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GEOPHYSICAL PROGRESS REPORT

ON

ELLIOT BAY E.L. 27/76 TASMANIA

77-1233

by

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**MICROFILMED**

**GEOPEKO LIMITED**

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**OPEN FILE**

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INTRODUCTION

E.L. 27/76 covers approximately 300 square kilometres in the south west of Tasmania and is immediately south of the Birch Inlet area. This area was previously held by Broken Hill Proprietary Co., who covered the majority of the area with an airborne E.M. magnetometer survey.

Geophysical field exploration by Geopeko during the 1976-1977 field season has been ground location of airborne E.M. anomalies from the B.H.P. survey. Some localities with known mineralisation were partly investigated.

This report discusses the results of both airborne and ground geophysics in this area.

AIRBORNE SURVEY

A Geox H-400 magnetic-electromagnetic survey was flown by Geox in the Elliot Bay area in 1975. Data available is a recovery plan with E.M. anomalies plotted and an aeromagnetic contour plan.

Some aspects of the data are:-

a) Aeromagnetics

1. The aeromagnetic data shows large relief along the western edge of the survey area.
2. Several small and large isolated magnetic anomalies are evident. As there is little geological information available the significance of these anomalies is not known at this stage.
3. In the southern part of the area magnetic anomalies exist on the margin of two granites and may be related to magnetic skarns.

b) Electromagnetics

1. Over 100 anomaly zones and individual anomalies have been interpreted by Geox. They point out that no zones of major interest were detected.
2. Of the priority 1, 2, 3, and 4 anomaly classifications selected by Geox, most anomalies are long and linear and probably related to long conductors which may be fault/shear zones or carbonaceous shale. Within these four groups, six anomalies which are isolated or of short strike length appear to be the most encouraging. These are:-

Anomaly 96  
Anomaly 18  
Anomaly 7 (northern anomaly on line 4)  
Anomaly 70  
Anomaly 54  
Anomaly 99

3. Of the priority 5 anomalies the following appear to be the most interesting.

Anomaly 19  
Anomaly 23  
Anomaly 25  
Anomaly 27 (northern anomaly on line 23)  
Anomaly 63

4. Of these anomalies above, follow up work has been done on:-

Anomaly 18  
Anomaly 7 (ground work incomplete)  
Anomaly 25 (Lewis River Prospect)

1976 FIELD SEASON GEOPHYSICS

Geophysical field work during this period consisted of V.L.F., E.M. and some I.P. and magnetic, surveys over known mineral occurrences, airborne E.M. anomalies and aeromagnetic anomalies.

A summary of the results is:-

a) V.L.F. Electromagnetics

Anomalies comparable in strength and character to case history anomalies over known orebodies both in Tasmania and elsewhere were recorded in many places. Any of these could be the response of an orebody but the technique is unable to define conductor types or the geometry of the causative body.

In summary V.L.F. anomalies can be the response of:-

1. Orebodies
2. Ionic conductors associated with fault or shear zones etc.
3. Carbonaceous-pyritic shales.
4. Broad anomalies may be the effect of variation in lithology with no associated "anomalous" conductor.

b) Magnetics

1. Surface follow up of aeromagnetic anomalies has been insufficient to adequately define them.
2. Geological investigation as to the cause of anomalies needs to be carried out.
3. Mineralisation associated with magnetic skarns on the margins of the granite bodies is a possibility.

c) Induced Polarisation

Only one prospect (Voyager I) has had I.P. coverage and anomalies recorded are encouraging.

d) Prospects

Geophysical results for all prospects investigated are not very encouraging. The I.P. anomalies at Voyager I make it the most prospective.

CONCLUSIONS

Geophysical data indicates that both ground and airborne E.M. techniques are of limited use.

From the limited work done to date it appears magnetics may be a usefull path finder in this area. The applicability of this technique poses few problems.

Further geophysical work over airborne anomalies or prospect grids should use both E.M. and I.P. Theoretically the E.M. method is best for locating massive sulphide conductors. The I.P. method is somewhat more specific in delineating subsurface mineralisation and most massive sulphide orebodies have some I.P. signature associated with them..

RECOMMENDATIONS.

The proposals for further work next field season are tentative only and need to be reviewed in collaboration with the geologists and geochemists.

Voyager I warrants gridding and more geophysical work. Geochemical and geological investigation of the I.P. and E.M. anomalies are first priority.

Voyager 2. Further geophysical work will depend on recommendations from the geologists and geochemists.

A.E.M. Anomaly No. 3 and Drake's Prospect. Extensions of work done to the west and south may locate Drake's Prospect and possible associated geophysical responses.

Locate and investigate the cause of isolated magnetic anomalies in the area. Anomalies in the vicinity of granites may be the response of skarns.

Follow up on the ground A.E.M. anomalies 96, 7 (northern anomaly), 70, 54, 99, 19, 23, 27 and 63. This order is the priority listed by Geoex.

APPENDIX PROSPECT SUMMARIESVOYAGER I (PENDERS PROSPECT)

What geophysical data we have is encouraging. Four north-south lines 50 metres apart were surveyed with the V.L.F. method and one line 150E, has S.P., I.P. and resistivity data.

V.L.F. Data.

Broad in-phase lows, with magnitudes in the vicinity of 25%, were recorded on lines 50E, 100E and 150E. The overall response suggests a conductor the top of which is centred below the easterly inflection point with a moderate dip to the south west. The data on line 150E suggests the existence of a comparable anomaly north of 300N. Quadrature data has little relief and indicates the overburden is not conductive and the causative conductor has a moderate to high conductivity.

The line to line correlation is good indicating a strike of about  $315^{\circ}$ M. Underlying rock resistivities appear to be in the range 300-1000 ohm metres. This gives a skin depth of about 100 metres meaning 100 metres is the limit of the "depth of penetration". Semi quantitative interpretation suggests the source depth is in the range 100-150 metres and the depth to top is in the range 20-100 metres. The anomaly character is suggestive of a large volume conductor which apparently extends further to the north west and south east. This in turn suggests the likely cause of the V.L.F. response is geological rather than anomalous i.e. differing rock conductivities.

I.P. Data

Only line 150E is covered with I.P. data and shows a chargeability anomaly of from 2.5%-4% centred about 50N and another anomaly 4% on the southern end of the line. Background appears to be about 2% or less. The form of the central I.P. high also suggests a dip to the south. The I.P. anomalies do not correlate with any V.L.F. anomaly. The central I.P. anomaly correlates with a 200n.T. magnetic high.

S.P.

No anomalous S.P. character was recorded. Only one line 150E was read.

Apparent Resistivity. (fa)

The resistivity data on line 150E indicates an area of high resistivity between 100N and 250N and resistivity lows which correlate with the two I.P. anomalies and with the central V.L.F. cross over.

Conclusions and Recommendations

The V.L.F. character which appears anomalous is not that of the usual anomaly and may be interpreted in several ways. Longer lines with data extending from 600S to 400N may help to clarify anomaly forms. The I.P. data is encouraging. The V.L.F. anomalies are not supported by coincident I.P. effects which suggests the cause of the E.M. response is non-metallic.

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On geophysical grounds alone the prospect is worthy of further work. I recommend establishment of a grid with traverse lines at least 1 Km long and grid coverage with I.P., E.M. and magnetics. V.L.F. correlations indicate the strike is about  $315^{\circ}\text{M}$  and unless it is known that the geological strike differs significantly this would be the optimum base line bearing. (Geological strike of  $315^{\circ}\text{M}$  in this region is optimum for coupling of conductors to the V.L.F. transmitter at North West Cape).

VOYAGER 2 (LEWIS RIVER PROSPECT)  
A.E.M. ANOMALY NO. 25

Two lines 500 metres apart were surveyed with V.L.F. E.M. and magnetics. Anomalies recorded are by no means outstanding but are sufficient to retain some interest in the prospect on geophysical grounds alone.

Magnetics

No character.

V.L.F. Data.

A broad in-phase and quadrature anomaly (magnitude 15% and 10% resp.) with the inflexion point at about 200E on line 0.0 is indicative of a relatively deep seated poor conductor. Similar but less well formed anomalies are at about 350E and 900E on line 500S. The more easterly one appears to be related to a shallower source than the other anomalies.

The V.L.F. anomaly on line 00 is just west of an old mine shaft and for this reason its priority is enhanced.

Conclusions and Recommendations

There is insufficient data to make any positive conclusions. Geological and geochemical considerations may warrant further work in which case more detailed E.M. and I.P. coverage would be in order.

A.E.M. ANOMALY NO. 7

The A.E.M. Anomaly Zone 7 designated by Geoex consists of "two weakly defined anomalies" on adjoining flight lines. The anomaly separation is 950 metres. The anomaly was given a priority of 4 by Geoex because of its proximity to Penders Prospect, however the southern anomaly on line 5 is about 500 metres east of Penders Prospect. The northern anomaly on line 6 is about 1500 metres NE of Penders Prospect.

Ground reconnaissance in this area consisted of two north-south lines 200 metres apart which were read with V.L.F. E.M. data on both lines is high amplitude (up to 30% in-phase) noise (wave length approx. 100 metres). The V.L.F. cross overs reflect near surface conductors. Some of the larger amplitude anomalies could be caused by ore bodies. The surfeit of anomalies tends to rule out this possibility.

AEROMAGNETIC ANOMALY NO.1 (Voyager 5)

The aeromagnetic contour data (BHP/GEOEX) shows this anomaly is about 200n.T. and was recorded on two adjacent flight lines (spacing 240m approx.). The anomaly is not discrete and appears to be part of an ill-defined N-S magnetic trend and possible related to another NE-SW trend. No airborne E.M. anomalies are reported from this locality. Follow up ground work consisted of four E-W traverses, 100 metres apart, read with magnetics and two of these traverses line 0.0 and line 200N read with V.L.F. E.M.

Magnetic Data

The ground magnetic data shows the anomaly to be broad (400m) with a magnitude of about 600n.T. Further ground work is required to adequately define the shape and extent of this anomaly. There is not any significant anomalous E.M. character associated with the magnetic anomaly.

Narrow large magnitude magnetic highs were recorded at 575E on line 200N and at 700E on line 100N which are related to near surface effects but can be tenuously correlated with anomalous E.M. responses.

V.L.F. Data

Line 0 has a V.L.F. anomaly of the order of 20% in-phase (quadrature is negligible) with the inflection point at about 475E. The data on the end of the line suggests there may be an anomaly east of 800E. Two anomalous V.L.F. responses were recorded on line 200N. The western one, inflection point at about 475E has in-phase magnitude of 15% and quadrature of 10%. The low inphase/quadrature ratio indicates a poor conductor. The eastern anomaly, inflection point at about 925E is the largest in magnitude

(in-phase 30%, quadrature-negligible) and the large in-phase/quadrature ratio is indicative of a good conductor.

Semi quantitative interpretation suggests the source conductors have an effective depth of about 80 to 100 metres and the depth to top is the order of 30 metres.

#### Conclusions and Recommendations

On the basis of geophysical data this prospect may be considered a borderline case. The V.L.F. anomalies warrant some I.P. follow up. Geological and geochemical considerations should decide the future development of this prospect.

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AEROMAGNETIC ANOMALY NO. 3 (Voyager 6)

From the aeromagnetic data this 100-200n.T. anomaly appears to be discrete, however it may be related to the broad linear trend to the north. No airborne E.M. anomalies are reported in this locality. One E-W ground traverse was read with magnetics and V.L.F.

The surface data shows a broad (300 metres) magnetic anomaly of 450n.t. with a reasonable V.L.F. anomaly (in-phase 30%, quadrature 7%) on the eastern margin of the magnetic anomaly.

More ground work is required to define the magnetic anomaly.

This prospect falls into a classification similar to Aeromagnetic Anomaly No. 1. <sup>Voyager 5</sup> Further work depends on geological and geochemical considerations.

A.E.M. ANOMALY NO.18 (Voyager 4)

This airborne E.M. anomaly is described by Geox as a "low amplitude "D" type (i.e. poor) with a moderate conductivity ratio (.6)". They allocated a priority of 3 because of an associated 5n.T aeromagnetic anomaly. Ground follow up has not located the magnetic anomaly.

Ground follow up consisted of two E-W lines 900 metres long 100 metres apart being read with V.L.F. E.M. and one line (00N) with magnetics.

The magnetic character is flat.

The V.L.F. data shows both high frequency (wave length about 150 metres) and low frequency (wave length about 400 metres) in-phase displacements of moderate magnitude.

The significance of any of the E.M. "anomalies" cannot be determined at this stage. Further E.M. and I.P. work may be justified if the geology and geochemistry are encouraging.

A.E.M. ANOMALY NO. 3 (Voyager 3)

This airborne E.M. anomaly was attributed to near surface aqueous conductors by Geoex.

Ground follow up consisted of one E-W line 1Km long which from the locality sketch (S. Mudge) is entirely east of the anomalous zone. This line was read with magnetics and V.L.F. E.M.

The magnetic character is flat.

The V.L.F. data is mostly low magnitude noise. The data suggests the possibility of a larger magnitude anomaly off the western end of the line. Known mineralisation (i.e. Drake's Prospect) is reportedly just south of the airborne E.M. anomaly and extension of the reconnaissance V.L.F. line to the west and south may find the old prospect and possibly an associated V.L.F. anomaly.

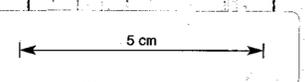
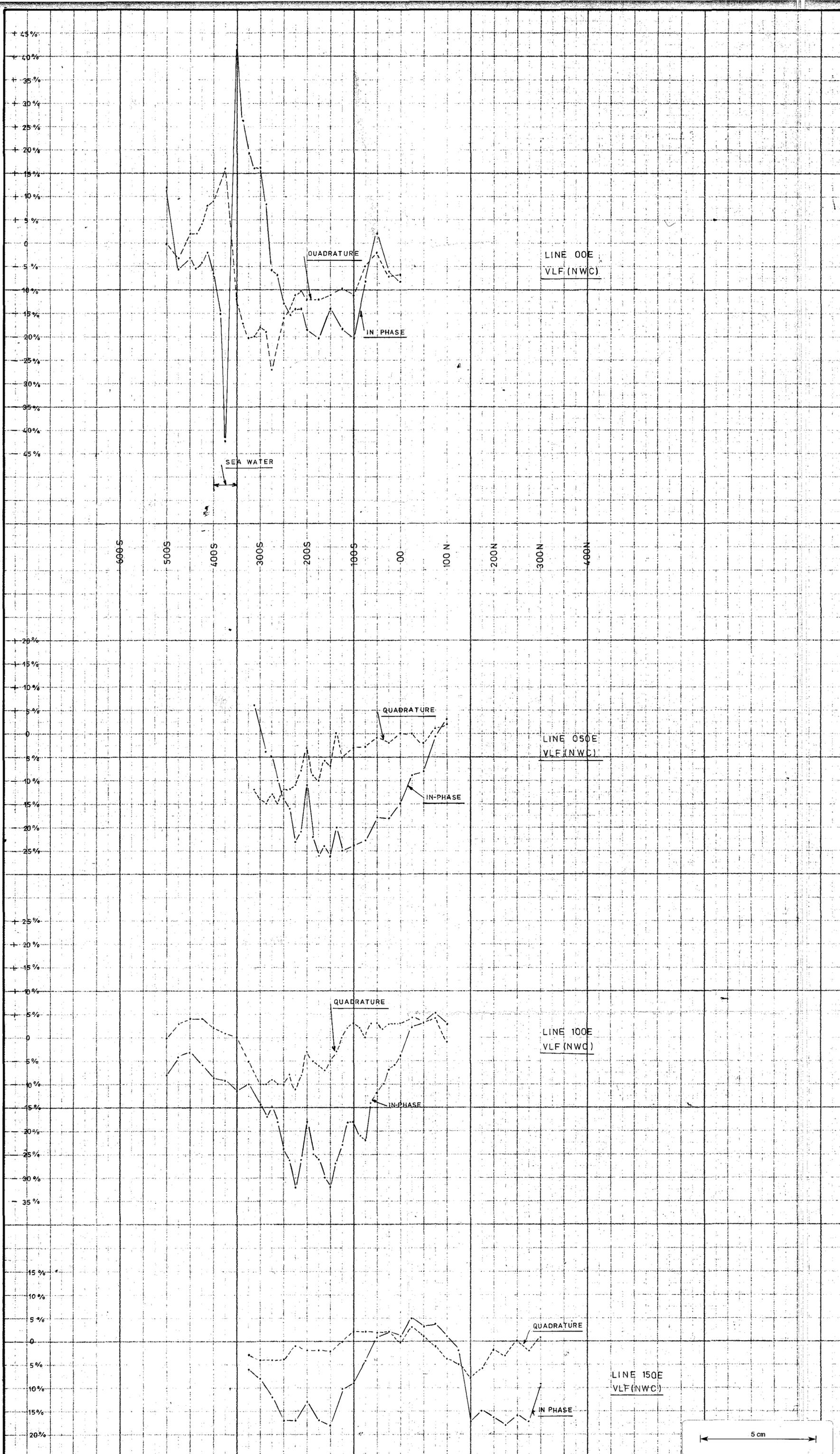
For this reason only is further work justified at this stage.

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## LIST OF PLANS

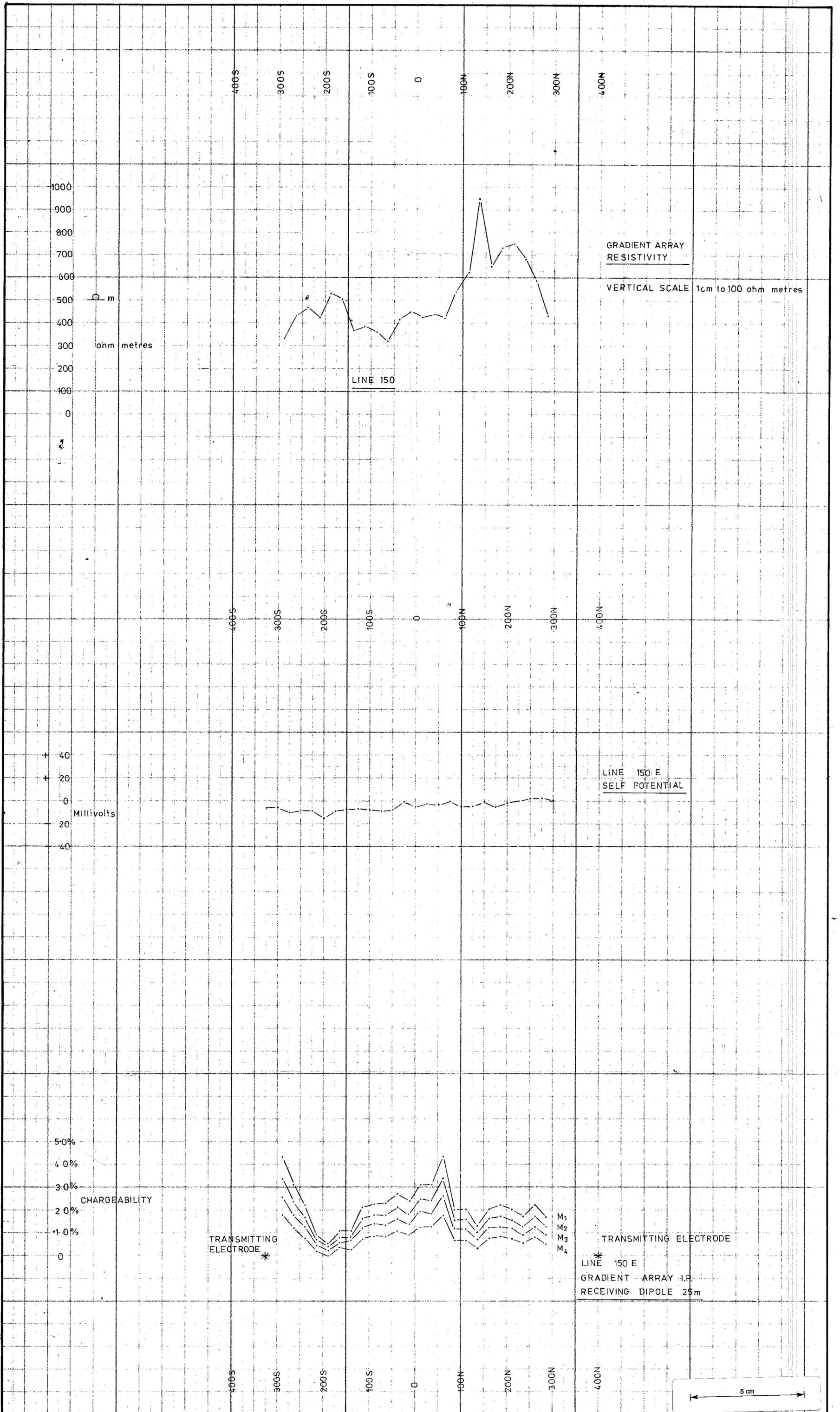
- PLAN 1. VOYAGER 1. VLF-EM
- PLAN 2. VOYAGER 1. IP & SP
- PLAN 3. VOYAGER 1. MAGNETICS
- PLAN 4. VOYAGER 2. VLF-EM & MAGNETICS
- PLAN 5. EM ANOMALY 7. VLF-EM
- PLAN 6. MAG. ANOMALY 1. MAGNETICS
- PLAN 7. MAG ANOMALY 1. VLF-EM
- PLAN 8. MAG ANOMALY 3. VLF-EM & MAGNETICS
- PLAN 9. MAG ANOMALY 3. VLF-EM & ANOMALY
- PLAN 10. EM ANOMALY 18. VLF-EM

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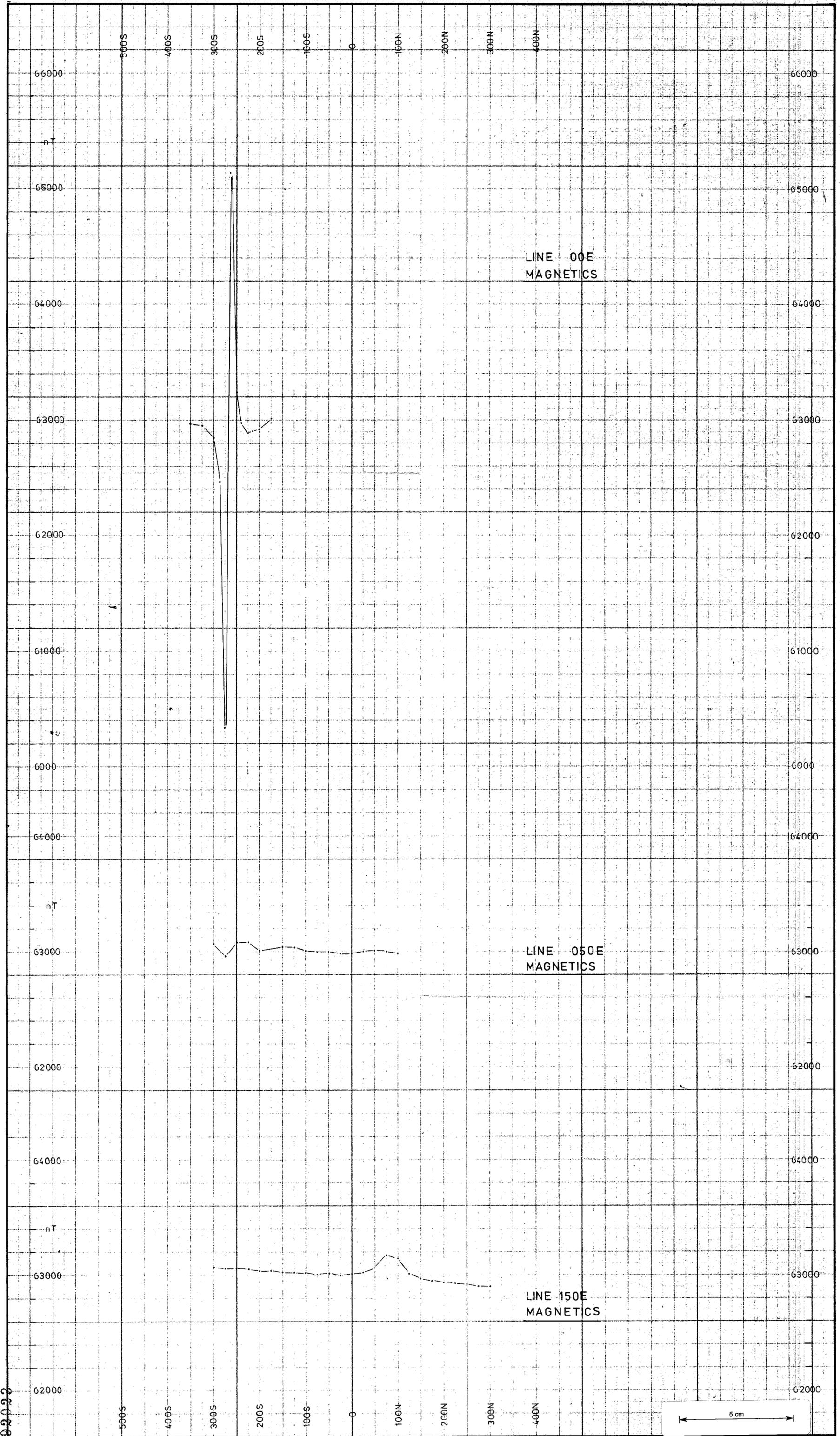
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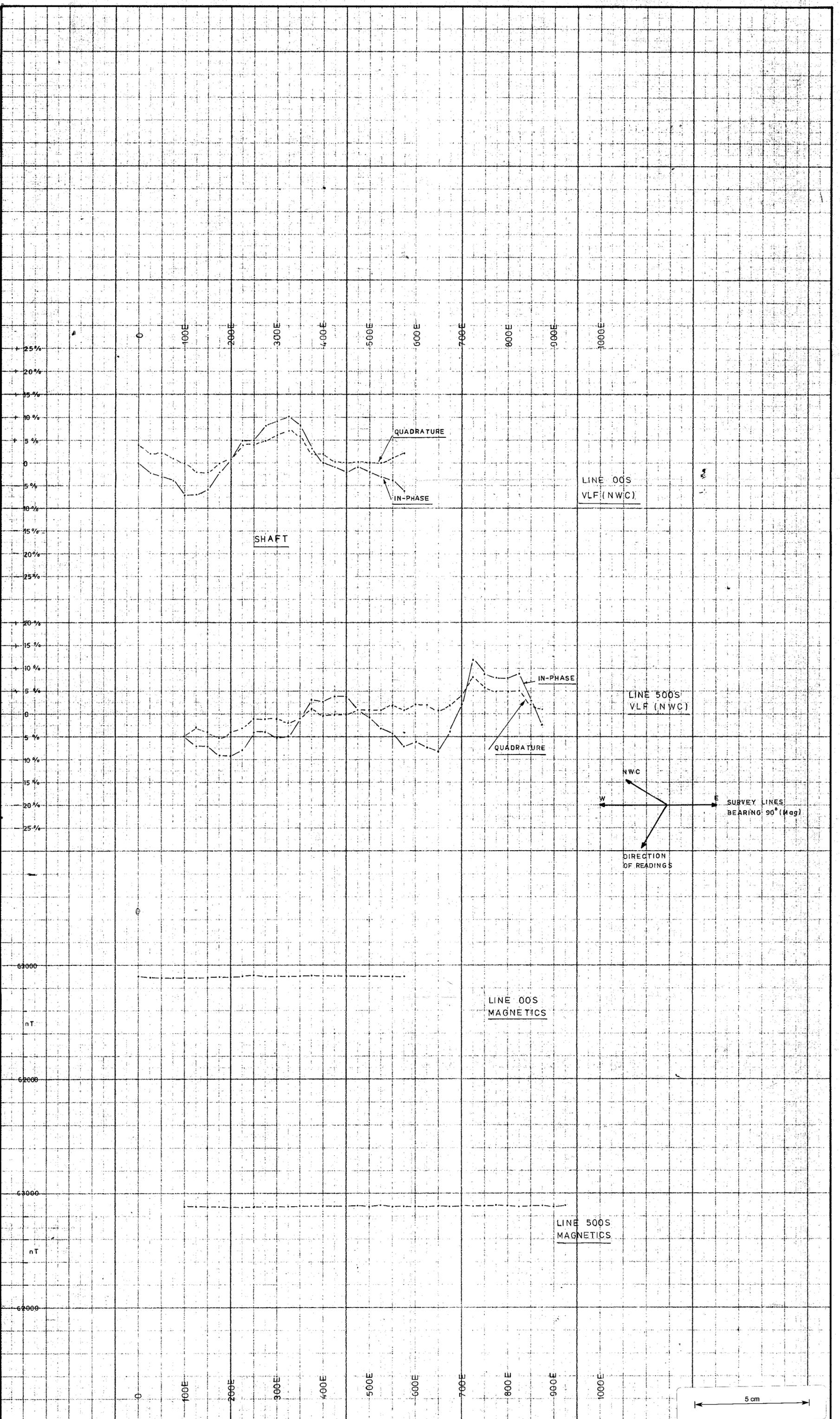


GEOPEKO LTD.  
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Plan No 3 003

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Scale Fact.		Date	March 77	Cont. Int.	-

AREA.	Elliott Bay Tasmania
PROSPECT.	VOYAGER 1 (PENDERS PROSPECT)
PLAN SHOWS	Reconnaissance Geophysics 77-1233

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GEOPEKO LTD.  
Geophysical Surveys.  
Plan No 4 004

Instrument	Geonics EM6 Geometrics Unimag	Datum	G3000nT	Hor. Scale	1 cm to 50 m.
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Scale Fact.	—	Date	March 77	Cont. Int.	—

AREA. Elliott Bay Tasmania  
PROSPECT. VOYAGER Lewis River Prospect  
E.M. Anomaly No. 25  
PLAN SHOWS Reconnaissance Geophysics 77-1233

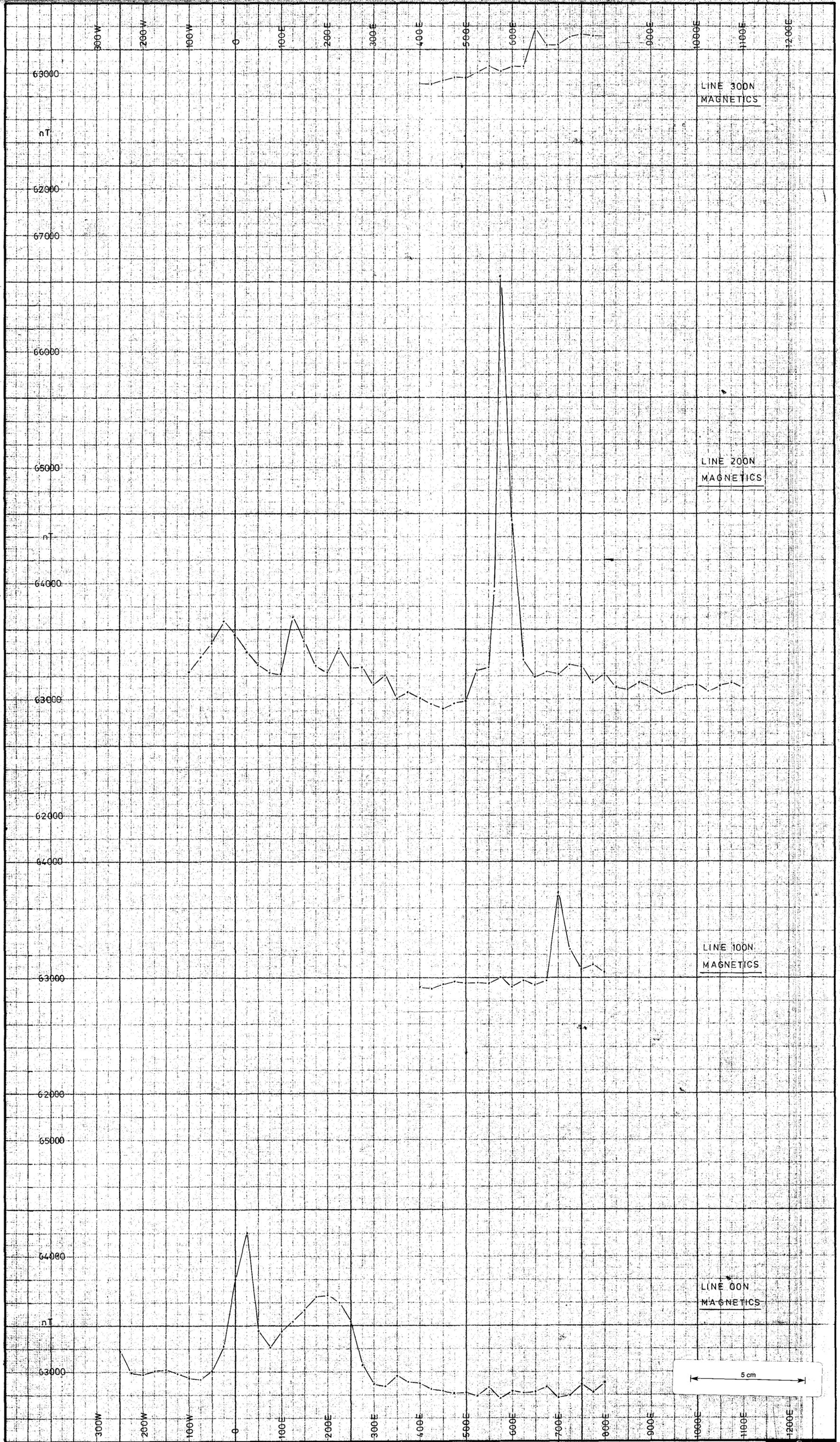
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	Scale Fact.	-	Date	March 77	Cont. Int.	-	PLAN SHOWS	Reconnaissance Geophysics

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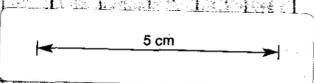
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Plan No 6 006

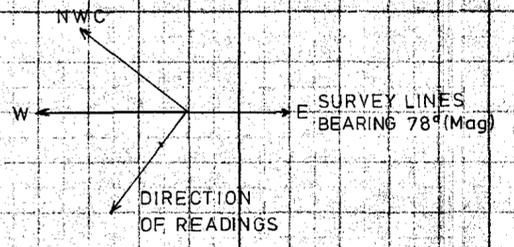
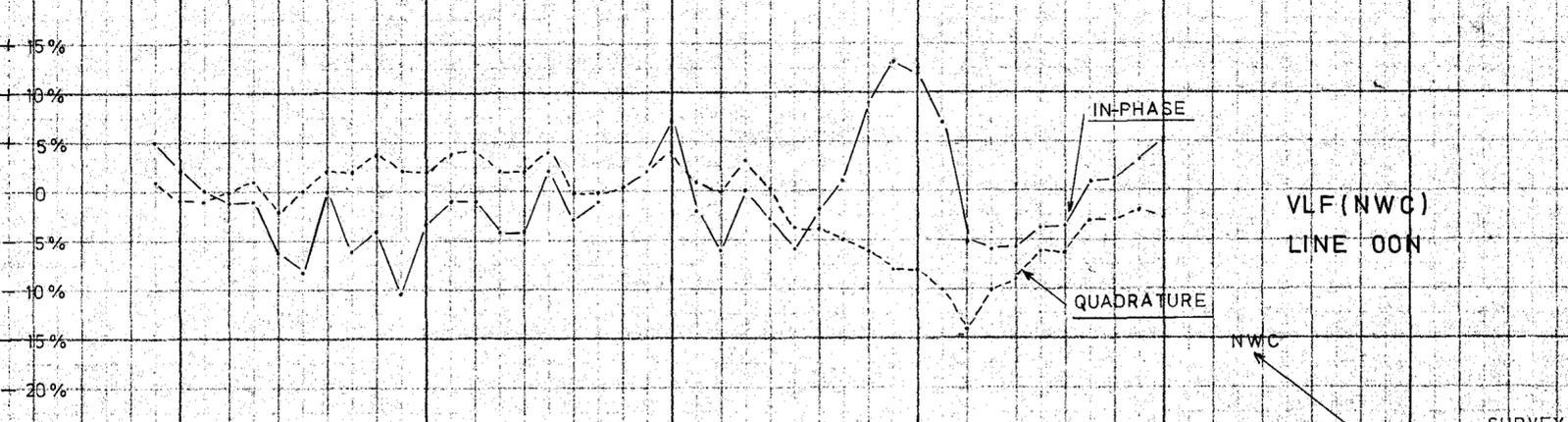
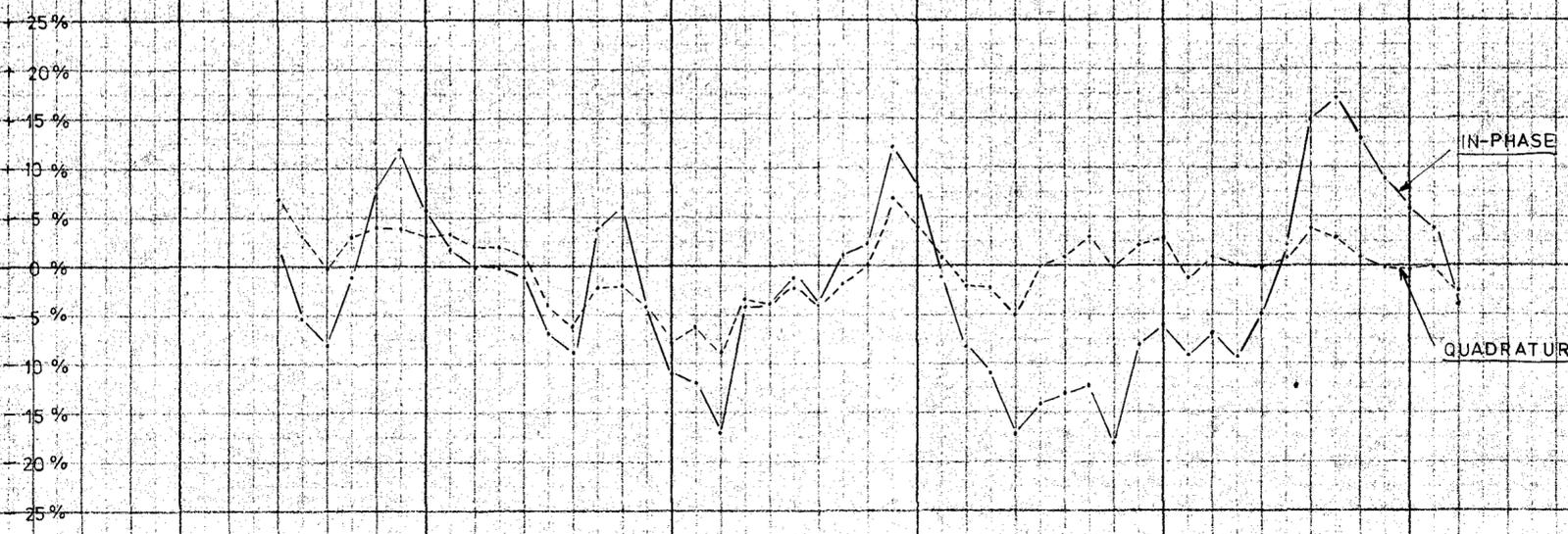
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Observer	S.Mudge	Base Peg		Vert. Scale	1 cm to 200 nT
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AREA.	Elliott Bay 77-1233
PROSPECT.	MAG. ANOMALY No 1
PLAN SHOWS	Reconnaissance Geophysics

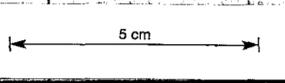


300W 200W 100W 0 100E 200E 300E 400E 500E 600E 700E 800E 900E

VLF(NWC)  
LINE 200N



300W 200W 100W 0 100E 200E 300E 400E 500E 600E 700E 800E 900E



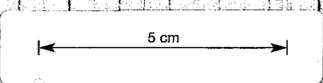
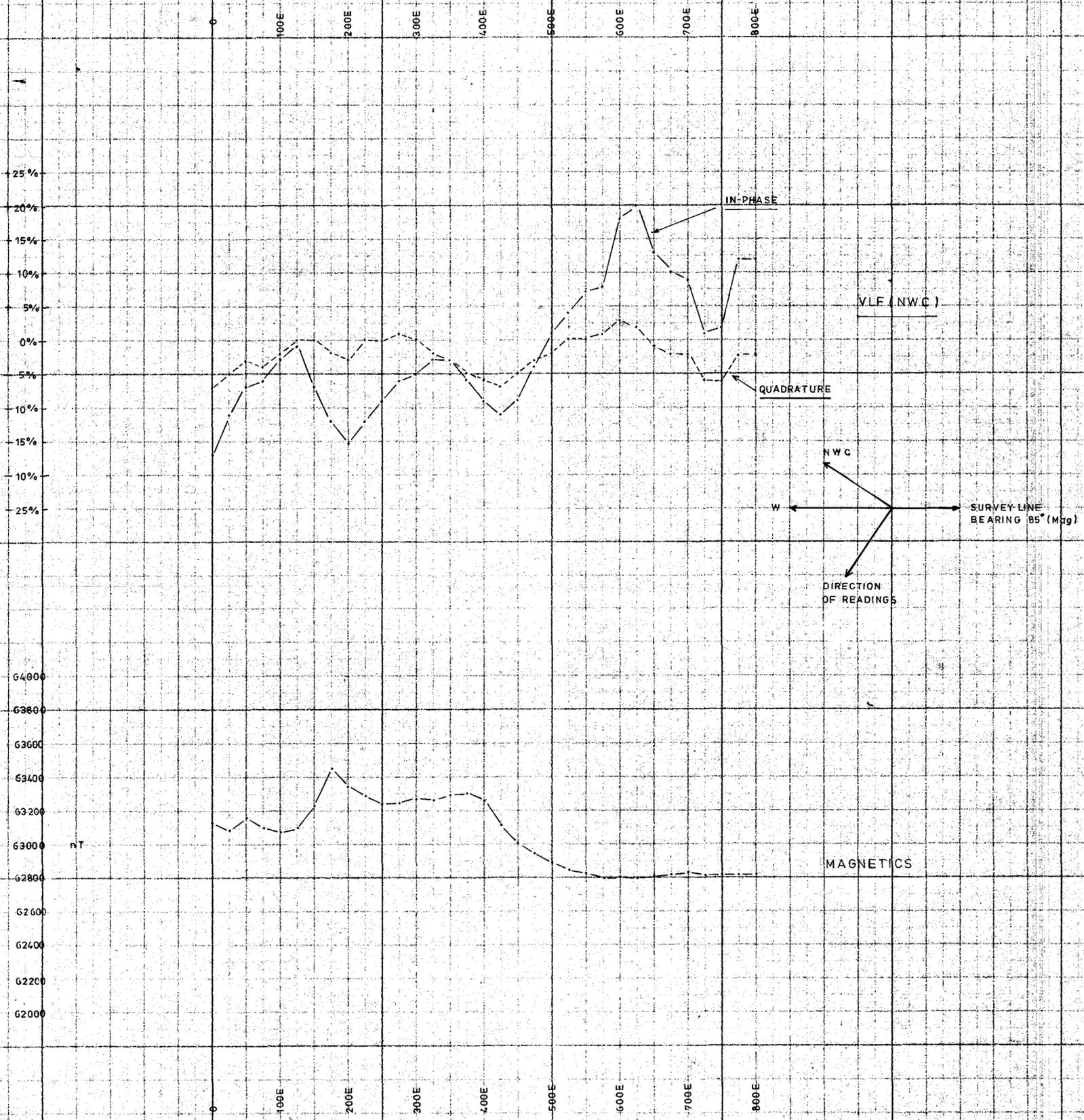
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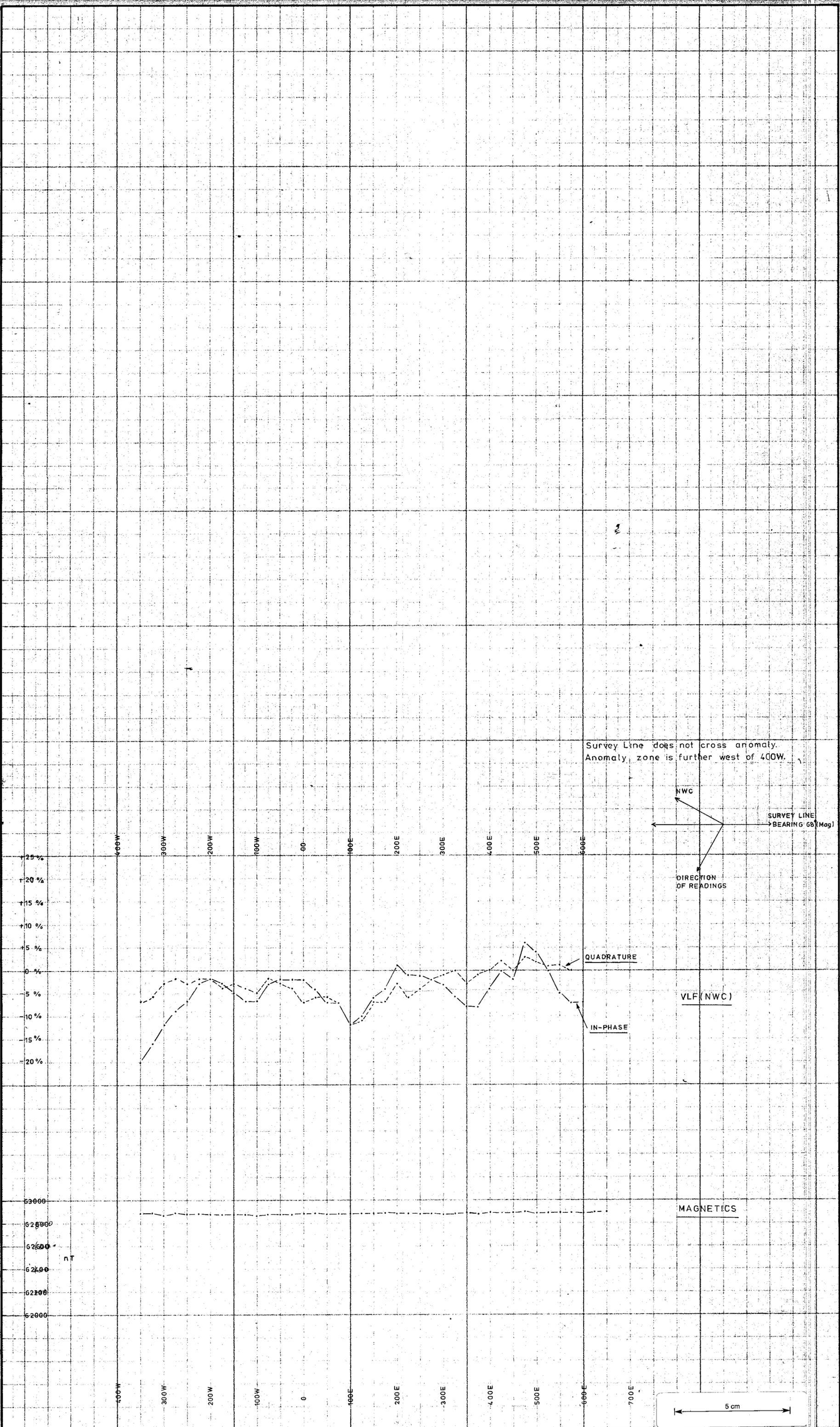
AREA. Elliott Bay  
PROSPECT. MAGNETIC ANOMALY No1  
PLAN SHOWS Reconnaissance Geophysics. 77-1233

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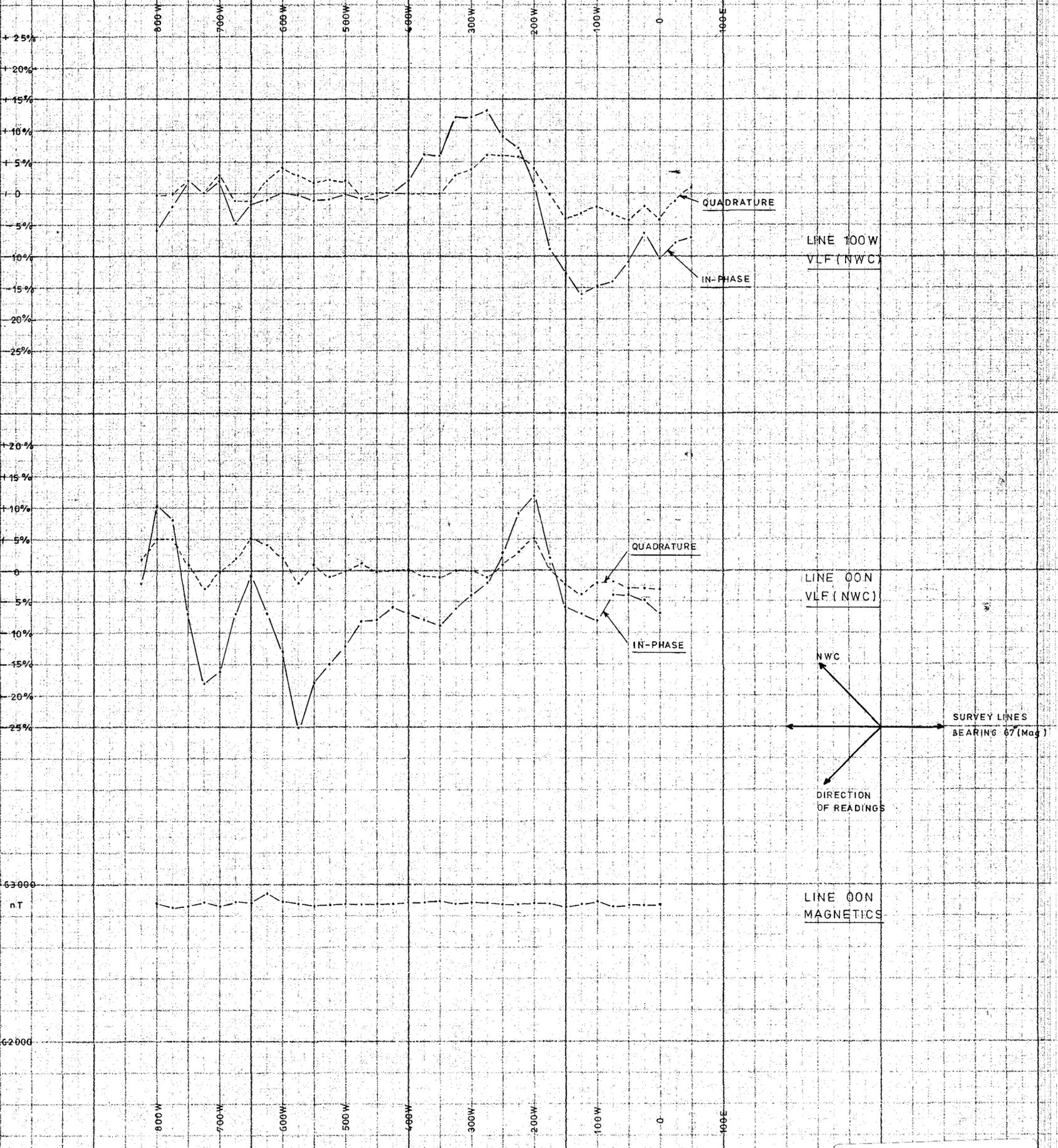


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GEOPEKO LTD. Geophysical Surveys. Plan No. 9. 009	Instrument	Geonics EM16 Geomag	Datum	G3000NT	Hor. Scale	1cm to 50m	AREA.	Elliott Bay Tasmania
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	Scale Fact	—	Date	March 77	Cont. Int.	—	PLAN SHOWS	Reconnaissance Geophysics 77-1233



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Geophysical Surveys.

Instrument	Geonics EM 16 Geometrics Unimag	Datum	63000nT	Hor. Scale	1cm to 50m
Observer	S. Mudge	Base Peg	-	Vert. Scale	as shown
Scale Fact.	-	Date	March 77	Cont. Int.	-

AREA	Elliott Bay Tasmania
PROSPECT	EM ANOMALY 18
PLAN SHOWS	Reconnaissance Geophysics

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