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INDUCED POLARISATION  
AND  
ELECTROMAGNETIC SURVEYS  
VOYAGER 3

ELLIOTT BAY, TASMANIA

79-1348

S. T. Mudge

April, 1979.

**MICROFILMED**

**OPEN FILE**

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INTRODUCTION

VOYAGER 3 is located about 1 kilometre east of Drake Creek on the northern shore of Elliott Bay, E.L. 27/76 (Elliott Bay) in south-west Tasmania. Its location is shown in drawing no. 3964 S/A.

The area is held under licence by Geopeko as part of a base metal exploration tenement.

The prospect originated from favourable geological results obtained from the 1977 reconnaissance survey of the area. In February 1978 induced polarisation (IP) and magnetometer surveys were conducted along three (3) wide spaced (400 metres) lines (Mudge 1978). These surveys along with geochemical surveys gave favourable results in area between 8750E and 9400E.

During February 1979 IP, very low frequency EM (VLF-EM), TURAM and self potential (SP) surveys were conducted over this area. The 100 metre grid extends from 8750E to 9400E between 9400N to 10300N.

The results of these surveys are the subject of this report.

GEOLOGY

The prospect is located on a belt of north-south striking acid pyroclastics with interrelated quartz feldspar porphyries. These rocks are believed to be the southern portion of the Cambrian Mt. Read volcanic suite.

The prospect lies east of the Low Rocky Point granite, believed to be of either Upper Cambrian or Silurian age. The granite contact is along Drake Creek, and is a faulted contact.

The area is flat and covered by several metres of peat. It is a button grass plain with dense forest lying to the west of the prospect.

A massive sulphide deposit, similar to those found elsewhere in the Mt. Read volcanics, is the exploration model.

INDUCED POLARISATION (IP)

A dipole-dipole IP survey was conducted on lines 9500N to 10200N inclusive, excluding line 10000N. The survey was aimed at defining the IP anomaly on line 9600N and to detect any along strike extension.

A 50 metre dipole length was used, considered a suitable compromise between resolution and depth sought. An Elliott 1.5 KW 2 second time domain transmitter was used in conjunction with a Scintrex IPR-8 receiver.

Signal-to-noise ratios were generally high.

The dipole arrays for each line were centred at 8900E and 9250E.

Results are presented as pseudosections of apparent resistivity, chargeability and metal factor, drawing nos. 4543 S/B, 4541 S/B and 4542 S/B respectively. Chargeabilities are those for the  $M_{232}$  portion of the Scintrex IPR-8 decay curve.

Line 10200N and 10100N show poorly developed anomalies at 9375E and 9300E respectively. They indicate narrow (less than half a dipole length) near surface sources of little depth extent.

Line 9900N exhibits a well developed anomaly at 9200E. The source also has small dimensions and limited depth extent. Data west of 8875E shows a well developed but "unclosed" anomaly.

Line 9800N exhibits a well developed anomaly west of 8900E . At 9050E, a strong metal factor /resistivity anomaly indicates a source at depth, greater than half dipole length to top.

Line 9700N exhibits a well developed anomaly west of 8875E. The anomaly is unclosed but probably indicates a source at depth.

Line 9600N exhibits two poorly developed anomalies from near surface sources at 8875E and 9000E.

Line 9500N exhibits a well developed anomaly with a near surface expression at 8925E.

The most significant anomalies detected by the survey are those to the western end of lines 9700N, 9800N and 9900N. The latter require further surveying to the west to adequately define them.

NOTE:- A well developed anomaly implies a coincident low resistivity and high chargeability, thus a high metal factor.

The results of the survey are shown diagrammatically in drawing no. 4544 S/B .

VLF-EM

A VLF-EM survey was conducted on the entire grid, lines 9400N to 10300N inclusive.

The survey was aimed at detecting any VLF response over the IP anomalies. A second aim was to provide a high resolution plan of any near surface structure or mineralisation.

A Geonics EM16 VLF receiver was used in conjunction with the signal from the North West Cape (NWC) transmitter. NWC is the only transmitter having sufficient signal strength in the area.

Readings were taken at 25 metre intervals. Profiles of vertical in-phase and quadrature components are shown in drawing no. 4548 S/B.

Plotting of the profiles is such that an easterly dip of the in-phase component indicates the presence of a conductor. Orientation of the receiver with respect to the primary signal is also shown.

The in-phase profiles are generally noisy, no major anomalies are present. This component has been filtered in accordance with the method outlined by Fraser 1969.

The filtering process phase shifts the profiles (as well as noise filtering) to produce a positive high at the point of maximum easterly dip. This positive high is a contourable parameter and is shown in drawing no. 4545 S/B.

The filtered in-phase profiles show four prominent anomalous zones:-

1. A major anomaly cuts the grid diagonally from 9400N 9300E to 10300N 8750E. This zone has a coincident IP anomaly at 9800N 9050E.

This anomaly appears to be sub-parallel with the Drake Creek fault west of the grid.

The poor IP response along the anomaly, its orientation and large linear extent suggest that its source may be structural i.e. fault, fold axis etc.

2. The anomaly extending from 10300N 9000E to 10000N 9150E has no IP response on lines 10100N and 10200N. A weak IP response exists only on line 10000N and may be due to mineralisation.

The source of the VLF anomaly is also attributed to structure.

3. The zone extending from 9900N 9325E to 10300N 9400E shows little correlation with IP anomalies.

This zone may be due to ionic conduction in the peat overburden or structural features.

4. The zone extending from 9900N 8850E to 9600N 8900E has well developed IP anomalies associated with it. This is the only VLF anomaly considered to be of importance with regard to mineralisation.

NOTE:- The amplitude of the filtered in-phase response is not only related to the conductivity thickness product of the source. It also depends upon source orientation with respect to the primary signal, overburden thickness and conductivity, and data spacing.

TURAM

A TURAM-EM survey was conducted along lines 9600N and 9800N. The survey was done to further test the coincident IP/VLF anomalies at 8850E.

A 500 metre square transmitting loop was laid out east of the grid. Loop corners were located at 10000N 9250E, 10000N 9750E, 9500N 9250E and 9500N 9750E. A Scintrex TSQ-2M 500 watt square wave transmitter was used to generate the primary signals.

The receiving system consisted of a Scintrex SE-77 multi-frequency EM receiver and two horizontal receiving coils. The instrument measures the ratio of the amplitude of the vertical magnetic components coupling to each coil. The phase difference between them is also measured.

The receiving system was moved along each traverse line. The receiving coils were separated 25 metres. Readings of field strength ratio and phase difference were taken at 25 metre intervals. These readings were attributed to the point midway between the two receiving coils.

Three frequencies were used, 105Hz, 315Hz and 945Hz. This was done to determine which would give the strongest anomaly if such an anomaly existed. The lines were surveyed between 8750E and 9200E.

The field strength ratios were normalised for the natural decrease in field strength away from the transmitting loop. The reduced ratios and phase differences (no normalisation required) are shown in drawing no.4546 S/B .

Several "point" anomalies were detected on line 9800N at 9012.5E and 8862.5E. The reduced field strength ratios of line 9600N are noisy and show no anomalies. The point anomalies on line 9800N are indicative of narrow conductors and are coincident with the IP/VLF anomalies.

The survey showed that no significant TURAM response was detectable on lines 9600N and 9800N. For this reason, the survey did not extend over the entire grid.

SELF POTENTIAL

Two single traverse SP surveys were conducted on lines 9600N and 9800N to further test the coincident IP/VLF anomalies at 8850E.

A Fluke 8020A digital voltmeter was used in conjunction with a pair of non-polarising copper in copper sulphate electrodes. A measurement base (0mV) was established at 9050E on each line of readings were taken at 25 metre intervals.

Profiles corrected for pot (electrode) potentials are shown in drawing no. 4547 S/B .

No SP anomaly was detected over the IP/VLF anomalies on lines 9600N and 9800N. For this reason the survey did not extend over the entire grid.

The lack of an SP anomaly indicates that either the source of the IP/VLF anomalies or the environment is not suited to the development of an SP anomaly.

SUMMARY OF RESULTSINDUCED POLARISATION (IP)

1. The dipole-dipole IP survey provided better resolution of the 1977 (100 m dipole) anomaly on line 9600N.
2. The anomalies on line 9600N extend north. They are shown diagrammatically in drawing no. 4544 S/B .
3. The anomalies at 9900N 9200E and those to the west of lines 9900N 9800N and 9700N are well developed. The latter have VLF anomalies associated with them.
4. The other IP anomalies are poorly developed and are as such considered of little importance.

VLF-EM

1. The VLF survey located four anomalous zones.
2. One of these zones crosses the entire grid. It has little IP character and is attributed to either ionic conduction or weak mineralisation in a subsurface structural feature.
3. The zone between 9600N and 9900N at 8850E has well developed IP anomalies associated with it.
4. The other two zones are considered of little importance with regard to mineralisation.

TURAM

The coincident IP/VLF anomalies produced no significant TURAM response.

SELF POTENTIAL (SP)

No anomaly was detected over the coincident IP/VLF anomalies.

A diagrammatic summary of these results is shown in diagram drawing no. 4544 S/B.

CONCLUSIONS

The IP and VLF surveys have each located a coincident anomalous zone attributable to sulphide mineralisation.

The lack of a significant TURAM anomaly suggests that the source of the IP/VLF anomaly is not a massive electrical conductor.

A strong VLF anomaly intersecting the grid diagonally may indicate the presence of a major subsurface structural feature.

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RECOMMENDATIONS

Should the combined results of geology, geochemistry and geophysics indicate that further work is warranted, the IP survey should continue further west.

Lines 9600N to 9900N inclusive require further surveying with dipole-dipole IP. The survey should extend west with one dipole array centred at 8550E.

The results of these surveys should enable final evaluation of the "unclosed" anomalies detected by the surveys reported here.

APPENDICESIP Metal Factors

Metal factors for the IP survey were calculated using:

$$MF = \frac{M_{232}}{\rho_a} \times t \times 2000 \left[ \Omega^{-1} m^{-1} \right]$$

where

$M_{232}$  =  $M_{232}$  portion of the Scintrex IPR-8 decay curve  $mV^{-1}$

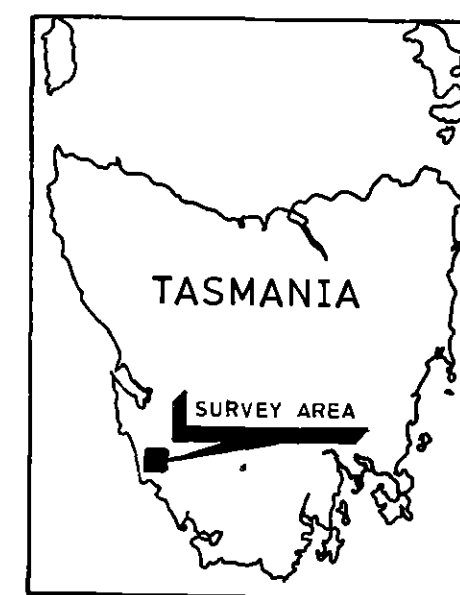
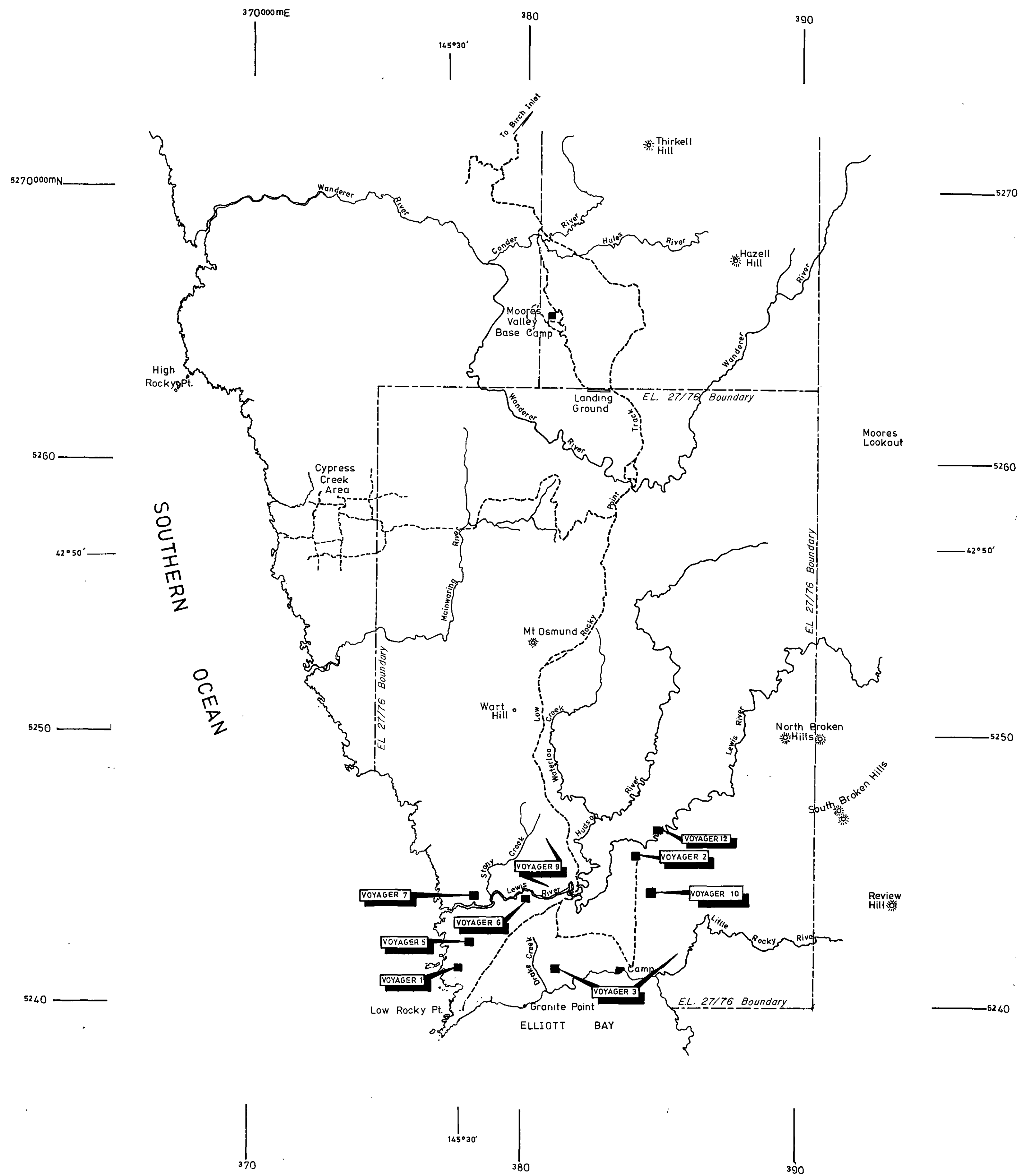
$\rho_a$  = apparent resistivity  $[\Omega m]$

$t$  = integration period for the Scintrex IPR-8  $M_{232}$  component, 520ms.

2000 is a scaling factor to obtain the units  $\Omega^{-1} m^{-1}$ .

REFERENCES

- GEOEX PTY. LTD., 1975: Report on Helicopter Magnetic and Electromagnetic Survey in the Lewis River Area, Tasmania (for BHP Company Ltd.)
- MUDGE, S.T., 1978: Induced Polarisation Survey Voyager 3 L.A.R. Company Report.



5 cm

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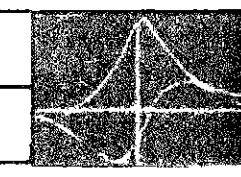
GEOPEKO LTD  
Geophysical Surveys  
Plan No. 3964 S/A

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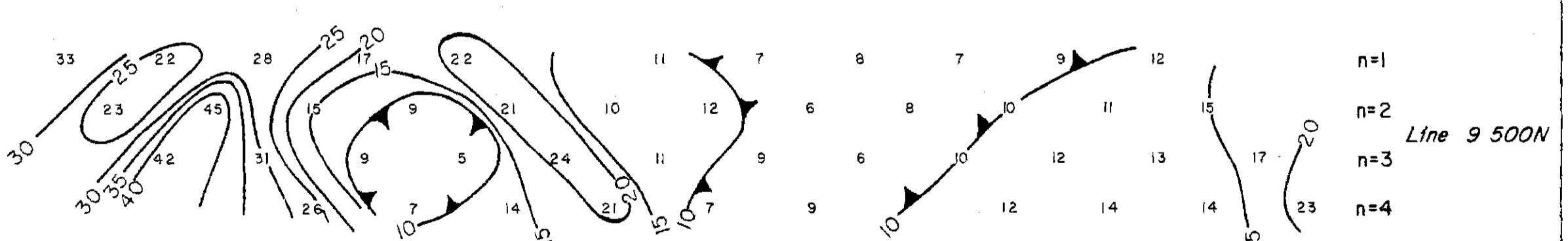
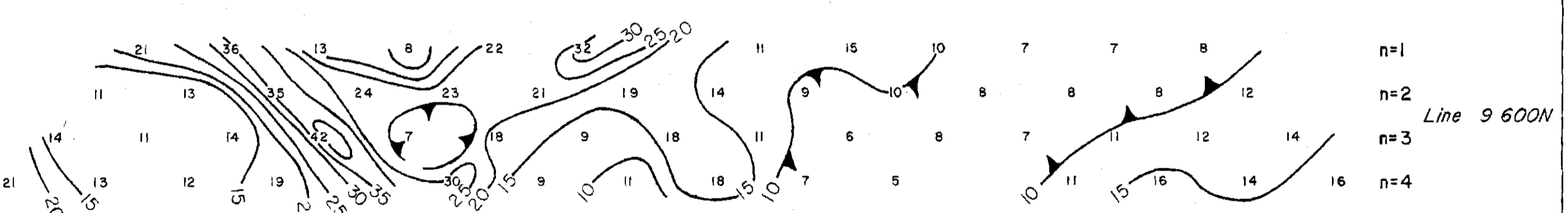
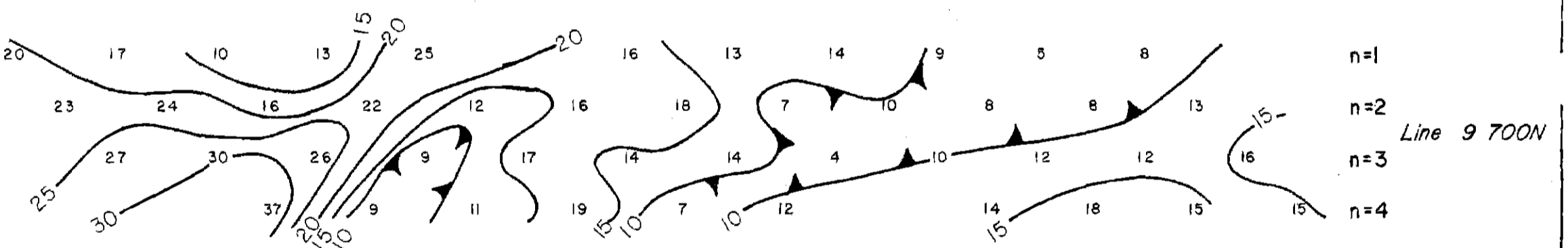
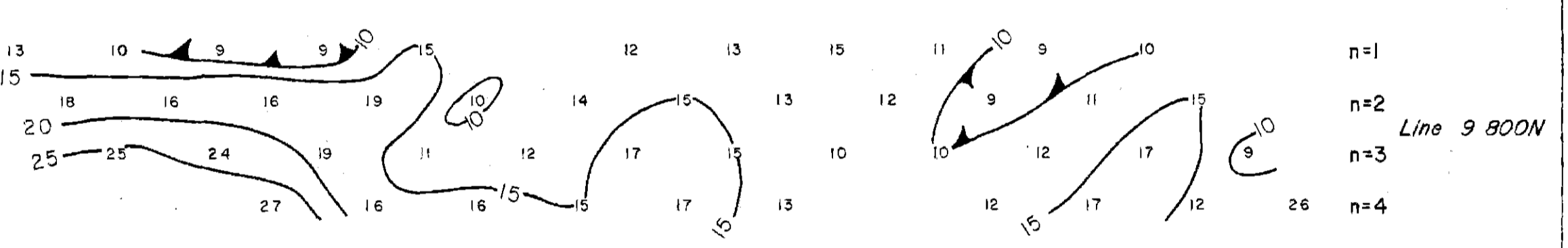
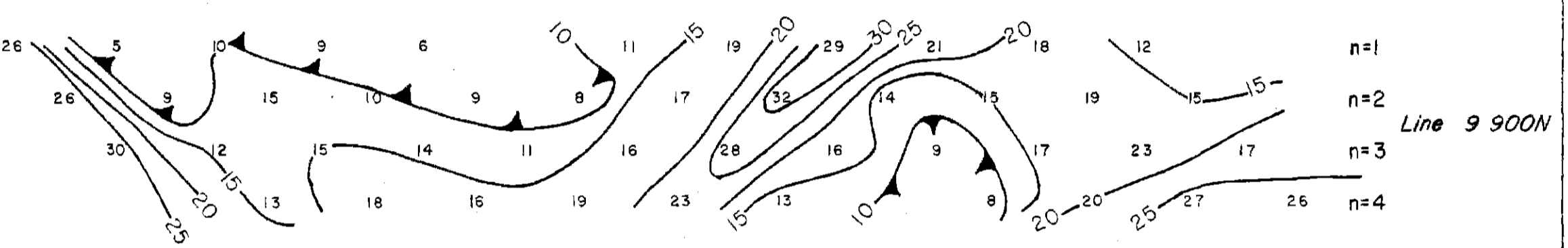
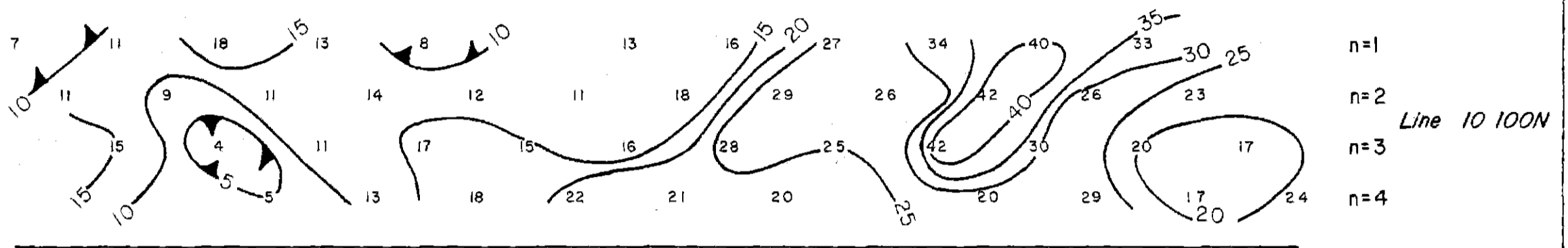
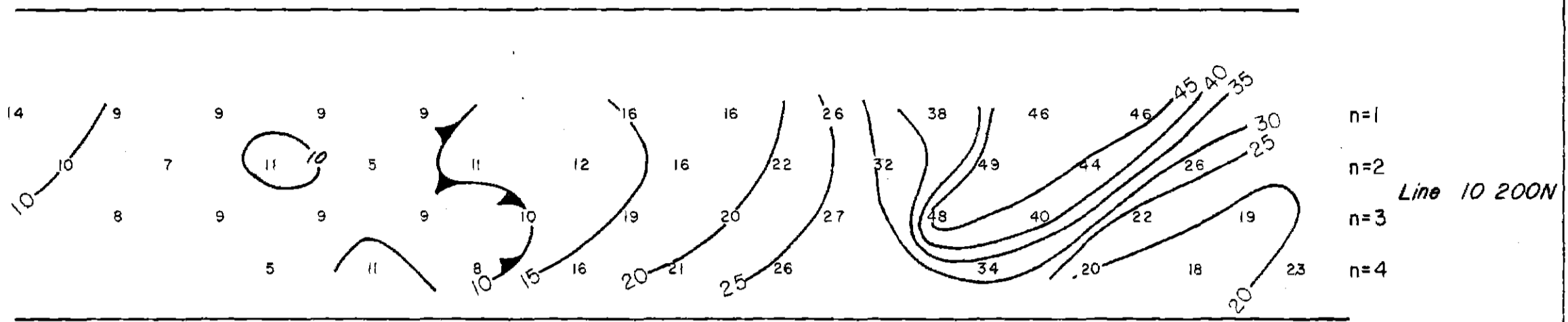
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Instrument	Datum	Hor Scale	1:100 000
Observer S. Mudge	Base Peg	Ver Scale	
Scale Factor	Date	Cont Int	
	September 1978		

AREA	Elliott Bay - Tasmania E.L. 27/76
PROSPECT	VOYAGER PROSPECTS
PLAN SHOWS	Location Diagram



8 700E 8 750E 8 800E 8 850E 8 900E 8 950E 9 000E 9 050E 9 100E 9 150E 9 200E 9 250E 9 300E 9 350E 9 400E 9 450E



8 700E 8 750E 8 800E 8 850E 8 900E 8 950E 9 000E 9 050E 9 100E 9 150E 9 200E 9 250E 9 300E 9 350E 9 400E 9 450E

5 cm

Note:- Dipole Length=50m

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GEOPEKO LTD. 002  
Geophysical Surveys.

Plan No. 4541 S/B

Instrument IPR-8

Datum

Hor Scale 1:2500

AREA

Elliott Bay Tasmania

Observer S.Iltton

Base Peg

Vert Scale

PROSPECT

VOYAGER 3

Scale Fact

Date

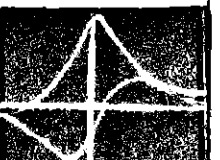
Feb. 1978

Cont Int

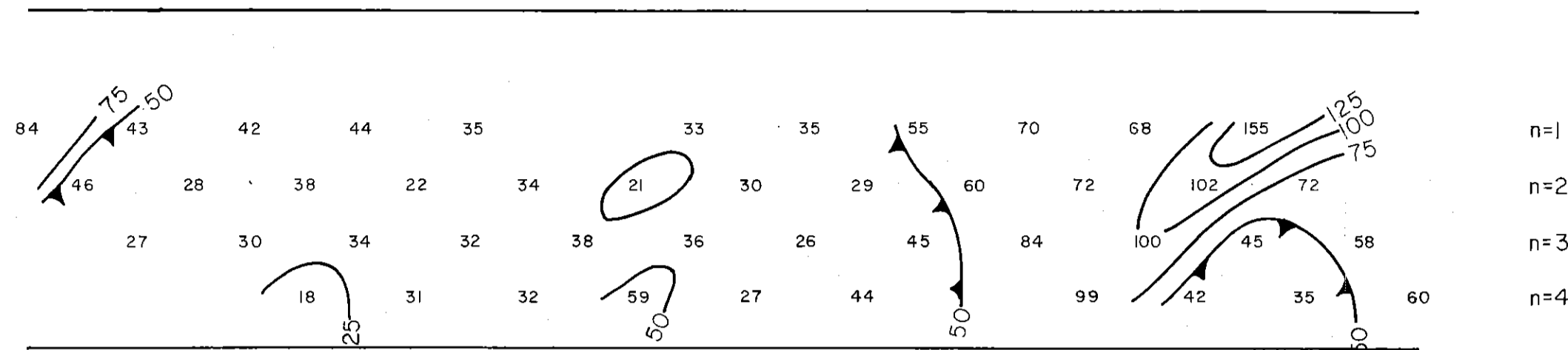
5mVV<sup>-1</sup>

PLAN SHOWS

Pseudosections of Dipole-Dipole IP (Apparent Chargeability - M<sub>232</sub>)

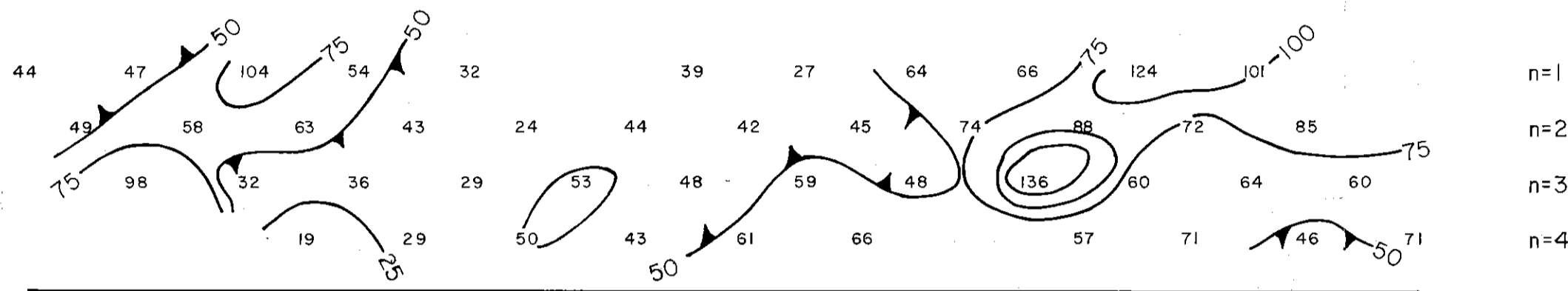


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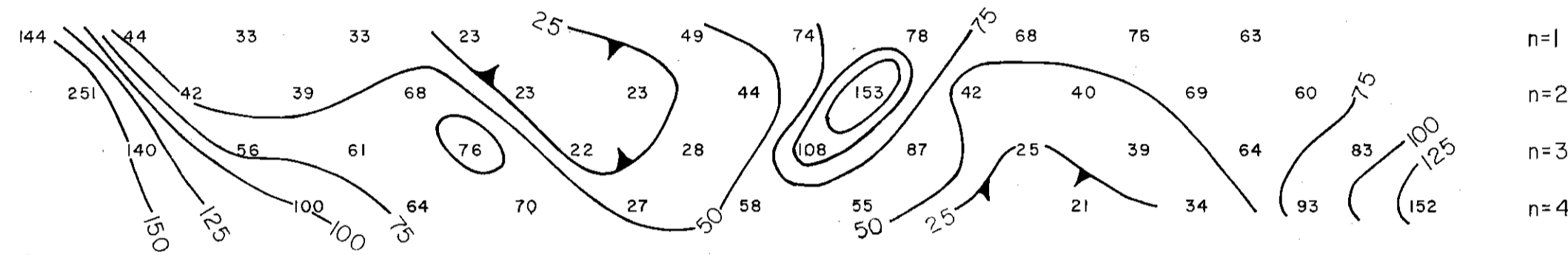
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Line 10 200N



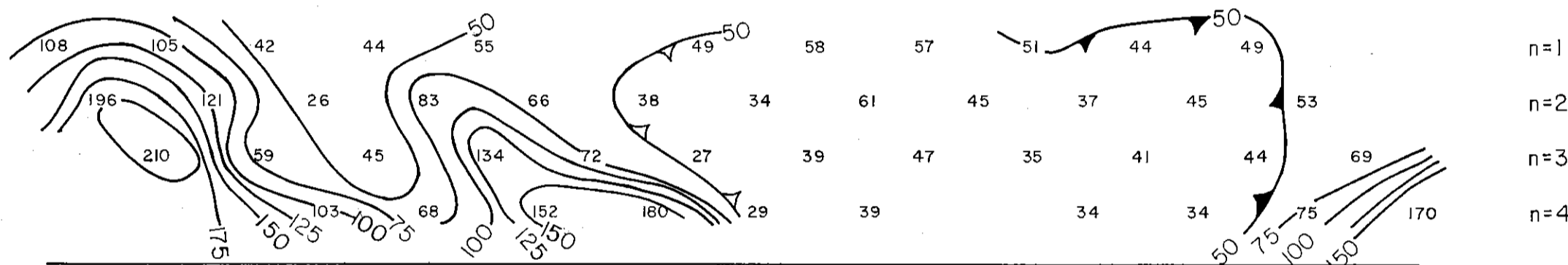
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Line 10 100N



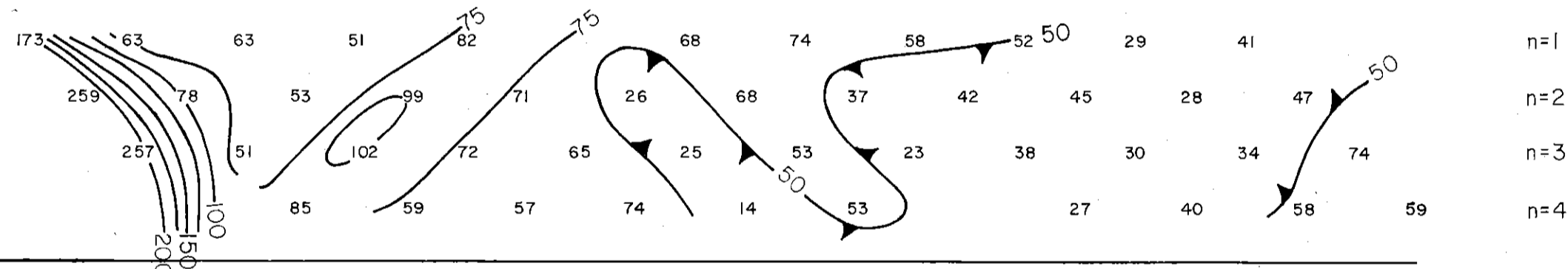
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Line 9 900N



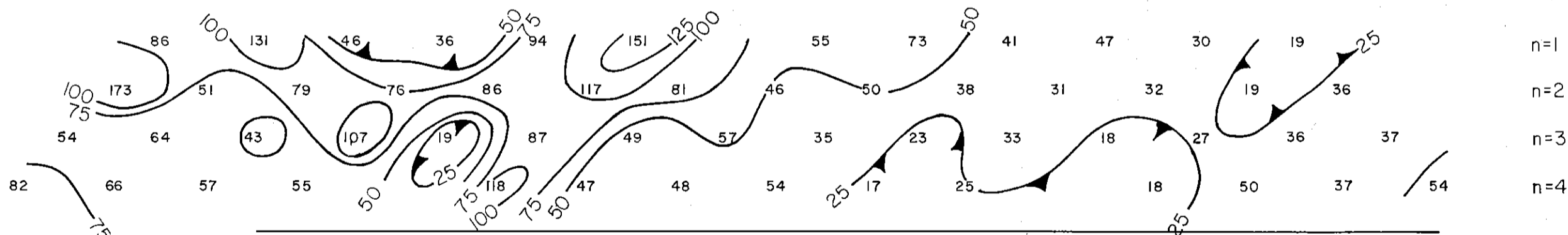
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Line 9 800N



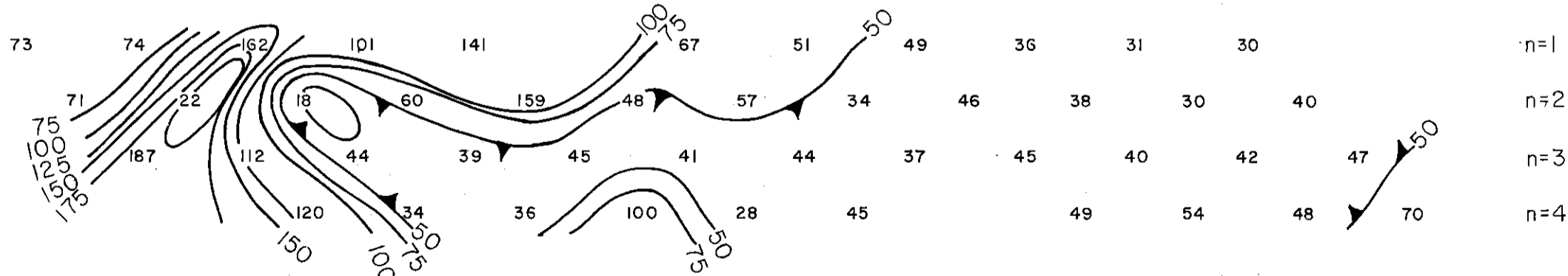
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Line 9 700N



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Line 9 600N

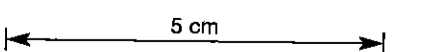


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Line 9 500N

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Note Dipole Length = 50 metres

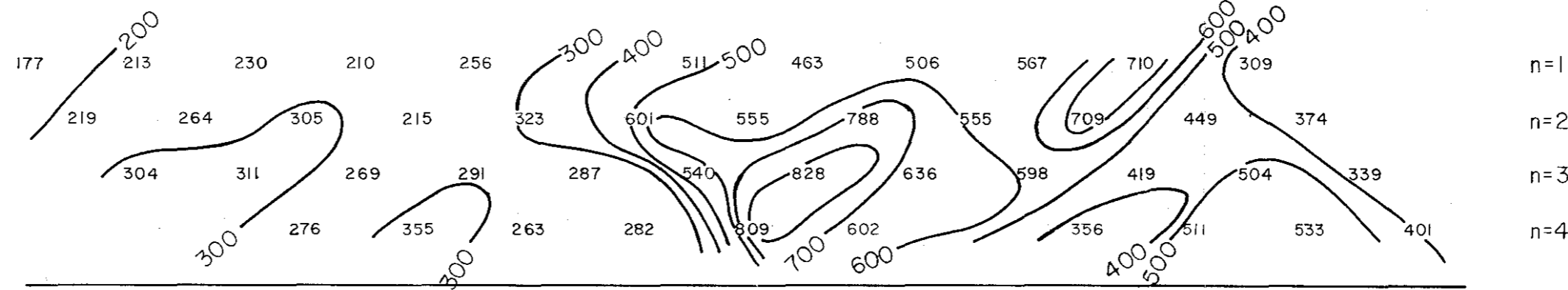


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GEOPEKO LTD.	Instrument	IPR-8	Datum		Hor. Scale	1:2 500	AREA	Elliott Bay Tasmania
Geophysical Surveys	Observer	S. Ilton	Base Peg		Vert. Scale		PROSPECT	VOYAGER 3
Plan No. 4542 S/B 003	Scale Fact.		Date	February 1979	Cont Int	25 $\Omega^2 m^1$	PLAN SHOWS	Pseudosections of Dipole-Dipole IP(Apparent Metal Factor - M232)

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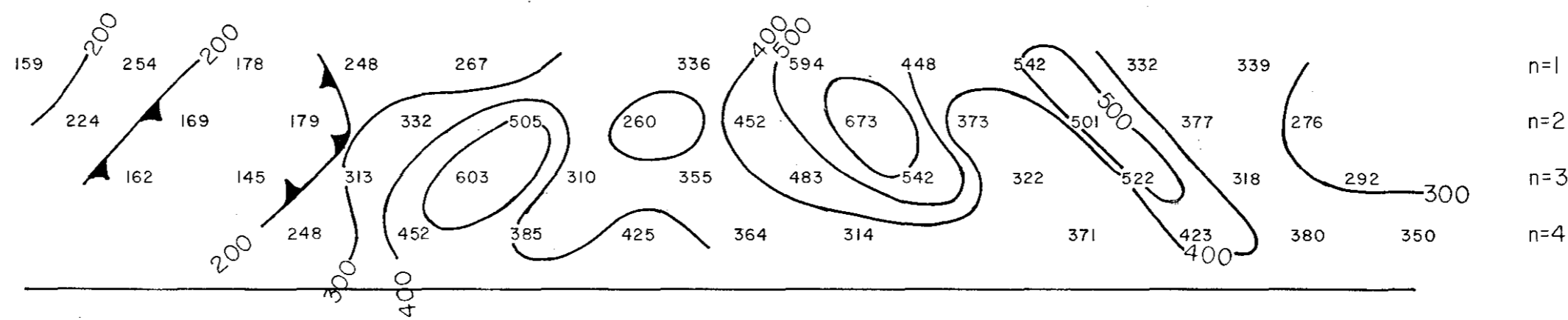
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Line 10 200N



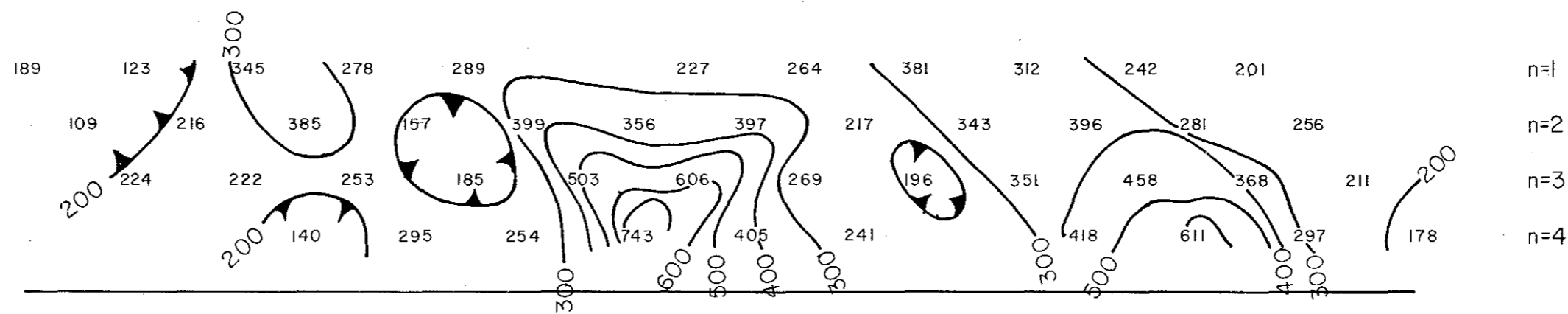
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Line 10 100N



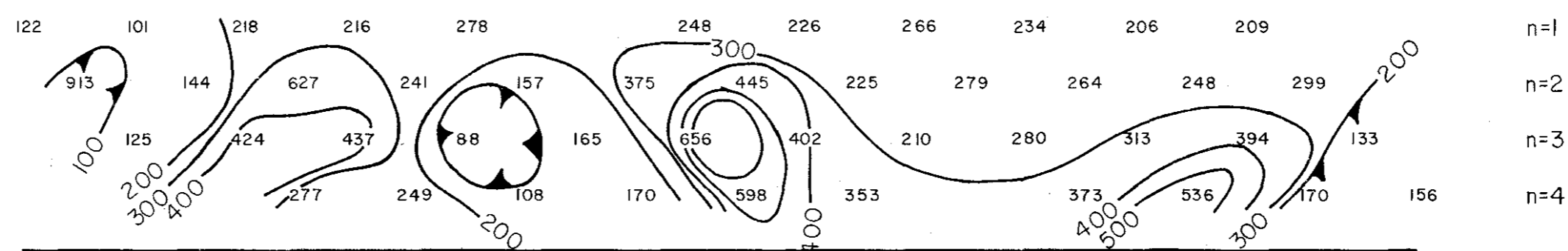
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Line 9 900N



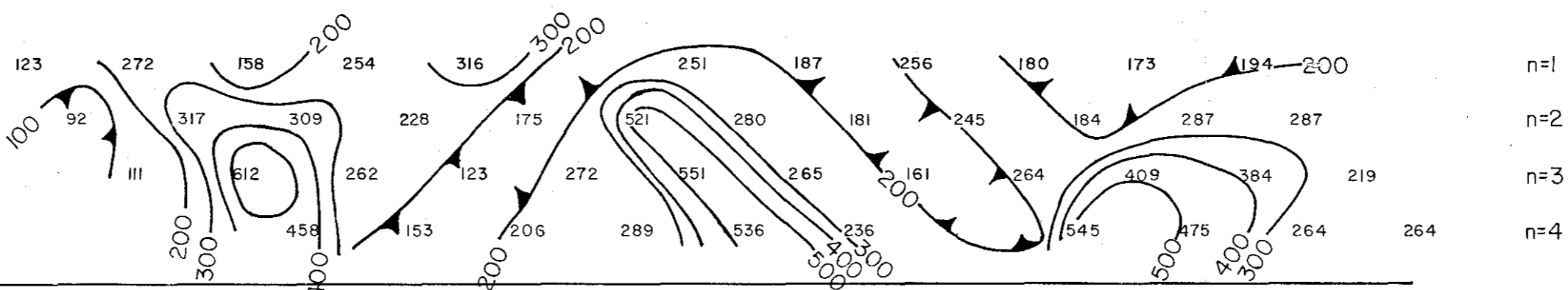
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Line 9 800N



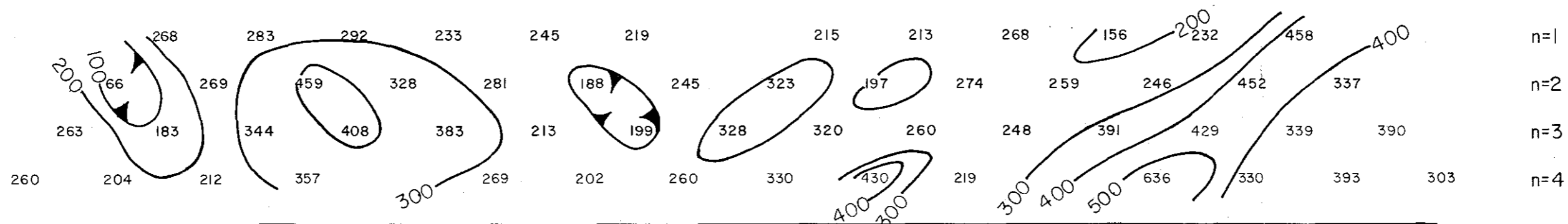
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Line 9 700N



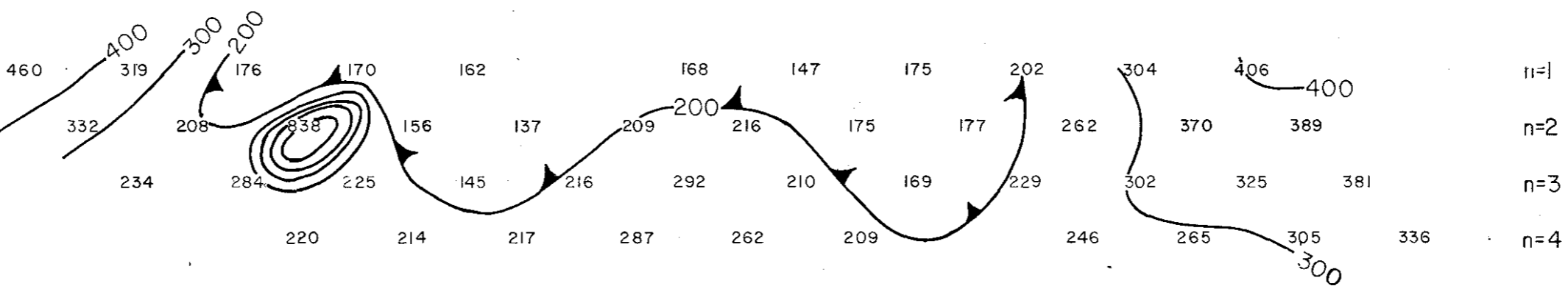
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Line 9 600N



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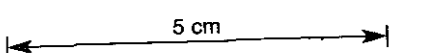
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Line 9 500N

8 700E 8 750E 8 800E 8 850E 8 900E 8 950E 9 000E 9 050E 9 100E 9 150E 9 200E 9 250E 9 300E 9 350E 9 400E 9 450E 9 500E

Note:- Dipole Length=50m



172022

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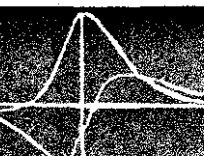
GEOPEKO LTD.

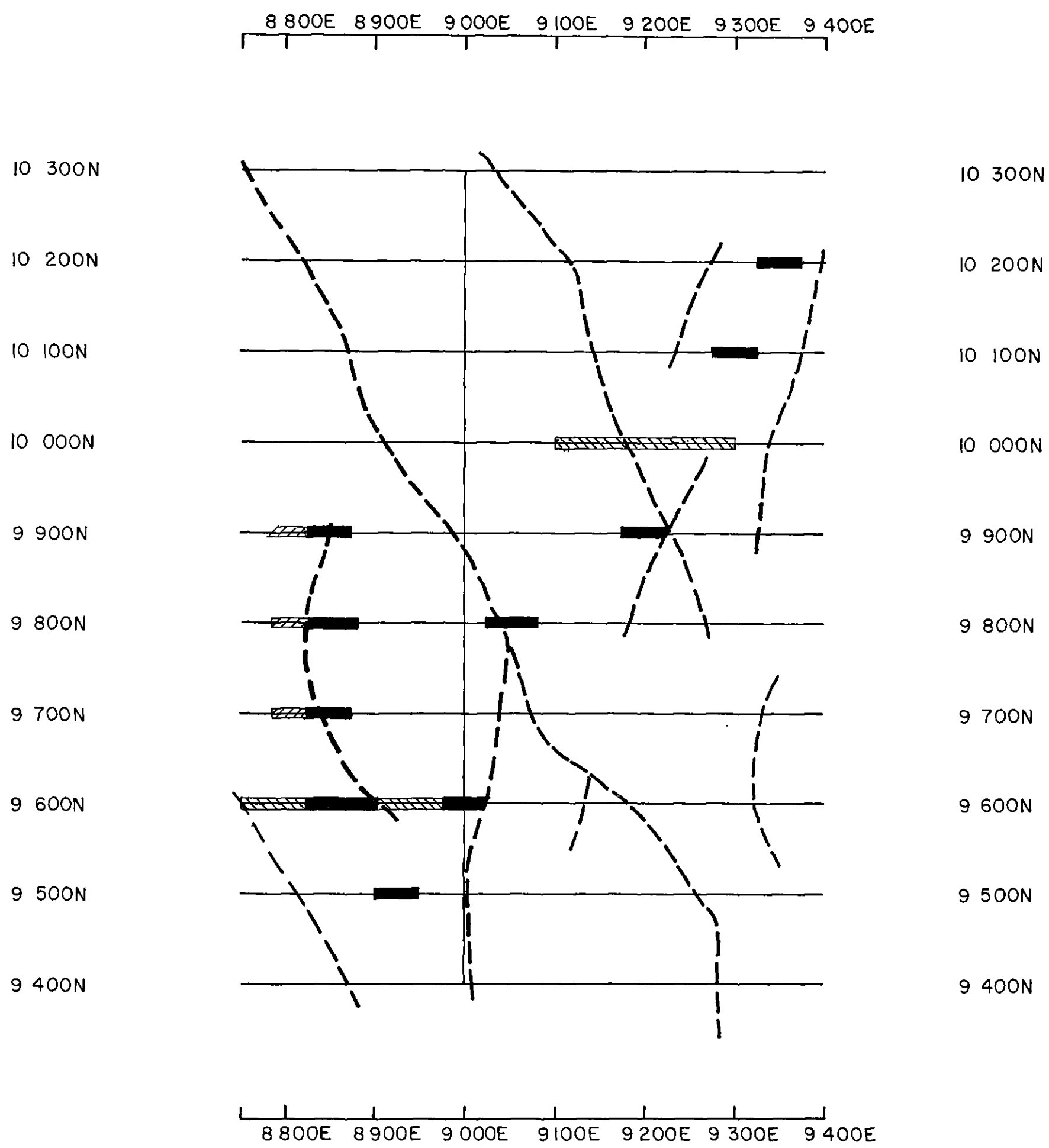
Geophysical Surveys

Plan No. 4543 S/B

004

Instrument	IPR-8	Datum		Hor. Scale	1:2 500	AREA	Elliott Bay Tasmania
Observer	S Ilton	Base Peg		Vert. Scale		PROSPECT	VOYAGER 3
Scale Fact.		Date	February 1979	Cont Int	100Ωm	PLAN SHOWS	Pseudosections of Dipole-Dipole Apparent Resistivity ( $\rho_a$ )





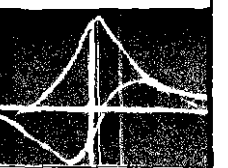
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IP:- Polarisable Zone  50m Dipole  
Polarisable Zone  100m Dipole  
Possible Extension of Polarisable Zone   
VLF:- Conductor Centre

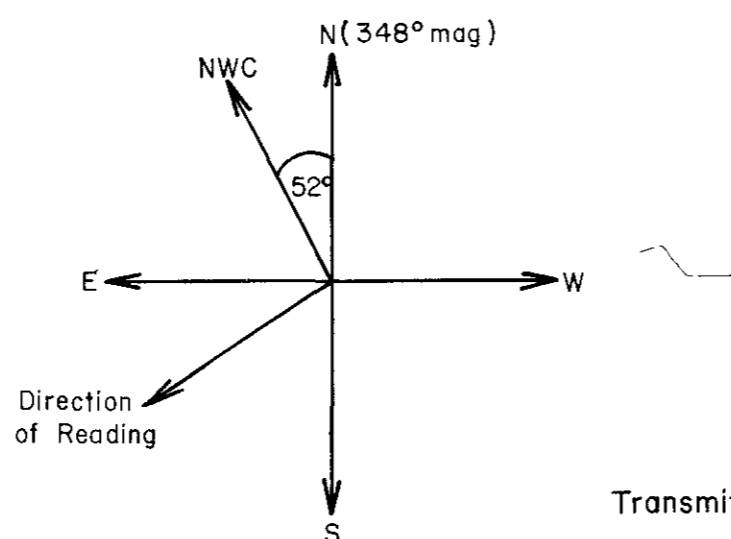
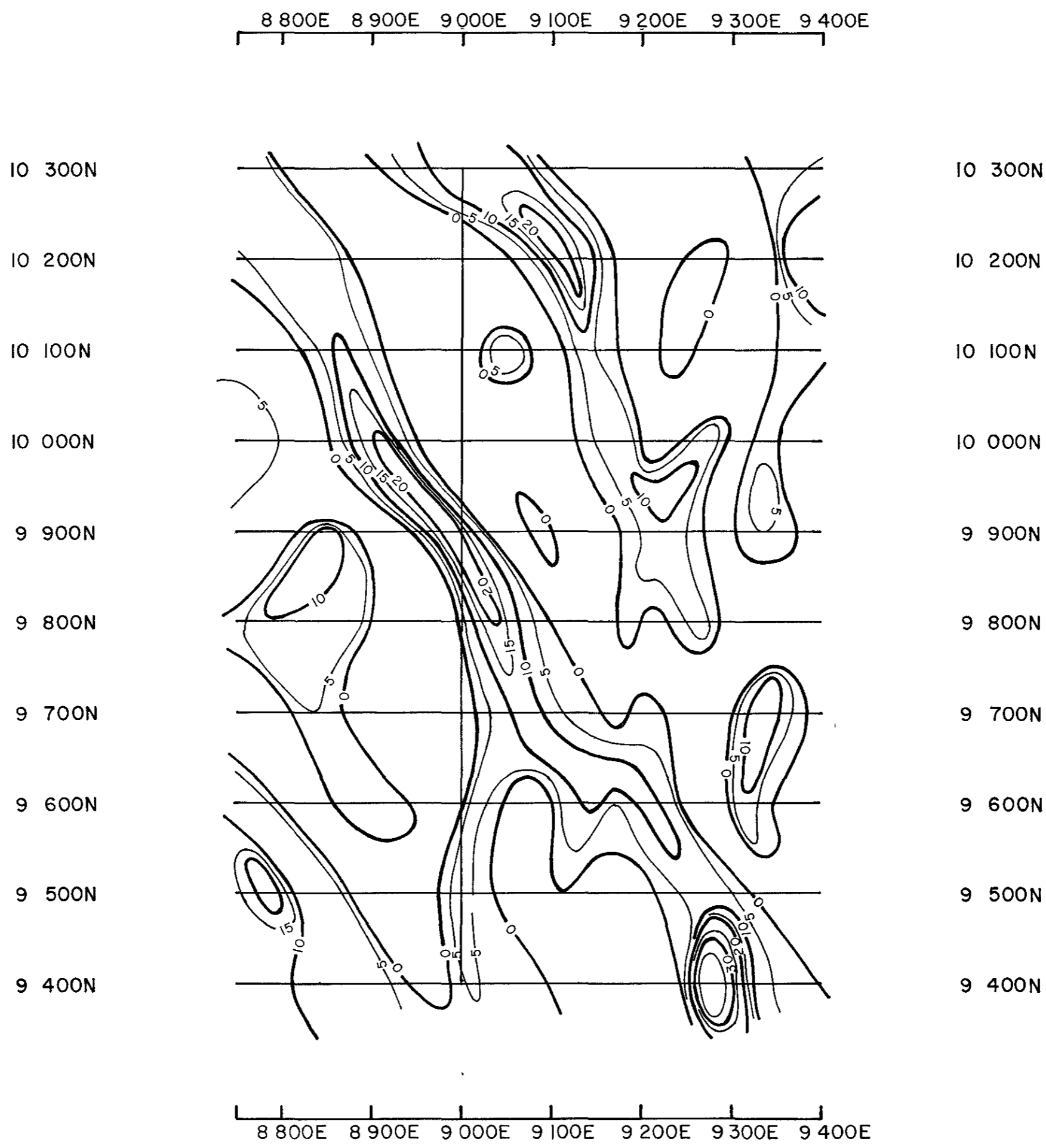
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GEOPEKO LTD. 005 Geophysical Surveys Plan No. 4544 S/B	Instrument	Datum		Hor Scale	1:5 000	AREA	Elliott Bay Tasmania
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	Scale Fact		Date	March '79	Cont Int	PLAN SHOWS	Diagrammatic Interpretation Summary





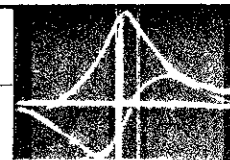
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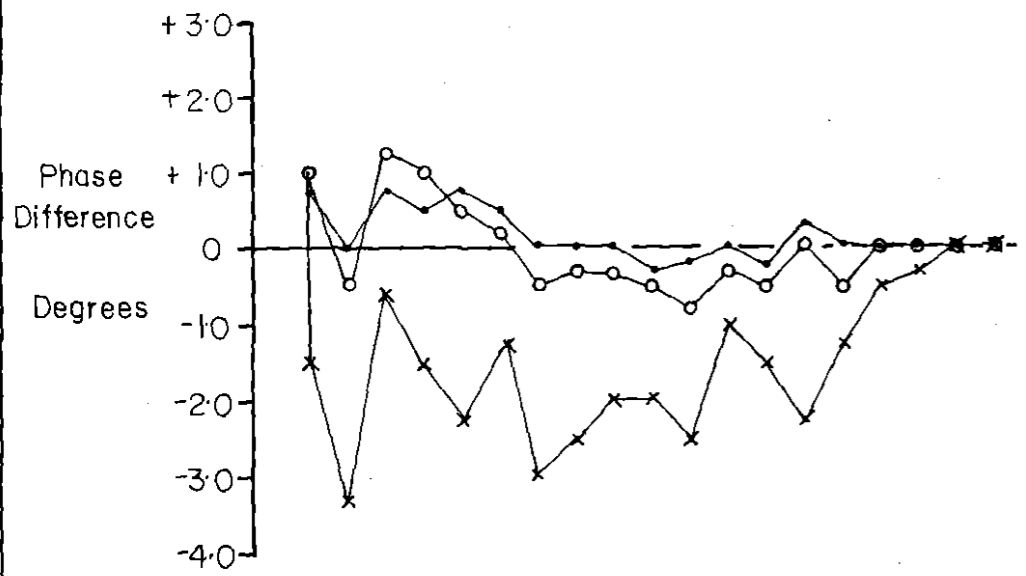
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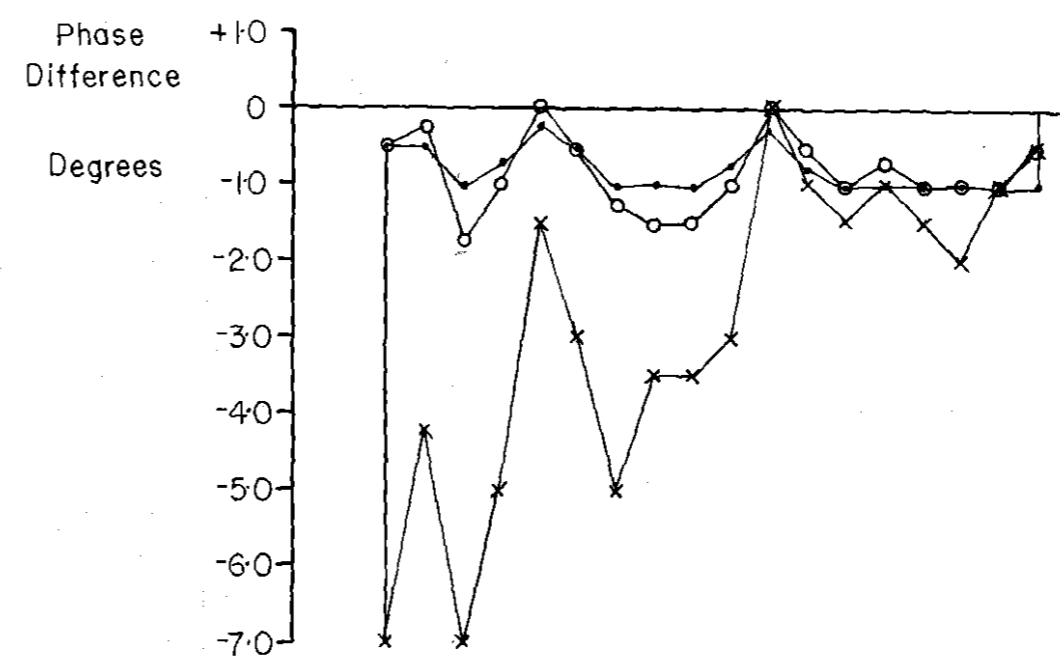
79-1348

GEOPEKO LTD. 006 Geophysical Surveys Plan No. 4545 S/B	Instrument	EM16	Datum		Hor Scale	1:5 000	AREA	Elliott Bay Tasmania
	Observer	S. Mudge	Base Peg		Vert Scale		PROSPECT	VOYAGER 3
	Scale Fact		Date	Feb 1979	Cont Int	5 %	PLAN SHOWS	Contours of Filtered In-phase VLF-EM.

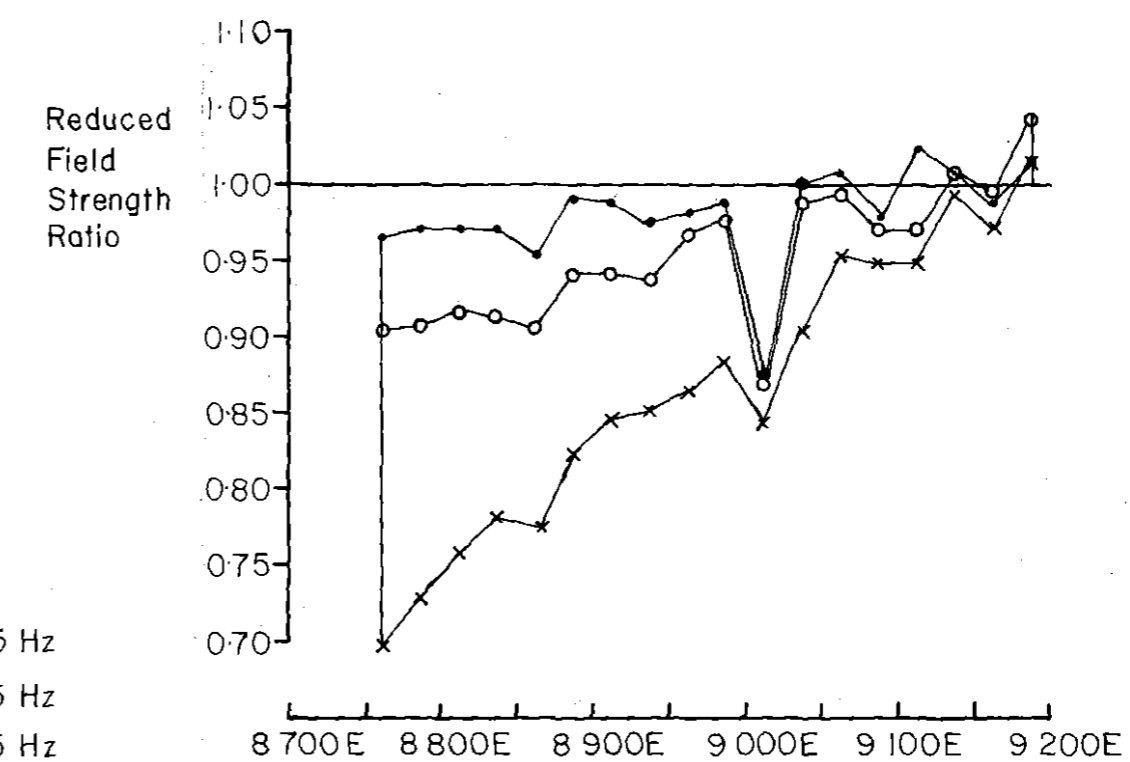
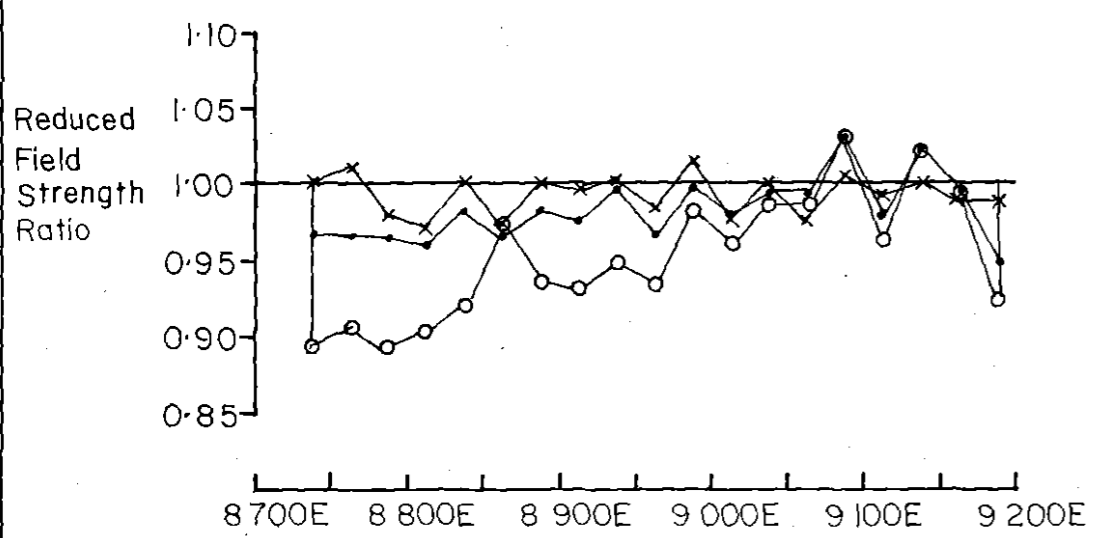




Line 9600N



Line 9800N



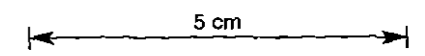
Vertical Scales:- 1cm=0.05 (Ratio)  
1cm=1° (Phase Difference)

Key   
 x — 945 Hz   
 o — 315 Hz   
 — 105 Hz

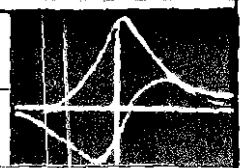
Transmitter Loop = 500m x 500m  
 Loop Corners at 10 000N/9 250E, 10 000N/9 750E  
 9 500N/9 250E, 9 500N/9 750E  
 Receiver Coils Spaced 25 metres.

172025

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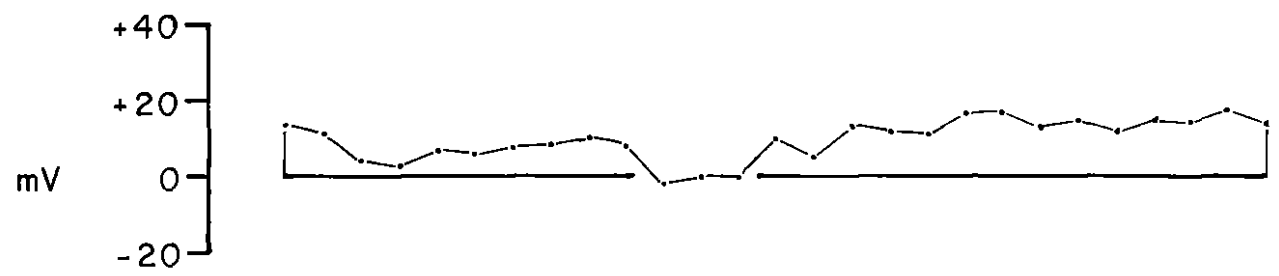


GEOPEKO LTD. 007 Geophysical Surveys. Plan No. 4546 S/B	Instrument	SE 77	Datum		Hor. Scale	1:5 000	AREA	Elliott Bay Tasmania
	Observer	S Mudge	Base Peg		Vert. Scale		PROSPECT	VOYAGER 3
	Scale Fact		Date	Feb. 1979	Cont. Int.		PLAN SHOWS	Turam Survey

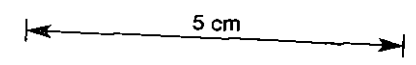
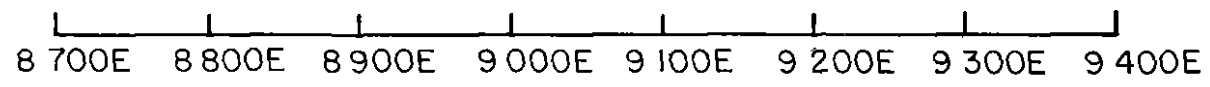




Line 9 800N



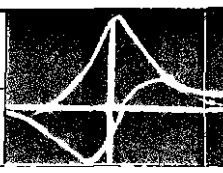
Line 9 600N



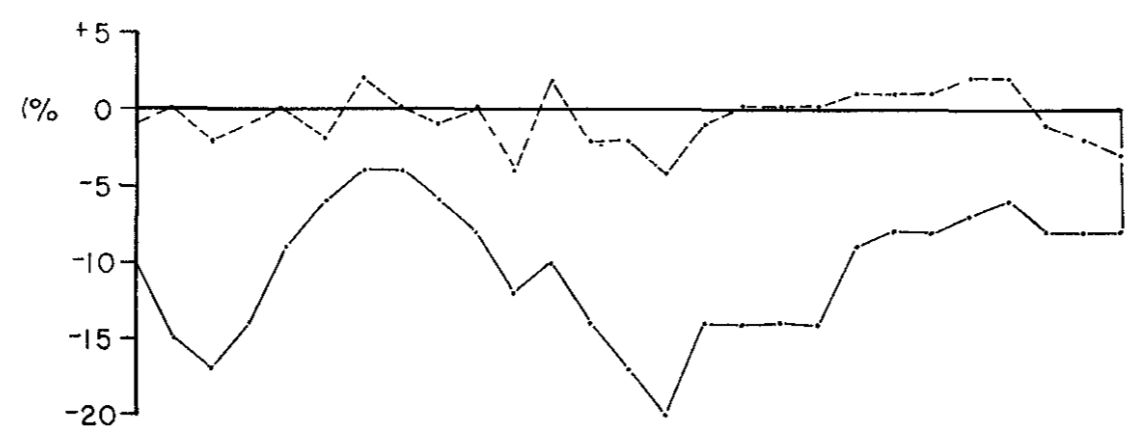
79-1348

172026

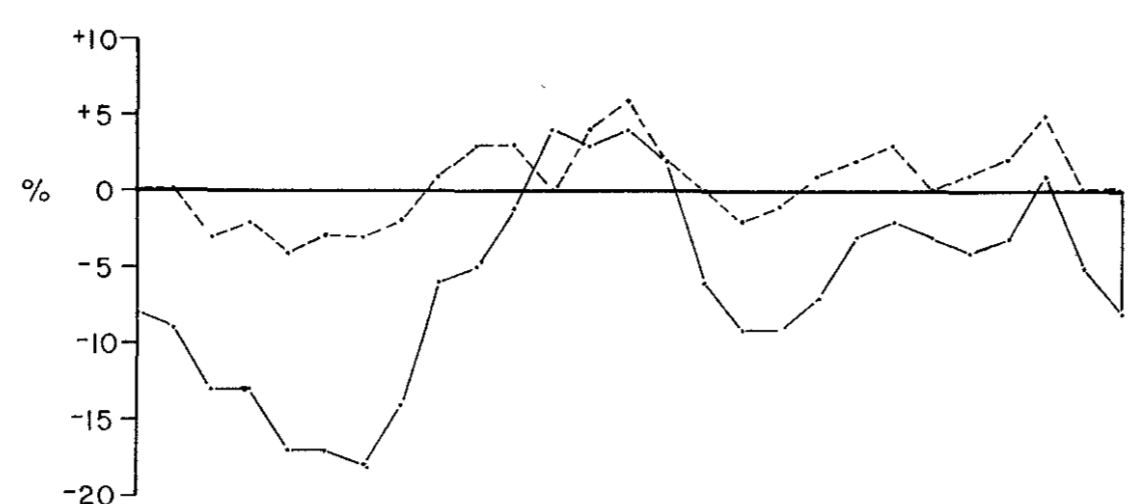
GEOPEKO LTD. 008 Geophysical Surveys. Plan No 4547 S/B	Instrument Fluke 8020A	Datum 0mV	Hor Scale 1:5 000	AREA Elliott Bay Tasmania
	Observer S Ilton S Mudge	Base Peg 9 050E (0mV)	Vert Scale 20mV/cm	PROSPECT VOYAGER 3
	Scale Fact	Date Feb.1979	Cont Int	PLAN SHOWS Profiles of Self Potential



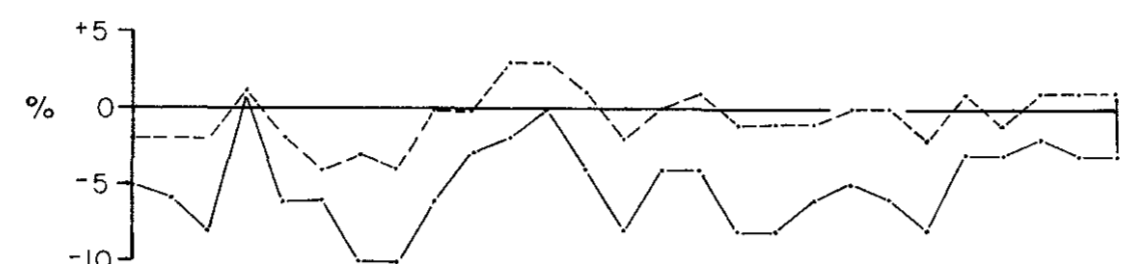
8 800E 8 900E 9 000E 9 100E 9 200E 9 300E 9 400E



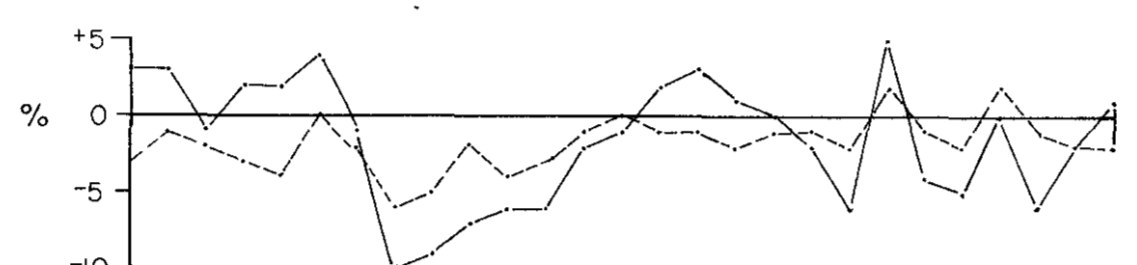
LINE 10 300N



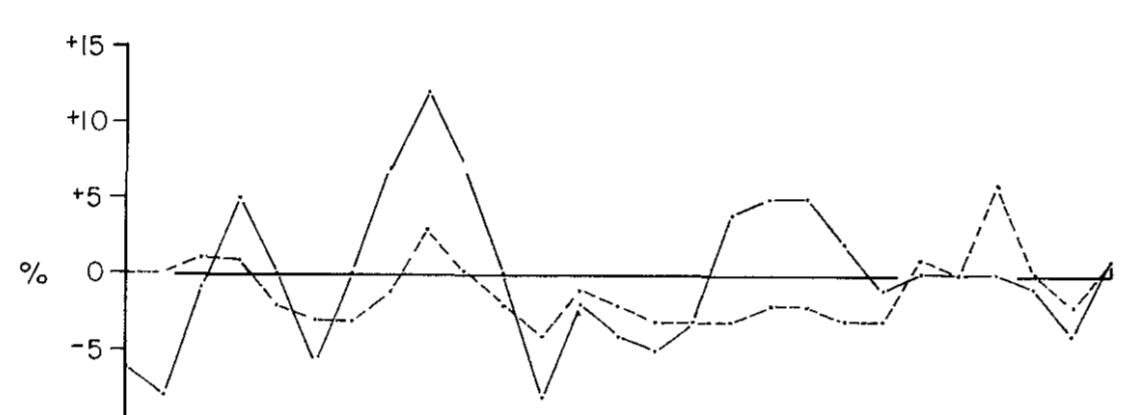
LINE 10 200N



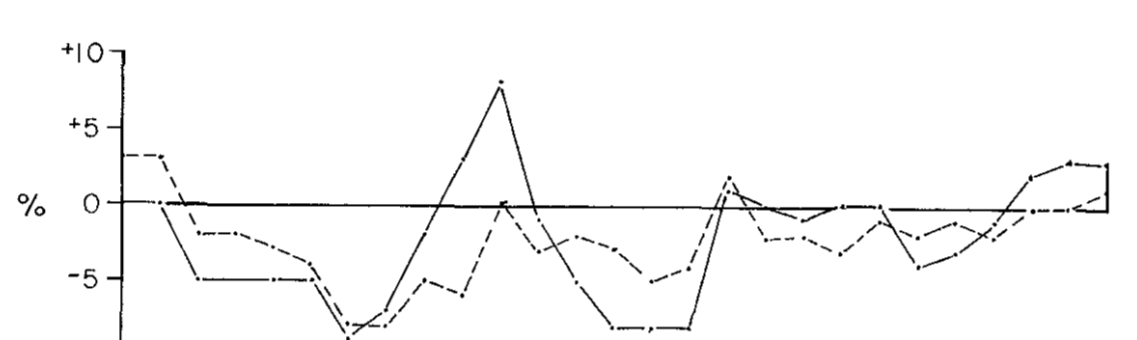
LINE 10 100N



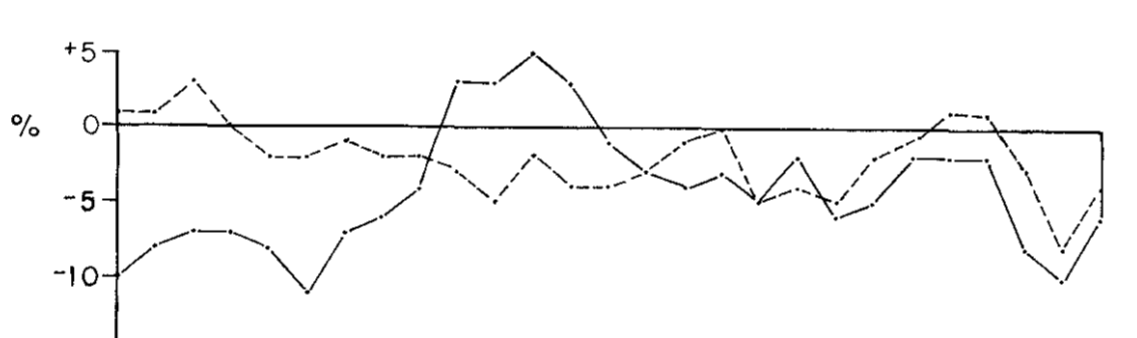
LINE 10 000N



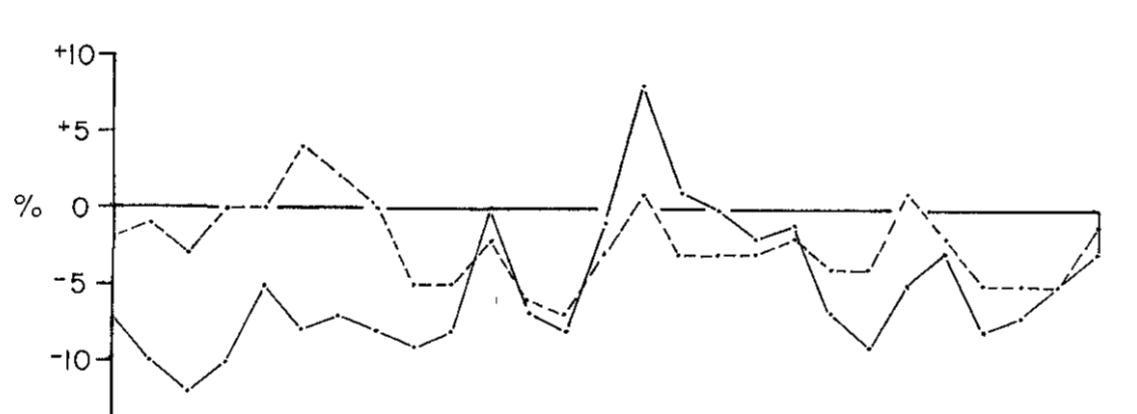
LINE 9 900N



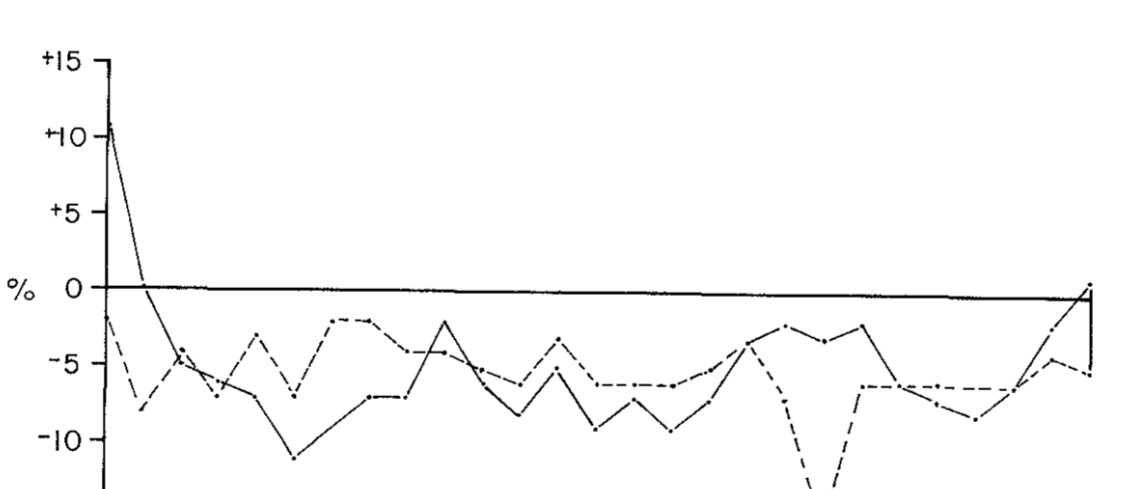
LINE 9 800N



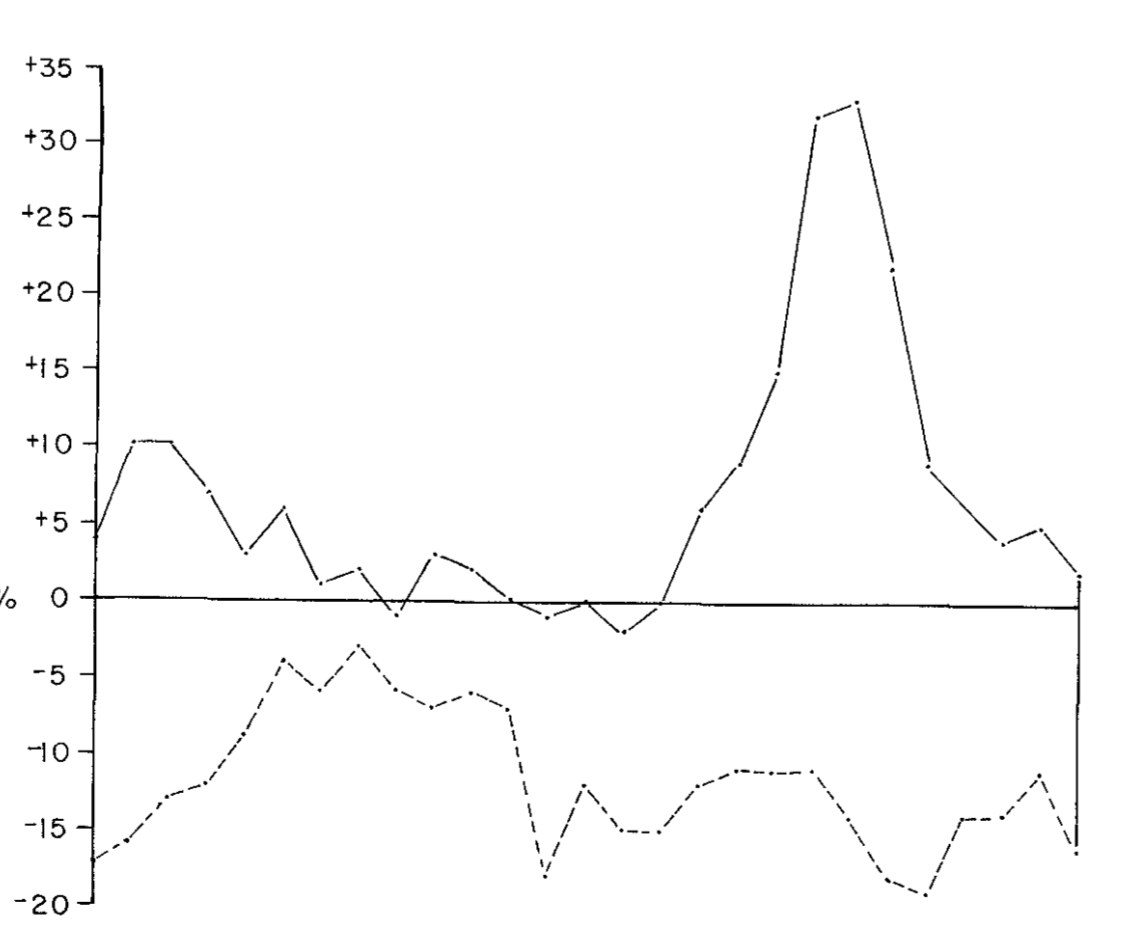
LINE 9 700N



LINE 9 600N



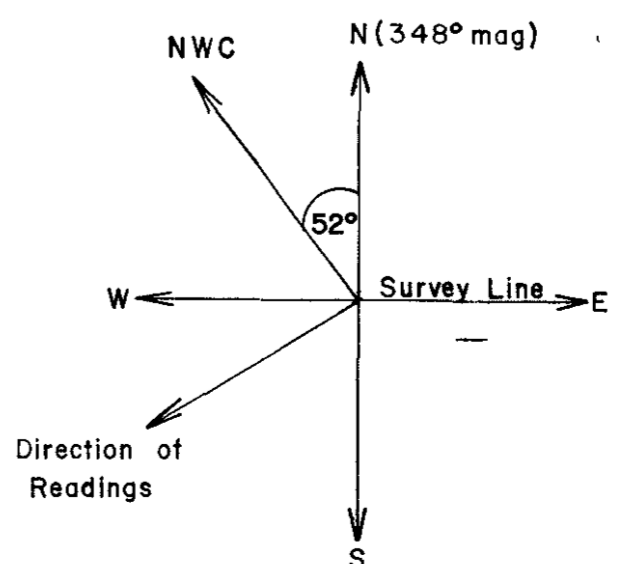
LINE 9 500N



LINE 9 400N

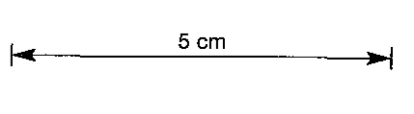
IN-PHASE  
QUADRATURE

Transmitter - North West Cape (NWC)



172027

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GEOPEKO LTD  
Geophysical Surveys  
Plan No. 4548 S/B

003

Instrument	EM-16	Datum	0%	Hor. Scale	1:5 000	AREA	Elliott Bay Tasmania
Observer	S. Mudge	Base Peg		Vert. Scale	1cm to 5%	PROSPECT	VOYAGER 3
Scale Fact		Date	February 1979	Current		PLAN SHEET	Profiles of VLF-EM

