Loop 1 of 1



400m x 250m loop

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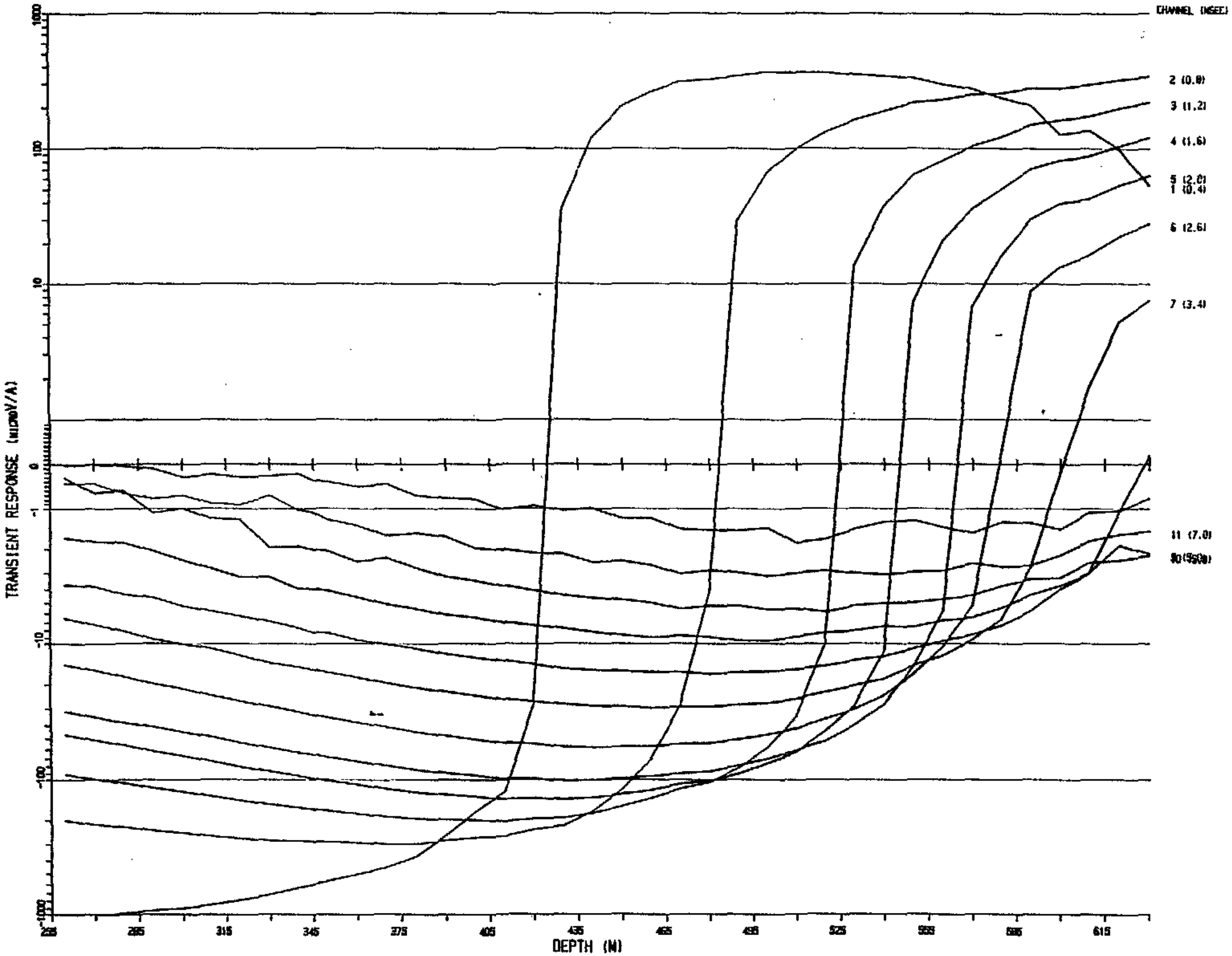

SURVEY SPECIFICATIONS

DATA ACQUIS'N : McSKINNING GEOPHYSICS P/L

SURVEY DATE : JUNE, 1987
CONFIGURATION : 400M SQUARE TRANSMITTER LOOP, DRILL HOLE SURVEY
READING INT. : 15 METRES
NO. OF STACKS : 2048
TRANSMITTER : MEDIUM POWER
RECEIVER : SIROTEM II S/N 1237
CURRENT : 12.6 AMPS

OPERATOR : P. McSKINNING

PLOT SPECIFICATIONS

HORIZONTAL SCALE - 1:1500
VERTICAL SCALE - LOGARITHMIC
3CM. PER DECADE
LINEAR BETWEEN -1 AND +1

5 cm

ABERFOYLE EXPLORATION

QUE RIVER, TAS.
MARIONOAK
SIROTEM PROFILE
LINE DDH MO 3

SCALE - 1:1500

816109

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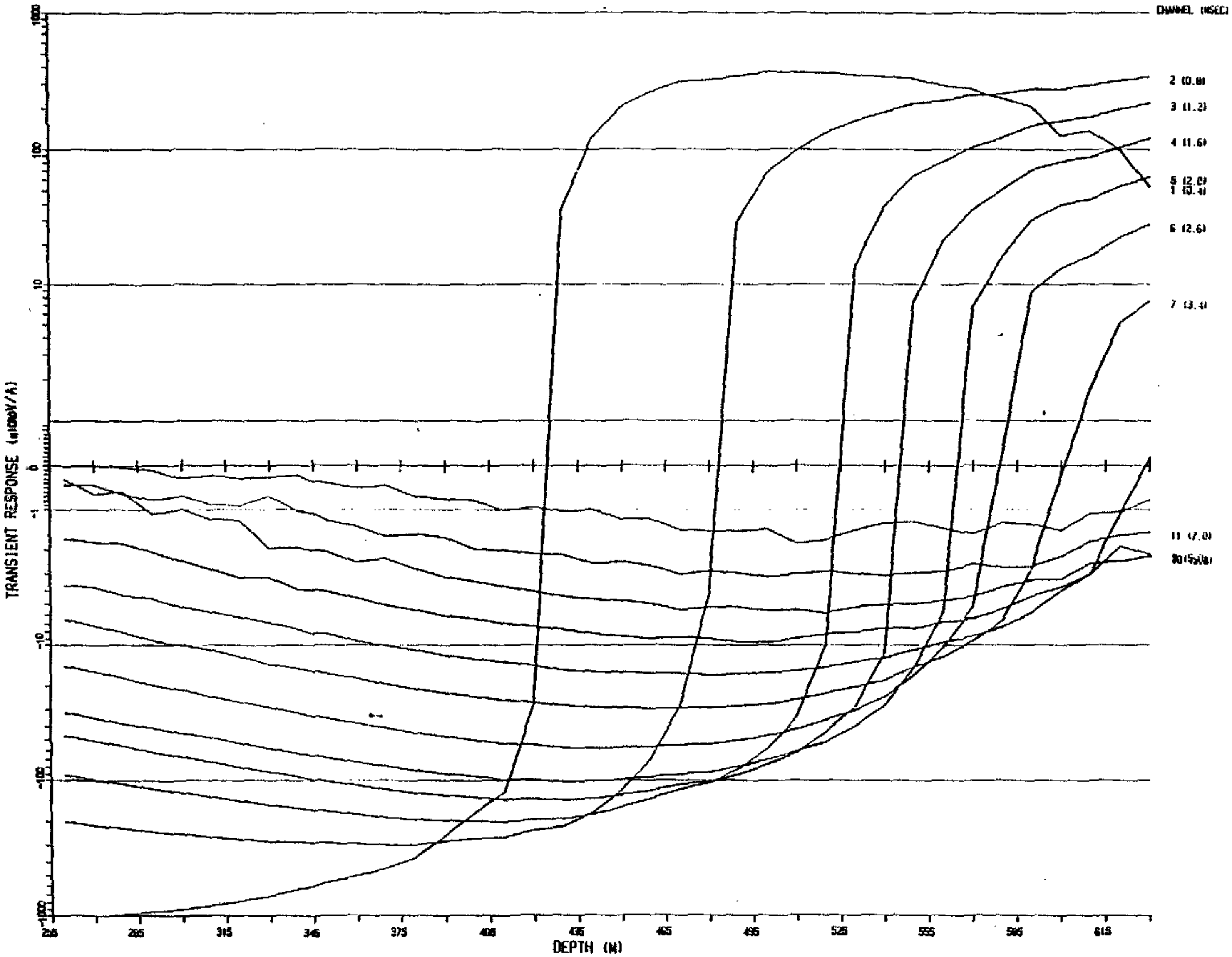

SURVEY SPECIFICATIONS

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PLOT SPECIFICATIONS

HORIZONTAL SCALE - 1:1500
VERTICAL SCALE - LOGARITHMIC
3CM. PER DECADE
LINEAR BETWEEN -1 AND +1

5 cm

ABERFOYLE EXPLORATION

QUE RIVER, TAS.
MARIONOAK
SIROTEM PROFILE
LINE DDH MO 3

SCALE - 1:1500

816110

816111

Aberfoyle Resources Limited
EXPLORATION DIVISION

88-2773

REVISIONS			
Init.	Date	Init.	Date

NORTH WEST TASMANIA

MARIONOAK E.L. 22/74

BASTYAN DAM - SUMMARY GEOLOGY

Compiled :	AMcN
Drawn :	RJE
Traced :	RJE
Checked :	AMcN
Location Code :	K55/3
Scale :	1:2500
Date :	December, 1987
Plate No :	MOC 22

6529

LITHOLOGY COMPOSITION

R	Rhyolite
D	Dacite
A	Andesite
B	Basalt
Y	Polymict
Ss	Sandstone
Sh	Shale
Slt	Siltstone
Ba	Barite
Py	Pyrite
BMS	Base Metal Sulphide
Ch	Chert
Av	Altered volcanics
JDo	Jurrasic Dolerite
OCg	Ordovician Conglomerate

LITHOLOGY TEXTURE / FORM

l	lava
lb	lava breccia
pl	pillow lava
av	ash volcaniclastic
flv	fine lapilli volcaniclastic
mlv	medium " "
clv	coarse " "
bv	breccia "
xv	crystal "
ves	vesicular
por	porphyritic
eux	eutaxitic
fbn	flowbanded
gnlr	granular
lbd	interbedded
md	matrix dominant
gl	glassy
mas	massive
lm	laminated
fp	feldspar phyric
rnd	rounded
pep	peperitic
sph	spheriolitic

VOLCANICLASTIC SIZE RANGE

> 2mm	ash
2-8	fine lapilli
8-32	medium lapilli
32-64	coarse lapilli
> 64	breccia

ALTERATION COMPOSITION

Co	Carbonate
Cl	Chlorite
Kf	K-feldspar
Fu	Fuchsite
Py	Pyrite
Se	Sericite
Si	Silica

ALTERATION TEXTURE / FORM

per	pervasive
dis	disseminated
pat	patchy
spt	spotty
spr	selected fragments
stw	stockwork
stc	structure controlled
vn	vein
mtx	matrix

ALTERATION INTENSITY WEATHERING INTENSITY

1	trace
2	weak
3	moderate
4	strong
5	extreme

COLOUR

br	brown
bk	black
gy	grey
gn	green
or	orange
pk	pink
wh	white
yw	yellow
bl	blue

FAULT TERMS

cav	cavernous
lch	leached
slk	slickenside
rhd	rehealed
rbb	rubble
shd	sheared

GENERAL TERMS

tr	trace
lgt	light
dk	dark
brt	bright
ox	oxidised
fg	fine grained
mg	medium grained
cg	coarse grained

ABBREVIATED DESCRIPTION FORMAT

LITHOLOGY:

LITHOLOGY WEATHERING ALTERATION

colour. composition. form. texture / intensity / composition. intensity. form. texture

example gy - gn. YA. flv / Ox3 / Fu.3. dis

Interpretive comment can be added in brackets ( )

FAULT:

WIDTH (cms) / MINERALOGY. TEXTURE

example F 20 / Cl. cav.

VEIN:

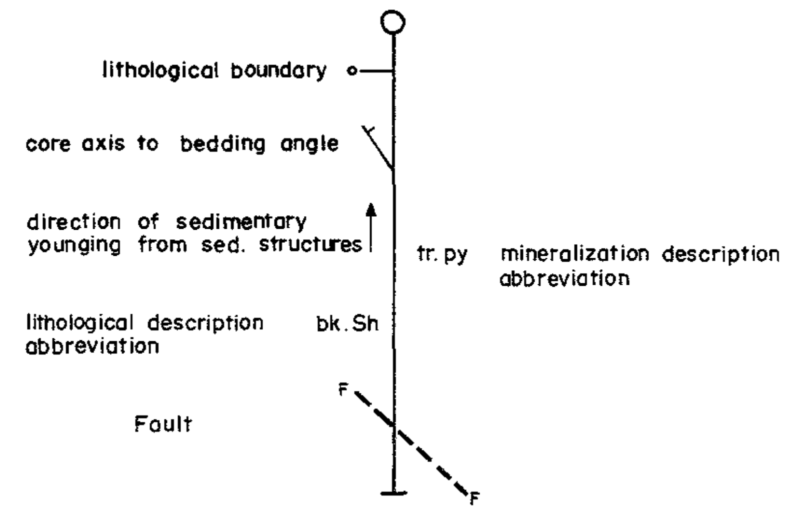
WIDTH (cms) / MINERALOGY. TEXTURE

example V 5 / Q. Py. cav

(SYMBOLS AS SHOWN IN ABEX "STANDARDS FOR GEOLOGICAL DRAWINGS", JAN. 1983)

LINE TH'NESS / LEROY LETTER SIZE	(LENGTH AS SHOWN)	
·35		Outcrop boundary
·35		Float
·35		Contact known
·35		Contact interpreted
·35	—?—	Contact inferred
·35		Facies change
·35		Unconformity
·25		Anticline, syncline with plunge and trend
·25		Minor fold with plunge and trend
·25/50	20 350	Bedding, strike, dip
·25/50		Cleavage, strike, dip
·25/50		Igneous foliation, strike, dip
·5/50,100	F 9 200 70	Fault, definite, strike, dip, mineralogy
·5/100	F—?—	Fault, inferred
·35		Shear zone
·35/60	A.lv	DDH collar and trace, top 20m geology shown
·25		Grid line, stadia surveyed
·25		Grid line, tape and compass survey
·25		Grid line, nominal position
/60	P 355012	Petrology sample location
·35		Track, unsurveyed
·35		Road (unsealed) or track, surveyed
·7		Major road
·35		Costean
·25		Creek
·35		Mining Lease boundary
·5		Exploration Licence boundary
/60	• 13	Peg with number, tape and compass surveyed
/60	⊕ HT17	Peg with number, stadia surveyed
·25		Alteration boundary

Diamond Drill Hole



816112

Aberfoyle Resources Limited
EXPLORATION DIVISION

88-2773

REVISIONS					
Init.	Date	Init.	Date	NORTH WEST TASMANIA MARIONOAK GEOLOGICAL LEGEND	Compiled : A Mc N
					Drawn : RJE
					Traced : RJE
					Checked : A Mc N
Location Code : -				Scale : - Date : January, 1988	Plate No. : MOC 23

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Aberfoyle Resources Limited

EXPLORATION DIVISION

88-2773

REVISIONS			
Init.	Date	Init.	Date

NORTH WEST TASMANIA

MARIONOAK

SECTION MO2

Compiled : AMcN
Drawn : RJE
Traced : RJE
Checked : AMcN

Location Code : K55/3
Scale : 1:1000
Date : January, 1988
Plate No : MOC 24

6531