THE SHELL COMPANY OF AUSTRALIA LIMITED

METALS DIVISION

E.L. 36/79 - LOONGANA

Progress Report on Exploration for the Period

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Authors : J.J. Lawton
R.G. Wright
I.J. Buchhorn
G.D. Oakes

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SUMMARY

Exploration Licence 36/79 was applied for by the Shell - Comalco JV in late 1979 primarily for its potential for sulphide tin mineralization in Ordovician Gordon Limestone.

A major part of the licence was flown with detailed aeromagnetics early in 1980 to search for deposits of magnetic skarn.

Follow-up showed that various magnetic anomalies were caused by Tertiary basalt hills or magnetite-bearing Cambrian volcanics.

Three Pb, Zn anomalies in Cambrian volcanics previously located by the Geopeko - E.Z. J.V. were re-examined. Only one, at Challenger II, still requires further investigation to determine its potential for economic mineralization.

To further explore the Cambrian volcanics an INPUT AEM survey was flown over the central and western portion of the licence in early 1982.

This area is covered with extensive but thin sheets of Tertiary basalt. Results now available suggest that the penetration of the INPUT system was severely restricted by the presence of widespread conductive clays/sand layers within and at the base of the basalt. Rugged topography on the eastern end of the licence prevented the survey from being flown to correct height in this area.

Extensive ground follow-up using magnetics, VLF EM, Max-Min EM and IP over various INPUT anomalies has failed to locate any zones of interest.

The geology of the licence area is currently being re-evaluated to try to correlate the exposed stratigraphy with that known further to the SW in the Dundas Trough. This study will help to determine which portions of the licence should be retained after the 1st July, 1984.

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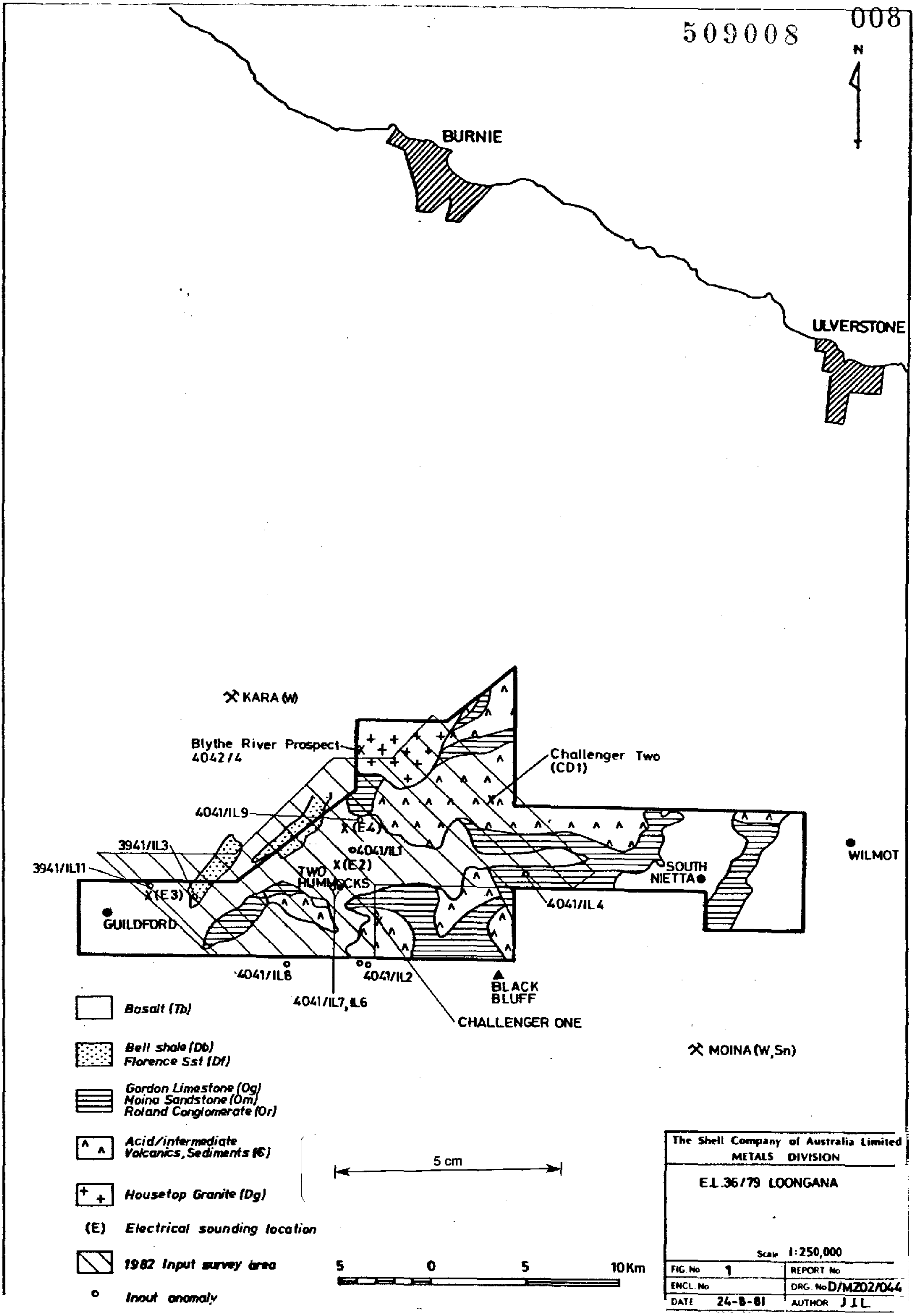

The Shell Company of Australia Limited METALS DIVISION	
E.L.36/79 LOONGANA	
Scale 1:250,000	
FIG. No 1	REPORT No
ENCL. No	DRG. No D/MZ02/044
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1.0 INTRODUCTION

1.1 General

The Loongana Exploration Licence 36/79 is located in northwest Tasmania approximately 40 km due south of Burnie, and has common boundaries with the Shell/ Comalco Exploration Licences of Guildford 1/76, High-clere 4/77, Moina 7/74, Hayes Peak 14/80 and Riana 8/77 (Refer Fig. 1). The area is thickly covered with rainforest and forestry is the predominant land use throughout the licence. There are no substantial towns in the area.

1.2 Tenement Status

The Loongana Licence of 277 sq km was granted to The Shell Company of Australia Limited on 1st November, 1979. The licence was subsequently included in the Moina Joint Venture with Comalco Limited, covering both E.L. 36/79 and the Moina Licence 7/74. Both parties contributed equally to exploration expenditure with Shell as operator.

In June 1981 Comalco gave notice of its intention to dilute within the Moina Joint Venture. Shell's equity within the Loongana Licence as at 30/6/83 was 78%.

1.3 Previous Investigations

The earliest recorded mineral exploration over the area was carried out by Tasminex N.L. prior to 1975. The area formed the southern portion of E.L. 17/68, and exploration was directed towards Kara-style scheelite occurrences around the periphery of the Housetop Granite.

Tasminex joint ventured the property with ANZECO, a wholly-owned subsidiary of Union Carbide in 1973. ANZECO concentrated on tungsten exploration but included a regional drainage survey of the Cambrian volcanics. A few anomalous values were located and geological inspection was carried out, although only of a regional nature. Later the area was granted as E.L. 2/76 to Geopeko Limited and the E.Z. Company of Australia in February, 1976. Detailed geological mapping and geochemical drainage sampling of outcropping Cambrian volcanics delineated three anomalies worthy of further work: Mt. Tor (Challenger I), Native Track Tier (Challenger II) and Two Hummocks (Challenger III) (Rogers, 1976). Gridding, soil and rock geochemistry and detailed geological mapping was carried out without locating drill targets. Location of these anomalies is shown plotted on Fig. 1 and Plan D/MZ 02/048.

Pennzoil of Australia Limited later entered into joint venture on E.L. 2/76 in July, 1978, primarily to test the Challenger III anomaly.

Pennzoil were unsuccessful and withdrew from the joint venture in April, 1979. Geopeko did not renew the licence when it became due in August, 1979 and Shell then made application for the ground.

Previously C.R.A. Exploration Pty. Ltd. had carried out considerable field work to the east within E.L. 19/72, in the Nietta area, primarily in search of Cambrian stratiform copper-lead-zinc mineralization. (Porter, 1974; 1975; 1976 and Purvis, 1978). Exploration consisted of geochemical drainage sampling, soil sampling, detailed geological mapping, an airborne EM survey, ground magnetics, dipole-dipole IP, gradient array IP, auger drilling and five diamond drill holes totalling 1152m.

All the prime geochemical and/or geophysical anomalies were drill-tested with negative results.

This work is relevant to Shell's E.L. 36/79 as the same volcanic sequence is being examined at the Challenger II prospect. The current E.L. 36/79 consists of part of the original Geopeko/E.Z. licence 2/76 and part of the C.R.A. Exploration Pty. Ltd. licence 19/72.

1.4 Exploration Approach

Shell's interest in the licence area was originally focussed on the possibilities for replacement sulphide tin mineralization within Gordon Limestone.

The Devonian Housetop granite outcrops to the north of the area and the prospective Gordon Limestone is distributed in an EW structural basin which trends east along the Leven River. (Refer Plan D/MZ 02/048). This coincides with the major fold axes in the region. Of particular significance is the northern extension of the Bismuth Creek Fault at Moina which transects Gordon Limestone in the basin. Movements related to this thrust fault, and other sub-parallel faults, have produced tension fracturing which are considered to be the main plumbing system for hydrothermal fluids from the Devonian granites.

The licence area was flown with low level, close-spaced aeromagnetics in March, 1980 to try to locate anomalies produced by Kara-Moina type magnetite skarns. (Refer Plan D/MZ 02/074). The approach adopted was to locate this strongly magnetic style of mineralization on a first pass and later to search adjacent to these deposits for lower T and P sulphide tin-style mineralization.

The initial programme detected various low-order magnetic anomalies over areas of Gordon Limestone. Ground follow-up downgraded all of them as being due to basalt hills or nearby magnetite-bearing Cambrian volcanics.

In recent years work on Loongana has concentrated more on the investigation of volcanogenic basemetal possibilities in the Cambrian volcanics. This work has built upon the early investigations by other exploration companies.

An INPUT survey was flown in January, 1982 to try to search for conductors through the extensive areas of basalt cover exposed on the central and western portions of the licence. (Refer Fig. 1 for location of survey lines).

Intensive exploration over E.L. 36/79 to date has been completed with negative results. It now appears that the penetration of the INPUT system has been restricted by the presence of widespread conductive clay/sand layers within and at the base of the Tertiary basalt cover. Rugged topography on the eastern end of the licence prevented the survey from being flown to correct height in these areas.

2.0 GEOLOGICAL SETTING

The Loongana licence covers the central western end of the WSW trending Fossey Mountain Trough at a position where this structure begins to trend SW into the Dundas Trough.

The area consists of a complex series of anticlines and synclines trending generally EW but with evidence for secondary NNE folding in the western part of the licence. (Refer Plan D/MZ 02/048). Major faulting trends NNW to NW. Much of the western side of the area is covered with thick vegetation and Tertiary basalt making an understanding of its structural geology extremely difficult.

Anticlinal cores are occupied by Cambrian acid-intermediate volcanics, sediments and cherts.

The Ordovician Roland Conglomerate-Moina Sandstone rest unconformably over these deposits, often in an angular unconformable relationship. Ordovician Gordon Limestone is preserved in a major EW trending synclinal structure partly exposed on the eastern end of the licence.

Disconnected outcrops of Silurian? Florence Sandstone occur on the western boundary of the licence.

Tertiary basalt, of variable thickness, is present across much of the licence especially over its central and western portions.

3.0 ECONOMIC GEOLOGY

3.1 Aeromagnetic/Radiometric Survey

A regional airborne magnetic and radiometric survey was flown by Geometrics in March, 1980 across E.L. 36/79 and several adjoining licences. Flight lines were run east-west at 250m spacings with a terrain clearance of 100m. Results are shown plotted on Plan D/MZ 02/074.

The aeromagnetic data was evaluated by Dr. G. Dickson, Consulting Geophysicist. A total of thirteen aeromagnetic anomalies were selected for inspection and sampling. Location of these anomalies is shown plotted on plan D/MZ 02/048.

Anomalies are numbered sequentially depending upon which 1:20,000 scale Cadastral sheet they occur on.

Ground follow-up showed that they were caused by basalt hills or magnetite-bearing Cambrian volcanics. Only one anomaly, at Blythe River, was caused by magnetite skarn. Details from the follow-up work are included in Appendix 1.

3.2 Challenger II Prospect

This major stream sediment anomaly in Cambrian volcanics, previously located by Geopeko, was re-examined and sampled.

The prospect was originally located through stream sediment sampling which gave anomalous values of 130-340 ppm Pb (against a background of 45 ppm Pb), 200-430 ppm Zn (background of 75 ppm) and 25-30 ppm Cu (background 10 ppm). The values occur in seven streams draining an area of about 1.2 sq km.

The Challenger II prospect was considered to be worth further examination due to its overall size and unexplained, spotty but high Pb, Zn soil geochemistry.

Geopeko had previously covered the anomalous area with a 100m x 50m spaced grid and auger sampled to the B or C horizon (generally less than 1.0m depth). Values in the soils reached 1200 ppm Pb and 730 ppm Zn against a background of 150 ppm Pb and 200 ppm Zn. Distribution of values were erratic and non-coincident. Their follow-up rock chip sampling detected only low order Pb, Zn values.

The Geopeko grid was established by Shell and extended to consist of 6 one km long lines bearing EW, pegged at 50m intervals and spaced 200m apart. The grid was resampled, again with a hand auger and the rock chips logged for a sub-surface geological map. (Refer Plan D/MZ 02/093). Ground magnetics were read at 25m intervals over the grid.

Only one bedrock exposure occurs on the NW corner of the grid, the rest of the area being covered with extensive and thick humus-rich soil.

Mapping by I.J. Buchhorn of outcrops to the west of the grid suggested that the strike of the volcanics is NS with a westerly dip. Mapping of rock chips from soil auger holes outlined the following sequence in ascending stratigraphic order from the east.

a) Interbedded laminated siltstones, quartz-feldspar crystal tuffs and volcaniclastics.

b) Massive pink feldspar-quartz crystal tuff.

c) Varigated agglomerate and lithic crystal tuff, pink felsic fragments in a chloritic, siliceous matrix with common fine limonite boxworks and pervasive sericitization.

   The agglomerate fragmental component decreases in size and amount to the west, becoming mainly lithic tuff at the western limit of the grid.

d) Porphyritic trachyte, occurring in the northwest part of the grid. Geopeko interpreted this unit to trend WNW and to be intrusive, on the basis of unconformable contact relationships with the pyroclastics. However, it was felt by Buchhorn that the porphyry is a younger unconformable lava, being relatively unaltered when compared to the underlying tuffs.

This rock is characterized by its high order Pb, Zn and Ba content (upto 2700 ppm Pb, 780 ppm Zn, 1650 ppm Ba at grid location 19000N 411300E).

Results for Pb, Zn, Mn and Fe obtained from auger sampling to the clay-rich B horizon (upto 1m depth) are shown plotted on plans D/MZ 02/094-097.

The geochemical results are hard to interpret with confidence and no attempt has been made to try to contour them. Distribution of the lead results appears to show a NNE trending zone of moderate order highs across the central part of the grid. A similar trend may be present in the Zn and Fe results. There is certainly a strong overall Zn-Fe correlation which may reflect a lithological origin.

Broader zones of high lead values occur on lines 19200N, 19400N and 19600N with a possible WNW trend. These zones possibly reflect the trend of the lead-bearing trachyte unit.

Ground magnetic data is shown plotted on plan D/MZ 02/051. The magnetic results appear to confirm previous Geopeko mapping which suggested that rocks on the western side of the grid had an EW to WNW strike. Rocks on the eastern side of the grid may strike in a NE direction.

The marked change in strike between the western and eastern sides of the grid plus the trends observed in the soil sampling results may indicate the presence of a central NNE trending fault zone.

The NNE zone of lead and zinc highs are possibly due to ?Devonian hydrothermal activity along a fault structure which intersected the lead-bearing trachyte.

The geology and structure of the prospect needs to be re-evaluated to test the above interpretations.

Following the re-establishment of the Geopeko soil results it was decided to cover the main geochemical anomaly with six lines of dipole-dipole IP. The survey was undertaken by Scintrex in April, 1981. Results are plotted on Figures 7-15 in Appendix 2. Modelling of the results from lines 19000N and 19600N is shown on Figures 2-6.

In general chargeabilities were high with background consistently exceeding 10 msec. Both resistivity and chargeability were very erratic and difficult to interpret. Instrument malfunction was suggested at the time but check readings of the more erratic values gave a constant repeatability. Another survey over selected lines was carried out and confirmed the early results.

The main anomaly of interest was a weak feature on line 19000N centred about 411 750E and situated 200m E of a Pb, Zn soil anomaly. Infill IP lines suggested that the anomaly extended N from the 18900N line to 19100N.

A gravity traverse was surveyed along line 19000N and both the IP and gravity data were modelled. A conductive body measuring 400m long by 150m by 50m was interpreted by G. Oakes to occur at 100m below 11675E. A broad 0.4 mgal gravity anomaly was inferred to be the modelled source.

Because the geochemistry was erratic and not clearly defined it was decided to test drill the best IP response recorded from the IP survey of the grid.

A diamond drill hole, DDH CD 1, was collared at 19000N 411 750E and angled at 60^{o} towards 270^{o} M to test the modelled source on this line. A section through the hole is shown on plan D/MZ 02/049.

The hole was completed in mid October, 1981 to a depth of 197.80m. A monotonous sequence of lithic and crystal tuffs was intersected throughout the hole. A strongly chloritic shear zone was intersected between 124m and 138m. A downhole IP survey was run as soon as the hole was completed. Chargeabilities are generally high (upto 110 msec.) with resistivities in the order of 3000 - 4000 ohm-m. Susceptibility values are consistently within the range 2500 - 5000 x 10^{-6} cgs units. These values are consistent with a disseminated magnetic source, although none has so far been observed in hand specimen. Trace pyrite is the only observed sulphide species present.

A log of the hole and the results of the downhole IP are presented in Appendix 3.

The drilling appears to have explained the IP and magnetic anomalies, although the broad 0.4 mgal gravity anomaly has yet to be explained.

Detailed logging and petrological sampling of the core showed that the rocks intersected in the hole are probably reworked pyroclastics, laminated tuffaceous siltstones, crystal tuffs and crystal lithic tuffs. The study also showed that the hole had been drilled approximately parallel to the dip of the beds and cannot therefore be regarded as an adequate test of the local stratigraphy. Assay results from the core were all low order. Petrological reports on core and outcrop samples are attached as Appendix 4.

Following this disappointing result little further work has been undertaken over the anomaly except for extension gridding and follow-up soil and rock sampling.

Soil lead geochemical anomalies are invariably associated with an intrusive - extrusive porphyritic trachyte unit. Magnetic anomalies are produced by more basic versions of these rocks.

Follow-up soil sampling reinforced previous results and tend to suggest that the high geochemical values are reflecting high background lithologies and hydrothermal activation along faults rather than mineralization.

This theory needs to be checked by remapping the grid to validate the structural interpretation and test pitting across the best soil geochemistry to expose the lead-bearing trachyte unit.

A full understanding of the significance and nature of the higher order Pb, Zn values is required before this prospect is downgraded.

3.3 Blythe River Prospect

Evaluation of the aeromagnetic coverage of E.L. 36/79 located a NS trending anomaly on the NW corner of the licence adjacent to the southern edge of the Housetop Granite. The anomaly (4042/4) traces out the contact of the Gordon Limestone with Moina Sandstone and was suspected to be due to skarn development.

Follow-up with magnetics and geological inspection located a sharp-peaked 7000 nT anomaly and fragments of coarse grained magnetite skarn in an area of basalt and alluvial cover just east of the Blythe River (Refer Plan D/MZ 02/054).

The zone was initially covered with a 1.5 km long NS baseline and 8 cross lines at 100 m intervals over the main magnetic anomaly. The grid was soil sampled and magnetically surveyed. Results are shown plotted on plans D/MZ 02/036, 042, 038 and 041.

Later the baseline 4100E was extended 1.2 km further S to cover the full extent of the aeromagnetic feature. Three cross lines were cut in to cover sections of the southern area. Ground magnetic and soil sampling results are plotted on plans D/MZ 02/037, 043, 039 and 040.

Soil sampling at 10 m intervals was carried out along a 150 m section of the baseline (4100 E) between 2700 N and 2850 N to cover the magnetic anomaly peak of 70765 nT recorded at 2760 N. Soil from 2760 N contains 3900 ppm W and 260 ppm Sn with adjacent values ranging from 25-55 ppm W and 10-40 ppm Sn.

Further soil samples collected on grid lines 2500 N, 2600 N, 2800 N and 2900 N at 100 m centres gave low order basalt, granite or sandstone related values. The only spot high located occurs at 2900 N 4000 E with 45 ppm W, 310 ppm Sn. This site is also coincident with a 6300 nT high.

Ground magnetic surveys were used to close off the extent of the main magnetic anomaly which was found to extend for over 500 m, striking about 330^{o} M.

* A shallow costean was excavated along line 2700 N across the main magnetic/geochemical peak (Refer Section Plan D/MZ 02/055). A 15 m thick zone of coarse grained magnetite skarn was uncovered dipping at 25^{o} SW. The

skarn is developed at the base of the Gordon Limestone where it passes into the transition siltstones and shales. Test pitting to the east located the underlying Moina Sandstone. Down dip extent of the skarn from magnetics and the costeaning appears to be only 15-20 m, severely limiting the tonnage potential of the prospect.

A total of 68 samples were sent in for assay and returned the following results:

Element	Range ppm	Average ppm
W	100 - 850	300
Sn	250 - 1600	500
Mo	8 - 24	12
Cu	8 - 100	25
Zn	12 - 230	100
Ba	15 - 150	35

The highest W values (upto 2400 ppm) were obtained in the shales and siltstones below the magnetite skarn. UV lamping of the samples detected no visible scheelite mineralization.

Another costean was excavated to the north on the 2750 N line to test the magnetic anomaly and poorly exposed magnetite skarns adjacent to the granite contact. (Refer Section Plan D/MZ 02/075).

The skarned base of the Gordon Limestone was again exposed dipping at 25° W. The skarn section is approximately 20 m thick but contains only two 3 m thick bands of magnetite skarn. Garnet-magnetite skarn occurs near the granite contacts.

A summary of the asay results from 135 channel samples from the costean shows that Sn is more abundant than W.

Element	Range ppm	Average ppm
W	55 - 1700	255
Sn	90 - 2100	710
Mo	30 - 310	55

The anomalous Sn values occur within the skarned sediments rather than the magnetite skarn and are possibly concentrated in the lattice of metasomatic biotite/ amphibole minerals.

No further investigation of the Blythe River skarn is warranted due to its low tonnage potential and generally low order W content. Any near surface scheelite concentrations present along strike in the skarns are also likely to have been oxidized in the pre-basalt weathering cycle.

3.4 Tulip Creek Prospect

Previous Geopeko stream sediment sampling located a low order Cu anomaly in streams situated about 1.5 km E of the Challenger II prospect. Follow-up in the area by soil sampling along forestry tracks located an inter-bedded sequence of laminated shales and crystal-lithic tuffs with soils containing upto 320 ppm Cu, 400 ppm Pb and 320 ppm Zn.

A small grid was established over the area for geological mapping and soil sampling (Refer Plan D/MZ 02/025). Outcrop is very poor and auger chip samples indicated that the area is underlain by a sequence of crystal-lithic tuffs, shales and sandstone-conglomerates with dips possibly about 30^{o} towards the SW.

Soil geochemical results were low-order, with sporadic highs of upto 100 ppm Cu, 135 ppm Pb, 185 ppm Zn, 5000 ppm Mn and 7.75% Fe. (Refer Plan D/MZ 02/026).

The original track soil sample Cu-Pb-Zn anomalies were not duplicated, which indicates extremely sporadic anomaly sources.

Ground magnetics are flat, with vague but complex E - W trends being indicated. (Refer Plan D/MZ 02/023 and 024).

No further investigation of this area is justified.

4.0 INPUT SURVEY

An INPUT AEM survey was flown by Geoterrex Pty. Ltd. over the western and central portions of E.L. 36/79 in January, 1982.

An outline of the survey area is shown on Fig. 1 and in more detail on plan D/MZ 02/086.

Flight line direction was NW - SE across the overall trend of the Cambrian stratigraphy. Nominal line spacing was 300 m with a mean terrain clearance of 120m.

Part of the Geoterrex report on Job No. 83-548 is attached as Appendix 5 together with six 1:20,000 scale plans of the Loongana survey area. (Refer Plans D/MZ 02/107-112).

Topography was a major problem over the central portion of the licence and this resulted in an excessive survey height. This would have had the effect of considerably decreasing the AEM response from poor, small or deep conductors.

No INPUT anomalies were recorded over the Challenger II prospect or directly over the Blythe River magnetic anomaly. The basalts, because of their low resistivities, were well delineated by the survey.

A total of eleven INPUT anomalies were selected for follow-up. (Refer plan D/MZ 02/048 for locations). These were initially checked using VLF EM and magnetics. Only one anomaly, IL 2, was found to occur in an area free of basalt cover. (Refer Appendix 5 for details). Further surveying with max-min EM was undertaken over four of the anomalies to try to define bedrock conductors. (Refer plans D/MZ 02/079-085). Single line IP surveys were later run across these anomalies to clarify the geophysical interpretation. (Refer Appendix 5).

The follow-up work has shown that the INPUT conductors occur within or just below the basalt profile. It now appears that the penetration of the INPUT system was restricted by the presence of widespread conductive clay and sand layers within and at the base of the basalt cover.

Pre-basalt weathering of the basement rocks has also produced conductive layers in the bedrock greater than 100 m thick in several places.

Overall it is considered that the INPUT survey was unlikely to have been effective in its penetration of the various conductive layers.

Only two anomalies, IL 2 and IL 8, are now considered worthy of further follow-up.

5.0 ELECTRICAL SOUNDINGS

Electrical soundings were made at three sites on the licence in an attempt to determine basalt thicknesses and resistivities. (Refer plan D/MZ 02/048 for locations). Only line number 2 appears to have reached basement at about 160 m. Work on Loongana and adjacent licences showed that the soundings had severe problems in outlining basement due to the large spreads required, low return signals and problems with lateral variations.

Details of this work are included in a memo in Appendix 4 and resistivity/chargeability plots are attached as Appendix 6.

6.0 AUDIO - MAGNETO TELLURIC SURVEY

Macquarie University's Centre for Geophysical Exploration Research carried out an AMT survey at 11 sites on Comalco and Shell licences north from Guildford township. The work was planned to investigate resistivity contrasts to depths of upto 1000 m in the Tertiary basalts and underlying bedrock.

The aim of the survey was to test out the system and to determine the depth of basalt cover overlying prospective Cambrian and Ordovician stratigraphy. The AMT sites were situated close to drill holes or adjacent to previous electrical sounding sites.

Two of the sites, AMT 6 and AMT 12, were located on the western end of the Loongana licence east of Guildford. (Refer plan D/MZ 02/048).

Results from the survey are presented in Appendix 7.

The AMT technique proved to be an effective method of checking for basalt thickness and could have an application for mapping bedrock lithologies below the basalt cover.

7.0 CONCLUSIONS & RECOMMENDATIONS

Two extensive aerial surveys have been flown across the Loongana area in the search for tin-tungsten and base-metal mineralization.

Detailed ground follow-up over various anomalies has so far failed to locate any zones of economic interest. The Challenger II prospect, previously outlined by Geopeko - E.Z. has still not been satisfactorily explained. More work is needed here to determine its economic potential.

The regional geological evaluation should be continued to help determine the overall possibilities of the exposed Cambrian volcanics.

R.G. WRIGHT
Supervising Geologist

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APPENDIX I

Details of follow-up over nine aeromagnetic anomalies
Refer to Plans: D/MZ 02/015-021, 001, 067-069

LOONGANA - E.L. 36/79

Details of follow-up over nine aeromagnetic anomalies selected by Dr. G. Dickson. (Rept. by I.J. Buchhorn).

Most anomalies were in heavy bush, making ground location difficult. All anomalies were accurately located, with most occurring within 50-200 metres of plotted position.

The follow-up technique was to do magnetics, soil, stream and rock sampling, and geology along flagged reconnaissance lines.

The nine most promising anomalies were covered.

A total of 210 stream and soil samples were despatched for geochemical analysis. Stream samples were analysed by spectrographic scan to assess the possibility of kimberlite or other anomaly sources.

Details of individual anomaly ground checks are as follows:

1. Anomaly 4041/2 (flight line/fiducial 333/2982)

   The airborne anomaly had an amplitude of 260 nT and was 200 m wide. There was no response in the potassium channel. It was interpreted to represent a near surface source, probably basalt. Ground magnetics gave very noisy profiles with no significant anomalies. This is typical of basalts, confirming the original interpretation.

   Tertiary basalt is the only outcropping rock type. Susceptibilities range from 200 - 800 x 10^{-6} cgs units. Assuming an average basalt susceptibility of 400 x 10^{-6} cgs units, the observed anomaly amplitudes of 400 - 1000 nT can be explained as basalt sources.

   Geology: Tertiary basalt.

   Soil Geochem: Maximum values, 71 samples: 30ppm Sn, 20ppm W 95ppm Cu, 240ppm Ni, 8ppm Pb, 185ppm Zn, 8.5% Fe, 0.46% Mn.

   Stream Geochem: Maximum values, 4 samples: 6ppm Sn, 15ppm W, 55ppm Cu, 185ppm Ni, 4ppm Pb, 200ppm Zn, 6.45% Fe, 0.07% Mn.

   Status: No further work, basalt anomaly source.

2. Anomaly 4041/3 (347/5100)

   Geology: Magnetite bearing Cambrian acid tuffs.

   Soil Geochem: Maximum values, 28 samples: 26ppm Sn, 15ppm W, 55ppm Cu, 36ppm Ni, 60ppm Pb, 85ppm Zn, 4.05% Fe, 640ppm Mn.

Stream Geochem: Maximum values, 4 samples: 8ppm Sn, 15ppm W, 16ppm Cu, 12ppm Ni, 16ppm Pb, 65ppm Zn, 2.35% Fe, 0.1% Mn.

Status: No further work, magnetite-bearing tuff anomaly source.

3. Anomaly 4041/4 (350/4961)

Geology: Magnetite-bearing Cambrian acid tuffs.

Soil Geochem: Maximum values, 45 samples: 24ppm Sn, 20ppm W, 26ppm Cu, 16ppm Ni, 31ppm Pb, 75ppm Zn, 4.15% Fe, 1.0% Mn.

Stream Geochem: Maximum values, 9 samples: 10ppm Sn, 15ppm W, 16ppm Cu, 16ppm Ni, 16ppm Pb, 44ppm Zn, 3.3% Fe, 0.3% Mn.

Status: The only result of interest was a 100m width of 0.05% - 1.0% Mn in soils associated with Roland Conglomerate scree. The conglomerate is red stained, which could explain the high manganese levels. No significant Cu-Pb-Zn is associated with the anomalous Mn. High Mn also occurs in streams in the northern part of the anomaly. No further work, magnetite-bearing tuff anomaly source.

4. Anomaly 4041/5 (354/4695)

Geology: Magnetite-bearing Cambrian acid tuffs.

Soil Geochem: Maximum values, 26 samples: 16ppm Sn, 20ppm W (coincident) 50ppm Cu, 20ppm Ni, 28ppm Pb, 80 ppm Zn, 3.70% Fe, 0.16% Mn.

Stream Geochem: Maximum values, 9 samples: 12ppm Sn, 20ppm W, 44ppm Cu, 12ppm Ni, 12ppm Pb, 85ppm Zn, 3.35% Fe, 0.14% Mn.

Status: The soil Fe background in volcanics is high, being approximately 3%. There is however, no basemetal backup apart from a high Mn background of 200ppm. No further work, magnetite-bearing tuff anomaly source.

The three preceeding anomalies were "step" type anomalies with magnitudes of the order of 300 - 400 nT and a strong response in the potassium channel. These anomalies were interpreted as basalt against or overlying granite. Ground magnetics yielded similarly shaped step anomalies with magnitudes of the order of 1000 nT. All three anomalies lie in a north-south line, are roughly one kilometer apart and clearly represent the same geological feature. Thus the anomalies probably represent a formational boundary within the Cambrian volcanics.

Sporadic float of magnetite-bearing crystal-lithic tuffs was located at each anomaly, with susceptibilities ranging from 1000 - 4000 x 10^{-6} cgs units. Magnetite tuff anomaly sources would appear probable.

5. Anomaly 4041/6 (355/4579)

The airborne anomaly had a magnitude of 150 nT and width of 200 metres. The anomaly coincides with a hill and was interpreted as basalt overlying granite. Ground magnetics gave a typical, noisy, basalt profile.

The only rock type was Tertiary basalt float. Basalt susceptibilities ranged from 200 - 600 x 10^{-6} cgs units, which probably explains the anomaly.

Geology:	Tertiary basalt.
Soil Geochem:	Maximum values, 11 samples: 12ppm Sn, 15ppm W 70ppm Cu, 175ppm Ni, 16ppm Pb, 150ppm Zn, 7.7% Fe, 0.37% Mn
Stream Geochem:	Maximum values, 3 samples: 14ppm Sn, 55ppm W, 65ppm Cu, 185ppm Ni, 24ppm Pb, 130ppm Zn, 7.2% Fe, 0.26% Mn
Status:	No further work. The anomaly is a basalt source. The isolated W anomaly does not warrant followup.

6. Anomaly 4141/4 (44/2695)

The airborne anomaly was 180m wide, and had an amplitude of 400 nT. There was a strong potassium channel response to the north, suggesting a granite contact. No interpretation was given. Ground magnetics give an east-west trending anomaly roughly 200m wide and with a maximum amplitude of 2000 nT. North-south profiles suggest a steeply dipping body. The potassium association can probably be explained by acid volcanics.

Outcrop consisted of magnetite-bearing green andesitic lithic crystal tuff to agglomerate. Susceptibilities ranged from 1000 - 5000 x 10^{-6} cgs units, which explains the airborne magnetic feature.

Geology:	Cambrian acid to intermediate lithic crystal tuff to agglomerate, often magnetite-bearing.
Soil geochem:	Maximum values, 34 samples: 20ppm Sn, 20ppm W 85ppm Cu, 210ppm Ni, 40ppm Pb, 125ppm Zn, 8.0% Fe, 0.7% Mn.
Stream Geochem:	Maximum values, 2 samples: 8ppm Sn, 10ppm W, 30ppm Cu, 145ppm Ni, 8ppm Pb, 170ppm Zn, 8.5% Fe, 0.1% Mn.
Status:	No further work, no Sn-W or basemetal geochemistry associated with outcropping volcanics. Magnetite-bearing agglomerate magnetic anomaly source.

7. Anomaly 4141/5 (47/2562)

From consideration of the complex magnetic profile and high potassium response, the airborne anomaly was interpreted to represent an unusually high magnetic response over granites. Two 800m long lines on the ground located an east-west trending magnetic low of amplitude 600 - 1000 nT and 150 - 200m width corresponding to a boundary between Tertiary basalt and Cambrian acid tuff. This anomaly does not appear to correspond to the airborne anomaly. As the area has been cleared since its aerial photography was taken, it seems possible that flight path recovery was difficult, leading to poor location of the airborne anomaly.

The Cambrian tuffs had susceptibilities of less than 100 x 10^{-6} cgs units, while values for the Tertiary basalt ranged from 100 - 300 x 10^{-6} cgs units.

Geology:	Tertiary basalts overlying Cambrian tuffs.
Soil Geochem:	Maximum values, 33 samples: 20ppm Sn, 20ppm W 90ppm Cu, 140ppm Ni, 20ppm Pb, 115ppm Zn, 7.7% Fe, 0.1% Mn.
Stream Geochem:	Maximum values, 2 samples: $<$4ppm Sn, $<$10ppm W 24ppm Cu, 85ppm Ni, 16ppm Pb, 60ppm Zn, 3.4% Fe, 0.03% Mn.
Status:	No further work, although anomaly flight path recovery is suspected to be poor. The overall geological setting is unfavourable for skarns.

8. Anomaly 4141/6 (542/6621)

The airborne anomaly was a north-south trending high (of amplitude of the order of 200 nT) which is part of a larger overall east-west trending feature. A steep gradient to the west appears to indicate a north-south trending fault. Ground magnetics located a 100m wide anomaly of 450 nT amplitude, superimposed on a 600 nT step in the regional trend, which probably corresponds to the fault. This anomaly probably represents a magnetite rich zone within the Cambrian volcanics.

Float consists of a distinctive magnetite-bearing green agglomerate unit with susceptibilities of 1000 - 5000 x 10^{-6} cgs units. This would appear to be the anomaly source. Float at the anomaly site included limonitic (gossanous) tuffs and one sample of massive hematite. The source of this material is not known.

Geology:	Green, magnetite-bearing andesitic agglomerate
Soil Geochem:	Maximum values, 25 samples: 26ppm Sn, 15ppm W 85ppm Cu, 260ppm Ni, 80ppm Pb, 135ppm Zn, 7.9% Fe, 0.44% Mn.

Stream Geochem: Maximum values, 2 samples: 10ppm Sn, 15ppm W 12ppm Cu, 12ppm Ni, 16ppm Pb, 55ppm Zn, 3.2% Fe, 0.03% Mn.

Status: No further work. Although insufficient magnetic cross traverses were done for magnetic modelling the geological setting is unfavourable for skarns. The anomalous Cu geochemistry relates to basalts.

9. Anomaly 4241/1

The anomaly occurs on the western side of the Wilmot River valley in an area of basalt covered Gordon Limestone. Although the anomaly peak corresponds to basalts, the basalt magnetic susceptibilities in outcrop were considered too low to explain the observed ground magnetic anomaly (1500 nT).

Later evaluation by Dr. Dickson of aerial and ground magnetic data downgraded the anomaly as being a basalt source.

Three other aeromagnetic anomalies, 4141/2, 4041/8 and 4041/1 were later ground checked by G. Oakes. All three appear to be related to basalt.

APPENDIX 2

Challenger II Prospect

I.P. Surveys

15/6/81
M202-744

MEMORANDUM

TO: DMH/DEVONPORT (D.W. & I.B.)

FROM: AHO/DMN:NH:YG

DATE: June 15, 1981

SUBJECT: CHALLENGER TWO (4041/?) - GEOPHYSICS

The IP results show frequent correlation with the magnetics. Hence it is suspected that the responses are often due to disseminated magnetite in particular stratigraphic units, especially since resistivities generally remain high.

The most interesting zone, geophysically, is on lines 18900 N to 19100 N between 411650 E and 411750 E. Strong chargeability anomalies are indicated on three lines using dipole-dipole electrode spacings of 200,100 and 50 metres. However these anomalies appear to have quite a broad and shallow source contrary to the associated magnetic anomalies which are narrow (i.e. 50 metres) but also shallow. The magnetics and possibly the IP suggest dips to the west with a northerly strike. There appears to be a minor associated geochemically anomalous zone (Cu, Mn, Fe). A suggested DDH location is on line 19000 N at 411690 E. Collar angle of 60°, and azimuth of 90°N, to intersect a target about 100 metres below 411750 E. This chargeability (and magnetic) zone possibly continues to the north east having been faulted to the east (dextral slip).

(1) 19000 N / 411690E

Another target showing associated chargeability, magnetic and weak Pb anomalies is on line 19600 N. It is more diffuse and likely also to have a purely lithologic origin. Dips are not apparent but are probably vertical. Both chargeability and magnetic responses show shallow and erratic effects presumably due to magnetic float derived from the underlying unit. A possible DDH location to intersect a target at 100 metres below 411400 E is at 411340 E, with collar angle of 60° and azimuth of 90°N.

(2) ...N / 41134E

Neither of these locations appears very accessible from existing tracks, but there is little alternative unfortunately.

Would it be possible in future to put as much information (such as ground mag, geology and topography) onto the IP pseudo-sections to assist interpretation. Initially it would not need to be drafted as formally as the enclosed example from Mt. Isa.

Nigel

REGARDS - NIGEL HUNGERFORD

File:

MEMORANDUM

TO: DMH/Devonport (J. Lawton), DMN

FROM: DMN/1:GO:AP

DATE: 14 September, 1981

SUBJECT: CHALLENGER TWO GRAVITY AND IP INTERPRETATION

Two models have been prepared from the gravity data on line 19000N at Challenger Two, and are shown on the attached diagrams. Model one has a more reasonable strike length (370m), to fit the IP and magnetic data and is the one I prefer. (However, model 2 also fits the data well and could be adjusted, e.g. by increasing the depth extent, to have a smaller strike length). The important thing to note is that the proposed drillhole (dip 60°E from 11690E) will miss both of these models.

The probable explanation for the gravity anomaly not being coincident with the IP anomaly would be a massive body at depth with a 'halo' of disseminated mineralization above and to the east of it. I have modelled this situation using IP2D and the results are attached. Although a perfect fit has not been obtained with the observed data, it is clear that a reasonable fit could be obtained with some relatively minor changes to the model. The resistivity data appears to fit gravity model 1 better than model 2.

A hole, using the drill site already prepared at 11690E, to intersect this target should dip at 80° to the west.

G. OAKES

Att.

509039 039

Model 1

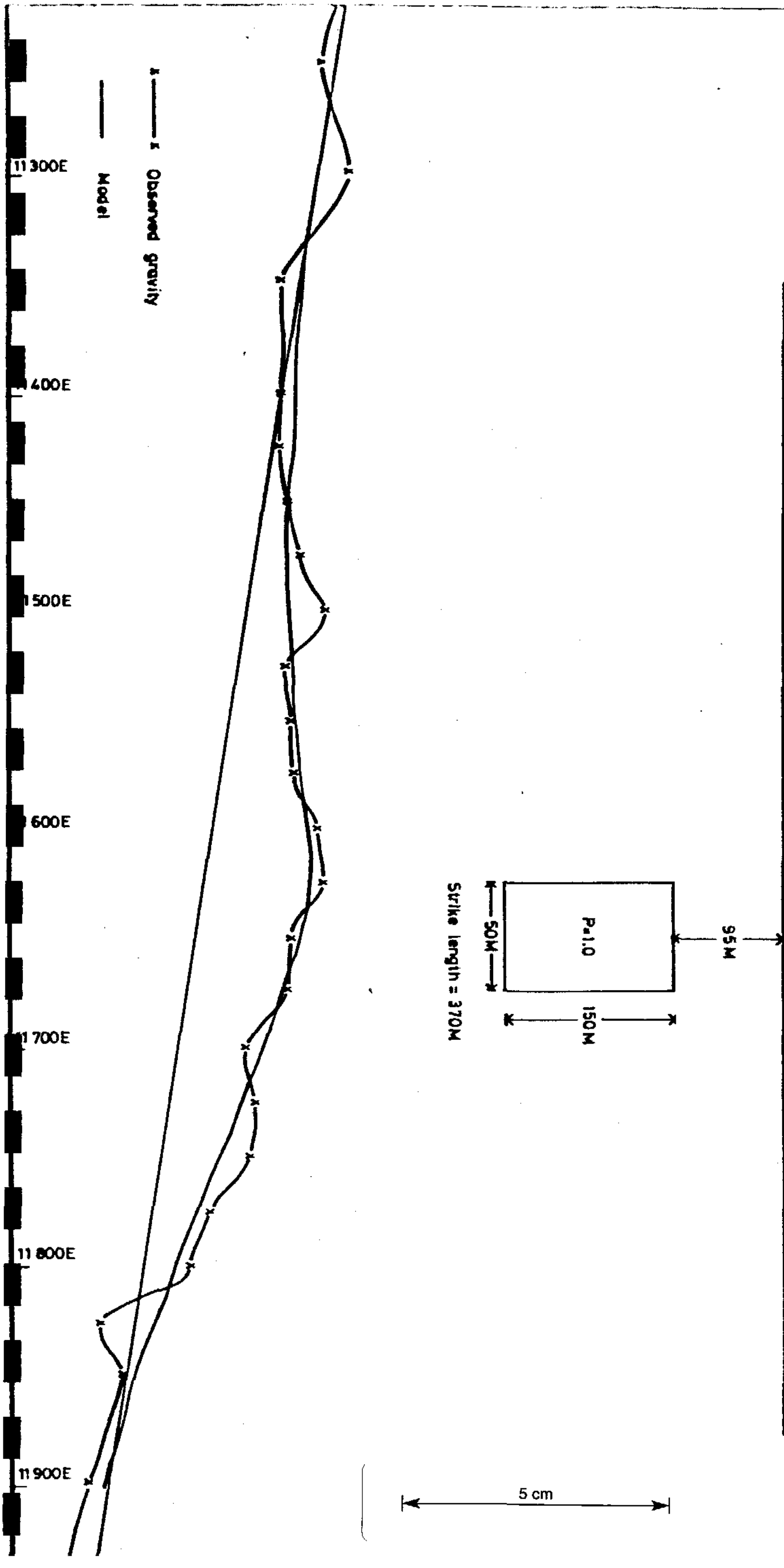


FIG. 2

The Shell Company of Australia Limited METALS DIVISION	
CHALLENGER TWO 19 000 N GRAVITY E.L.36/79 LOONGANA (Terrain corrected, P= 2.5)	
SCALE 1:2500	DATE 5-10-81
AUTHOR G.Oakes	DRAWN H.L.H.
OFFICE DEVONPORT	
DRG No. D/ M702 / 046	

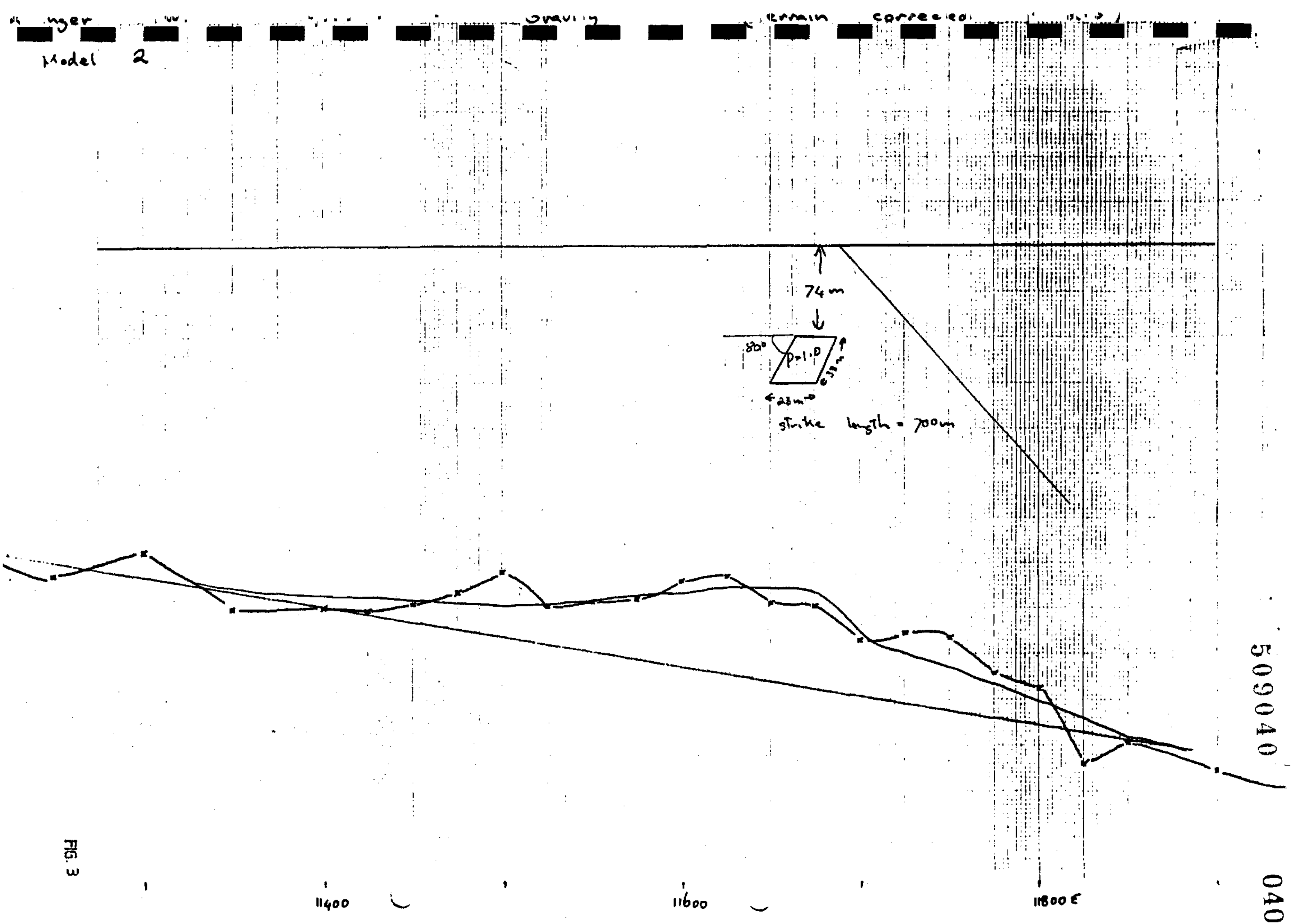

Gravity
terrain corrected
Model 2
74 m
80°
ρ=1.0
23 m
strike length = 700 m
11400
11600
11800 E

FIG. 3

509040

File:

MEMORANDUM

TO: DMH/Devonport (J. Lawton), DMN

FROM: DMN/1:GO:AP

DATE: 16 September, 1981

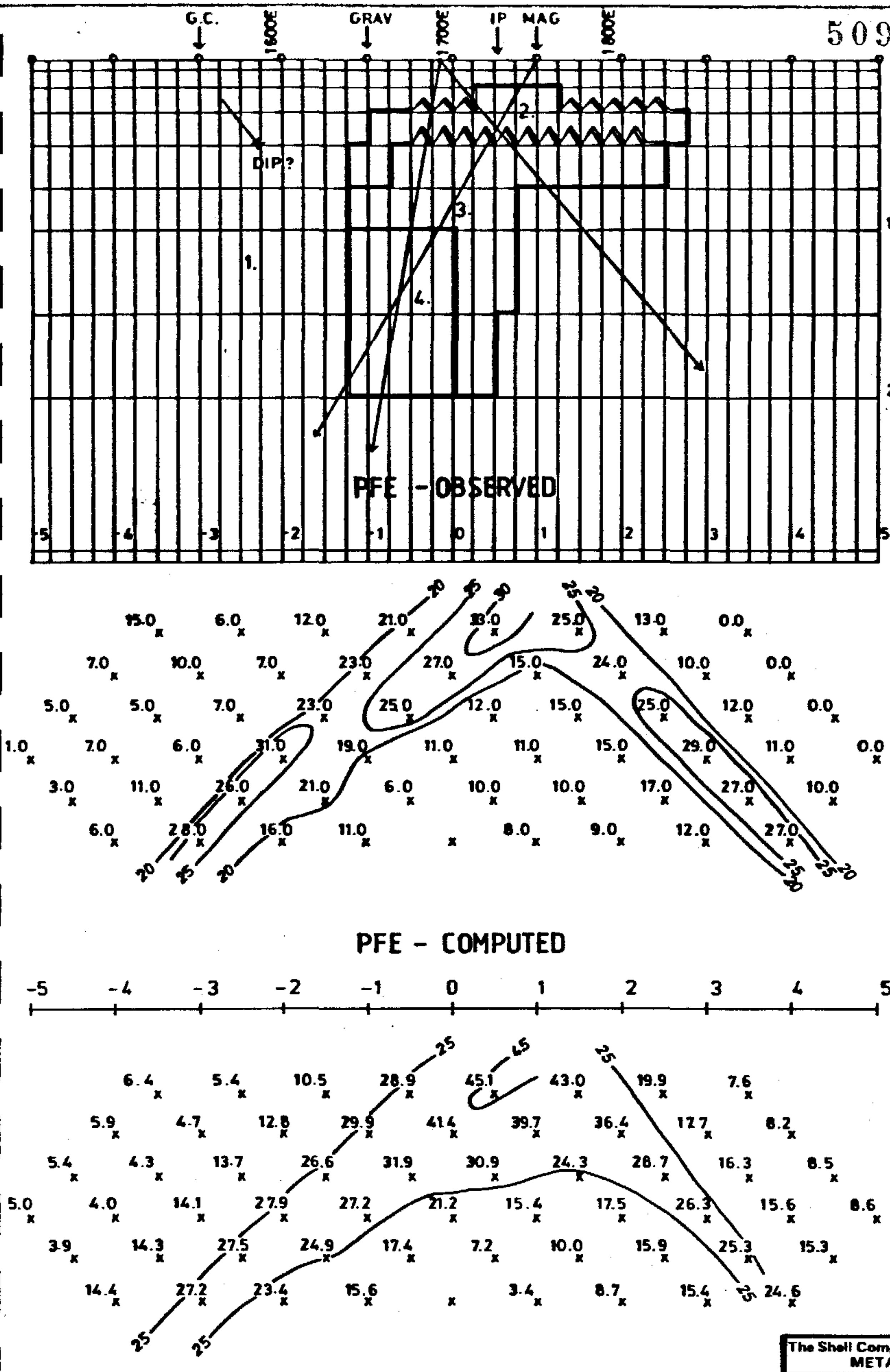
SUBJECT: CHALLENGER II - REFINED IP INTERPRETATION

I have generated some additional models for the 50m dipole IP on line 19000N. The attached model is probably the best I can do, given the 3 dimensional nature of the body being modelled and the limitations of program IP2D.

The main feature is a moderately conductive (100 ohm - meters), dense (3.5 - 4.0 g/cm^3) body centred on 1675E at a depth of 100m. The body has a strike length of about 300 - 400m, width of the order of 50m and depth extent of roughly 150m. Above and to the east of this body is a halo of more resistive mineralization with a highly chargeable cap at a depth of 20 - 40m.

The best hole to test this target would start at 1750E and dip 60°W. Given that a drill site at 1690E has already been prepared, the optimum hole would dip 80°W. Disseminated mineralization could be expected at a depth of 20 - 40m, with a more massive body at a vertical depth of 100m.

G. OAKES



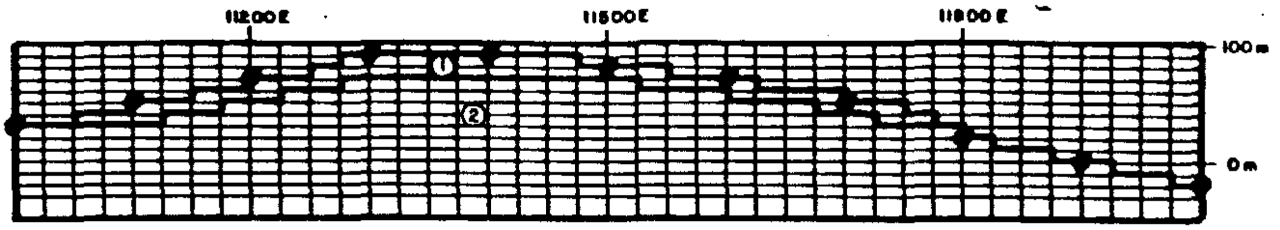
P	PFE
1. 1200	7
2. 1100	120
3. 1400	20
4. 100	15

FIG. 4

The Shell Company of Australia Limited
METALS DIVISION

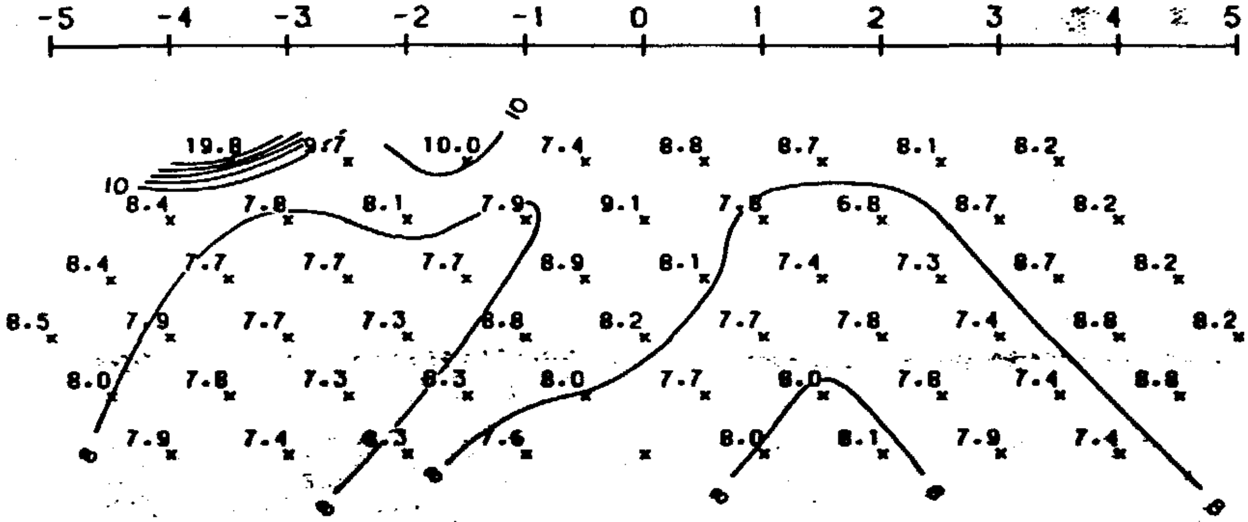
E.L. 36/79 LOONGANA
CHALLENGER TWO
19 000 N
FINAL MODEL

SCALE	DATE 5-10-81
AUTHOR G. Oakes	DRAWN H.L.H.
OFFICE DEVONPORT	
DRG No D/MZ02/045	



Material	Resistivity	Chargeability
①	15000 Ω-m	90
②	1400 Ω-m	8

PFE - COMPUTED



APPARENT RESISTIVITY - COMPUTED

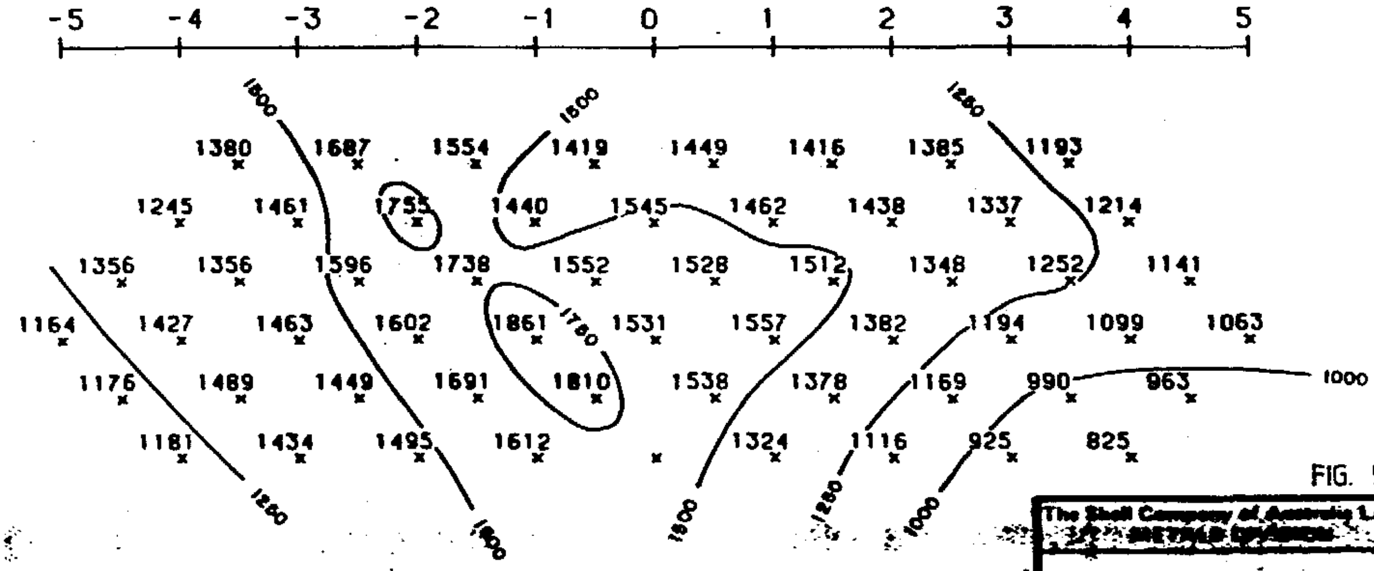


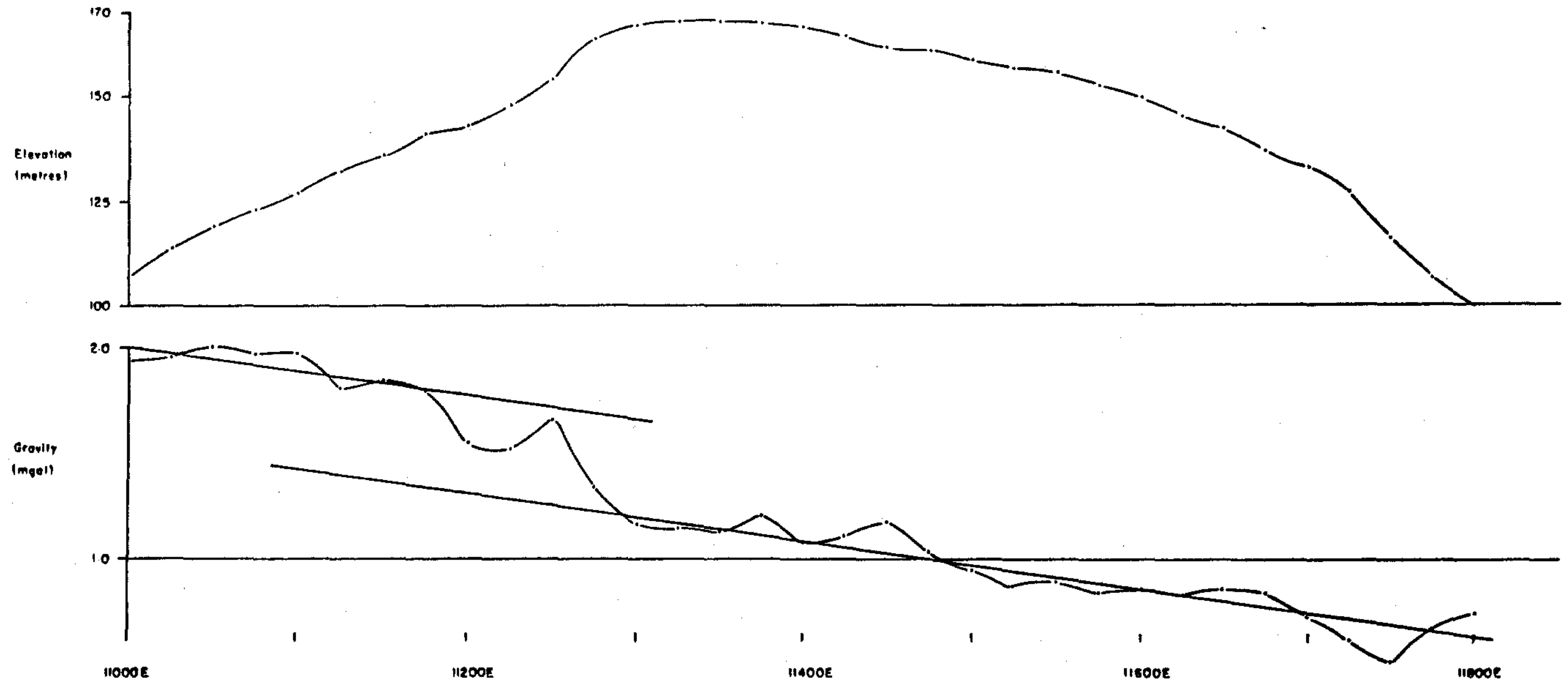
FIG. 5

The Shell Company of Australia Limited

CHALLENGER II
LINE 19800N

TOPOGRAPHIC MODEL

SCALE	DATE Nov 81
AUTHOR B Oakes	DRAWN
OFFICE AND	



500044

044

The Shell Company of Australia Limited
METALS DIVISION

CHALLNGER II
Line 19600 N

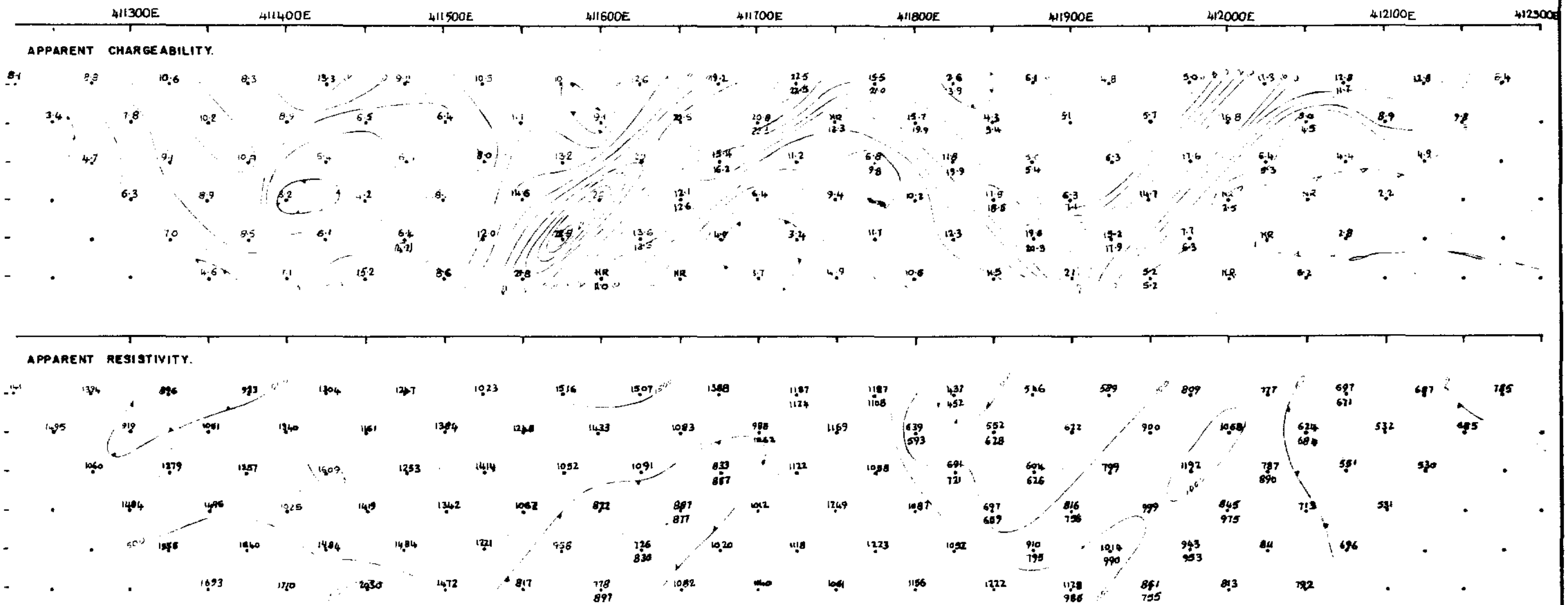
Terrain Corrected Gravity

SCALE	DATE NOV. 89
AUTHOR B. OAKES	DRAWN Y. CATON
OFFICE MELB - AHO	REP No.
DRG. No. MZ02/1009	FIG. No. 6

BORNE GEOPHYSICS
EM, MAG, etc)

509045

GEOLOGY
& TOPOGRAPHY



Contractor : SCINTREX
Date : 19-4-81
Timing : 2 sec
Transmitter : IPTA/A
Receiver : IPR8
Integration time : M3
Array : DIPOLE-DIPOLE
Dipole length : 50m

The Shell Company of Australia Limited
METALS DIVISION

IP / RESISTIVITY SURVEY
LOONGANA EL 36/79
CHALLENGER TWO
Line 18900 N

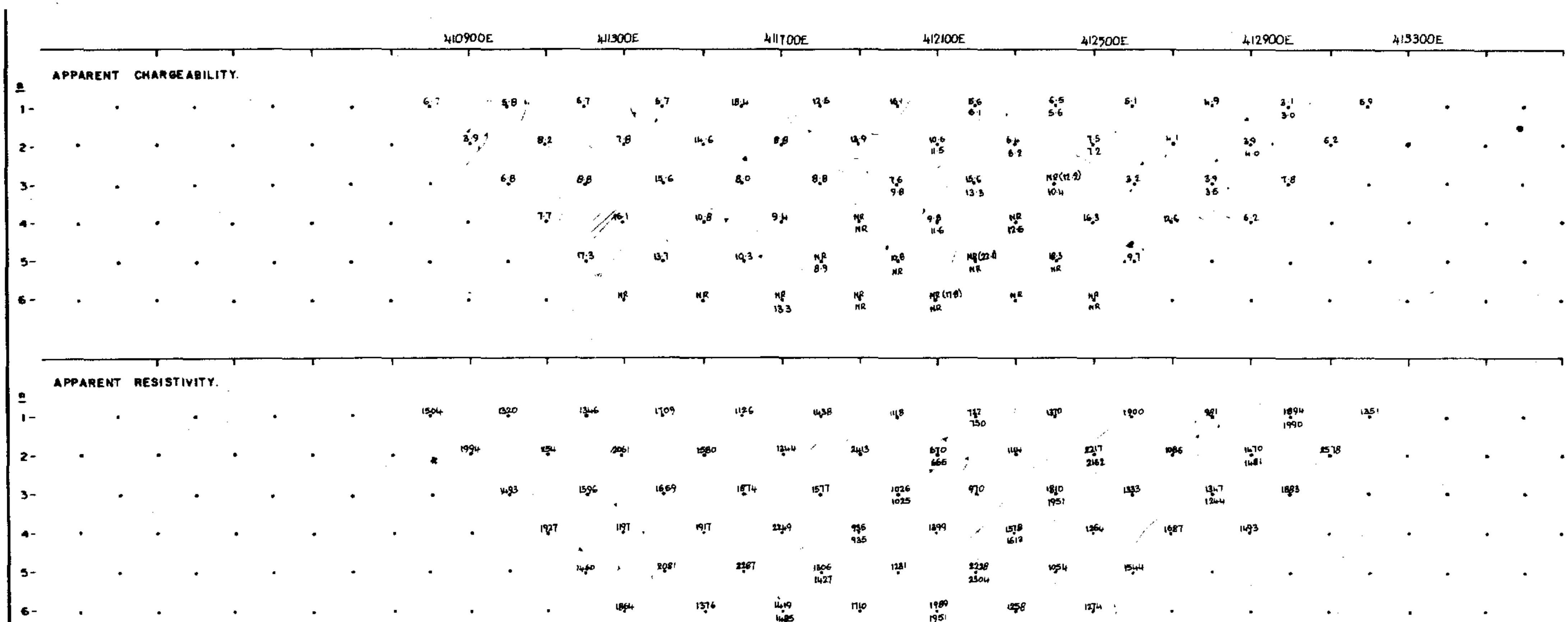
DRG. No. 0/M202/188

045

AIRBORNE GEOPHYSICS
(EM, MAG, etc)

509046

GEOLOGY
& TOPOGRAPHY



Contractor : SCINTREX
Date : 6 4 81
Timing : 2sec
Transmitter : IPTA/A
Receiver : IPR-8
Integration time : M3
Array : DIPOLE-DIPOLE
Dipole length : 200m

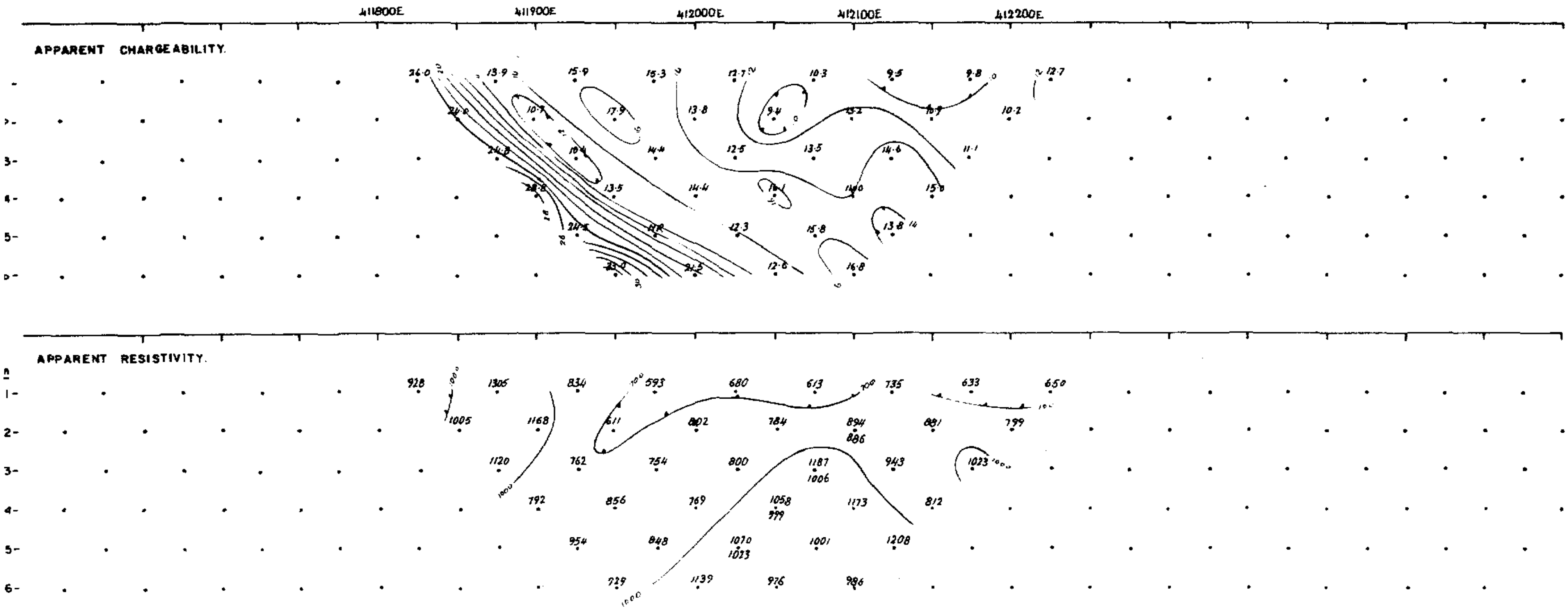
The Shell Company of Australia Limited
METALS DIVISION

IP / RESISTIVITY SURVEY
LOONGANA EL 36/79
CHALLENGER TWO
Line 19000N

FIG. No	8	REPORT No	
ENCL. No		DWG. No	D/MZ02/101
DATE		AUTHOR	
DRAWN			

RBORNE GEOPHYSICS
EM, MAG, etc)

GEOLOGY
& TOPOGRAPHY



Contractor : SCINTREX
Date : 29-4-81
Timing : 2 Sec
Transmitter : IPTA/A
Receiver : IPR-8
Integration time : M3
Array : DIPOLE - DIPOLE
Dipole length : 50m

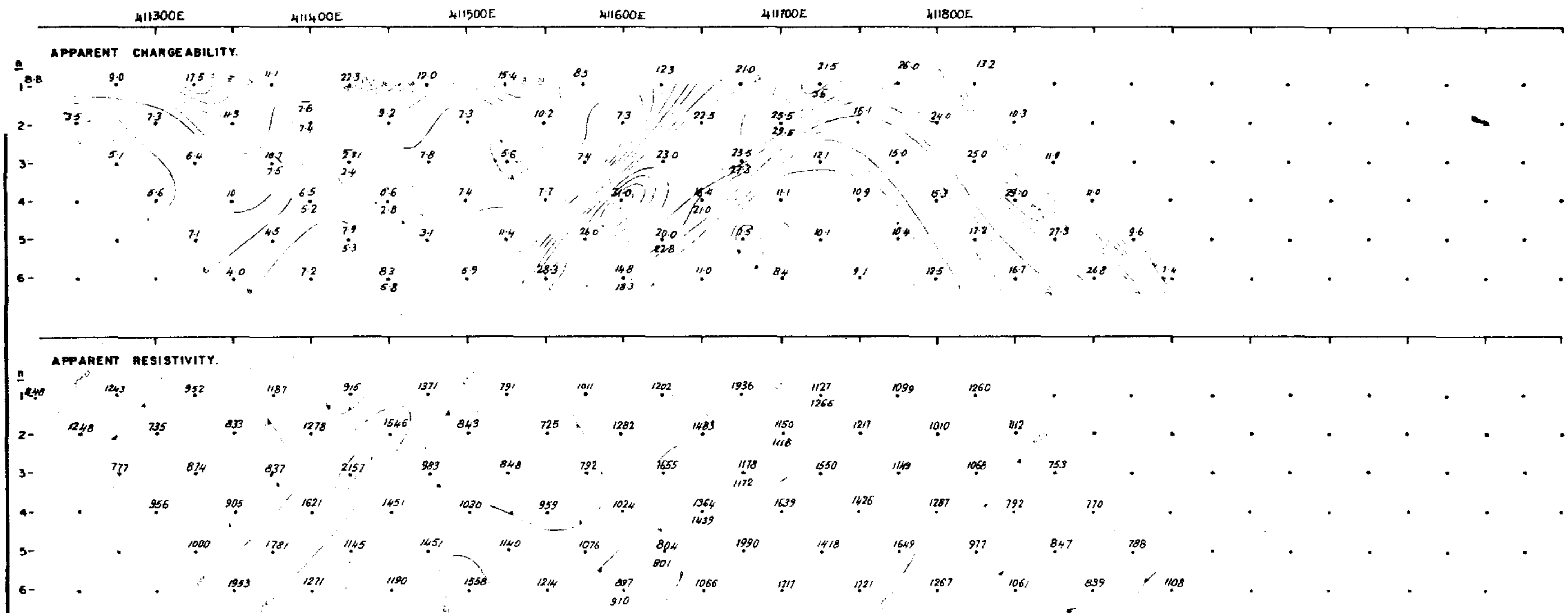
The Shell Company of Australia Limited
METALS DIVISION
IP / RESISTIVITY SURVEY
LOONGANA EL 36/79
CHALLENGER TWO
Line 19000N
D/MZ02/102

5009047

AIRBORNE GEOPHYSICS
(EM, MAG, etc)

509048

GEOLOGY
& TOPOGRAPHY



Contractor : SCINTREX

Date :

Timing : 2 sec

Transmitter : IPTA/A

Receiver : IPR8

Integration time : M3

Array : DIPOLE-DIPOLE

Dipole length : 50m

The Shell Company of Australia Limited
METALS DIVISION

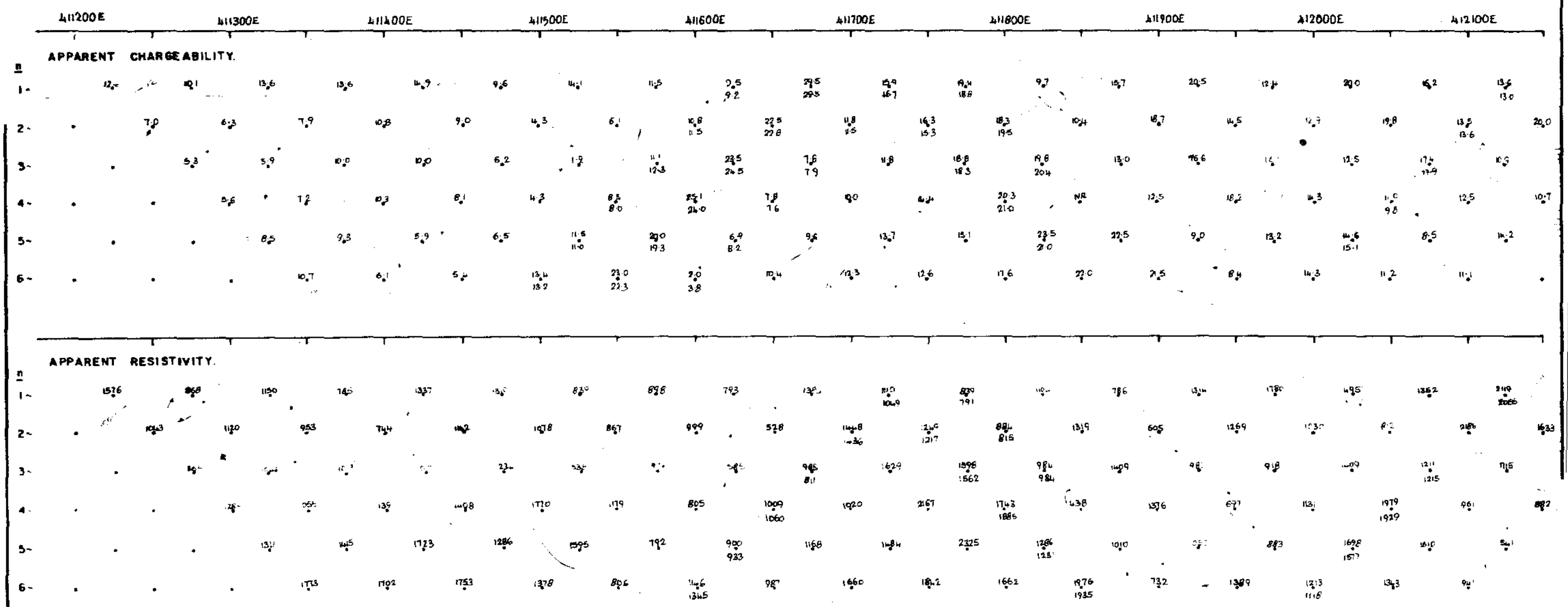
IP / RESISTIVITY SURVEY
LOONGANA EL 36/79
CHALLENGER TWO
Line 19000N

FIG. No	10	REPORT No	
FIELD No		DWG No	D/HZ02/103
DATE		APPROVED	
DRAWN		CHECKED	

50040

AIRBORNE GEOPHYSICS
(EM, MAG, etc)

GEOLOGY
& TOPOGRAPHY



Contractor : SCINTREX
Date : 12-4-81
Timing : 2 sec
Transmitter : IPTA/A
Receiver : IPR8
Integration time : M3
Array : DIPOLE-DIPOLE
Dipole length : 50m

The Shell Company of Australia Limited
METALS DIVISION

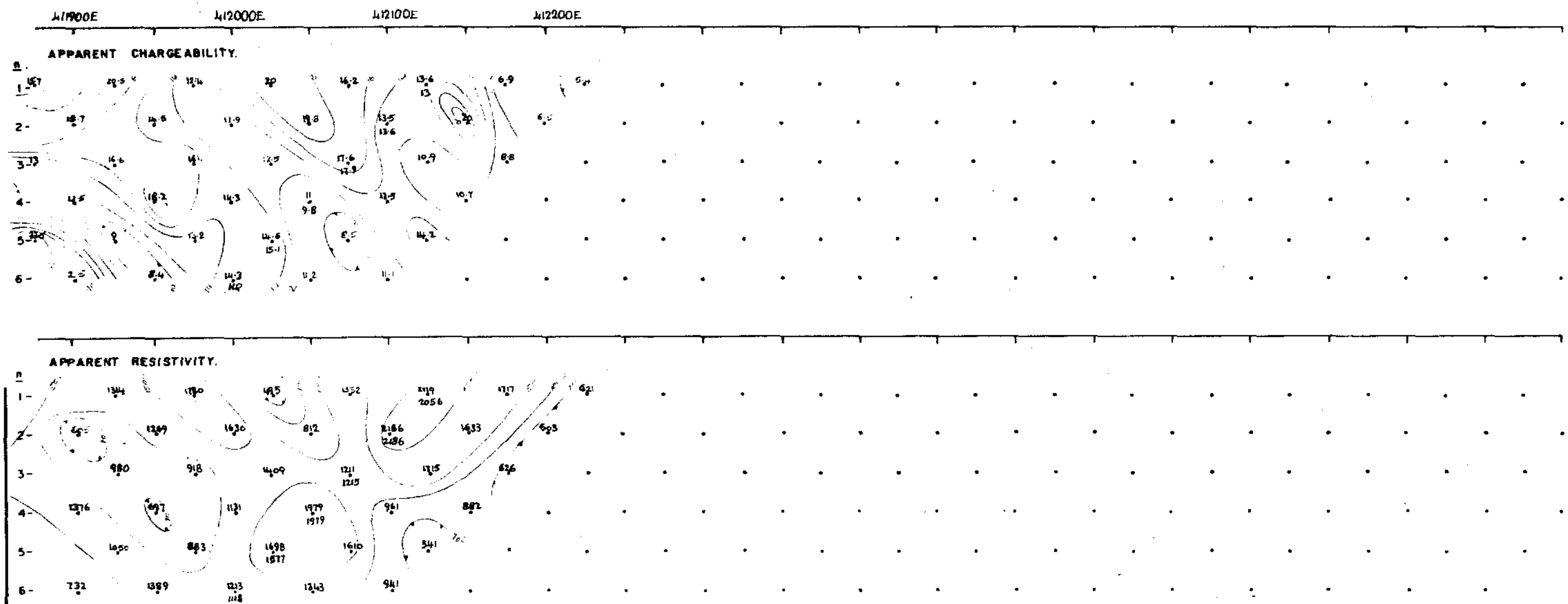
IP / RESISTIVITY SURVEY
LOONGANA EL 36/79
CHALLENGER TWO
Line 19100N.

SHT-1
FIG. No 11
DRG. No D/MZ02/104
REPORT No
DATE
AUTHOR
DRAWN
OFFICE

AIRBORNE GEOPHYSICS
(EM, MAG, etc)

509050

GEOLOGY
& TOPOGRAPHY

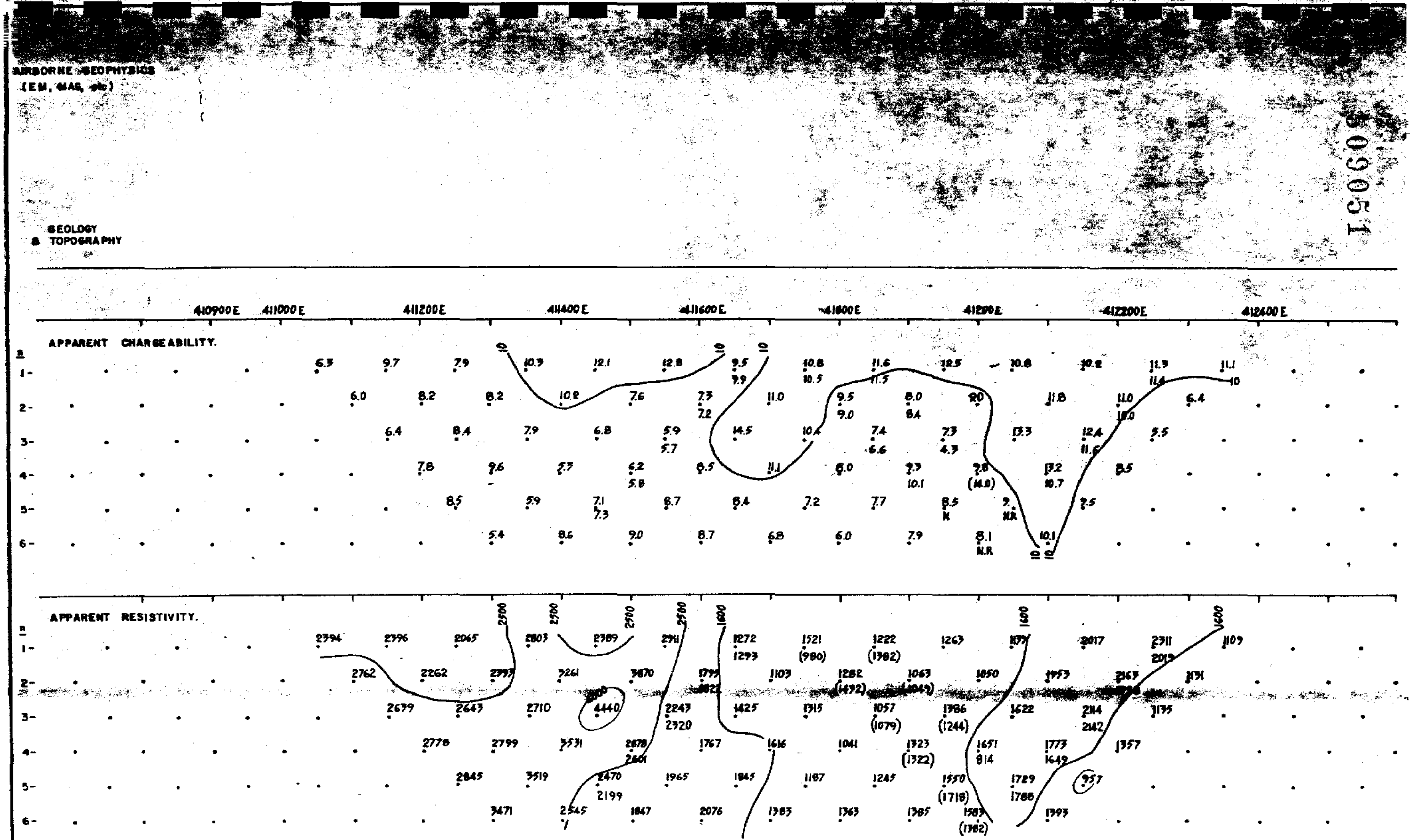


Contractor : SCINTREX
Date : 12-4-81
Timing : 2 Sec
Transmitter : IPTA/A
Receiver : IPR8
Integration time : M3
Array : DIPOLE DIPOLE
Dipole length : 50m

The Shell Company of Australia Limited
METALS DIVISION

IP / RESISTIVITY SURVEY
LOONGANA EL 36/79
CHALLENGER TWO
Line 19100N

SHT 2
12
D/H202/105



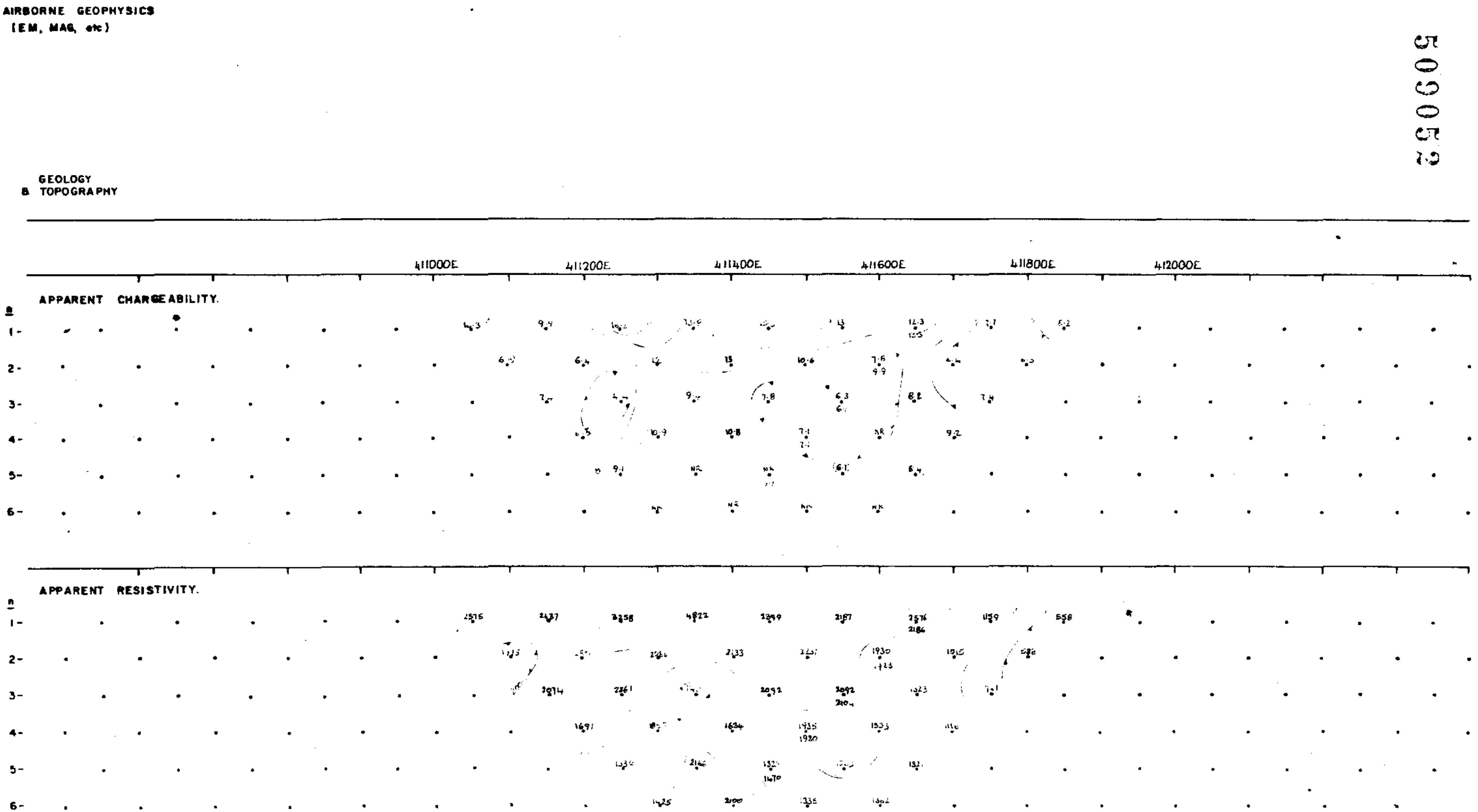
Contractor : SCINTREX
Date : 7-4-81
Timing : 2 SECOND
Transmitter : IPTA/A
Receiver : IPR8
Integration time : M3
Array : DIPOLE-DIPOLE
Dipole length : 100M

The Shell Company of Australia Limited
METALS DIVISION

IP / RESISTIVITY SURVEY
LOONGANA E.L. 36/79
CHALLENGER TWO 4141/1
LINE 19400N

FIG. No. 13	REPORT No.
ENCL. No.	DWG. No. D/MZ02/0
DATE 15-4-81	AUTHOR I.J.B.
DRAWN H.L.H	

T.C.06.09



Contractor : SCINTREX
Date : 21-4-81
Timing : 2 Sec.
Transmitter : IPTA/A
Receiver : IPR-8
Integration time : M_3
Array : DIPOLE-DIPOLE
Dipole length : 100m

The Shell Company of Australia Limited
METALS DIVISION

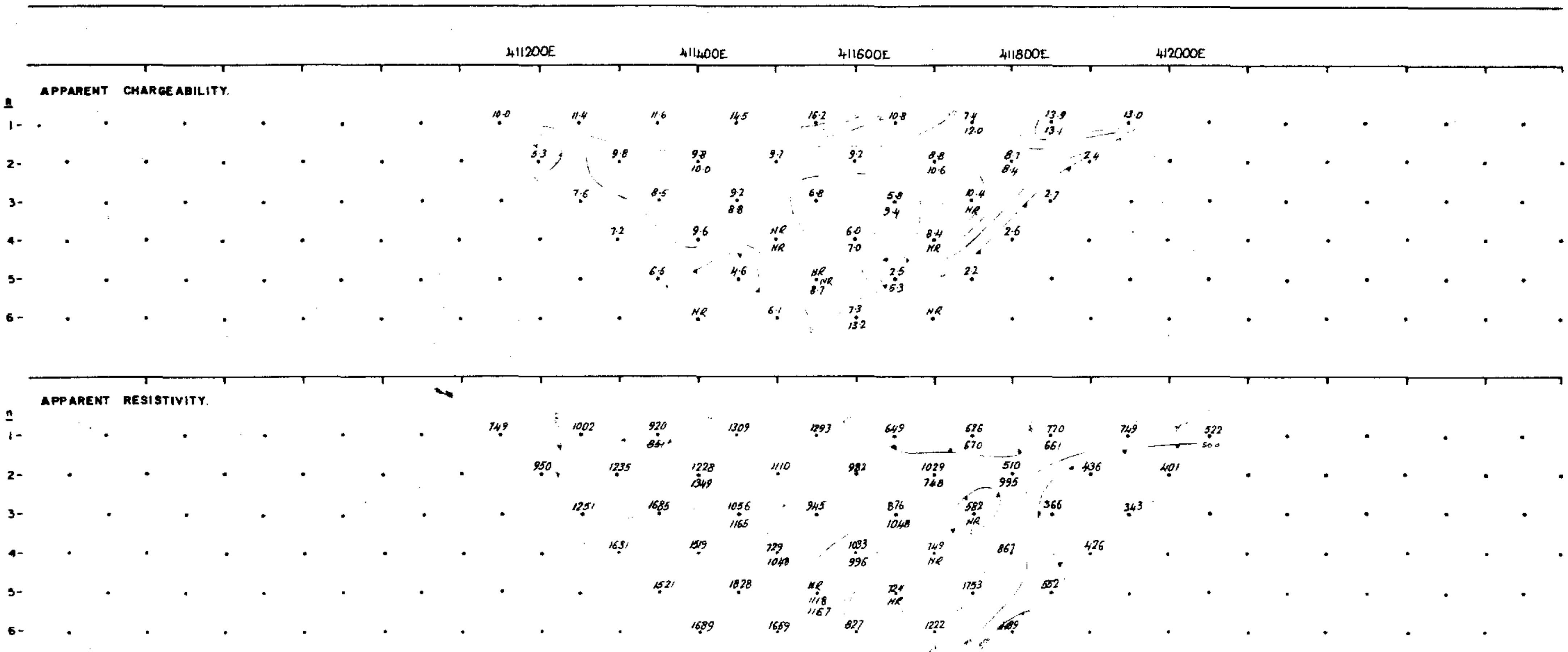
IP / RESISTIVITY SURVEY
LOONGANA EL 36/79
CHALLENGER TWO
Line 19600N

Fig No 14
Report No
Dwg No D/MZ02/106
Author
Date

AIRBORNE GEOPHYSICS
(EM, MAG, etc)

50053

GEOLOGY
& TOPOGRAPHY



Contractor : SCINTREX
Date : 26-4-81
Timing : 2 sec
Transmitter : IPTA/A
Receiver : IPR8
Integration time : M3
Array : DIPOLE - DIPOLE
Dipole length : 100m

The Shell Company of Australia Limited
METALS DIVISION

IP / RESISTIVITY SURVEY
LOONGANA EL 36/79
CHALLENGER TWO
Line 19800N

Fig No 15

509054

APPENDIX 3

Drill Log Sheets for DDH CD 1

Challenger II Prospect

The Shell Company of Australia Limited
METALS DIVISION

509055

DRILL LOG SHEET

Hole No : DDH CD 1

PROJECT: LOONGANA

LOCATION CODE: MZ 02

COLLAR CO-ORDINATES: 11750E/19000N

COLLAR R.L.:

LOCATION: CHALLENGER TWO

MAP/PHOTO REFERENCE: 5419000mN, 411750mE

DATE STARTED	28-9-81	HOLE SIZE		FROM	TO	TOTAL	CORE STORAGE	Devonport
DATE FINISHED	12-10-81	NON CORE					Nº OF TRAYS	28
TOTAL DEPTH	197.80m						SAMPLE STORAGE	
LOGGED BY	J.J. LAWTON	CORE	HQ	0	6	6m	ASSAY LAB.	Comlabs
CONTRACTOR	A.D.D.		NQ	6	16	10m	ASSAY REPORTS	
RIG	MINDRILL		BQ	16	197.80	181.80m		
DRILL CREW	K. Brooker/P. Febey	CASING					MIN. & PET. LAB.	
							MIN & PET. REPORTS	
		CASING LEFT						

HOLE SURVEY DATA

INSTRUMENT:

DEPTH	INSTRUMENT INCL.	INSTRUMENT AZ.	ACID ETCH INCL.	ACID ETCH AZ.	REMARKS
COLLAR	+60	270°			
26.5	+60	255°			
94.0	+64	250°			
118.0	+60	245°			
195.0	+58	252°			

GRAPHIC/LETTER SYMBOL LOGGING KEY

STRUCTURE / ALTERATION CODE

B BEDDING
J JOINTING
C CLEAVAGE
F FOLIATION
sh SHEARING
q QUARTZ VEINS
O OXIDATION

DRILLING SUMMARY:

CHALLENGER TWO

DIAMOND DRILL LOG - SAMPLING RECORD

HOLE NO: DDH CD 1

From	To	Interval (m)	Core Rec'd	% Rec	Sample No.	Compos No.	Cu	Pb	Zn	Ni	Bi	Cd	Susceptibility x 10^{-6} S.I.	% Estimate	Core Angles	Alt	T.C. P.S.	Description
0	1.0			20	2701		28	44	530	22	<4	<1						Strongly weathered volcaniclastic - volcanomict conglomerate:
1.0	2.0			20														predominantly pebble clasts of sandstone, tuff clastic magnetite,
2.0	3.0			20														dacite? in matrix of similar components.
3.0	4.0			20									25					Secondary Fe and Mn.
4.0	5.0			20									1500					Magnetite hematised in part.
5.0	6.0			20									2000					
6.0	7.0			20									3500					
7.0	8.0			20														
8.0	9.0			20														
9.0	10.0			20														
10.0	11.0			20									3000					
11.0	12.0			50									4000					
12.0	13.0			50														
13.0	14.0			50									3500					
14.0	15.0			90									4500					Moderately weathered volcanoclastic.
15.0	16.0			90	2702		28	44	350	14	<4	<1	6500					As above. Clasts upto 40cm diam.
16.0	17.0			100									5500					
17.0	18.0			100									5000					Gritty to pea stone volcanomict sandstone, clasts of rhyolite (with
18.0	19.0			100									4500					qz, plag phenocrysts) clastic magnetite, qz sst. tuff.
19.0	20.0			100									5500					Secondary Fe and CO_3 gash vein fillings CO_3 cement.
20.0	21.0			100	2703		20	32	440	10	<4	<1	6000					Weak banding developed parallel to hole
21.0	22.0			100									6000					
22.0	23.0			100									5500					
23.0	24.0			100									3500					
24.0	25.0			100									3500					
25.0	26.0			100	2704		44	24	300	20	<4	<1	5000					
26.0	27.0			100									3500					
27.0	28.0			100									1000					27.40m Volcanomict conglomerate
28.0	29.0			100									450					Pebbles up to 10cm diam consisting of rhyolite (with qz, plag pheno-
29.0	30.0			100									100					crysts) dacite with phenocrysts, qz and sst (f.g.), tuff
30.0	31.0			100	2705		60	16	240	18	<4	<1	500					CO_3 matrix and veining common.
31.0	32.0			100									250					Some brecciation
32.0	33.0			70									150					Secondary Fe
33.0	34.0			70									200					Pebbles well rounded in immature matrix.
34.0	35.0			70									850					20cm Mg CO_3? vein at 52.30m
35.0	36.0			100	2706		50	16	250	16	<4	<1	1500					
36.0	37.0			100									1200					
37.0	38.0			100									1500					
38.0	39.0			100									500					
39.0	40.0			100									1000					
40.0	41.0			100	2707		36	20	310	16	<4	<1	800					
41.0	42.0			100									2000					
42.0	43.0			100									2500					
43.0	44.0			100									3000					
44.0	45.0			100									4500					
45.0	46.0			100	2708		32	28	310	18	<4	<1	5000					
46.0	47.0			100									4500					
47.0	48.0			100									4500					
48.0	49.0			100									1500					49.0m
49.0	50.0			100									1500					Pred. volcanoclastic pebble congl with only minor pebbles Sand size matrix
50.0	51.0			100	2709		16	28	260	12	<4	<1	700					
51.0	52.0			100									1500					52.0m Volcanoclastic - conglomerate with some zones of only minor pebbles
52.0	53.0			100									2000					Clasts - rhyolite, tuff, qz, feldspar, granite (£?) intermediate - basic
53.0	54.0			100									3000					volcanic, sediment. CO_3 cement and veining moderate to intense with
54.0	55.0			100									3000					some brecciation (CO_3 predom. dolomite)
55.0	56.0			100	2710		22	28	270	14	<4	<1	6000					Trace pyrite as coatings on fractures
56.0	57.0			100									4500					Trace obsidian?
57.0	58.0			100									5000					Clasts mature
58.0	59.0			100									1000					Secondary Fe obliterates texture in part
59.0	60.0			100									450					

THE SHELL COMPANY OF AUSTRALIA LTD. - METALS DIVISION

PROJECT CHALLENGER TWO

DIAMOND DRILL LOG - SAMPLING RECORD

HOLE NO: DDH 2D 1

From	To	Interval (m)	Core Rec'd	% Rec	Sample No.	Compos No.	Cu	Pb	Zn	Ni	Bi	Cd	Susceptibility $\times 10^{-5}$ S.I.	Description
60.0	61.0				2711								70	
61.0	62.0						18	16	135	4	<4	<1	600	
62.0	63.0												2500	
63.0	64.0												2500	T.S. 5384 (63.15m)
64.0	65.0												2000	
65.0	66.0				2712		8	24	230	<4	<4	<1	1500	Fractures generally in 2 principal planes – parallel to ?bedding and
66.0	67.0												2000	approx. 45° to core axis.
67.0	68.0												2500	Veins up to 20cm thick.
68.0	69.0												3500	
69.0	70.0												3500	
70.0	71.0				2713								3000	
71.0	72.0						14	28	320	6	<4	<1	3000	
72.0	73.0												1500	
73.0	74.0												1500	
74.0	75.0												2000	
75.0	76.0				2714								600	
76.0	77.0						10	24	130	6	<4	<1	800	
77.0	78.0												850	
78.0	79.0												500	
79.0	80.0												2000	
80.0	81.0				2715								2000	
81.0	82.0						16	24	130	10	<4	<1	250	
82.0	83.0												150	
83.0	84.0												50	
84.0	85.0												150	
85.0	86.0				2716								150	
86.0	87.0						18	44	125	8	<4	<1	150	Core fragmented (weathered) between 86-92m.
87.0	88.0												50	Strong dolomite veining.
88.0	89.0												50	
89.0	90.0												20	
90.0	91.0				2717								20	
91.0	92.0						14	36	150	8	<4	<1	30	
92.0	93.0												150	
93.0	94.0												3000	
94.0	95.0												3500	
95.0	96.0				2718								2000	
96.0	97.0						8	20	370	6	<4	<1	3000	
97.0	98.0												4000	
98.0	99.0						-						3500	
99.0	100.0												3500	
100.0	101.0				2719								1000	
101.0	102.0						14	28	330	<4	<4	<1	3500	
102.0	103.0												2500	
103.0	104.0												2500	
104.0	105.0												3000	
105.0	106.0				2720								2500	
106.0	107.0						26	24	320	10	<4	<1	1200	
107.0	108.0												3000	Pebbles becoming more scarce downward.
108.0	109.0												2500	Granite pebbles up to ~20cm diam. and tuff? CO_3 cement and vein
109.0	110.0												1500	filling.
110.0	111.0				2721								2500	Intraformational congl.?
111.0	112.0						34	24	350	8	<4	<1	3500	
112.0	113.0												1500	
113.0	114.0												2500	
114.0	115.0												3500	114.50m - Gradational contact - crystal lithic tuff (or pebbly volcanomict
115.0	116.0				2722								3000	sandstone).
116.0	117.0												3000	Qz veins (10cm wide) at 120.5 and 121.0m.
117.0	118.0						22	28	460	10	<4	<1	2000	CO_3 (dolomite) cement.
118.0	119.0												3000	CO_3 veins decreasing to few (Chloritic material in Qz veins.
119.0	120.0												3500	
120.0	121.0				2723								3000	

[redacted] THE [redacted]ELL C[redacted]NY O[redacted]STR[redacted] LTD [redacted]ETAL[redacted]VISI[redacted]

PROJECT: CHALLENGER TWO

DIAMOND DRILL LOG – SAMPLING RECORD

HOLE NO: DDF CD 1

From	To	Interv. (m)	Core Rec'd	% Rec	Sample No.	Compos No.	Cu	Pb	Zn	Ni	Bi	Cd			Susceptibility x 10⁻⁵ S.I.	% Estimates	Core Angles	Alt	T.S P.S	Description
121.0	122.0			100											1500					
122.0	123.0			100											1500					
123.0	124.0			100			50	60	460	24	<4	<1			30					
124.0	125.0			100	2724										30					
125.0	126.0			100											30					
126.0	127.0			100			30	24	450	65	<4	<1			20					T.S. 5385 (126.40m).
127.0	128.0			100											20					
128.0	129.0			100											25					Sharp contact between laminated tuffaceous siltstone unit and overlying?
129.0	130.0			100	2725										25					poorly sorted tuff.
130.0	131.0			100			50	24	150	60	<4	<1			25					Well laminated green chloritic siltstone with thin interbeds of f.g.
131.0	132.0			100											30					sand, interlayered with poorly sorted tuff.
132.0	133.0			100											30					
133.0	134.0			100											35					
134.0	135.0			100	2726										25					Bedding parallel core axis.
135.0	136.0			100			65	95	300	66	<4	<1			30					
136.0	137.0			100											1500					CO_3 veins (calcite) present but not common.
137.0	138.0			100											800					
138.0	139.0			100	2727										3000					Gradational contact with vitric, crystal tuff poorly sorted, some
139.0	140.0			100			18	20	440	10	<4	<1			3500					reworking.
140.0	141.0			100											3000					Glass shards.
141.0	142.0			100											3500					Passing into c.g. crystal tuff at 138.50m. with pervasive alteration (Fe)
142.0	143.0			100											3000					
143.0	144.0			100											3000					5cm qtz vein at 140.5m.
144.0	145.0			100											4000					CO_3 cement throughout
145.0	146.0			90	2728										2500					Trace sulphide (py, cpy) assoc. with small CO_3 (dolomite) stringers.
146.0	147.0			90			20	16	440	10	<4	<1			6500					
147.0	148.0			90											5000					Detrital magnetite throughout.
148.0	149.0			90											4500					Reworking again obvious from ~147.0m but not intense. Lithology
149.0	150.0			100											3000					remains poorly sorted crystal tuff. (with minor shards?)
150.0	151.0			100	2729										5000					8cm dolomite vein at 149.25m.
151.0	152.0			100			22	16	350	12	<4	<1			3000					Thin randomly oriented carbonate veining throughout
152.0	153.0			100											3000					
153.0	154.0			100											2500					
154.0	155.0			100											3000					T.S. 5386 (154.60m)
155.0	156.0			100	2730										4000					
156.0	157.0			100			16	20	430	12	<4	<1			3000					
157.0	158.0			100											450					
158.0	159.0			100											5000					Qtz vein – 10 cm thick at 158.20m.
159.0	160.0			100											1500					
160.0	161.0			100	2731										2500					Predom. strongly altered (Fe) crystal tuff.
161.0	162.0			100			28	12	410	6	<4	<1			5000					CO_3 cement decreasing towards base of interval
162.0	163.0			100											4000					Minor CO_3 stringers and qtz veins at 165.30 (15cm)
163.0	164.0			100											450					
164.0	165.0			100											150					
165.0	166.0			100	2732										350					
166.0	167.0			100			40	<4	185	14	<4	<1			400					Pred. crystal tuff with rounded clasts (i.e. reworking)
167.0	168.0			100											20					
168.0	169.0			100											50					Thin tuffaceous slst gradational contact with crystal tuffs. Bedding
169.0	170.0			100											1500					approx. 70-80 to core axis grading into crystal-vitric tuff at 168.80m
170.0	171.0			100	2733										1000					showing weak banding of shards.
171.0	172.0			100			55	4	165	14	<4	<1			1500					
172.0	173.0			100											15					Lithic clasts (predom. granite (€) or rhyolite) from ~169m
173.0	174.0			100											1500					Abrupt transition to laminated tuffaceous slst at 172.80m.
174.0	175.0			100											200					
175.0	176.0			100	2734										250					Gradational change to crystal tuff, CO_3 cement decreasing to negligible
176.0	177.0			100			55	<4	200	12	<4	<1			300					
177.0	178.0			100											1500					Scapolite? and shearing common. Talc.
178.0	179.0			100											400					Qtz veining more common.
179.0	180.0			100											600					Clasts rare to ~185m.
180.0	181.0			100	2735										650					

3 4

THE SHELL COMPANY OF AUSTRALIA LTD. - METALS DIVISION

PROJECT: CHALLENGER TWO

DIAMOND DRILL LOG - SAMPLING RECORD

HOLE NO: DD- CD 1

From	To	Interl (m)	Core Rec'd	% Rec	Sample No.	Compos No.	Cu	Pb	Zn	Ni	Bi	Cd			Susceptibility x 10⁻⁶ S.I.	% Estimates	Core Angles	Alt	T.S P.S	Description
181.0	182.0			100			44	8	210	12	<4	<1			300					
182.0	183.0			100											850					
183.0	184.0			100											800					
184.0	185.0			100											300					
185.0	186.0			100	E736										3000					Volcaniclastic - crystal tuff.
186.0	187.0			100			44	4	190	12	<4	<1			700					Veining predom. qtz (non oriented) with no CO_3 cement or veining.
187.0	188.0			100											35					
188.0	189.0			100											50					Clasts generally acid volcanic.
189.0	190.0			100											30					
190.0	191.0			100	E737										50					
191.0	192.0			100			100	<4	175	28	<4	<1			25					
192.0	193.0			100											35					
193.0	194.0			100											40					T.S 5387 (193.25m) volcanomict pebbly sandstone.
194.0	195.0			90											40					
195.0	196.0			90	E738		130	44	240	50	<4	<1			70					
196.0	197.0			90											100					
197.0	197.80			90																

509059

SHELL COMPANY OF AUSTRALIA LTD.

Geophysical Log

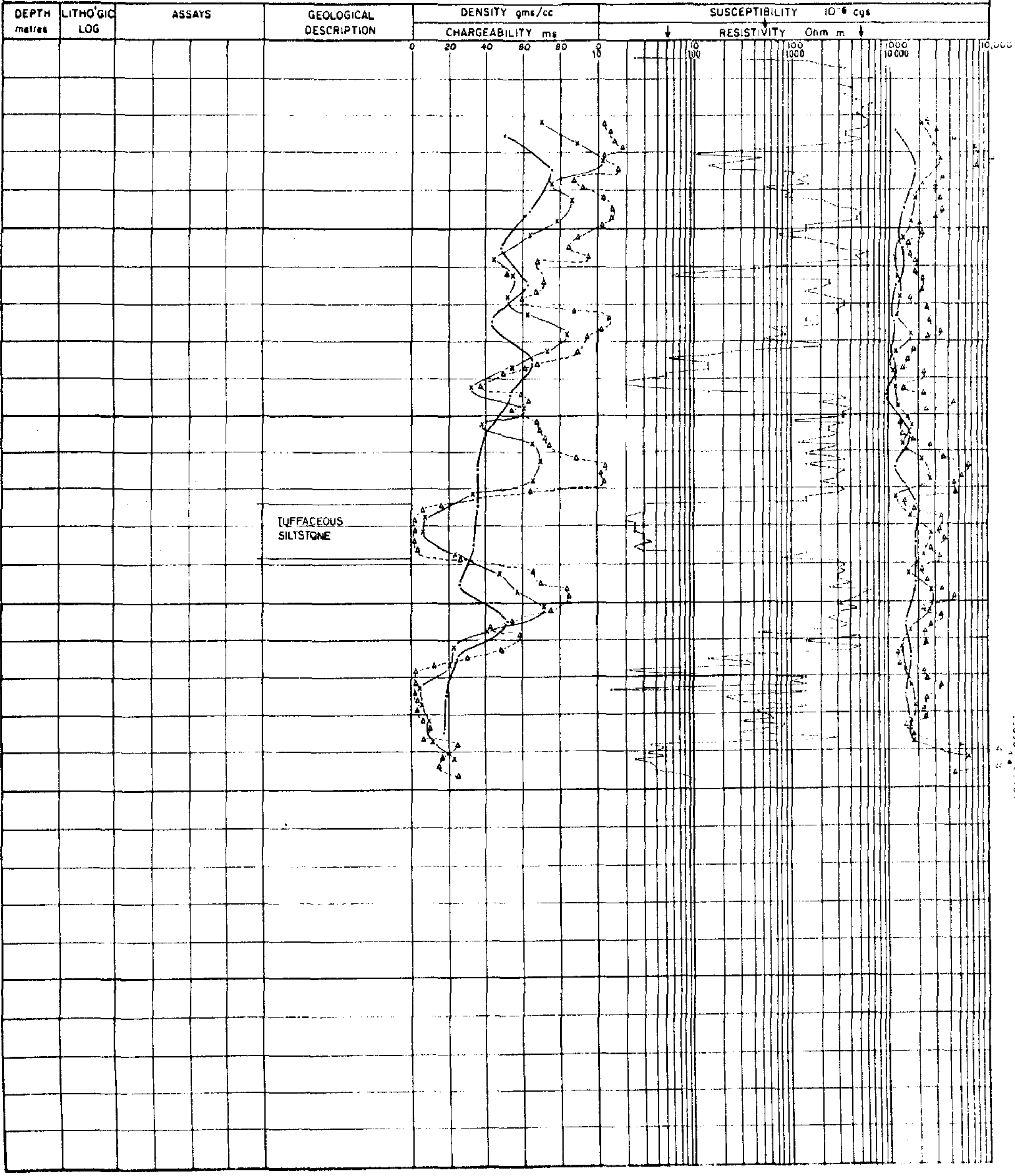
PAGE.......OF...... PAGES

DIAMOND DRILL HOLE N° : DDH CD1

PROJECT	: CHALLENGER II	STATE	:	IP / RESISTIVITY LOGGING —	
ANOMALY N°	:	GRID COORDS	:	CONTRACTOR : SCINTREX	DATE LOGGED : 13-10-81
INCLINATION	:	AZIMUTH	:	ARRAY : 3 ARRAY	ELECTRODE SPACINGS : 2.5m, 5m, 10m
DATE DRILLED	:	TOTAL DEPTH	:	SUSCEPTIBILITY LOGGING	—— 10m; x——x 5 m; Δ----Δ 2.5m
CASING	:			BY :	DATE LOGGED :

GROUND GEOPHYSICAL ANOMALIES :

5 cm



APPENDIX 4

Petrological Reports

CMS 81/4/2	Sample 1363 - Challenger II Prospect
CMS 81/10/31	Samples 5384-5387 - Core from DDH CD 1
CMS 82/3/26	Samples 2739-2748 Refer Plan D/MZ 02/93 for locations.
	Samples 2749-2755 Road traverse through Challenger II Prospect - locations not recorded.
	Samples 2756-2764 Regional rock samples - collected outside E.L. 36/79

Central Mineralogical Services

CMS
39 Beulah Road
Norwood, S.A. 5067
Telephone 42 5659

Mr. I. Buchhorn
Geologist
The Shell Co. of Aust.Ltd.
Metals Division
P.O. Box 860
DEVONPORT / TAS. 7310

7th May, 1981

REPORT CMS 81/4/2

YOUR REFERENCE:	Sample Despatch No. MZ02/IB/25
DATE RECEIVED:	1st April, 1981
SAMPLE NOS.:	1363
SUBMITTED BY:	I. Buchhorn
WORK REQUESTED:	Petrology

Date Rec'd 11/5/81		File
Date Ans		
Action	Info.	Initials
IB		IB

H.W. Fander, M. Sc.

Copy to:
Dr. R. George
The Shell Co. of Aust.Ltd.
Metals Division
G.P.O. Box 872K
MELBOURNE / VIC. 3001

CENTRAL MINERALOGICAL SERVICES

Date 7th May, 1981

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

IDENTIFICATION
1363
Porphyritic Trachyte

Job No. CMS 81/4/2 Date Received: 1.4.1981

Reference Sample Despatch No. MZ02/IB/25

Sample No. 1363

Nature of Sample: Hand Specimen

DESCRIPTION **SECTION No.** 36618

a. Hand Specimen:

Grey, fine-grained rock with pinkish veins.

K-stain test positive, but patc hy.

b. Microscopic:

This is a fairly extensively altered porphyritic trachyte, originally of dominantly sodic composition; its fabric suggests that it was intrusive, but this is not certain and may be contradicted by the field evidence.

The rock consists of small, well-defined, randomly-orientated and -distributed phenocrysts of albite set in a fine-grained groundmass of albite laths and interstitial chlorite (?possibly after ferromagnesian minerals) with fine oxide opaques. The groundmass may be partly devitrified glass, but there are no indications of flow-banding, flow-alignment of crystals, or related features.

The rock is cut by thin veins of clear albite, and the adjacent feldspars have been replaced by fine potash feldspar, as shown by K-staining. Poikiloblastic patches of carbonate are common.

No sulphides were seen, and no obvious sources of Pb and Zn were detected; veins of degraded, ferruginised carbonate/goethite occur which may be related to these anomalous metal values.

H.W. Fander, M. Sc.

ROCK SAMPLE 1077 FROM CHALLENGER II - I.B.

135 ppm Cu
1550 ppm Pb
1200 ppm Zn
<4 ppm Ni
4.20% Fe
1250 ppm Mn
<1 Ag

LOCATION — OUTCROP AROUND 19600N 11300E ?

Central Mineralogical Services

CMS
39 Beulah Road
Norwood, S.A. 5067
Telephone 42 5659

Mr. J.J. Lawton
Senior Geologist
The Shell Co. of Aust. Ltd.
Metals Division
P.O. Box 860
DEVONPORT / TAS. 7310

17th November, 1981

REPORT CMS 81/10/31

YOUR REFERENCE:	Sample Despatch No. 4062/MZ02/JJL/46
DATE RECEIVED:	16th October, 1981
SAMPLE NOS.:	5384 - 5387
SUBMITTED BY:	J.J. Lawton
WORK REQUESTED:	Petrology

H.W. Fander, M. Sc.

REPORT CMS 81/10/31

D.D. Cores 5384 - 5387

Four drill core samples were received for petrological study; thin-sections were prepared, and offcuts were subjected to potash stain tests. Each core is briefly described in the accompanying table.

Summary

The covering letter implies that the samples are in sequence and are from one drill-hole, and the following comments will be based on this assumption.

It would seem that, whilst there is evidence of the deposition (in an aqueous environment) of pyroclastic material, or of material derived from a primary volcanic source, much of the material is re-worked, i.e. secondary and not strictly pyroclastic. Thus, the rocks may be classed as "volcanomict" which, by definition, means that they consist of re-deposited and other material. Unless there is good petrographic evidence of the presence of pyroclastic features (e.g. shard textures, glass, chilled margins on larger fragments, welding, etc.), a pyroclastic origin must be regarded as doubtful (as in 5386); unfortunately, much of this type of evidence is easily destroyed, but on the whole, a clastic origin is more probable.

In view of the nature of the components, it would appear that these sediments represent re-deposited elements of the more acid members of the Mt. Read Volcanics, and are thus younger; formation of these sediments may have occurred in the waning stages of the Mt. Read volcanism, with unstable conditions in the aqueous environment and rapid denudation and deposition.

H.W. Fander, M. Sc.

Sample No.	Rock Type - Composition	Fabric	Minor Minerals	Central Mineralogical Service Comments
5384 (T.S. 39313)	Volcanomict Conglomerate. Pebble- and grit-sized, rounded grains of porphyritic rhyolites, felsites, dacite, quartzite, quartz, ?tuff; clastic quartz matrix, calcite cement.	Poorly-sorted; generally rounded components. Stressed, micro-fractured.	Clastic, hematitised magnetite, leucoxene. Secondary sericite, chlorite.	Components are dominantly volcanic (probably minor/shallow acid intrusives), but all are re-worked.
5385	Laminated Tuffaceous Siltstone. Alternating bands of micaceous siltstone (clastic micas, quartz) and poorly-sorted tuff (quartz, feldspars, rhyolite, felsite, quartz-mica matrix).	Well-laminated, with slump structures and clastic dykes, faulting.	Carbonate, chlorite, quartz, pyrite, chalcopyrite, along dykes/faults.	A mixed, subaqueous sediment of pyroclastic/clastic origin, unstable environment of deposition, epigenetic, epithermal mineralisation.
5386	Crystal Tuff(?). Mainly relatively coarse plagioclase fragments (albite), scattered quartz, felsite-trachyte grains; mainly dolomitic matrix/cement.	Moderate to poor sorting; weakly bedded, coarse-grained. Minor shearing.	Interstitial chlorite, earthy hematite. Clastic magnetite. Secondary sericite.	Consists mainly of crystal fragments, but is pervasively altered, dolomitised, and critical textures destroyed.
5387 (T.S. 39316)	Pebbly, Volcanomict Sandstone. Rounded pebbles and sand-size grains of porphyritic rhyolite, obsidian, felsite, quartz, feldspars; matrix of the same components.	Most grains are sub-rounded to rounded. Moderately sorted/sized.	Rounded granitoid grains. Interstitial chlorite, carbonate. Quartz veins.	All framework components appear to be re-worked, not primary pyroclastic grains.

990 990605

509067

067

CII rock chip samples M202/1847

COMLABS Pty. Ltd.

COMPUTERISED ANALYTICAL LABORATORIES

NATA REGISTERED No. 1526

Head Office and Central Laboratory
305 SOUTH ROAD,
MILE END SOUTH
STH. AUST. 5031
TEL.: (08) 43 5722
TELEX: AA89323

Queensland Preparation Laboratory
172 LAVARACK AVE.,
EAGLE FARM,
QUEENSLAND. 4007
TEL.: (07) 268 4748

OUR REF.: COM 820314
YOUR REF.: 4078/mz02/jjl/62

Mr. J. Lawton,
The Shell Co of Aust. Ltd.,
P.O. Box 860,
DAVENPORT TAS. 7310

Dear John,

RE: JOB COM 820314

Enclosed are the assays for the samples delivered to our laboratory on the 24th February, 1982.

Yours sincerely,

P R Harvey

Philip Harvey
Laboratory Manager

Date Rec'd 11/3/82		File
Date Ans		
Action	Info.	Initials

COMLABS Pty. Ltd.
COMPUTERISED ANALYTICAL LABORATORIES

NATA

ANALYTICAL REPORT

JOB COM820314   O/N : 4078/MZ02/JJL/62

Results in ppm

SAMPLE	Cu	Pb	Zn	Ni	Bi	Cd	CHALL. II GRID. COORDS
2739	9	44	860	<4	<4	<1	19600N 411320E
2740	16	165	420	10	<4	<1	19600N 411360E
2741	5	30	740	<4	<4	<1	19600N 411340E
2742	24	440	770	16	<4	<1	19400N410725E
2743	5	48	760	<4	<4	<1	19400N 411275E
2744	40	26	120	6	<4	<1	19400N410640E
2745	18	730	190	<4	<4	<1	19800N 410400E
2746	5	2700	780	<4	<4	<1	19800N 411300E
2747	32	450	100	<4	<4	<1	19800N 410400E
2748	75	700	400	<4	<4	<1	19800N 410400E
2749	4	16	730	<4	4	<1	ROAD TRAVERSE
2750	26	12	80	24	<4	<1	" "
2751	24	8	70	16	<4	<1	" "
2752	14	12	75	20	<4	<1	" "
2753	18	22	300	16	<4	<1	" "
2754	24	44	65	14	<4	<1	" "
2755	32	4	44	12	<4	<1	" "

Method of Analysis : Cu Pb Zn Ni Bi Cd : AAS1

.../ 2

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ANALYTICAL REPORT

JOB COM820314   O/N : 4078/MZ02/JJL/62

Results in ppm

SAMPLE	Ag	Mo	As	Ba
2739	<1	<4	<2	1950
2740	<1	<4	3	1350
2741	<1	<4	<2	820
2742	<1	<4	7	930
2743	<1	12	2	2000
2744	<1	<4	10	750
2745	<1	<4	2	840
2746	<1	<4	<2	1650
2747	<1	<4	8	640
2748	<1	<4	3	830
2749	<1	8	5	1800
2750	<1	<4	6	1100
2751	<1	<4	6	1700
2752	<1	<4	4	990
2753	<1	<4	3	780
2754	<1	<4	5	730
2755	<1	<4	3	780

Method of Analysis : Ag Mo : AAS3
As Ba : XRF1

Central Mineralogical Services

CMS

39 Beulah Road
Norwood, S.A. 5067
Telephone 42 5659

Mr. J.J. Lawton
Senior Geologist
The Shell Co. of Aust. Ltd.
Metals Division
P.O. Box 860
DEVONPORT / TAS. 7310

27th April, 1982

REPORT CMS 82/3/26

YOUR REFERENCE:	Sample Despatch No. 4081/MZ02/JJL/65
DATE RECEIVED:	16th March, 1982
SAMPLE NOS.:	2739 - 2764
SUBMITTED BY:	J.J. Lawton
WORK REQUESTED:	Petrology

H.W. Fander, M. Sc.

REPORT CMS 82/3/26

Rock Samples 2739 - 2764

Twenty-six rock samples were received for petrological description; thin-sections were prepared, and offcuts were subjected to K-stain tests to aid interpretations.

Summary

1. 2739 - 2755

   Only one of these rocks contains sulphides, including sphalerite (2749); there is no obvious explanation for the geochemical anomalies in the other rocks, though conceivably there are sparse, erratically distributed sulphides which are not detected with routine examinations, but would require special techniques of sampling and investigation. In particular, the Pb anomaly in 2746 has not been explained. There may be a correlation between the abundance of Ba and K-feldspar (i.e. Ba in the feldspar lattice, as molecules of celsian), as most of the anomalous rocks are trachytic, but there are exceptions.

   Most of the rocks are trachytes and trachytic tuff-lavas/lava breccias, with a few tuffs which generally had a more andesitic source.

   The magnetic susceptibilities are related to the content of primary magnetite.

2. 2756 - 2759

   These four rocks are all of broadly rhyolitic composition, contrasting quite markedly with the first group; they include an altered vitric tuff and three rhyolite-obsidians, all sericitised and silicified, but with well-preserved relict features. Two of the rocks contain pyrite, and one (2757) may contain ?chalcocite, but this needs verification.

3. 2760 - 2764

   This miscellaneous collection includes two closely similar indurated arkoses, a chert, an altered vitric tuff, and a metasomatic quartz-tourmaline-pyrite rock which may have originated as an impure banded chert.

H.W. Fander, M. Sc.

Central Mineralogical Service

Sample No.	Rock Type - Composition	Fabric	Minor Minerals	Comments
2739 (T.S. 41412)	Porphyritic Trachyte. Small albite phenocrysts in fine groundmass of felted K-feldspar, interstitial chlorite and fine magnetite.	Randomly-orientated and -distributed phenocrysts, "trachytic" fabric.	Quartz veinlets. Quartz-chlorite-filled vugs.	Probably extrusive, but flow-features are weak; field relationships may indicate minor intrusive.
2740	Felsic Lava with Xenoliths. Irregular xenoliths of rhyolite-obsidian, small albite phenocrysts, embedded in fine groundmass of K-feldspar, altered glass, quartz splinters.	Definite preferred fabric due to flow, partly pyroclastic. Fine-grained.	Streaks of chlorite aggregates. Fine Fe pigmentation throughout	May be tuff-lava or evenwelded tuff. Broadly rhyolitic-trachytic composition.
2741	Porphyritic Trachyte. Well-formed fresh albite phenocrysts in a fine groundmassof K-feldspar and abundant secondary chlorite.	Phenocrysts are random, but groundmass has felted subparallel textures.	Accessory fine magnetite. Quartz veins and veinlets.	Similar to and correlatable with 2739, and thought to be extrusive. Chlorite is deuteric.
2742	Sheared Porphyritic Trachyte. Abundant close-packed small albite phenocrysts, in a schistose altered groundmass of chlorite, K-feldspar.	Strong preferred fabric; stressed, fragmented phenocrysts	Conspicuous fragmented magnetite crystals. Accessory apatite. Carbonate veins.	Probably verging on trachyandesite composition. Shearing postdates carbonate veins (these are truncated).
2743	Porphyritic Trachyte. Small well-formed albite phenocrysts set in fine felsitic groundmass of K-glass (devitrified) and fine albite laths.	Random fabric, devitrification textures. Uniform, fine-grained.	Small chlorite- and chalcedony-filled amygdales. Quartz veins.	Verging on rhyolite in composition and characteristics. Groundmass probably originally glassy, but rock was ?intrusive.
2744	Sheared Lithic Andesitic Tuff. Coarse irregular grains of various andesites, altered vitric tuffs, plagioclase fragments; sheared and altered.	Grainsizes mostly in 1-5 mm range. Close-packed, weakly sheared throughout.	Scattered magnetite. Fragments of hematitic "melaphyre".	Alteration of components precludes exact classification, but broadly andesitic. Alteration is post-depositional.
2745	Altered ?Trachytic Lava Breccia. Extensively argillised albite phenocrysts set in fine altered groundmass; fragmented, with albite, goethite patches.	Groundmass has faint relict flow-banding. Brecciated in two events.	Small hematite aggregates scattered throughout.	Textures suggest flow-brecciation with later, superimposed tectonic brecciation. Too altered for exact classification.
2746	Porphyritic Trachyte. Small , partly argillised albite phenocrysts set in a strongly potassic, felsitic groundmass with dark chlorite streaks.	Semi-spherulitic devitrification textures. Random phenocrysts.	Small primary magnetite crystals. Isolated chalcedony vug fillings.	Quite similar to the other trachyt especially 2743; thought to be extrusive. Chlorite streaks may be vugs.

Central Mineralogical Service

Sample No.	Rock Type - Composition	Fabric	Minor Minerals	Comments
2747	Altered ?Trachytic Lava Breccia. Albite phenocrysts set in altered fine groundmass of quartz, clays, and patches of ferruginised material.	Relict fine flow-banding in places. Flow- and tectonic brecciation.	Fine sericite throughout.	Severely altered, but broadly similar to 2745. Vague suggestion of two intermingled lava types.
2748	Altered Trachytic Lava Breccia. Scattered albite, rare quartz phenocrysts, set in fine felsitic K-glass/chlorite groundmass with secondary quartz.	Relict flow-textures; flow-breccia fabric. Devitrification textures.	Accessory apatite. Chlorite patches. Trace oxidised pyrite.	Similar to the other trachytes, but with evidence of flow brecciation. Dissimilar to 2745, 2747.
2749	Porphyritic Trachyte with Amygdales. Small albite phenocrysts set in fine felsitic K-glass groundmass; irregular chlorite/chalcedony-filled amygdales.	Devitrification textures. Random phenocrysts; uniform. Fine-grained.	Pyrite veinlets; associated fine white sphalerite. Primary magnetite. Carbonate rhombs.	Sulphides seem to be more or less contemporaneous with amygdale-filling minerals, i.e. broadly deuteric.
2750	Lithic Tuff. Closely-packed irregular fragments of altered glassy lavas and welded vitric tuffs, porphyritic trachyte-andesite, quartz and plagioclase crystals.	Grainsizes average 2-3 mm. Rock is well-lithified. Moderately-sorted/sized.	Interstitial quartz, a few chlorite patches and carbonate aggregates.	Framework components include lavas and pyroclastics, of broadly acid to intermediate composition.
2751	Lithic-Crystal Tuff. Coarse crystals and crystal fragments of andesine, augite, magnetite, andesite and porphyritic augite-trachyte; interstitial chlorite, epidote.	Closely-packed, coarse-grained; lithic grains up to 10 mm across.	Finely-granular and radiating needles of pumpellyite throughout.	Unusually fresh. Development of pumpellyite, chlorite and epidote has obscured some details. Intermediate to basic source rocks.
2752	Pebbly Volcanomict Sandstone. Pebbles and smaller rounded grains of rhyolite, trachyte, in matrix of quartz, feldspar, lithic volcanic grains. Interstitial chlorite.	Lithic components are definitely reworked. Sandy matrix is medium-grained.	A few micaceous meta-quartzite grains. Detrital magnetite.	Rock is clearly younger than volcanism, i.e. younger than Mt. Read volcanics. Origin of meta-quartzite grains not known.
2753	Tuff-Lava (Trachytic). Fragments of andesite and trachyte, microdiorite, embedded in trachyte with albite phenocrysts in felted feldspathicgroundmass.	Fabric partly fragmental, partly extrusive, with flow-banding.	Streaks, patches of chlorite. Accessory magnetite. Limonite patches.	Shows characteristics of both lavas and tuffs; lithic grains hav different composition to lava matrix.
2754	Crystal Tuff. Large angular fragments of oligoclase-andesine, augite, augite/andesine, trachyte, andesite; interstitial chlorite, epidote.	Closely-packed components, 0.1 - 1mm range, averaging 0.4 mm. Not bedded.	Interstitial chlorite, epidote. Detrital magnetite.	Intermediate to basic source rocks Similar to, and correlatable with, 2751, with different lithic/crysta ratio.

073 509073

Sample No.	Rock Type - Composition	Fabric	Minor Minerals	Comments
2755	Lithic-Crystal Tuff. Fragments of porphyritic trachyte and andesite, augite and andesine, cemented by fine interstitial albite and quartz.	Closely-packed, with wide range of grain-sizes up to 10 mm. Not bedded.	Detrital magnetite and apatite. Fine chlorite, cloudy epidote. Carbonate.	Correlatable with 2751 and 2754; minor differences are normal for this type of coarse tuff.
2756	Sheared, Altered Vitric Tuff. Occasional quartz and albite fragments set in semi-schistose matrix of quartz, sericite with good shard textures.	Suggestion of welding and flow-banding, flow-brecciation/ folding.	Carbonate patches. Fine leucoxene grains and pyrite crystals.	Alteration minerals indicate originally rhyolitic composition. Very different from tuffs already described here.
2757	Altered Rhyolite-Obsidian. Scattered albite phenocrysts, cognate xenoliths of rhyolite, in a mass of altered, devitrified glass (now quartz, sericite).	Quite well-preserved perlitic textures; flow-banding/ brecciation.	Secondary carbonate throughout. Traces of chlorite, pyrite, ??chalcocite.	Probably related to 2756, but lava rather than pyroclastic rock. Exact composition not known, because of alteration.
2758	Rhyolite Breccia. Whole and fragmentary quartz and albite phenocrysts, and altered lava fragments, set in quartz-sericite mass (altered glass).	Good flow-banding/ brecciation; devitrification and perlitic textures.	Partly leucoxenised magnetite. Traces of pyrite.	Very similar to 2757. Originally a largely glassy rock of presumed rhyolitic composition.
2759	Porphyritic Rhyolite (altered). Scattered albite phenocrysts, singly and in clusters, rare quartz, in altered glass - now quartz, sericite.	Fine flow-banding, incipient brecciation; devitrification, perlitic textures.	Partly leucoxenised magnetite. Veins of coarsely-crystalline carbonate.	Almost identical with 2758, except for absence of pronounced flow-brecciation.
2760	Altered Vitric Tuff. Mostly sericitised shards, with scattered quartz, albite fragments and irregular rhyolite and porphyritic trachyte grains.	Weakly bedded, generally fine-grained May be welded. ?Flow-banded.	Veinlets of quartz with muscovite, chlorite, traces of tourmaline.	Alteration of shards to sericite suggests that they were of feld-spathic composition, so possibly tra-chytic rather than rhyolitic.
2761	Chert. Consists entirely of microcrystalline quartz with irregularly distributed limonite, hematite pigmentation.	Faint bedding, accentuated by pigmentation. Uniform.	Occasional small spherical chalcedony bodies - ?radiolaria.	Featureless chemical sediment; no indication of tuffaceous material. K-stain test negative.
2762	Indurated Arkose; stressed interlocking quartz grains, partly recrystallized; feldspar grains, subrandom clastic mica flakes. Interstitial sericite.	Very evenly-sized, well-sorted; fine-sand size. No bedding.	Detrital tourmaline (dravite), oxide opaques, apatite, zircon.	Well-lithified rock, but not meta-morphosed. Grainsize verging on siltstone.

Sample No.	Rock Type - Composition	Fabric	Minor Minerals	Comments
2763	Quartz-Tourmaline-Pyrite Rock. Crudely banded, with pyritic bands, subradiating colourless tourmaline, microcrystalline quartz. Partly leached.	Quartzose bands have cherty textures; other minerals are metasomatic.	Patches of matted fine hydromuscovite. Fine rutile.	Appears to be a partly metasomatised chert. Sn assay may be advisable.
2764 (T.S. 41436)	Indurated Silty Arkose. Silt-sized grains of quartz, fresh and sericitised feldspars, clastic mica flakes; interstitial sericite.	Very uniform, closely-sorted/sized, weak bedding. Micas are aligned.	Detrital zircon, oxide opaques, tourmaline. Pervasive Fe-staining.	Closely resembles 2762, merely slightly finer-grained. Featureles well-lithified, but not metamorphosed.

APPENDIX 5

INPUT AGM Survey & Ground Followup Details

Refer Plans D/MZ 02/058 - IL 1
060 - IL 3
066 - IL 4
062 - IL 5
056 - IL 6
057 - IL 7
065 - IL 8
063 - IL 9
061 - IL 10
059 - IL 11

Max-Min Followup D/MZ 02/079 - IL 1
080 - IL 1
081 - IL 1
085 - IL 2
083 - IL 3
082 - IL 3
084 - IL 3

INTERPRETATION REPORT

AIRBORNE ELECTROMAGNETIC SURVEY
BARRINGER 'INPUT' SYSTEM

OF THE

RIANA, HIGHCLERE AND LOONGANA AREAS
TASMANIA

FOR

THE SHELL COMPANY OF AUSTRALIA LIMITED

BY

GEOTERREX PTY. LIMITED

(83-548)

Sydney, Australia
April, 1982

M. Schneider
Geophysicist

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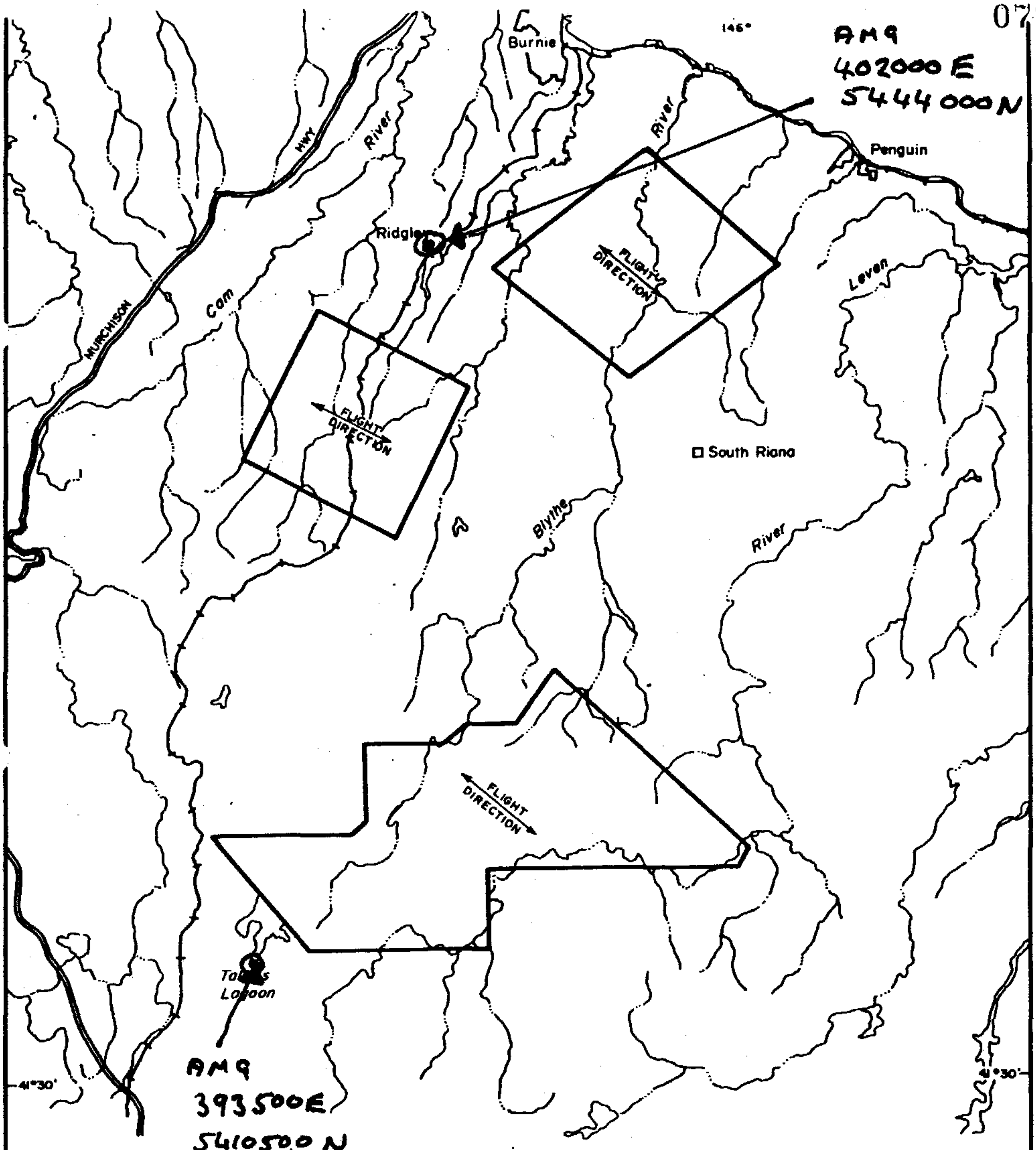
not included with this appendix



AMG REFERENCE POINTS ADDED

5 cm

SURVEY AREA LOCATION MAP

SCALE 1:250 000

0 5 10 15km

NORTH- WEST 1:250 000 SHEET

I. INTRODUCTION

During the period January 7th to January 11th, 1982, Geoterrex Pty. Limited flew a combined electromagnetic and magnetic survey over the Riana, Highclere and Loongana areas of Tasmania on behalf of the Shell Company of Australia Limited. The base for the duration of the survey was Burnie.

A total of 248.0 kilometres was flown at a flight line spacing of 300 metres in a north west direction in the Riana area, 216.0 kilometres were flown at a flight line spacing of 300 metres in a north west direction in the Highclere area, 996.1 kilometres were flown at a flight line spacing of 300 metres in a north west direction in the Loongana area.

The project was conducted with the Super Canso PBY-5A under registration VH-EXG, which is operated by H.C. Sleigh Aviation for Geoterrex Pty. Limited and was equipped with :-

- a Barringer Mark V Input EM System
- a Geometrics G803 nuclear precession magnetometer
- a Geoterrex 'Madacs' digital acquisition system
- a Sperry RT220 radar altimeter
- a 50 Hz monitor
- a Geocam 705 35mm continuous strip tracking camera
- a Honeywell 1912 visicorder

Navigation was by visual means from black and white government photography enlarged to a scale of 1:20,000. The aircraft was operated at a mean terrain clearance of 120 metres.

II. PERSONNEL

The following Geoterrex personnel participated on the field phase of the survey

J. Edwards	Pilot
D. Bowen	Co-Pilot
W. Mitchell	Aircraft Mechanic
L. Williams	Senior Electronics Technician
S. Kiss	Electronics Technician
M. Curtis	Data compiler
G. Butt	Senior Geophysicist
M. Schneider	Geophysicist

The entire project was planned and supervised by G. Butt of Geoterrex Pty. Limited in conjunction with N. Hungerford representing the Shell Company of Australia Limited.

Digital data processing was carried out at Engineering Computer Services Pty. Limited of Bowral, New South Wales.

Drafting was by Geodrafting Pty. Limited of Sydney.

III. DATA PRESENTATION.

The geophysical data is presented in the following form and all maps are at a scale of 1:20,000.

- EM Anomaly Map (overlay to topagraphic sheet)
- Original Input analogues
- Flight path plotted on Tasmanian 1:20,000 cadastral sheets.

EM ANOMALY MAP

The EM Anomaly Maps which overlay each 1:20,000 cadastral sheet show the INPUT anomalies from the high resolution channels.

The anomalies are plotted in their correct lateral positions (i.e. the 2.0 second lag between the six HRC INPUT* responses and the true ground position has been accounted for) on the flight lines and grouped according to similarity of amplitude and shape from line to line. The boundaries of these anomalouse zones are determined from the halp peak amplitude width on Channel 3. A diamond symbol indicates the anomaly peak and hence whether the anomaly is symmetrical or not. The number at the upper left of the diamond is the ratio of Channel 2 to Channel 5 in 10ths of inches chart deflection. The number at the upper right is the aircraft altitude in metres. Any significant association between an INPUT and magnetic anomaly is indicated by plotting the amplitude of the magnetic response beneath the diamond. If there is any offset between these peak responses an arrow indicating the direction of offset is drawn beneath the amplitude of the magnetic response.

During the course of data evaluation, groups of anomalies are outlined to show our interpretation of the extent of the geologically conductive zones. If any doubt exists, the outlines are dashed. Conductors of interest are numbered to facilitate reference to the report.

* For the Highclere area only the slow time constant channels were used for picking and plotting anomalies due to the undue amount of 50Hz and cultural interference on the HRC responses. The lag used to plot these anomalies was 40 seconds. Otherwise the procedure was the same as outlined above.

THE RECOVERED FLIGHT PATH is presented on both the recovery photo-mosaic and the 1:20,000 cadastral sheets for each area. The flight path on the cadastral sheets was used as the base for all processing on EM anomaly maps.

The original visicorder records of the raw INPUT, altitude and magnetic data are presented bound in line number order. All calibration data is included and a copy of the analogue format is shown in Figure 3 of Appendix A.

The 4 rolls of negative 35mm continuous strip tracking film are delivered and labelled according to their flight number.

The aerial photography, bearing all the points, along with the tracking film is provided for accurate location of any followup investigation.

The flight logs which contain all relevant information regarding the collection of geophysical data are presented bound in flight order.

The data was processed at Engineering Computer Services Pty. Limited in Bowral, New South Wales. Compilation and interpretation of the data was performed in Sydney.

The survey was conducted in consultation with N. Hungerford, representing the Shell Company of Australia Limited.

IV. INTERPRETATION - General

Commonly used interpretation techniques rely mainly on qualitative review of data and refer to anomaly shape, symmetry, strike extent and variability within conductive zones. The apparent conductivity, as determined by the amplitude and rate of decay of the INPUT response, is an important critereon in our analysis of conductors. Other important factors taken into account include:-

- the shape and size of the INPUT anomalies,
- the strike length and degree of isolation of the conductor,
- the form of conductors particularly with respect to direction and dip of geological and cultural structures,
- the associated geophysical parameters such as aeromagnetics,
- variation of response characteristics within a given conductor,
- the geological environment and the response of the system to known mineralization.

Conductors delineated by an EM survey can be separated into categories based on their probable origins, namely bedrock, surficial and cultural.

The term cultural is used for those conductors thought to be due to any man-made construction. These are responses due to fences, telephone and powerlines etc.

Surficial conductors refer to sources in the overburden, in the weathered portion of the bedrock or in those formations not usually considered as host material for sulphide orebodies. In the context of this report the word surficial should not be used in the geological sense but rather as a geophysical term.

fails if there is little or no difference between overburden and target body. This method (Verma 1975*) is useful in areas of extensive high conductivity.

b) Curve matching to theoretical homogeneous half-space response (HHS) curves. Sets of HHS response curves of various transmitter-conductor altitudes are stored in computers for matching the field data. A degree of fit measurement is made. Apparent resistivity and apparent depth are calculated. The mechanism of parameter calculation and plotting are described in the appendix concerning quantitative interpretation of the data.

c) Consideration of average response amplitude, as defined by Dyck et al, 1974**, and decay time constant can yield a broad definition of the two-layer case solution. It is possible to distinguish between thin and thick layer cases in certain controlled environments.

INPUT CLASSIFICATION

All conductors of interest are classified according to the following priority system:-

Priority 1 zones satisfy most of the criteria associated with a bedrock source which could be due to massive sulphides. They contain responses indicating a highly conductive source, and may be isolated or extensive, bearing in mind the expected size of sulphide deposits in this region.

* Verma. S.K. 1975.
Resolution of responses due to conductive overburden and orebody, through time-domain EM measurements; a field example; G.P. 23 No. 2: 292-299.

** Dyck. A.V., Becker. A., Collett. L.S. : 1974.
Surficial conductivity mapping with the airborne INPUT system. CIM Bulletin, page 104-109, April, 1974.

Priority 2 zones also satisfy most of the criteria associated with bedrock features but anomalies display characteristics such as faster rate of decay or broader width which preclude them being listed as Priority 1.

Zones which are rated as Priority 3 targets are almost certainly of surficial origin, but a small degree of uncertainty is present.

Priorities assigned to zones are made primarily on the merits of the INPUT responses, with some influence from the magnetic data. Geological information must be further analysed to determine the ultimate priority for followup.

The priority rating system refers to the probability that the conductive source of given zones is related to massive sulphide mineralization.

IX. INTERPRETATION OF LOONGANA SURVEY DATA

The INPUT data from the Loongana survey distinguishes a number of broad conductive zones extending the entire length of the survey area. These responses are related to the extensive basalt cover in the region established from geological mapping and aeromagnetics. However, a comparison between the EM anomaly map and the geology and aeromagnetics shows that the INPUT system has more clearly defined the boundaries of the paleovalleys filled with basalt. The typical INPUT response from these features are broad 'surficial' * responses, some of which bear a close resemblence to modelling data over flat lying horizontal plates performed at the University of Toronto.

The separation of true bedrock responses from within "surficial conductors" has not been realisable in practice but zones of enhanced response within the broad responses is certainly an achievable target. However, in the Loongana area, there are no enhancements within the surficial zones which correlate between more than one line. There are a number of peaks within these zones which indicate localised increases in conductivity, but there are no outstanding airborne geophysical parameters which set them apart from any other peak found with the broad responses. The only conceivable way of upgrading their importance would be the addition of geochemical evidence.

Hence there are only three anomalously conductive zones which are described in this section. Peaks from within the broad zones which may become important with the addition of further information are tabulated in Table 3.

* The word surficial is used in a geophysical rather than geological sense here.

ZONE 20/4041/IL1 — Priority 2

Line 3332	Fiducial 660924	Ratio 8.0/1.0
Line 3322	Fiducial 656110	Ratio 4.0/0.8

Anomalies:	Shape	: narrow, asymmetric
	Amplitude	: small
	Decay Rate	: slow
	Cultural Signs	: none
	Mag Association	: none

Conductor:	Dimensions	: 1.2 kilometres long x 250 metres w
	Strike	: East

Location: Forested area

Remarks:

This zone is weak and situated on the edge of a broad conductive zone. The best response is on line 333.2 where the decay is very slow and the anomaly shape is well defined. The proximity of this zone to the edge of the broad zone introduces some doubt as to whether a separate source is responsible for this anomaly, but there are sufficient differences between this site and other "edge responses which enhance the importance of this zone.

Recommendations:

Ground follow up is recommended.

ZONE 20/4041/IL2 Priority 3

Line 3191	Fiducial 621860	Ratio 8.0/1.2
Line 3181	Fiducial 620770	Ratio 15.0/1.0

Anomalies:

Shape	:	narrow and symmetric
Amplitude	:	moderate - small
Decay Rate	:	moderate - slow
Cultural Signs	:	none
Mag Association	:	100 - 160nT discrete anomaly

Conductor:

Dimensions	:	600 metres long x 300 metres wide
Strike	:	East

Location:

Remarks:

This discrete zone with magnetic association may be an expression of topography on the airborne geophysical records. The zone has a tenuous extension to the south on the ends of lines 3171 and 3161 where the response is broader and weaker mainly due to increased terrain clearance. The associated magnetic anomalies do not persist to these lines. The anomalies do not indicate a highly conductive source is present.

Recommendations:

Ground follow up is recommended.

ZONE 20/3941/IL3 | | Priority 2

Line 3071	Fiducial 590160	Ratio 6.0/-
	to	
Line 3051	Fiducial 584796	Ratio 5.0/-

Anomalies:	Shape	: symmetric and solitary on line 3061 inflexion on the side of broader anomalies on the other lines
	Amplitude	: moderate
	Decay Rate	: moderate - slow
	Cultural Signs	: none
	Mag Association	: 50-60mt offset by approx 25 metres
Conductor:	Dimensions	: 1.0 kilometres long x 250 metres wide
	Strike	: North
Location:	In the middle of a forested section	

Remarks:

The best response in this zone occurs on line 3061 at fiducial 587540 where the anomaly is narrow, symmetric and well defined. On adjacent lines the anomaly occurs on the edge of a broader response. There is discrete magnetic association offset to the west by an average of 25 metres and this feature persists through to line 3031 whereas the INPUT anomaly becomes indistinct.

Recommendations:

Ground follow up is recommended and should be initiated in the vicinity of line 3061 with a deep penetration system capable of a quantitative discrimination between deep conductors and background response.

X. TABLE 3 SUMMARY OF SELECTED PEAKS WITHIN SURFICIAL ZONES

Line	Fiducial	Ratio	No. of Channels	
3511	489264	8.0/0.5	5	4141/IL4
3411	454620	10.0/1.2	6	4042/IL5
3271	642270	14.0/2.1	6	4041/IL6
3251	637740	14.0/1.8	6	4041/IL7
3111	599924	20.0/3.0	6	6041/IL8

XI. CONCLUSIONS AND RECOMMENDATIONS

Tables 1-3 summarise the interpretation of the geophysical data and the classification of zones according to their priority in the search for conductive massive sulphides. This categorisation is established primarily on the merits of the INPUT data with the magnetic and other information considered as secondary tools.

The main purpose of the survey was the delineation of discrete massive sulphide conductors, often from beneath the extensive basalt cover. The complex nature of such target conditions places limitations on the separation of true bedrock responses from responses originating from within the overburden (basalt) or at the base of the overburden, due mainly to the poorly understood interactions between "surficial" and bedrock conductors. Consequently there are very few high priority zones listed in this report.

The Loongana area contains only 2 Priority 2 and 1 Priority 3 zone. In this area the basalt cover was extensive and relatively uniform, there being no trending enhancements within the extensive areas of high conductivity.

Since there are very few zones listed as being possibly caused by a bedrock source. It is recommended that all zones regardless of priority be followed up. The zones which have been outlined as being anomalously conductive within the generally conductive background would require a deep penetration ground EM system capable of separation of background response from target response at the processing and interpretation stage.

Respectfully submitted,

Martin Schneider

Martin Schneider
Geophysicist

Memorandum

File: 509095

Date 15 January, 1982

From AHO DMN:NH:AP

To DMH/Devonport

INPUT SURVEY - TASMANIA, 1982

The INPUT survey was flown uneventfully by Geoterrex on 9th, 10th and 11th of this month. A few reflights were necessary, - in Loongana as fill-in lines, and in Riana as checks on the effect of power lines, especially in the Natone area.

As expected the basalt in all 3 areas is apparent as a poorly conducting surficial layer, but the response has certain characteristics that enable it to be differentiated from a good bedrock conductor. Naturally there will be occasions when the conductive properties of the two will overlap and interpretation will be difficult.

Ground follow-up should initially take the form of 3 or 4 lines (for 1 or 2 line INPUT anomaly) of Max-Min and ground mag to locate and identify the INPUT anomaly source (100 metre line spacing). If these results are encouraging a line of IP would be advisable to confirm the presence of a bedrock conductor rather than weathered basalt/clay (the soundings last year showed the basalts to have very low average chargeabilities).

I have looked through the INPUT analogue charts before passing them on to Geoterrex for their comprehensive interpretation and plotting of results, which will take some 1 to 2 months. Those anomalies of immediate interest are listed below by Line and Fiducial as a preliminary notation. Geoterrex will be numbering their anomalies by sheet number but with the subscript I (for INPUT) e.g. 4041/1I, to differentiate them from the aeromag anomalies.

LOONGANA

As might be expected from their known low resistivities in this area, the basalts are well delineated, and a careful interpretation will be necessary by Geoterrex to pin-point bedrock conductors beneath the basalt.

No INPUT AEM anomalies are evident at Challenger II or directly over the Blythe Road mag anomaly. One major problem with the survey is this area was the excessive survey height which could not be avoided, but which would have the effect of considerably decreasing the AEM response so as to make a poor, small, or deep, conductor effectively undetectable. The following anomalies are suggested for initial checking:

306/58705 - approx. 2 kms north of GF3. A moderate (6 channel) 1 line anomaly with no mag correlation (Note - situated on Sheppard's Creek !). Recce 3 lines EM/Mag.

318/62077, 319/62186 - in Cambrian volcanics on the southern boundary of the E.L. A 5 channel AEM anomaly with minor (20 nT?)

337/44556, 339/45041 - Part of a conductive trend in the north of the area possibly over θg beneath basalt. Minor (20 nT?) mag correlation. Recce EM/Mag grid.

I have plotted all the above mentioned anomalies on both the 1:20,000 geology maps and also the flight path photos for anomaly and grid location purposes. Please initially refer to these anomalies by Flight/Fid. no. until Geoterrex give them a number, by which time you can expect several more to follow-up.

I would hope to come over with Graham for a couple of days the last week in January to discuss the EM and Mag follow-up, start the gravity work off, a possibly due some SP at Natone. Would this be OK with you?

Regards

Nigel

N. HUNGERFORD

Memorandum

Date 3rd August, 1982.

From BXN/Devonport (G. Oakes)

To BXH/Devonport (J.J. Lawton)

Re: LOONGANA INPUT - INITIAL FOLLOW UP

Summary

Anomaly	Grade	Work Plan	Comments
IL 1	(III)	max-min, IP(?)	main interest is due to relatively high rating by GEOTERREX and to get a handle on basalt properties
IL 2	(I)	?max-min, IP	not in our E.L.
IL 3	(II)-(III)	max-min, IP	similar to IL 1, but higher priority
IL 4	(III)	none at this stage	work in future depends on results of IP over basalt in Highclere and Loongana
IL 5	(III)	max-min, IP(?)	as for IL 4 - interesting mag association
IL 6	(III)-(IV)	none	near electrical sounding 2 (gave thick conductive zone in basalt, with basement at 160m)
IL 7	(III)-(IV)	none	near electrical sounding 2 and probably same feature as IL 6, since only separated by 1 flight line
IL 8	(III)	none at this stage	as for IL 4
IL 9	(III)-(IV)	none	near electrical sounding 4 (near surface conductive zone in basalt, confirmed by VLF
IL 10	(II)	max-min, IP(?)	reasonably close to GF3, but far enough away to be some doubt - work largely to determine basalt properties
IL 11	(IV)	none	close to GF 3 and electrical sounding 3 (90m of basalt with near surface conductive zones, from sounding and VLF results)

Explanation of Anomaly Grades

(i) anomaly not in basalt (max-min to confirm location, IP over best max-min anomaly to give an idea of source parameters).

FORM 32/6000

(ii) anomaly in basalt; weak or no VLF response (work plan as for grade (i) anomalies).

(iii) anomaly in basalt; strong VLF response, suggesting a shallow source, probably a conductive zone in or at the base of the basalt. (max-min to confirm location and give a quantative idea of parameters, as a low priority, with further work dependent on the results at higher priority anomalies).

(iv) anomaly explained (e.g. by culture or mapped geology) or in basalt known to be very thick (e.g. near drillhole GF3).

Priority of Work

1. IL 2 - 3 north-south lines of max-min 200 metres apart, with IP over the best anomaly

2. IL 3 - 3 east-west lines of max-min, 200 metres apart, with IP over the best anomaly.

3. IL 10 - 3 east-west lines of max-min, 100 metres apart, with IP over the best anomaly.

4. IL 1 - 3 north-south lines of max-min, 200 metres apart, with IP over the best anomaly (?).

5. IL 5, IL 4 - 3 east-west lines of max-min, 100 metres apart (low priority).

6. IL 8 - 3 north-south lines of max-min, 100 metres apart (very low priority).

The first 3 anomalies (and possibly IL 1) should be ready for an IP program in late August. If IL 1 is not ready for August, it should probably be done in a program in November. The work at IL 3, IL 10 IL 1 should give an idea of basalt properties and conductivities of clay bands - the work on lower priority anomalies should then be evaluated in the light of this information. (IL 5 is possibly upgraded by its magnetic association. It may be covered by IP as an alternative to one of the higher priority anomalies).

IL 1

The VLF detected a broad, shallow conductive zone (dipping S?) in a basalt-covered area. This zone appears to be better coupled to North West Cape than Japan, which is consistent with the east-west trend of the INPUT anomaly. A shallow conductor in a basalt area is not a very promising target, and the INPUT anomaly is further downgraded as it may have been enhanced by low terrain clearance. However, Geoterrex rated this anomaly fairly highly (compared to any other anomalies in the area) so we should do max-min followed by IP over the best max-min anomaly, to check for a possible deeper conductor beneath conductive overburden. At worst, this work will give us more information on basalt properties and thus assist in grading the lower priority anomalies.

IL 2

This was the only anomaly which does not lie in a basalt covered area. It also doesn't lie within our E.L.'s.

The ground magnetics located the offset mag. anomaly associated with the INPUT, but no clear VLF anomaly was detected (although there was a possible cross-over in Japan's frequency at 25N). This lack of a clear anomaly would be in keeping with the cause of the INPUT being low terrain clearanc e, as suggested by Geoterrex, however we should still do max-min here to check for a deeper conductor, not detectable by VLF.

This is the only anomaly in the Loongana block which is certainly not caused by basalt, so IP may also be worthwhile if max-min detects a conductor. It would be hard to justify the cost of IP on an area outside our E.L.'s however.

IL 3

Two VLF conductors were detected. The western, deeper (or broader) one probably correlates with the INPUT anomaly: it certainly has the right magnetic association (which is a possible upgrading feature for this anomaly), and is in the right place by the INPUT plot.

The eastern conductor appears to dip shallowly west and strike west of north (from its coupling to the transmitters) - this would fit a clay band at the base of the small hill here. The shallow westerly dip suggests that both anomalies have the same source, i.e. the same clay band with local conductivity variations, as would be reasonable if the clay band is due to weathering. Alternatively, a second clay band or some deeper conductor could be involved. In any event, the strong VLF downgrades the anomaly, given the basalt cover.

Geoterrex have recommended follow-up with a deep penetration, discriminating system i.e. they feel that there is a reasonable chance of there being a bedrock conductor beneath conductive overburden. As the VLF cannot resolve the exact nature of the western conductor, it is certainly worth covering this anomaly with max-min and IP, therefore I would recommend future follow-up to consist of 3 east-west lines of max-min with IP over the best max-min anomaly.

IL 4

The VLF detected a phase rotation with a small anomaly superimposed, suggesting a conductive overburden with localized conductivity increase. The location of the anomaly on a basalt hill is not promising, so the only follow-up at this stage should be max-min with a very low priority.

IL 5

The VLF detected a shallow conductor at about 250 SE. The coupling and shape of the profiles (suggesting a line not perpendicular to strike) would be consistent with a body striking west of north and dipping east. The conductor is associated with a 600 nT mag. anomaly (this anomaly does not appear to be offset, as suggested by the INPUT) and in an interesting area (not far from Blythe R. and in the same magnetic trend as Kara East), but the existence of a shallow conductor in basalt downgrades it. It is still definitely worth max-min and IP.

IL 6

A weak VLF anomaly was observed slightly to the north of the plot of the INPUT anomaly. This probably represents the actual location of the anomaly (nb IL 7 is definitely plotted slightly too far south, as the strong VLF response there is slightly north of the INPUT's plotted location. IL 6 and IL 7 probably have a similar source, as they are separated by only a few hundred metres and one flight line). This anomaly is near electrical sounding 2 (station OON is on the raod used for the sounding) which gave a thick conductive zone in basalt (55 ohm metres) above basement at 160 metres, so there is little likelihood of anything other than basalt causing the anomaly.

I can't see much point in doing any further work.

IL 7

VLF detected 2 good conductors (or a broad conductive zone) in a hill top. The conductors are shallow and hence probably in basalt. The coupling suggests a strike west of north (better coupling to North West Cape, but still well coupled to Japan), which follows the strike of the hill top. Thus the most likely explanation is a clay band in basalt near the top of the hill (with low terrain clearance possibly enhancing the INPUT anomaly).

IL 7 is also very close to electrical sounding 2, confirming this interpretation, and therefore no further work is recommended.

IL 8

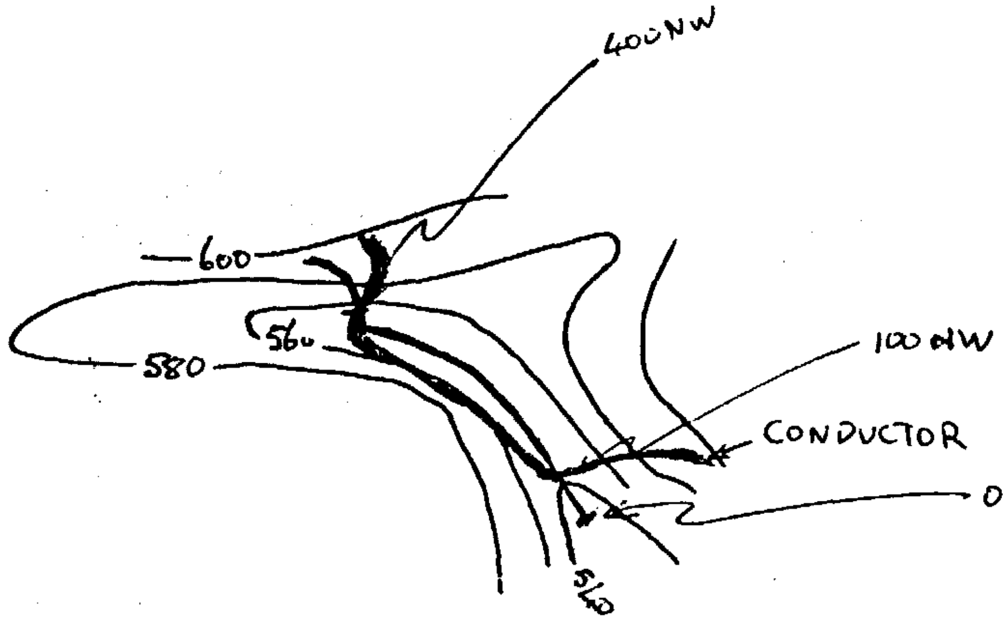
A clear VLF anomaly was observed on the plotted position of the INPUT anomaly. This anomaly suggests a very shallow source (probably in basalt and possibly related to the small ridge at the anomaly, which would fit the strike suggested by the coupling). The INPUT anomaly may also have been enhanced by low clearance.

I suggest max-min to confirm the location of the anomaly and check for deeper conductors, but with very low priority.

IL 9

Two strong VLF conductors were detected. The coupling to North West Cape and shape of the profiles suggests that the line was almost parallel to strike i.e. both anomalies are an expression of the same conductor. This could be explained by a shallowly dipping conductive layer (dipping SW?) as shown below:

509101



The anomaly at 100NW almost certainly coincides with a boundary between basalt flows (with a more resistant flow causing the rapids and small waterfall). Electrical sounding 4, which is nearby, gave a near-surface conductive zone in basalt, so the most likely explanation must be a clay band in basalt.

It is also worth noting that the INPUT was flown up the steep-sided gully and the anomaly plots at the gully's narrowest point. Thus there could be a topographic effect (similar to low terrain clearance) enhancing the anomaly. No further work is recommended.

IL 10

No clear VLF anomaly was detected (possibly crossover at roughly 25E, near the plotted location of the INPUT anomaly). Max-min is needed to confirm the location of the anomaly and since a deeper source could be involved (no VLF anomaly) IP may be worthwhile.

IL 11

A weak conductor (better coupled to Japan, fitting the north-south strike of the INPUT feature) was observed, correlating well with the plotted INPUT location. The anomaly has a small topographic association, suggesting a different basalt flow and hence the possibility of a clay band being the cause. Drillhole GF 3 is next to the anomaly (90m + basalt) so the only possible cause is a basalt related conductive zone. Electrical sounding 3 confirms that such zones exist here. No further work.

Appendix - Electrical Properties of Basalt

1.0 Soundings (Simplified summary)

(a) Guildford & Loongana

(1)

— 0
180 ohm.m
— 10m
12 ohm.m
— 40m
200 ohm.m
— 90m
10 ohm.m

(2)

— 0
700 ohm.m
— 13m
55 ohm.m
— 160m
5000 ohm.m

(3)

— 0
300-1000 ohm.m
— 20m
80 ohm.m

(nb. near GF 3 with 90+m basalt)

(4)

— 0m
1700 ohm.m
— 10m
73 ohm.m
— 25m
200 ohm.m

(5)

— 0
500 ohm.m
— 8m
23 ohm.m
— 39m
120 ohm.m
— 50m
40 ohm.m

(6)

— 0
400 ohm.m
— 3m
25 ohm.m
— 10m
170 ohm.m
— 15m
37 ohm.m
— 180m
300 ohm.m

(b) Highclere

— 0
229 ohm.m
— 10m
90 ohm.m

(c) Hellyer R. West

Layer	Depth
	0
300 ohm.m	
	7m
34 ohm.m	
	20m
300 ohm.m	
	80m
24 ohm.m	

(d) Lorinna East

Layer	Depth
	0
1000 ohm.m	
	40m
50 ohm.m	
	80m
750 ohm.m	
	110m
1800 ohm.m	

Notes

(1) Only the soundings at (2), (6) and Lorinna East appear to have reached basement. Electrical soundings look like having severe problems reaching basement, as the large spreads required give low signals and problems with lateral variations become very significant. I do not think we should bother using DC soundings for follow-up to the gravity - they are unlikely to give a sound idea of depth to basement. EM soundings may be more useful, but they will also be more expensive.

(2) Chargeability generally reflects resistivity, with low resistivity implying low chargeability. IP is therefore a useful tool in detecting sulphides beneath basalt.

(3) A thin resistive surface layer is always present and is always underlain by at least one conductive layer. This conductive layer may be quite conductive (resistivity as low as 10 ohm metres and always less than 100 ohm metres) and quite thick (greater than 100 metres in several cases). This suggests that a conductive layer lies at the base of the basalt (eg. paleo-weathering surface) over a widespread area. The thickness of this layer is probably exagerated by some soundings, implying that its conductivity is underestimated.

The existence of more than one conductive layer in several cases, suggests that conductive clay layers at basalt flow tops are also common.

(4) The existence of such conductive layers related to basalt suggests that INPUT is unlikely to have had the desired penetration in widespread areas over basalt. This would be confirmed if no IP anomalies are detected in the forthcoming program. If this is the case, all other anomalies in basalt areas are downgraded.

(5) The existence of several conductive layers suggests that mapping depth-to-conductive-half-space from the INPUT will bear little relation to depth-to-base-of-basalt in several areas.

Typical electrical section from soundings in basalt

1. thin resistive layer (300-2000 ohm.m)
   (possibly related to either thickness of uppermost flow or to depth to water-table)

2. conductive layer (10-40 ohm.m)
   (clay bands at flow interfaces?)

3. resistive layer (100-300 ohm.m)
   ("fresh" basalt?)

4. conductive layer (10-70 ohm.m)
   (paleo-weathering surface?)

5. resistive basement (300-5000 ohm.m)

   (layers 2 and 3 may not be present, or could quite conceivably be repeated several times).

2.0 Borehole Logs in Basalt

Hellyer R. West

Depth	3 metre spacing	12 metre	geology	sounding
0				
	600Ωm	<100 ohm.m	flow top	1 & 2 layers
20m				
	10,000 ohm.m	250 ohm.m	flow top	3
35m				
	700 ohm.m	150 ohm.m		4
65m			flow top	
	?	?		

- the 12 metre spacing shows a good correlation with the sounding results (and the geology). (As the 12 metre spacing samples a larger volume, it would be expected to be more comparable to the sounding than the 3m spacing). The upper, resistive layer is not apparent as the top of the hole was not logged. Thus it can be seen that the sounding has given useful results in determining basalt properties, although it has not given any idea on depth to basement.

Guide River

Depth	5 metre spacing	12 metre	Geology
0	300 ohm.m	1000 ohm.m	flow top
40m	10,000 ohm.m	10,000 ohm.m	
60m	150 ohm.m	1000 ohm.m	flow top
75m	1000-10,000 ohm.m	3000 ohm.m	
110m	60 ohm.m	400 ohm.m	base of basalt
125m	150 ohm.m		slates(?) and mudstones
140m	not logged		
170m		1000 ohm.m	

- two conductive zones were detected:-

  (a) the flow top at 66m (resistivity decreases with spacing therefore actual resistivity is probably less than 150 ohm.m)

  (b) the base of the basalt (again, the resistivity at smaller spacings is less therefore actual resistivity is less than 60 ohm.m).

- the top of the hole was not logged so the upper resistive layer was not detected and the flow top at 30 metres was not resolved.

Memorandum

Date 10th November, 1982

From BXN G. Oakes

To BXH J. Lawton

Re: LOONGANA INPUT ANOMALIES IL 1, 3, 5 & 10 (IL 2) - GEOPHYSICAL SUMMARY

SUMMARY

IP surveying of INPUT anomalies IL 1, 3, 5 and 10 has been completed. All 4 areas gave near-surface conductive zones with no chargeability response, implying basalt-related weathering effects are the cause of the INPUT anomalies.

IL 5 still retains some interest due to its proximity to an aeromag. feature.

Near-surface resistivities were uniformly low (generally less than 100 ohm-metres). At IL 10, resistivity was less than 100 ohm-metres throughout the entire section (100m dipoles, n = 1 to 6) and was commonly of the order of 50 ohm-metres or less. These low resistivities will present difficulties to all conventional (by Tasmanian standards) electrical methods, if they are to be used on the western half of Loongana and on Guildford E.L. It is unlikely that any airborne em system could be relied on to effectively penetrate overburden of this nature. Transient em (e.g. EM-37, PEM, SIROTEM) or IP with mores advanced receivers (IPR-11 or MK-4) and larger transmitters probably represent the most reliable exploration tools in this environment - but will be logistically difficult and expensive to use.

IL 1 - Dempster Creek

INPUT - Priority 2, weak conductor on edge of broad conductive zone.

VLF (recce line) - Broad, shallow conductive zone (dipping S?) in a basalt covered area. (See earlier memo for more details).

Max-min (3 lines) - (a) 0E/100S: Conductor dipping shallowly south (less than 30^{o}) at a depth of 40m. Conductivity-thickness of 2-3 mhos.

(b) 200W: Conductor at 0-100N.

(c) 400W: Broad conductor (or 2 conductors) dipping south from roughly 50N. Associated with topographic inflections.

Magnetics (3 lines) - Noisy basalt-type response with no outstanding features.

IP (line 400W) - Resistivity low at approx. 50S, corresponding to a chargeability low. This would appear to be the source of the INPUT (slight offset from max-min is due to different response of the two systems and to low resolution, especially of 100m dipole-dipole IP but also of 200m coil separation max-min). The lack of a chargeability anomaly indicates that a basaltOrelated weathering zone is the cause.

A zone of higher resistivity and chargeability (10-20 msec) is apparent at the northern end of the line. Similar features occur at IL 3 (eastern end of line) and IL 5 (western end) and probably reflect the characteristics of fresh basalt.

Recommendations - No further work.

<u>IL 3 - Rabbit Plains Road</u>

INPUT - Priority 2 narrow anomaly on edge of broader response with discrete magnetic association (offset by 25m).

VLF (recce line) - 2 conductors with western one coinciding with INPUT plot and having a magnetic association.

Max-min (3 lines) - (a) 200N: Conductor at 150W and dipping east. Another possible conductor off the western end of the line. the conductor at 150W gives a depth of 20m and conductivity-thickness of 1-2 mhos (but increasing at low frequency). This conductor probably correlates to the conductors on the eastern ends of lines ON and 200S (strike west of north is consistent with the INPUT results), and is probably the source of the large 6-channel INPUT response to the east of IL 3 (probably surficial conductor related basalt).

The anomaly at the western end of the line probably correlates to IL 3.

(b) ON: Conductors at 450W and approx. 100W. The conductor at 450W dips west at a depth of 60m(?) and has a conductivity-thickness of 8 mhos (and increasing at low frequency). This conductor appears to be the better of the two and is probably the source of the INPUT anomaly. IL 3. It also looks fairly broad.

(c) 200S: Conductors at 500-550W and roughly 50E (off eastern end of line). The conductor at 500W probably dips west at a depth of 20-30m and with a conductivity-thickness of 3-5 ohm metres (but decreasing at low frequency).

Magnetics (3 lines) - All conductors are associated with noisy, 500 nT magnetic anomalies. The magnetic field is very flat between the conductors.

IP (ON) - Resistivity/chargeability low dipping west from 450W is the source of the em anomalies and is probably explained by basalt-related weathering effects.

Recommendations - No further work.

IL 5 - Blythe Gate

INPUT - Six channel response in surficial conductive zone. Near an aeromag. anomaly and Blythe River.

VLF (recce line) - Shallow conductor dipping east.

Max-min (3 lines) - (a) ON: Conductors at 100W and 150E, probably dipping east (interference makes interpretation difficult). The conductor at 100W appears to be the better of the two, with a conductivity-thickness of 5 mhos (but decreasing at low frequency) and a depth of 40-50m.

(b) 100S: Conductors at 50W and 150E, probably dipping east (again, interference is a problem). The conductor at 50W is the better of the two, with a conductivity thickness of 5-10 mhos and depth of 20m.

(c) 200S: The conductors appear to have merged into a broad conductive zone between 50W and 150E and dipping shallowly east.

Magnetics (3 lines) - A noisy basalt-type response with no significant features was detected. The aeromag. anomaly does not appear to have been recovered as yet, unless it is due to aliasing of the basalt noise (quite possible).

IP (100S) - Resistivity/chargeability low at 50E-100W is the source of the em anomalies and is probably caused by basalt-related weathering zones.

A chargeability high (20 msec) and resistivity low at larger dipole spacings (n = 4-6) beneath 400E may be of interest however, especially as we may not have recovered the aeromag. anomaly in this area.

Recommendation - The 3 grid lines should be extended 500m to the east, to attempt to recover the aeromag. anomaly. If this anomaly has not been clearly recovered at that stage, spectral analysis of the ground mag. should be done. If a magnetic anomaly is detected, transient em (PEM or EM-37 would probably be the best - especially if a PEM crew is mobilized to log drillholes at Natone) should be done, to site a drillhole.

If the aeromag. anomaly is spurious, the area can be forgotten.

IL 10 - Wey Road

INPUT - 6 channel response in surficial conductive zone.

VLF - No anomaly.

Max-min (3 lines) - (a) 100S: broad conductive zone at 150W - OE (possibly 2 conductors at different orientations, with surficial conductor dipping E and deeper conductor dipping W). Deeper conductor is at 60 - 80m and has a conductivity-thickness of 3-6 mhos.

(b) ON: broad conductive zone at 100W - OE (again, possibly 2 conductors). Deeper conductor at 40 - 70m depth and has good conductivity thickness (20 - 40 mhos? and increasing at low frequency) and probably dips west. Surficial conductor appears to dip east.

(c) 100N: conductive zone at 0 - 100W. Dip 30 - 60° W depth of 20 - 30m and conductivity thickness of 1-2 mhos.

IP (ON) - The section showed fairly uniform low resistivity (generally of the order of 50 ohm-metres). The chargeability was also very low, but showed signs of em coupling (i.e. negative readings) and no readings were obtained beneath n = 4, with several n = 4 readings being lost. I'm not sure how significant this is, but it is reasonably certain that no strongly chargeable bodies are close to the surface (within 50 - 80m). Hence the INPUT anomaly can be ascribed to basalt-related weathering effects.

Recommendations - The INPUT anomaly is explained and is not worth any further work for its own sake. I would like to use line ON as a test line for the IPR-11 receiver however, to see if it can read larger n-spacings in a conductive environment. This line may also be useful for testing other techniques (e.g. transient em, RRMIP?). This test work may still be useful for resolving the possiblity of a deeper bedrock conductor beneath OE.

IL 2 - Black Marsh Road (Not yet completed)

Max-min has been completed on line 200E only with 2 lines of magnetics done. A 2000 nT mag. anomaly was detected, which still needs to be explained. The max-min yielded a conductor at 350N with conductivity-thickness of theorder of 5(?) and shallow depth (20-40m). Max-min and mag. on the remainder of the grid should be completed at some stage, although lack of geochem. downgrades the area.

Low Priority Anomalies

Anomalies IL 4 and IL 8 still remain to be followed up with max-min and magnetics. Later in the year I would hope to re-examine the INPUT analogues to see if it is worthwhile dragging out a few 2nd - order anomalies in geologically interesting locations.

Exploration Techniques for the Future

The IP (esp. at IL 10) has highlighted the fact that we are starting to look at a conductive overburden situation over our gravity anomalies in Highclere - Guildford. If we want to successfully see through such layers, I suspect we are going to need to use better equipment than the max-min and IPR-8 - either more advanced IP receivers (IPR-11/MK-4) with larger transmitters or transient em ground techniques. Any of these techniques will be expensive for reconnaissance under Tasmanian conditions.

If we are going to keep exploring here it would therefore be worthwhile to do a test survey to see which method gives us the best chance of seeing through the basalt and is at the same time logistically realistic. I suggest we try:-

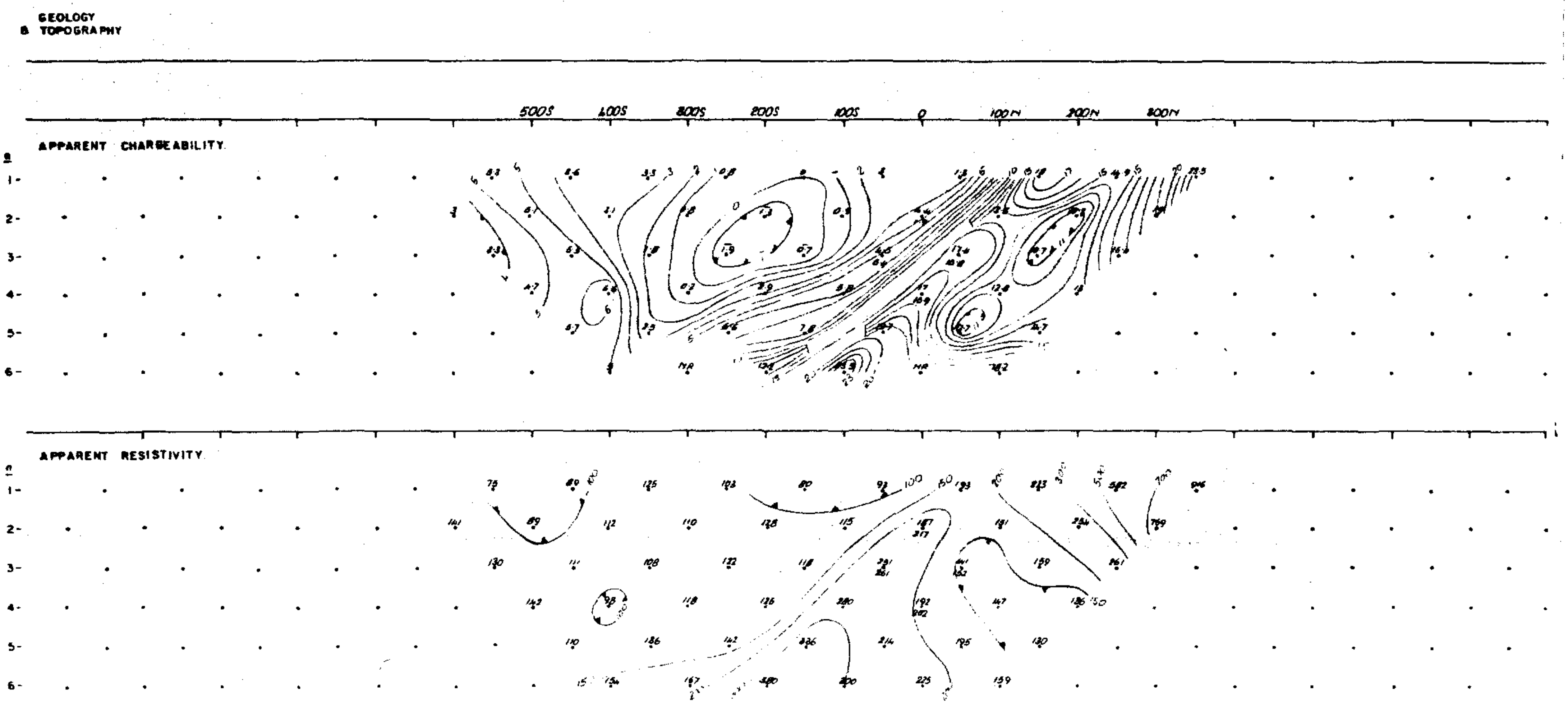
(a) IPR 11
(b) EM 37/UTEM
(c) SIROTEM
(d) PEM
(e) RRMIP (?) if we can mobilize crews at a reasonable cost. (IPR 11 will be mobilized for gravity follow-up; PEM may be for downhole em at Natone; SIROTEM floats around every now and then. The large loop systems may be the hardest to get cheaply, but they can probably give the most cost-effective production at least for detailed work. I won't lose too much sleep if we don't try RRMIP).

Test areas are a bit harder to come by - Natone is a but too easy and we don't know much about the geology beneath the basalt elsewhere. I suggest IL 10 be used for some test work; with most of the work done over one of the stratigraphic holes we will need to drill next year. this work could be kept in mind when siting these holes.

G. OAKES

AIRBORNE GEOPHYSICS
(EM, MAG, etc)

509111



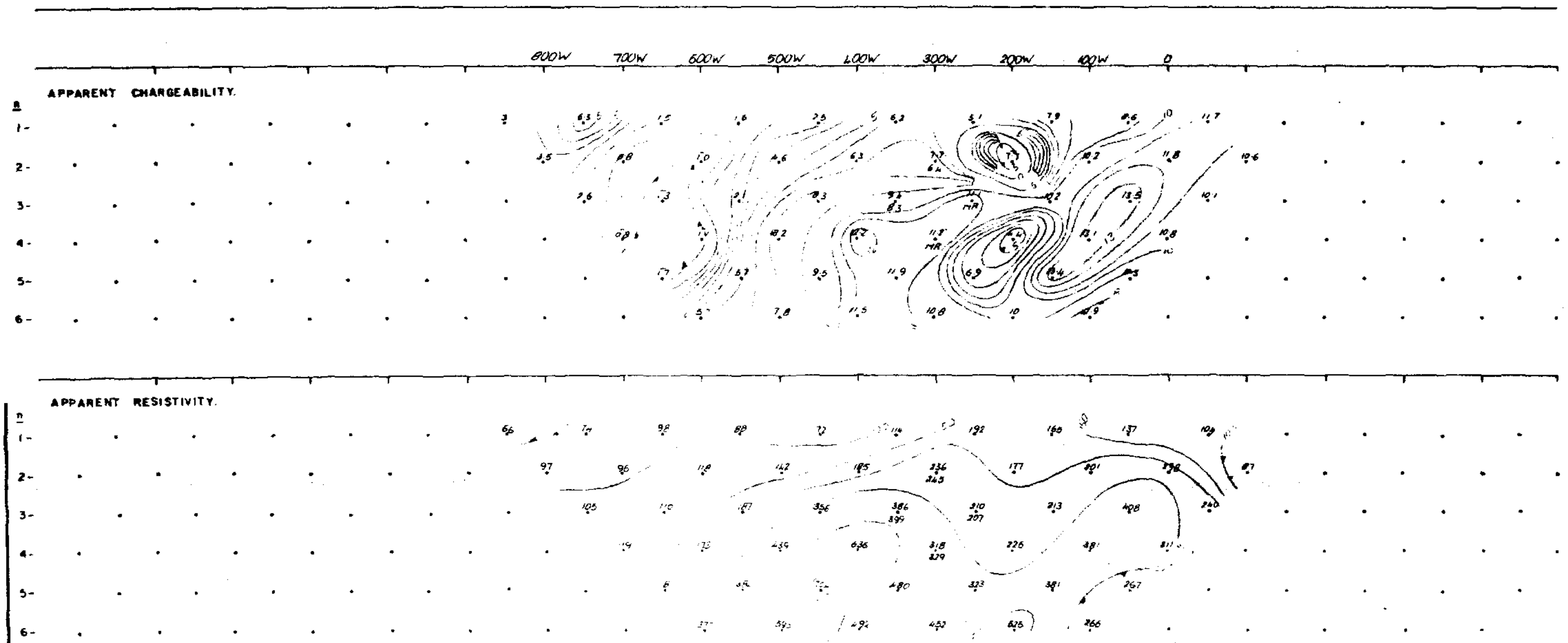
Contractor SCINTREX (TAS-101)
Date 5-10-82
Timing 2 sec
Transmitter : IPC-7 2.5Kw
Receiver IPR-8
Integration time
Array DIPOLE - DIPOLE
Dipole length 100m

The Shell Company of Australia Limited
METALS DIVISION
IP / RESISTIVITY SURVEY
E.L. 36/79 LOONGANA
DEMPSTER CREEK - JL 1
400 W
FIG. No. 16
DRG. No D/M202/081

AIRBORNE GEOPHYSICS
(EM, MAG, etc)

509112

GEOLOGY
& TOPOGRAPHY



Contractor SCINTREX (TAS-IP)
Date 5-10-82
Timing 2 Sec
Transmitter IPC-7 2.5 Kw
Receiver IPR-8
Integration time
Array DIPOLE - DIPOLE
Dipole length 100m

The Shell Company of Australia Limited
METALS DIVISION
IP / RESISTIVITY SURVEY
E.L. 36/79 LOONGANA
RABBIT PLAIN ROAD - IL 3
00 N

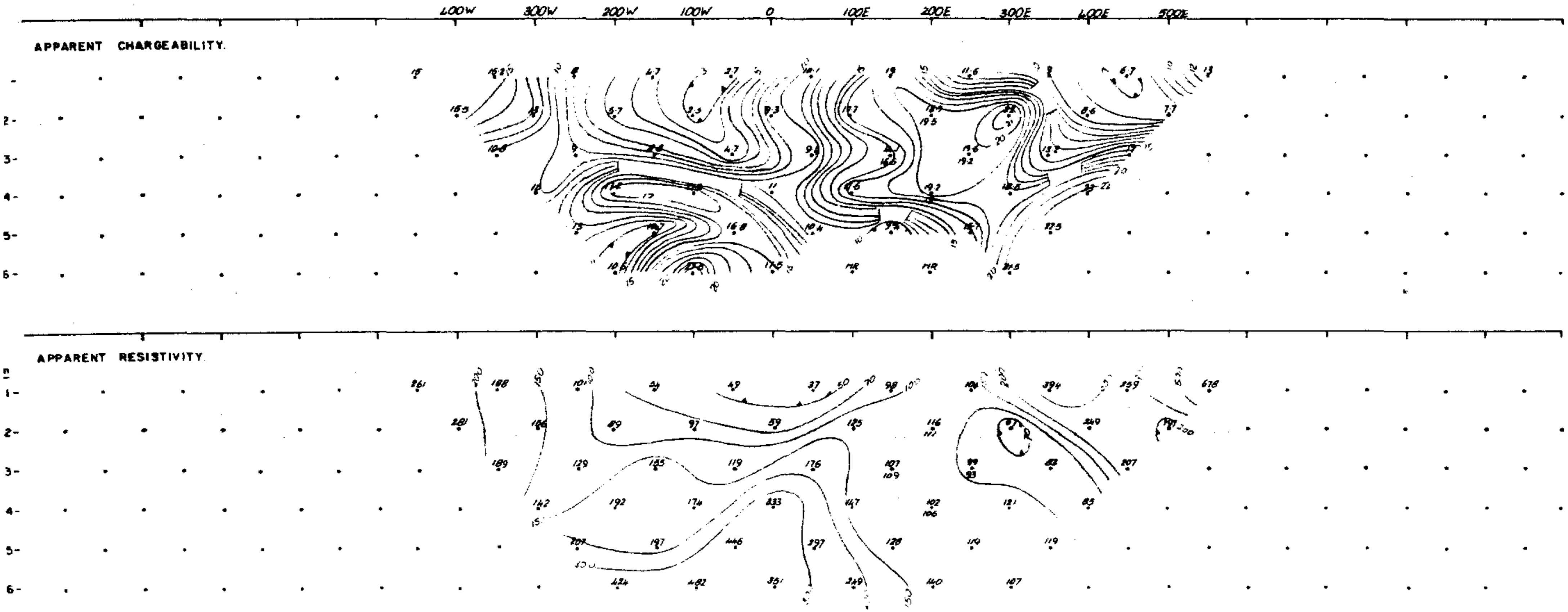
FIG No 17
DRG. No. D/MZ02/087

RBORNE GEOPHYSICS
(EM, MAG, etc)

509113

113

GEOLOGY
& TOPOGRAPHY



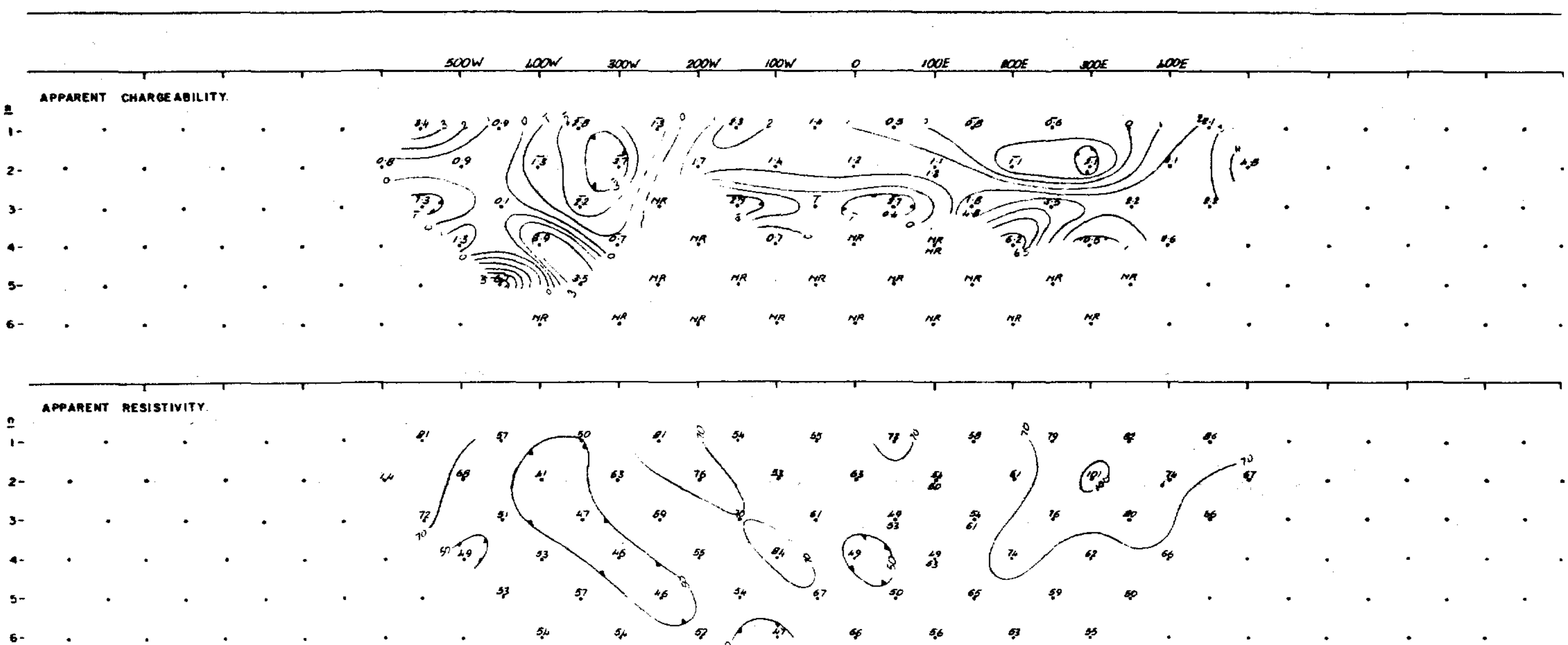
Contractor : SCINTREX (TAS-101)
Date : 4-10-82
Timing : 2 sec
Transmitter : IPC-7 2·5 Kw
Receiver : IPR-8
Integration time :
Array : DIPOLE-DIPOLE
Dipole length : 100m

The Shell Company of Australia Limited
METALS DIVISION
IP / RESISTIVITY SURVEY
E.L. 4/77 HIGHCLERE
I.L. 5
100 S
FIG No. 18
DRG No. D/MQ 03/078

509114

IRBORNE GEOPHYSICS
(EM, MAG, etc)

GEOLOGY
& TOPOGRAPHY



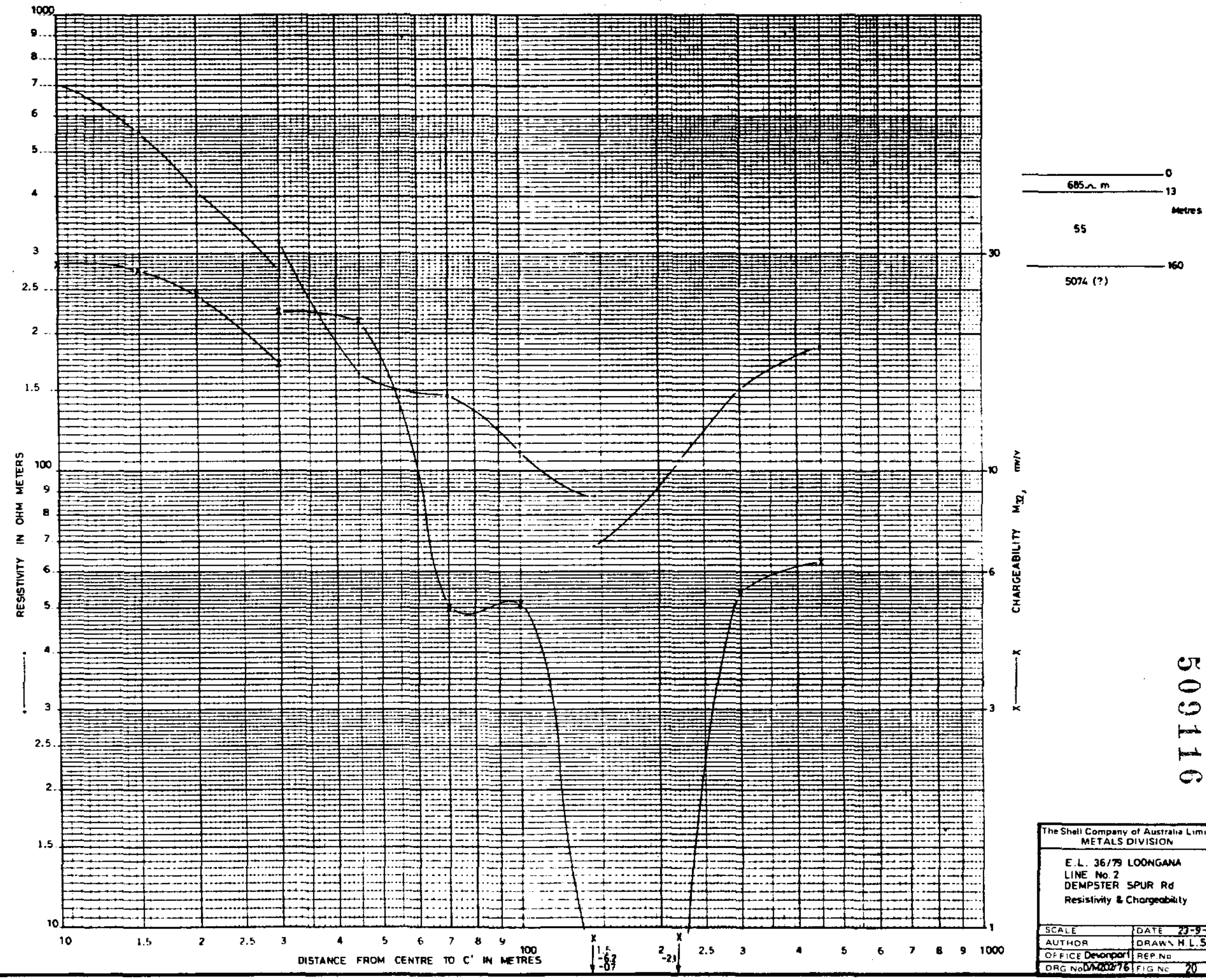
Contractor : SCINTREX (TAS-101)
Date : 6-10-82
Timing : 2 sec
Transmitter : IPC-7 2·5 Kw
Receiver : IPR-8
Integration time :
Array : DIPOLE DIPOLE
Dipole length : 100 m

The Shell Company of Australia Limited
METALS DIVISION
IP / RESISTIVITY SURVEY
E.L. 1/76 GUILDFORD
WEY ROAD - IL 10
00 N
FIG. No. 19
DRG. No. D/MOO2/045

APPENDIX 6

Electrical Sounding

Resistivity - Chargeability Plots

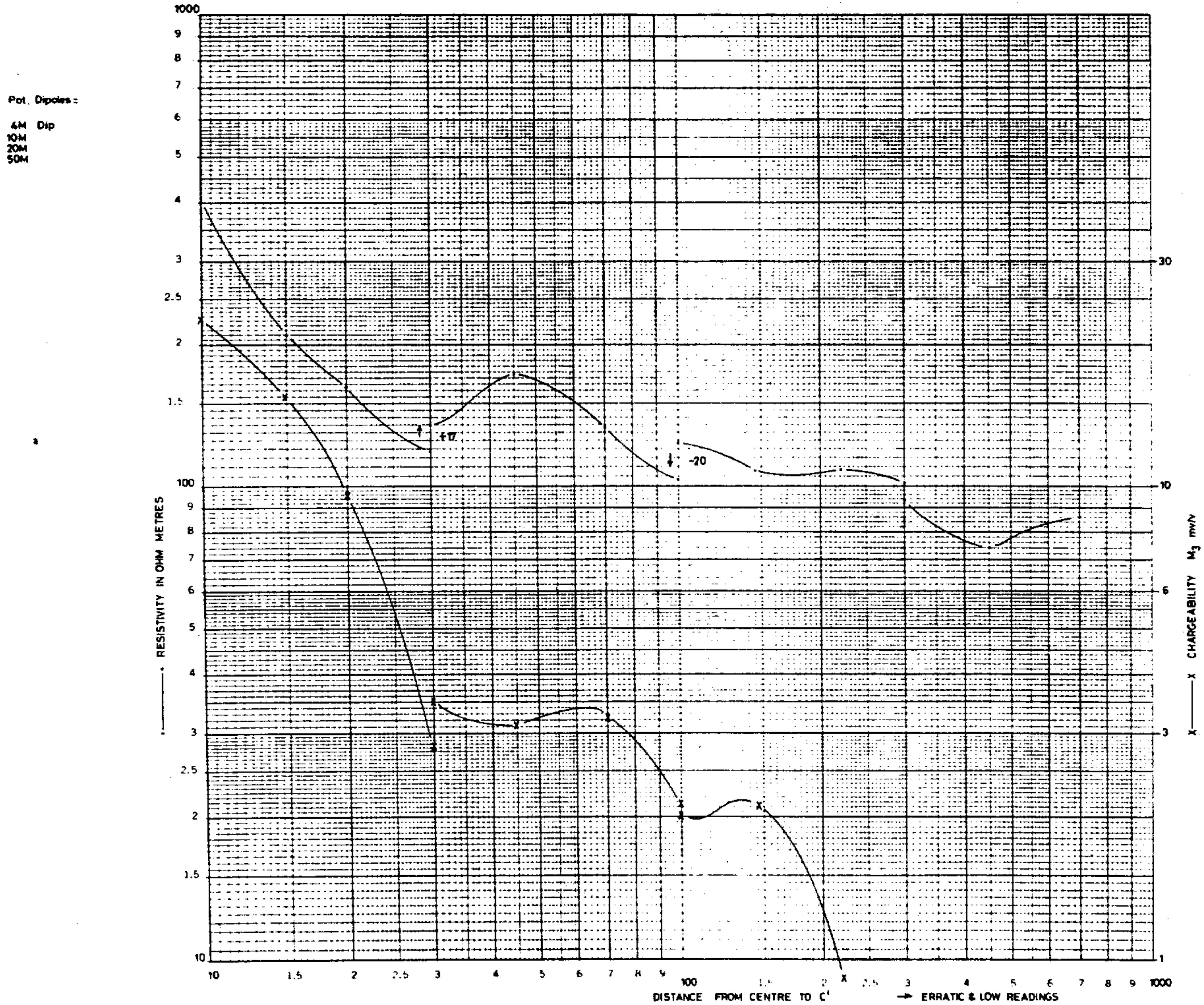


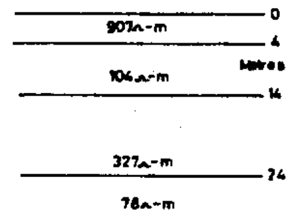
509116

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
LINE No. 2
DEMPSTER SPUR Rd
Resistivity & Chargeability

SCALE	DATE 23-9-82
AUTHOR	DRAWN H.L.S.
OFFICE Devonport	REP.No
DRG No D/M202/76	FIG No 20



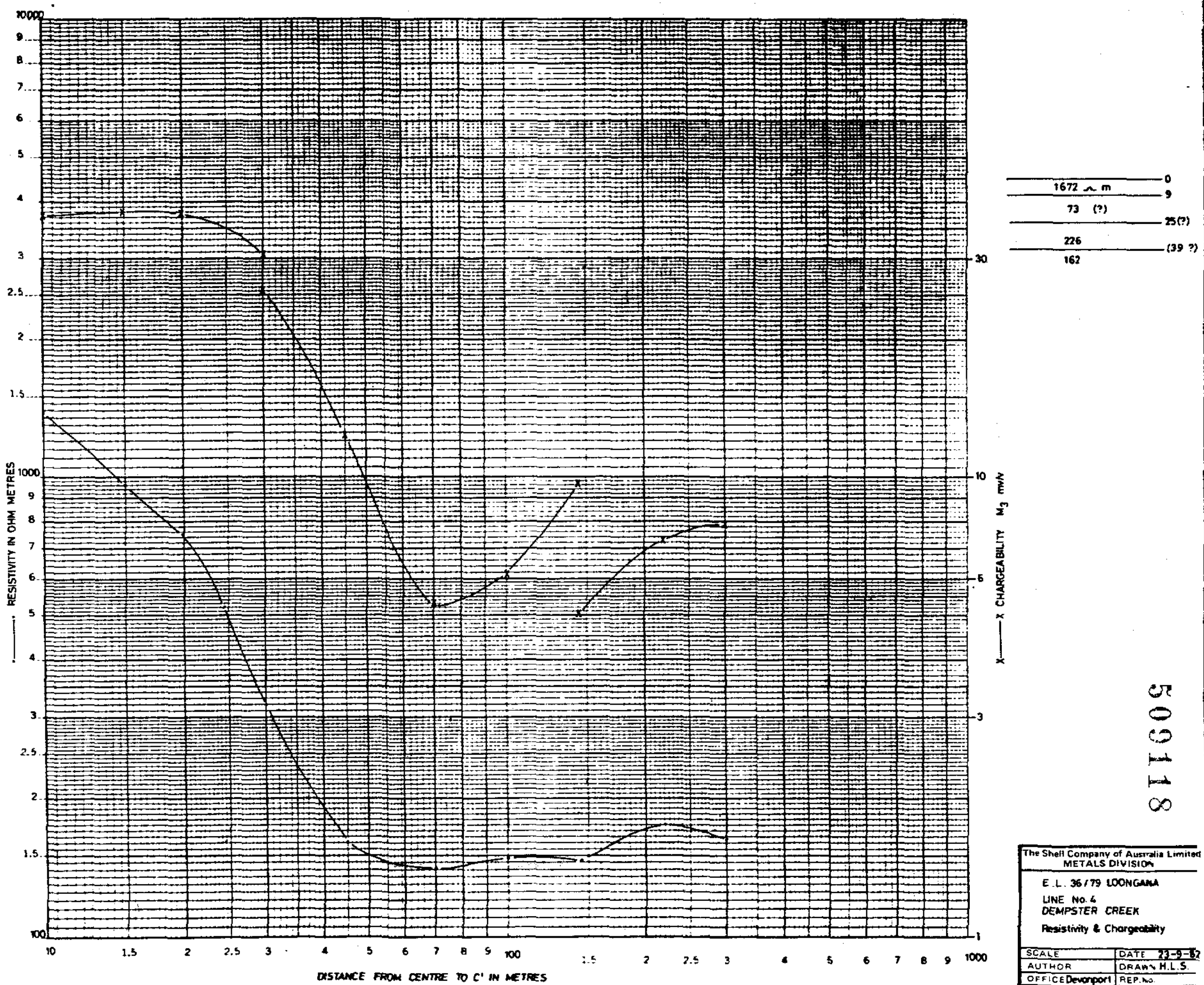


The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
LINE No.3
(adjacent to DDH-GF3)
Resistivity & Chargeability

SCALE	DATE 23-9-82
AUTHOR	DRAWN H.L.S.
OFFICE Devonport	REF.N:
DRG No DM202/77	FIG.No: 21

509117



The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA

LINE No. 4
DEMPSTER CREEK

Resistivity & Chargeability

SCALE	DATE 23-9-82
AUTHOR	DRAWN H.L.S.
OFFICE Devonport	REP. No.
DRG No D/M202/78	FIG. No. 22

5018

APPENDIX 7

Audio - Magnetic Telluric Survey

MACQUARIE UNIVERSITY

CENTRE FOR GEOPHYSICAL EXPLORATION RESEARCH

NORTH RYDE NEW SOUTH WALES 2113 AUSTRALIA
TELEPHONE: 888 8000 EXTN: 9220
TELEGRAPHS & TELEX: MACQUNI AA22377

Director: Professor K. Vozoff
Assistant Director: Dr A.P. Raiche

IN REPLY PLEASE QUOTE: KV:RS

22 March 1983

Final Report : Tasmania AMT Surveys - Shell EL

1. Introduction

AMT measurements were carried out at 11 locations on a Shell EL in the northwest of Tasmania. The general area is shown in Figure 1. The object of the survey was to determine whether AMT could define the thickness of the very irregular basalt cover, the depth to resistive basement, and the thickness of any material between. It is known that resistivities can vary widely amongst flows. Between flows and basement, sediments, skarn and weathered basement are found in places. Banks (1962) notes that the basalt flows covered a surface whose topographic relief in places exceeded 1000 feet. Basement rocks are not exposed in the immediate area but are thought to consist of lower paleozoic metasediments and granites.

To assist in the evaluation there were drill holes at five of the sites, electrical soundings at six sites and a dipole-dipole survey at a seventh. Several of the drill holes did not emerge from basalt, giving only minimum thicknesses. The sites were scattered over an area of 150 square kilometres. Borehole resistivity logs were available at a few places in the area, but values were much larger than observed from the surface measurements.

Dr Roger Lewis of the University of Tasmania helped with on-site inversion in the early part of the program.

2. Results

The equipment functioned without fault for the seven working days of the survey. Data quality was fair, although some power line interference was encountered at a few sites especially 5, 9 and 11. In addition the upper half frequency decade was distorted on both components at nearly all sites on account of high contact resistances. This gave a false downturn in apparent resistivity and phase. On inversion it produced a superficial layer of very low resistivity which artificially reduced the apparent depth to deeper interfaces. As a practical matter it was decided to reject the affected data points. (The problem does not arise with the new junction box).

Results and Discussion

The scalar apparent resistivities, phases and inversion models are shown in Figures 2-17. Resulting models are summarised in Table 1, alongside the drill data and DC inversions. Results are generally consistent with the external data and expectations. Most sites show a 3 layer pattern with a relatively conductive zone sandwiched between a moderately resistive surface layer and a more resistive basement. Basement resistivities are usually less than 1000 ohm-m, well resolved and direction-dependent.

Two outlying sites, 2 and 12, differ from the rest in that they do not have a conductive second layer, and their basement resistivities exceed 1000 ohm-m.

Tensor analyses yield definite strike directions and modest Tippers at all sites. These indicate distinct 'grain', and give its strike direction. This lies between WNW and NNW at sites 3, 4, 5, 10 and 11. At sites 2 and 12 it is NNE-NE. Tippers are largest at sites 1 and least at 2, 5 and 8. With more closely spaced sites it might be possible to map bedrock geology. The task would be complicated by buried topography but assisted by the frequency dependence of data rotations.

AMT results will differ from drill results for several reasons in an area of this kind. Buried topographic relief is important in some places. This is evidenced by major depth differences between the two AMT components, which are local averages in their respective directions. For example, at site 1 it appears that the base of the top (resistive) layer is roughly horizontal, but that the surface of the resistive basement has N-S oriented topographic relief, with an average (local) depth to the tops of 160 m. This accords with aeromagnetic indications.

Likewise AMT and DC results might differ for example because of their different responses to a thin resistive layer. Differences of this kind are resolved by joint inversion using anisotropic layers.

Usually the AMT and DC resistivities agree, and are much less than the borehole log values. The reason for the discrepancy is not known.

Conclusions

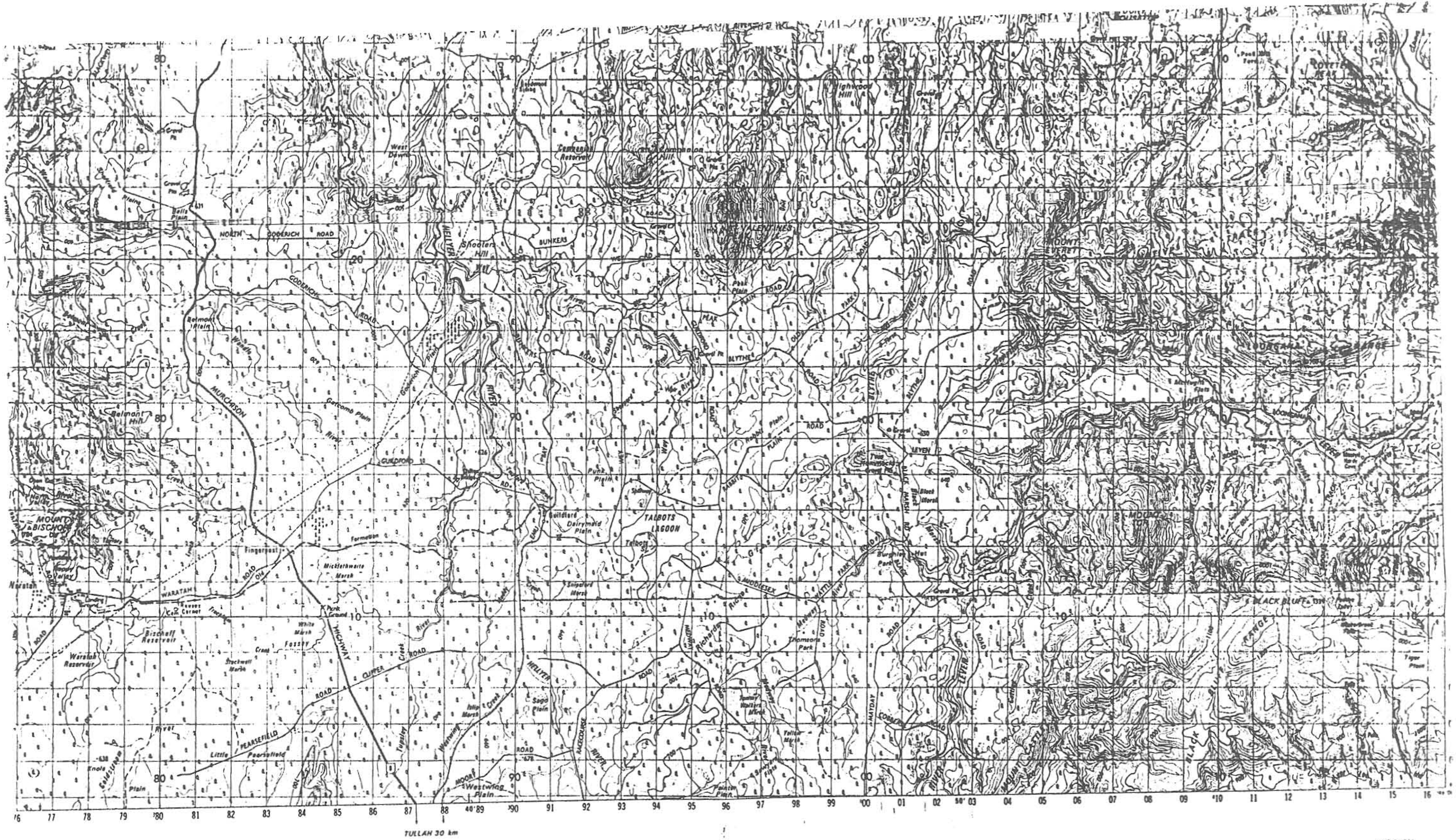
The AMT survey successfully achieved the objectives set out for it. The technique also indicated a potential for more detailed application to mapping bedrock beneath flows, but this would require more closely spaced sites.

While many improvements can be made, the system as it stands is practical and suited to its demonstration function.

We are indebted to Dr Roger Lewis for his help.

TABLE 1 Tasmania AMT Results : Shell Area : January 1983

SITE	EXHY	EYHX	JOINT with XY	JOINT with YX	DC	DRILLING	COMMENTS
1	87 — 119 26 — 245 570	85 — 114 16 — 164 1800	83 — 160 8 — 190 600			Basalt — 202 Seds,skarn — 255 Granite	N-S aeromag trend Dipole-dipole DC
2	50 — 420 980	40 — 360 1800					
3	65 — 26 39 — 260 980	35 — 58 26 — 235 390				→250 m of basalt	
4	20 — 34 140 — 105 30 — 330 570	20 — 50 60 — 60 40 — 320 170	(1000) — 1.5 14 — 6 40 — 430 770	(1000) — 1.2 23 — 90 60 — 440 290	104 — 1 55 — 130 10 — 150 (400)		N-S DC sounding (#6)
5	(4000) — (230) (3) — (250) 620	95 — 47 26 — 92 970					Noisy EXHY
6	76 — 213 9 — 250 2000	60 — 102 30 — 350 190		270 — 1 57 — 100 30 — 250 200	1000 — 4 130 — 180 10 — 230 (300)	Basalt >90 m	N-S DC sounding (#3)
7	NOT OCCUPIED						
8	50 — 230 5 — 270 440	60 — 200 19 — 330 260	53 — 245 3 — 255 430	53 — 245 7 — 300 280	700 — 5 60 — 220 (11) — 250 (300)		NW-SE DC sounding (#5)
9	54 — 240 10 — 290 230	63 — 170 16 — 270 390				Basalt >90 m	Noisy
10	40 — 160 2 — 180 600	40 — 56 34 — 310 530					
11	50 — 190 25 — 280 400	40 — 120 25 — 200 180					Noisy
12	25 — 13 70 — 210 1000	16 — 9 50 — 110 1100					



SCALE 1:100000

Kilometres 2 1 0 2 4 6 8 10 12 Kilometres

BLACK NUMBERED GRID LINES ARE 1000 METRE INTERVALS OF THE AUSTRALIAN MAP GRID, ZONE 55

GRID VALUES ARE SHOWN IN FULL ONLY AT THE SOUTH WEST CORNER OF THE MAP

HORIZONTAL DATUM: AUSTRALIAN GEODETIC DATUM 1966

VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM

TRANSVERSE MERCATOR PROJECTION

CONTOUR INTERVAL 20 METRES

ELEVATIONS IN METRES

5 cm

DUCED by the Survey Branch, Lands Department, Hobart, under the direction of the Minister
Minerals and Energy, as part of the national mapping programme
ITED by authority of the Minister for Minerals and Energy, 1975
RIBUTED by the Department of Minerals and Energy. A state edition is available from the
Department, Hobart
ACCURACY The average accuracy of this map is ± 25 metres in the horizontal position
of defined detail and ± 5 metres in elevation
RELIABILITY Topographic information shown on this map is correct to 1975.
CLASSIFICATION Roads are classified according to their intended function as part of the
nal road system

GRID REFERENCE

TO GIVE A UNIQUE REFERENCE ON THIS SHEET TO NEAREST 100 METRES

IGNORE the SMALLER figures of any grid number; these are for finding the full
...Use ONLY the LARGER figures of the grid number e.g. 175...

Built-up area: National route marker ....

Principal road and highway: Cutting ....

Secondary road: Embankment ....

Fence: Levee or bank ....

Mine; Windmill; Yard; Quarry ....

Building/s: Church; Ruin: Drive-in theatre ....

Lake, perennial; Stream, perennial ....

Lake, intermittent; Stream, intermittent ....

Lake, mainly dry; Stream, mainly dry ....

GRID CONVERGENCE 0.9°

GN TN MN

GRID/MAGNETIC ANGLE 11.6°

NMP/74/251

INDEX TO ADJOINING MAPS

CIRCULAR HEAD 7916	TABLE CAPE 8016	BASS STRAIT
ARTHUR RIVER 7915	HELLYER 8015	FORTH 8115
PIEMAN 7914	SOPHIA 8014	MERSEY 8114

devonport

SHELL TASMANIA SITE 1 INV -3 XY

SHELL TASMANIA SITE 1 INV -3 YX

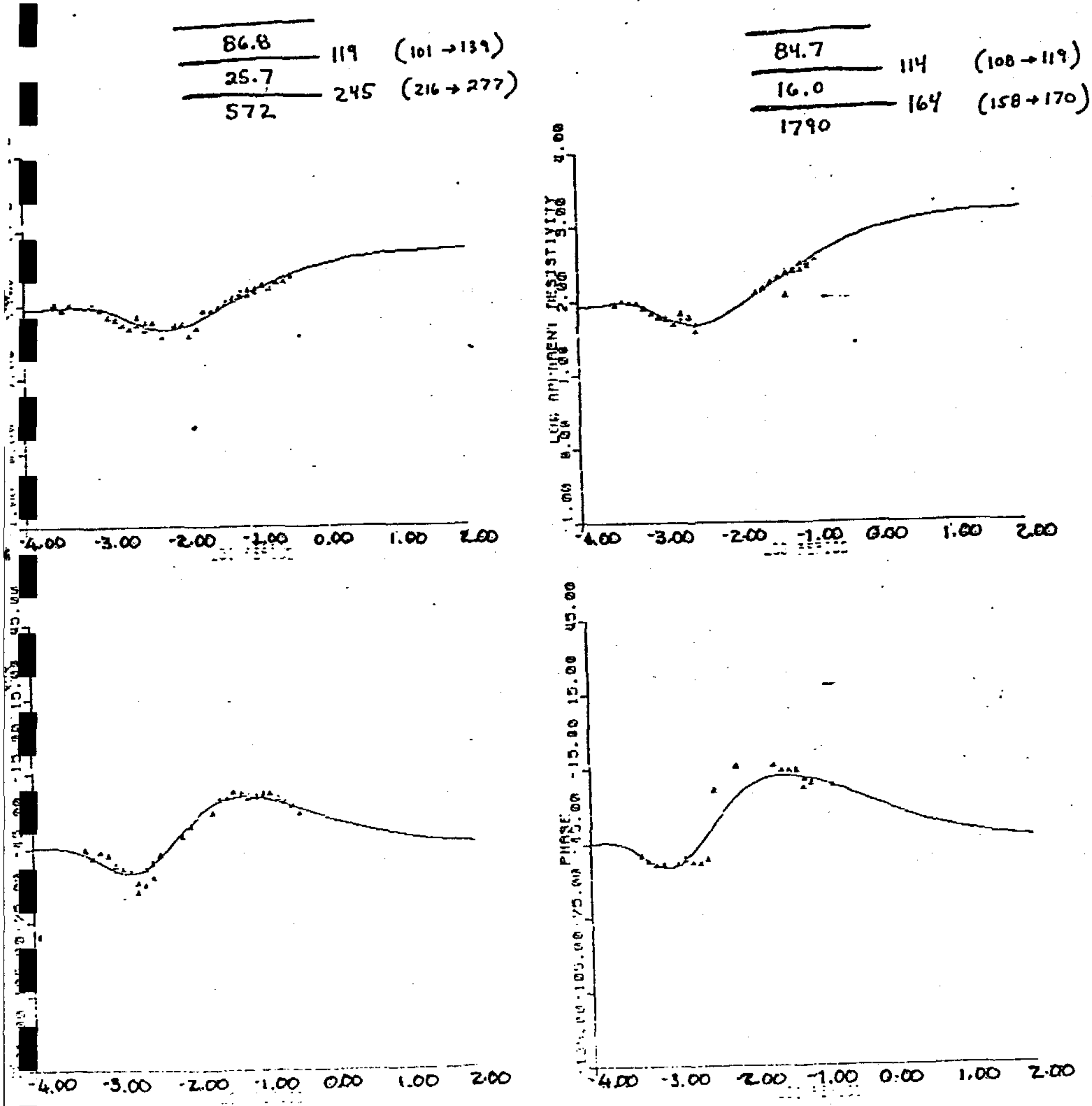


FIGURE 2

SHELL TASMANIA SITE 2 INV -3
XY

49.7 / 982 — 420 (402 → 438)

SHELL TASMANIA SITE 2 INV -3
YX

41 / 1800 — 362 (342 → 381)
1800 / 134 — 2017 (1758 → 2314)

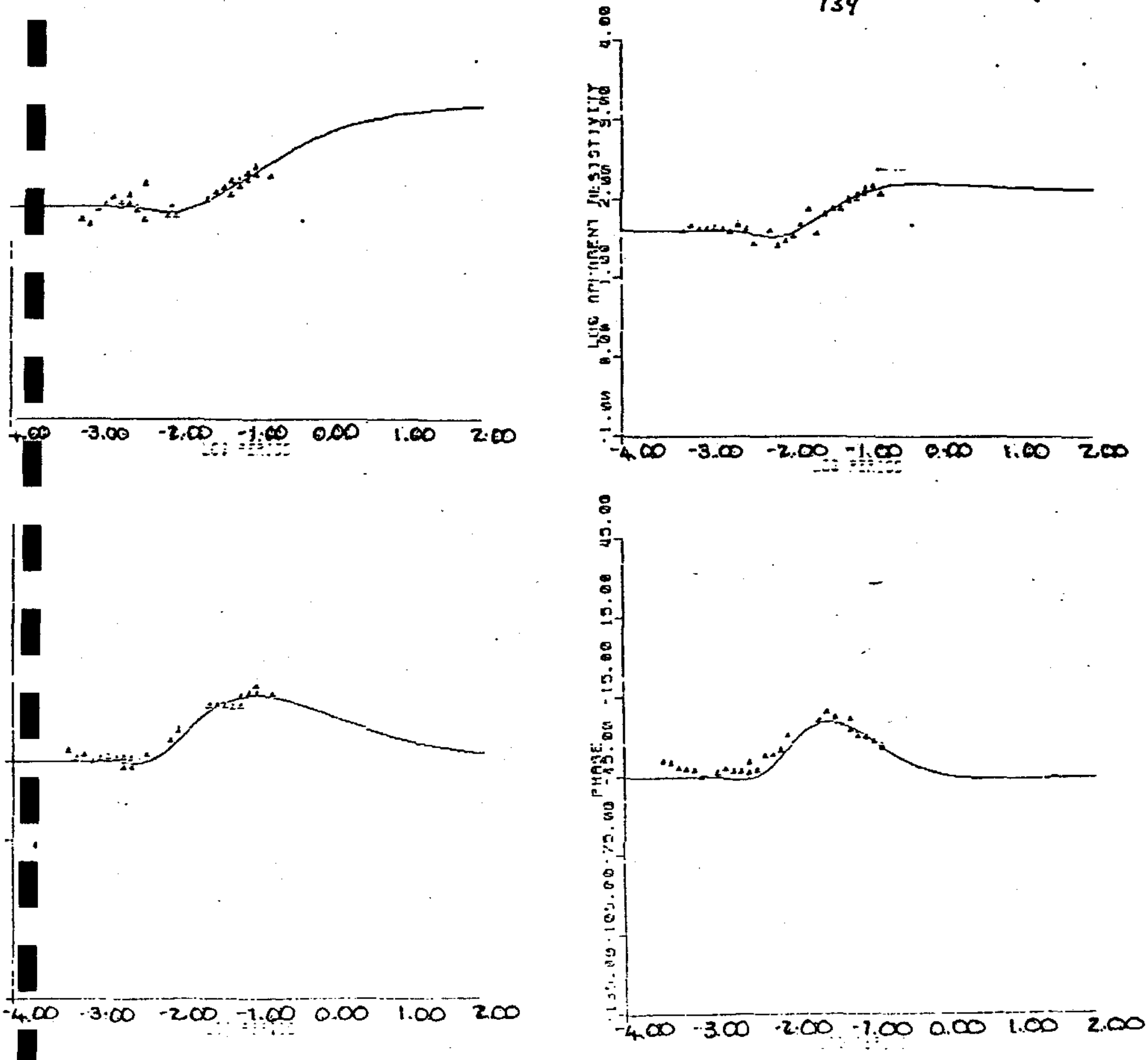


FIGURE 3

SHELL TASMANIA SITE 3 INV-2
XY.

SHELL TASMANIA SITE 3 INV-3
YX

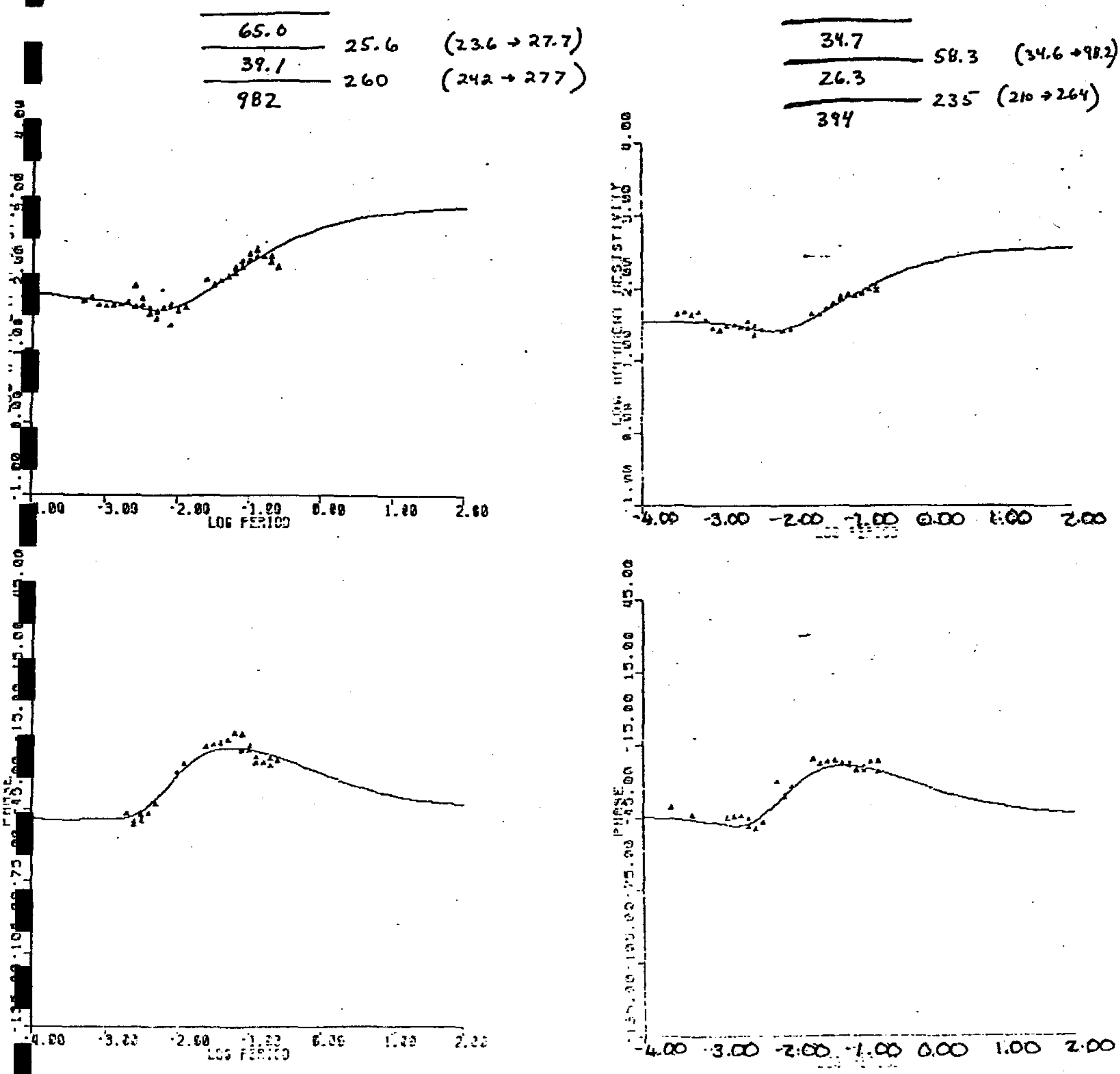
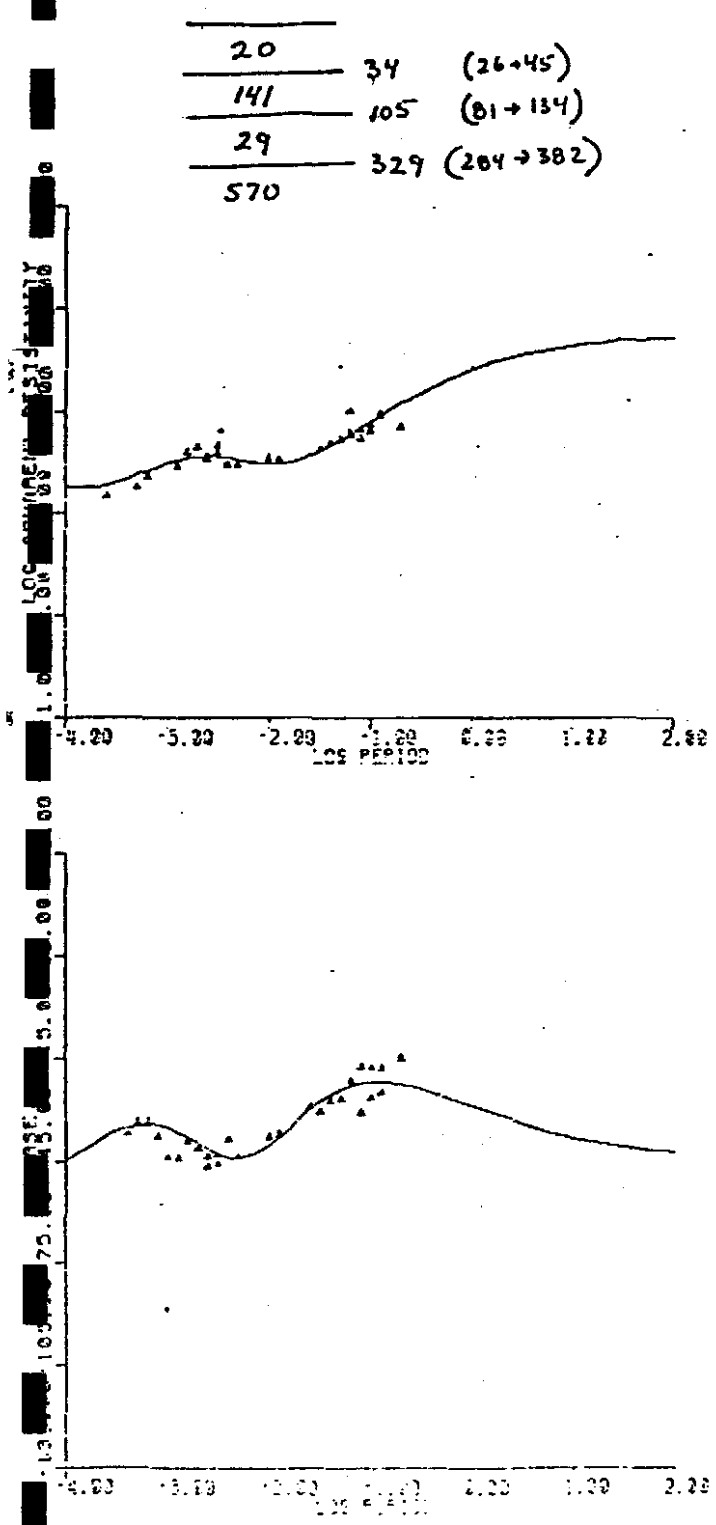


FIGURE 4

SHELL TASMANIA SITE 4 INV-3
XY



SHELL TASMANIA SITE 4 INV-4
YX

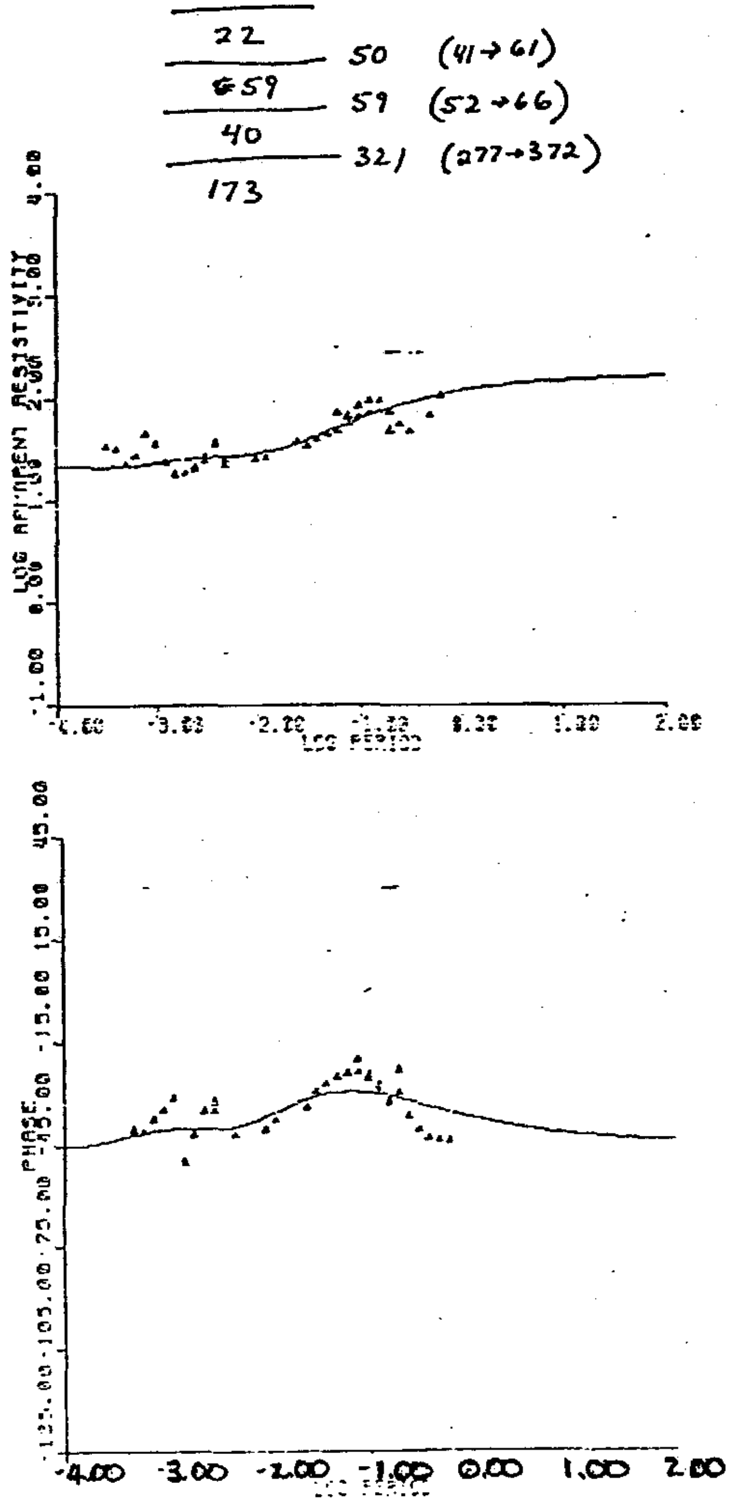
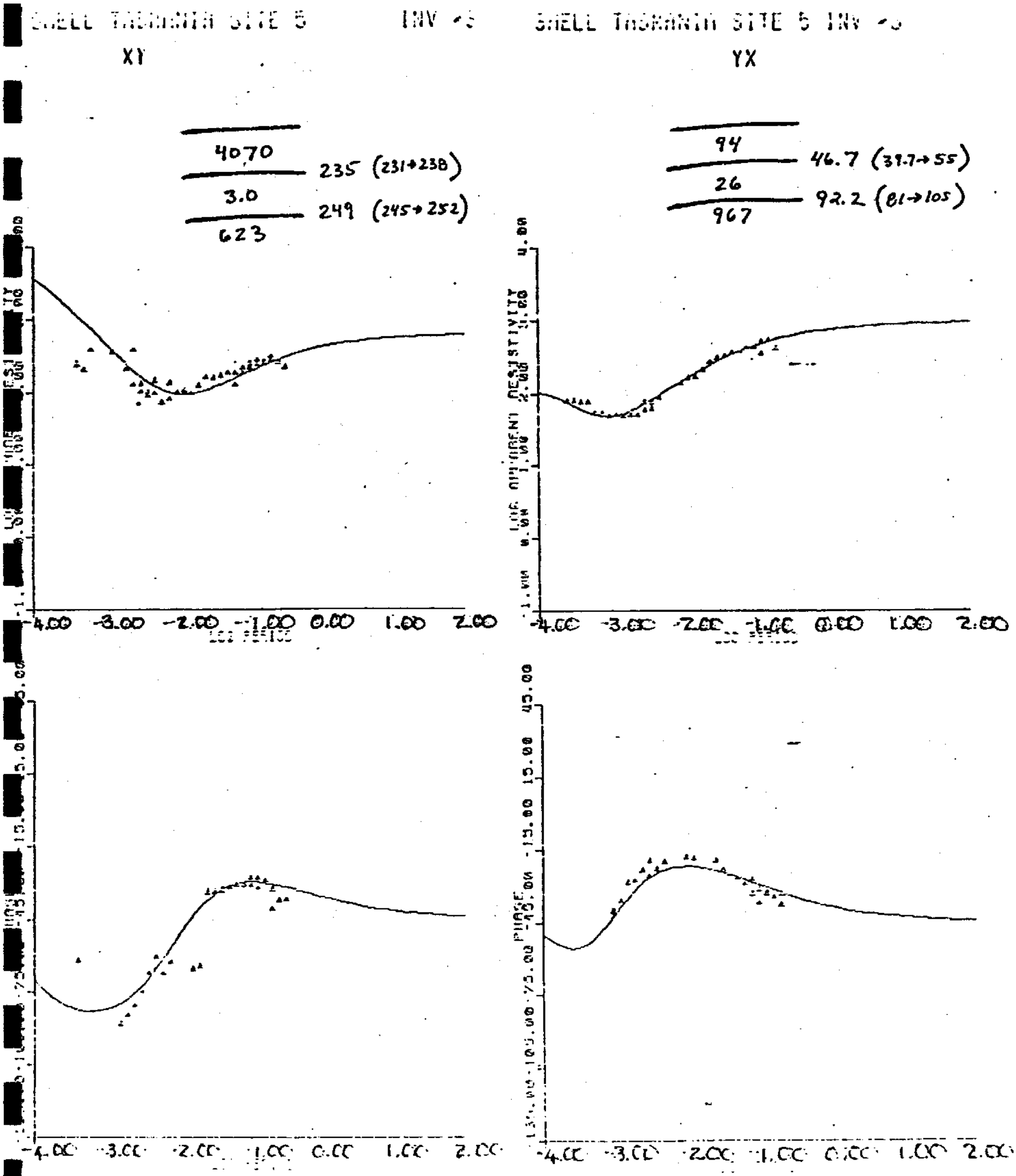


FIGURE 5



XY
YX
4070
235 (231→238)
3.0
249 (245→252)
623
94
46.7 (37.7→55)
26
92.2 (81→105)
967
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00

FIGURE 6

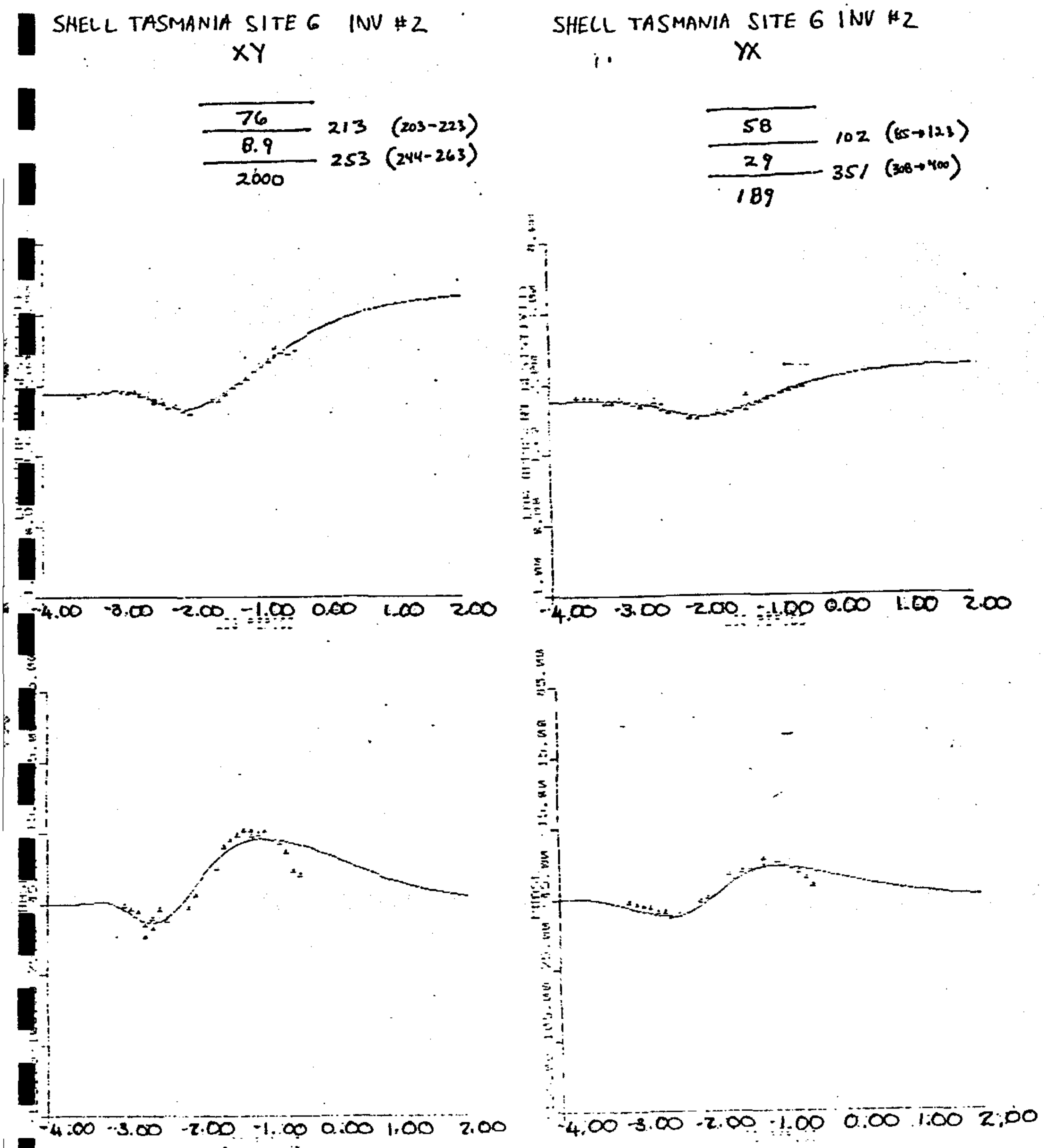

SHELL TASMANIA SITE 6 INV #2
XY
76
213 (203-223)
8.9
253 (244-263)
2000
SHELL TASMANIA SITE 6 INV #2
YX
58
102 (65→123)
29
351 (308→400)
189
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00

FIGURE 7

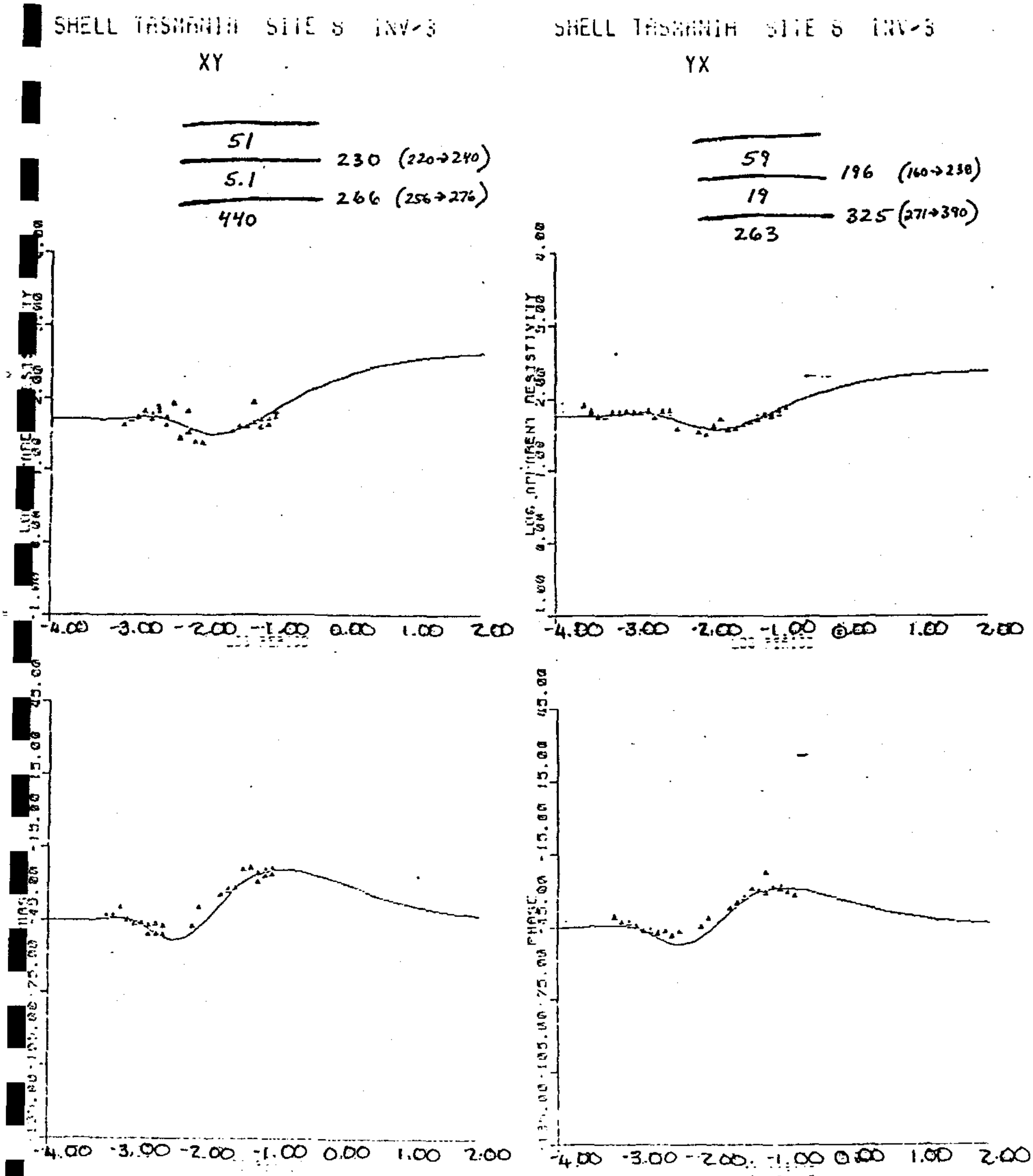
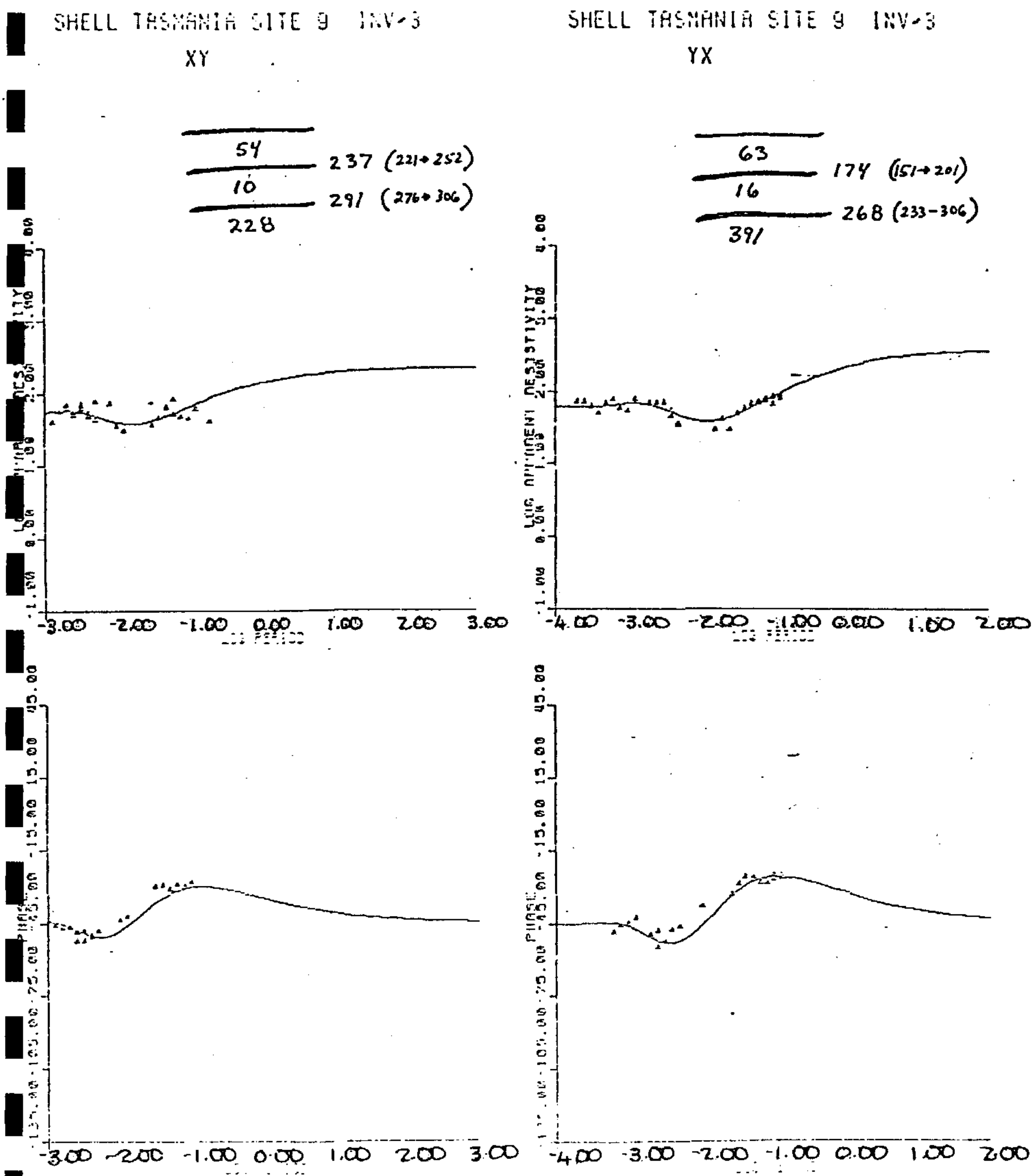

SHELL TASMANIA SITE 8 INV-3
XY
51
230 (220→240)
5.1
266 (256→276)
440
SHELL TASMANIA SITE 8 INV-3
YX
59
196 (160→230)
19
325 (271→390)
263
LOG APPARENT RESISTIVITY
PHASE
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00

FIGURE 8



SHELL TASMANIA SITE 9 INV-3
XY
54
237 (221→252)
10
291 (276→306)
228
SHELL TASMANIA SITE 9 INV-3
YX
63
174 (151→201)
16
268 (233-306)
391
LOG APPARENT RESISTIVITY
PHASE
-3.00 -2.00 -1.00 0.00 1.00 2.00 3.00
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00

FIGURE 9

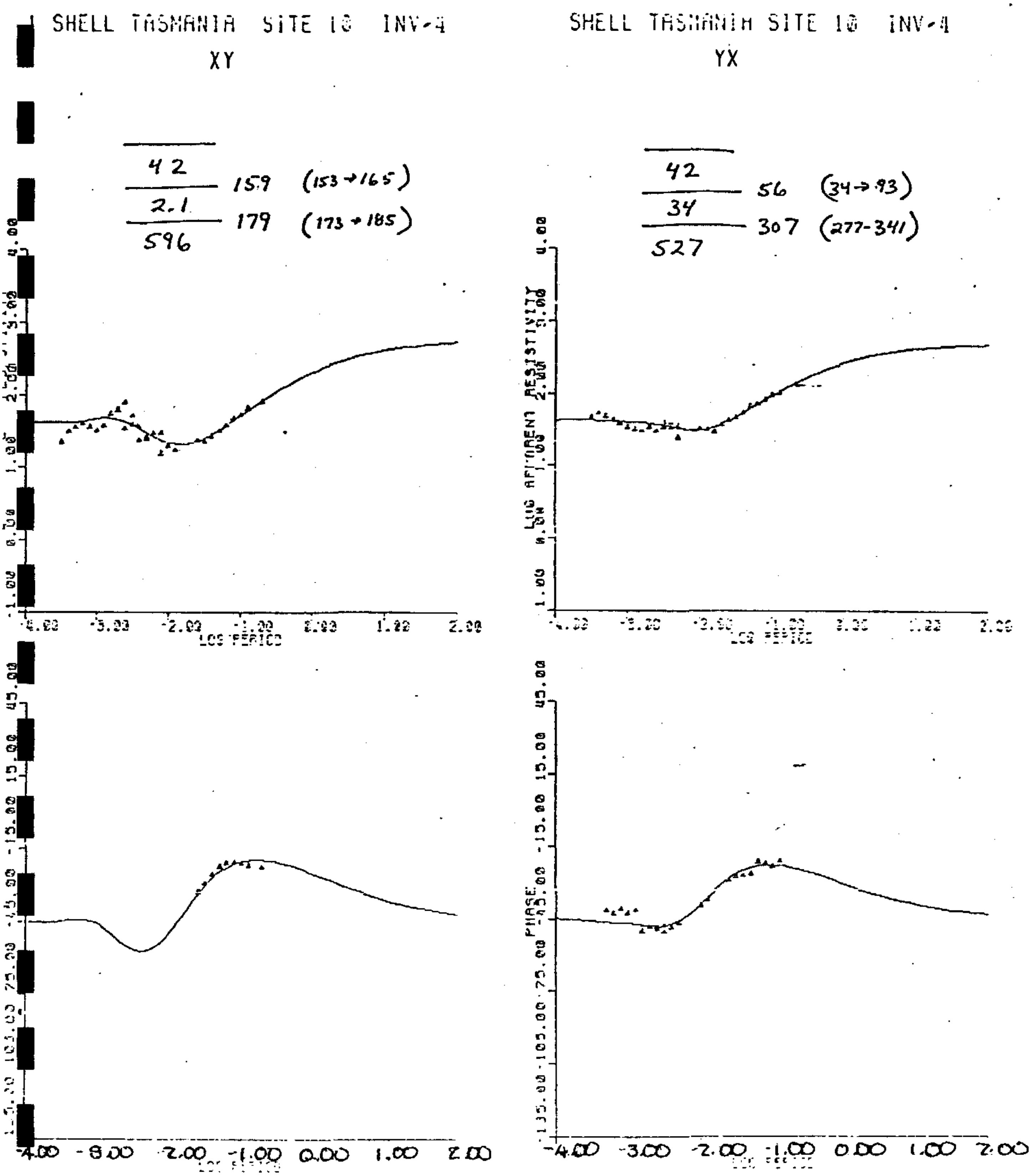

SHELL TASMANIA SITE 10 INV-4
XY
42
2.1
596
159 (153→165)
179 (173→185)
SHELL TASMANIA SITE 10 INV-4
YX
42
34
527
56 (34→93)
307 (277-341)
LOG APPARENT RESISTIVITY
LOG PERIOD
PHASE
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00

FIGURE 10

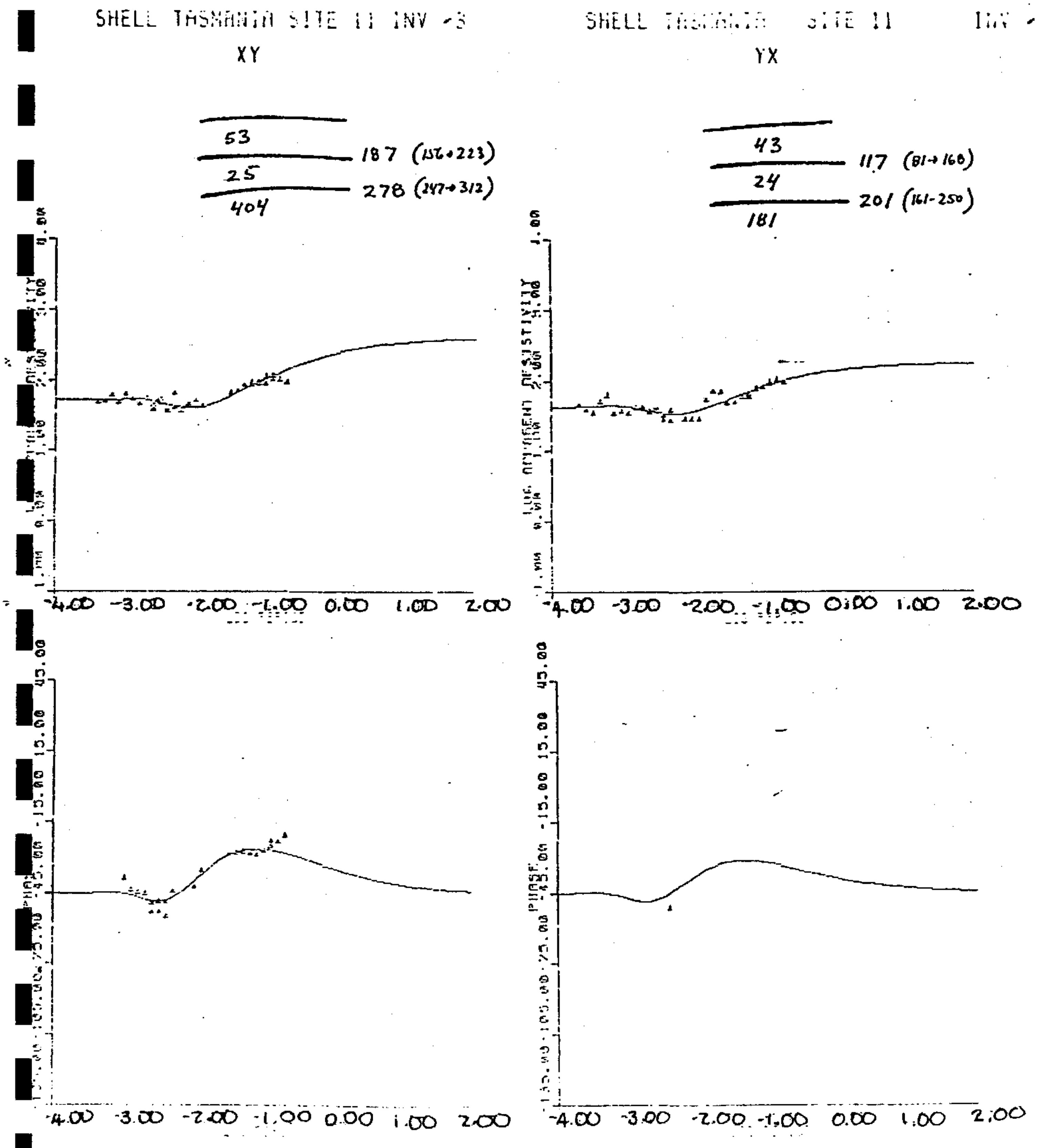

SHELL TASMANIA SITE 11 INV -3
XY
SHELL TASMANIA SITE 11 INV -3
YX
53
187 (156→223)
25
278 (247→312)
404
43
117 (81→160)
24
201 (161-250)
181
LOG APPARENT RESISTIVITY
PHASE
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00

FIGURE 11

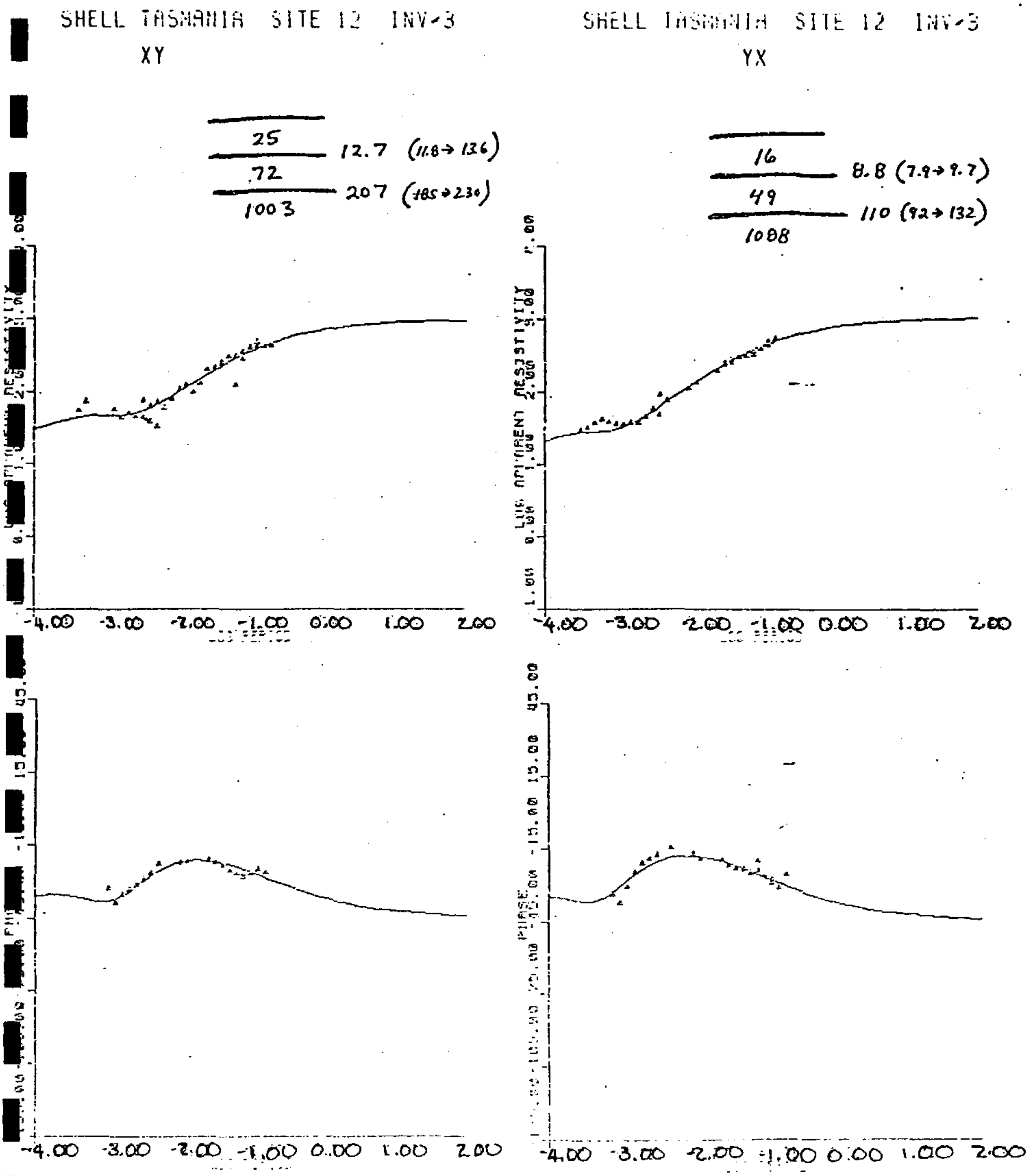
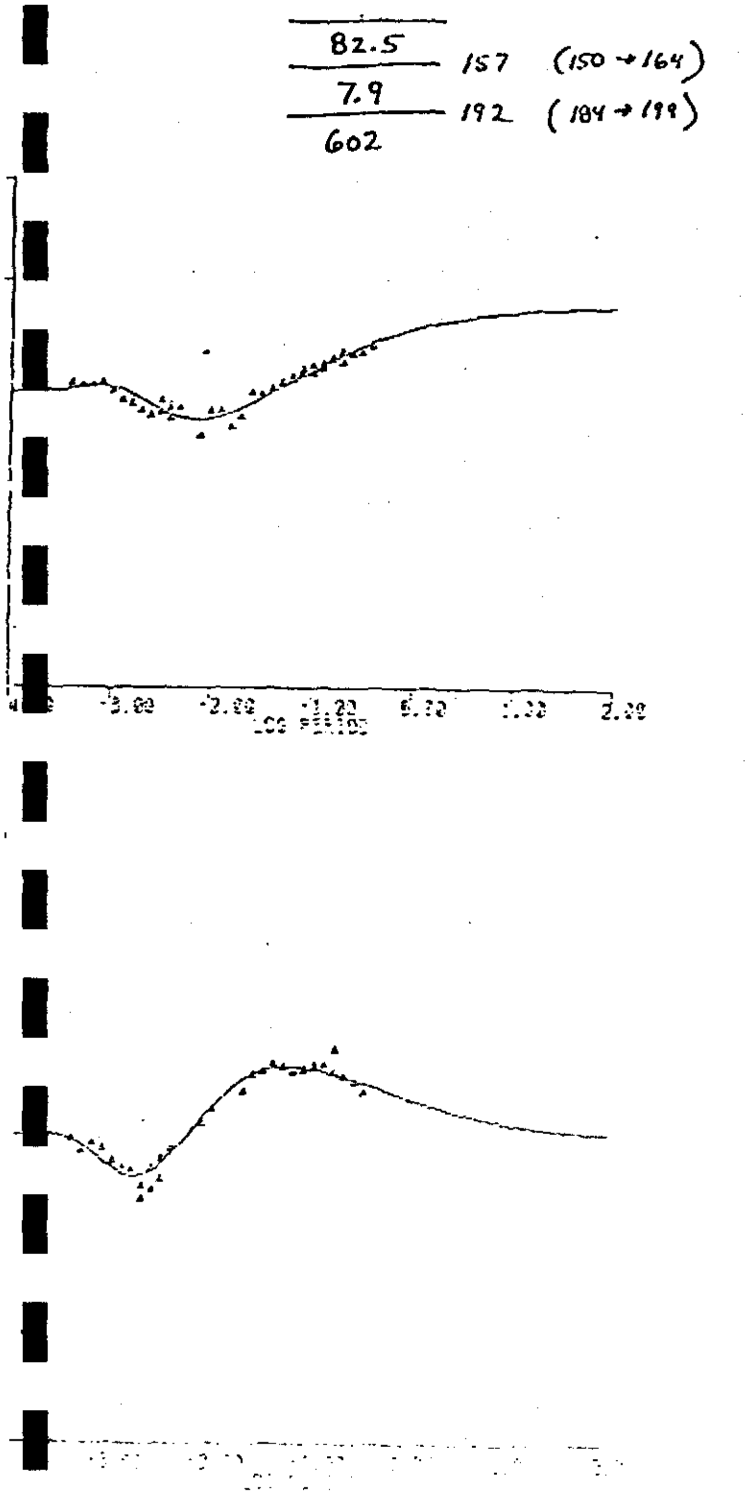

SHELL TASMANIA SITE 12 INV-3
XY
SHELL TASMANIA SITE 12 INV-3
YX
25
12.7 (11.8→13.6)
72
207 (185→230)
1003
16
8.8 (7.9→9.7)
49
110 (92→132)
1088
LOG APPARENT RESISTIVITY
PHASE
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00
-4.00 -3.00 -2.00 -1.00 0.00 1.00 2.00

FIGURE 12

SHELL TASMANIA SITE 1 JOINT INVERSION
AMT XY DATA AND DIPOLE DIPOLE



SHELL TASMANIA SITE 1 JOINT INVERSIO
AMT XY DATA AND DIPOLE DIPOLE

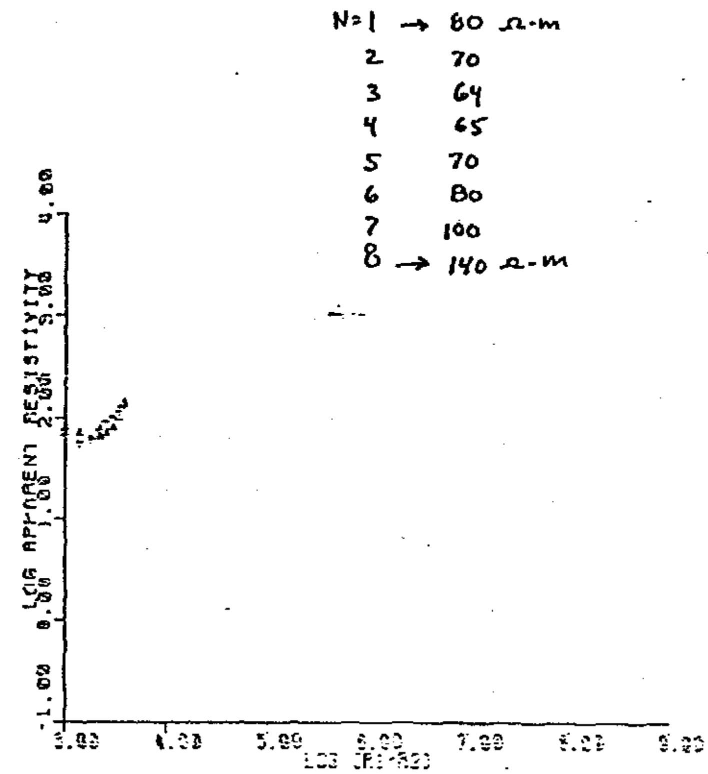
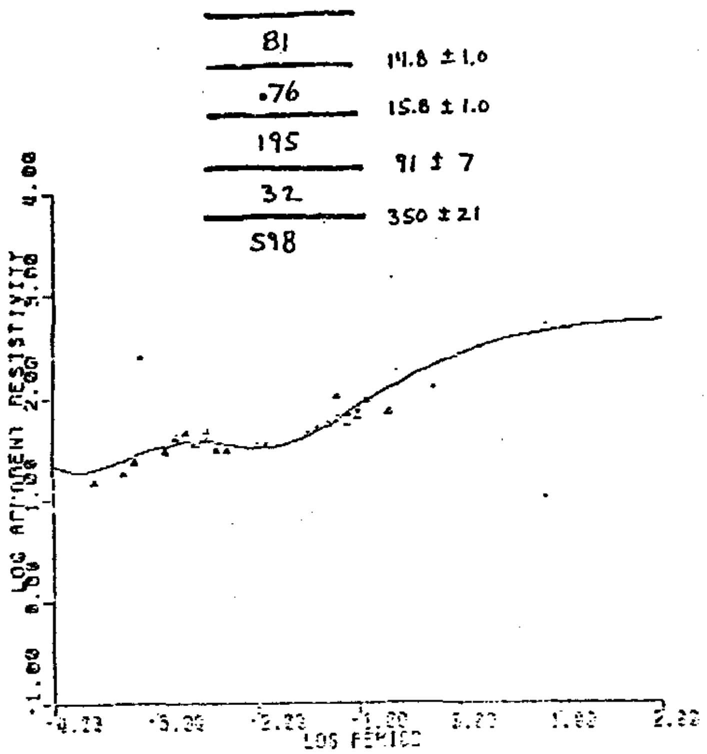
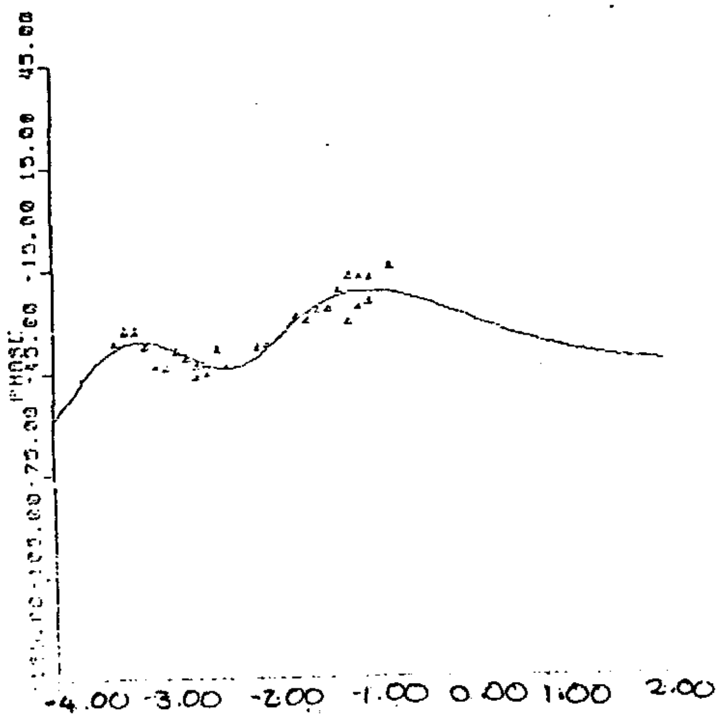


FIGURE 13

SHELL TASMANIA SITE 4 JOINT INV-1
XY DATA WITH VES SITE 6





SHELL TASMANIA SITE 4 JOINT INV-1
XY DATA WITH VES SITE 6

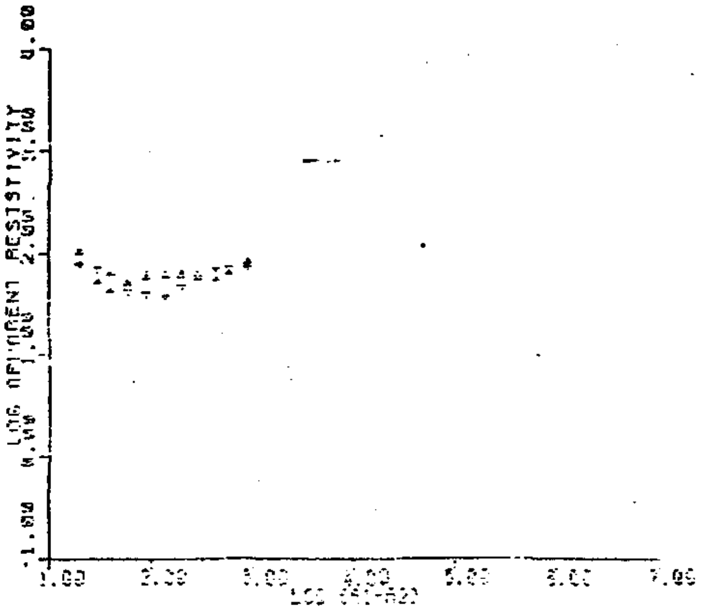
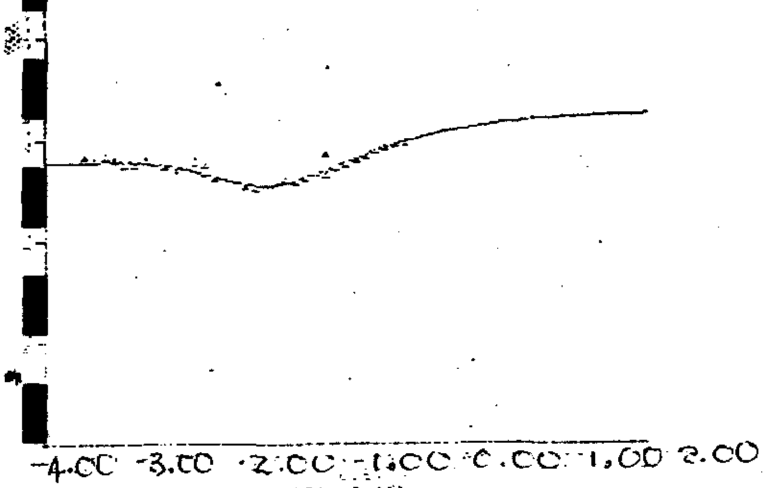


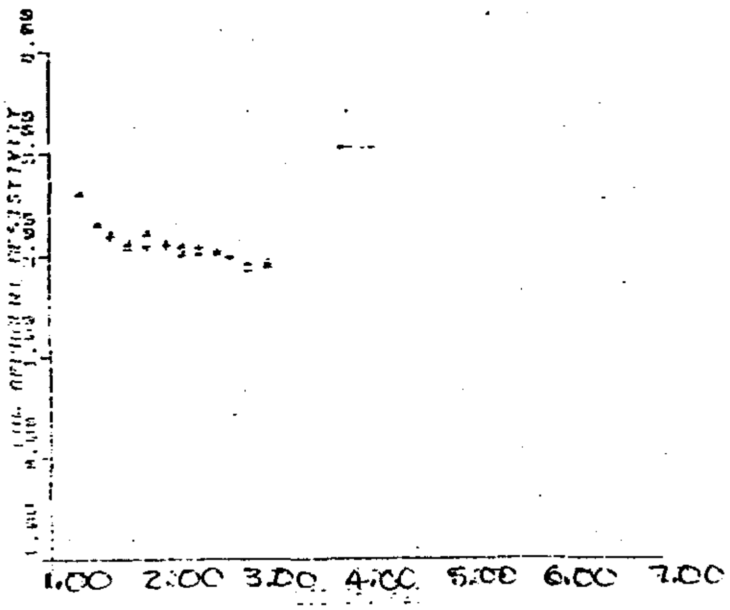
FIGURE 14

SHELL TASMANIA SITE 6 JOINT INV-1
MT YX DATA WITH VES-3 ANISOTR

SHELL TASMANIA SITE 6 JOINT INV-1 A
MT YX DATA WITH VES-3 ANISOTR

HORIZONTAL		VERTICAL	
268	1.14	3280	(.9→1.4)
57	100	264	(82→122)
29	250	18	(207→304)
188		3196	





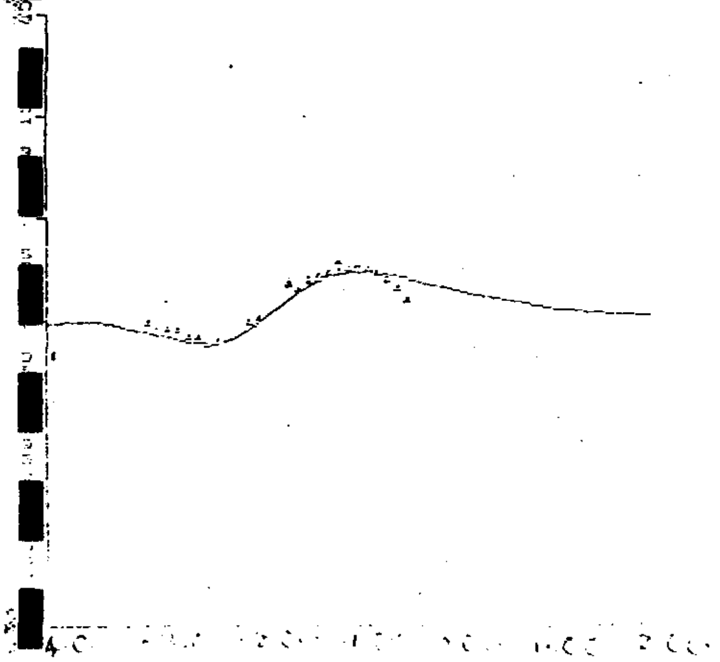
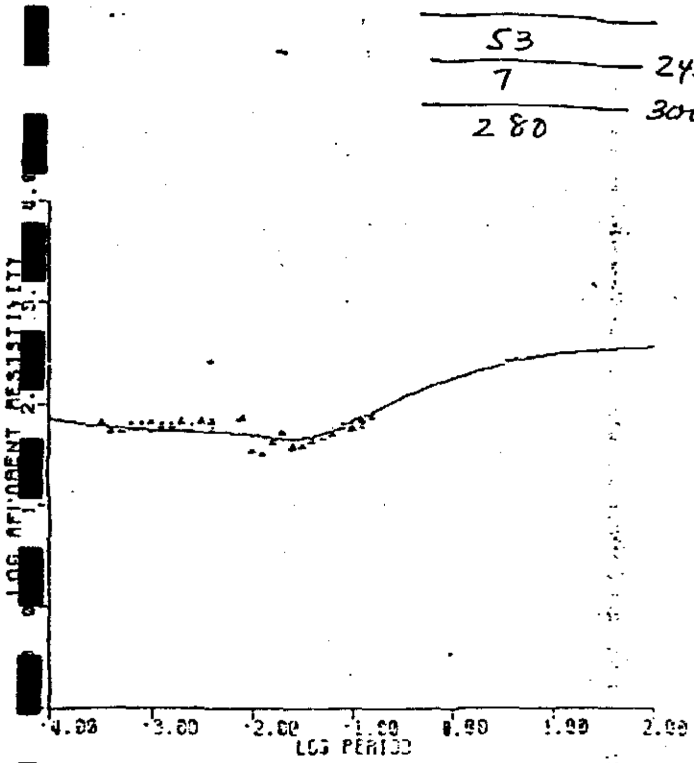
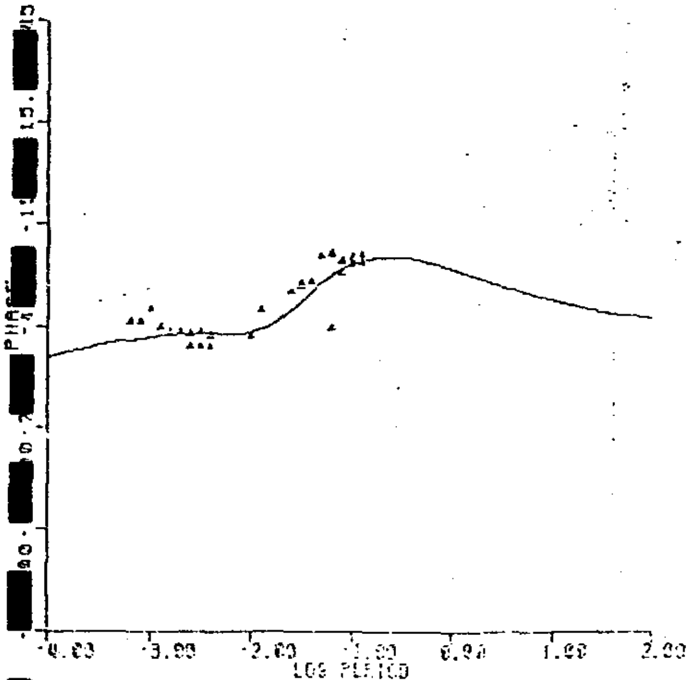


FIGURE 15

SHELL TASMANIA 8 YX JOINT WITH DC SOUNDING 5 ANIS -3





SHELL TASMANIA 8 XY JNT WITH DC SOUNDING 5 ANIS -3

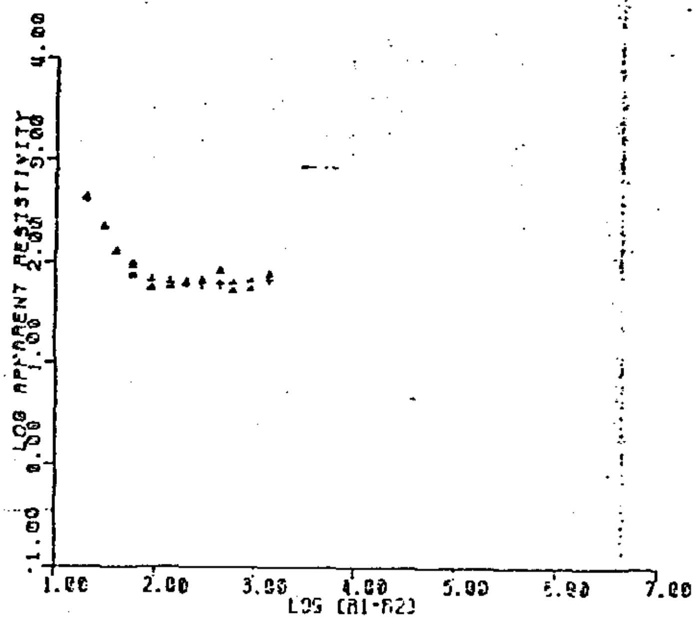
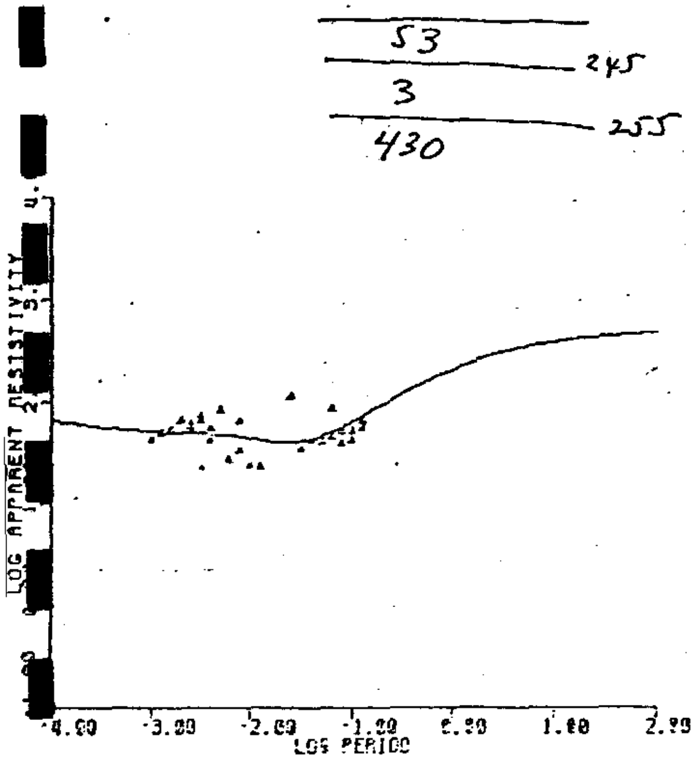
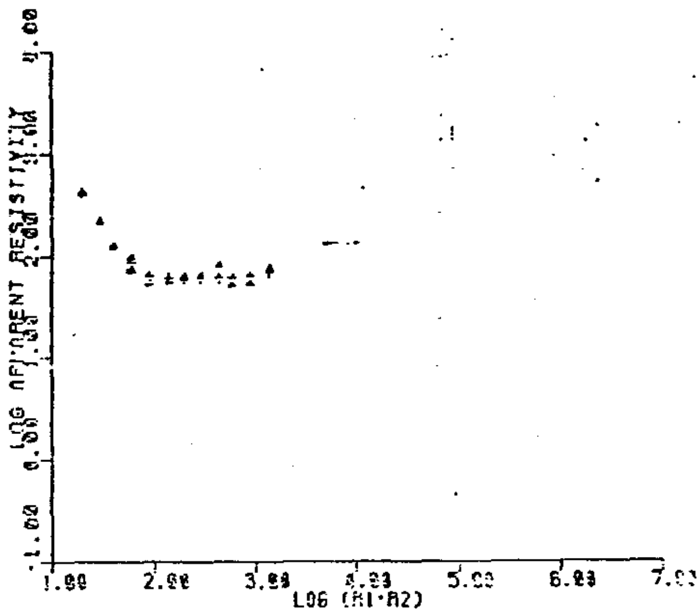


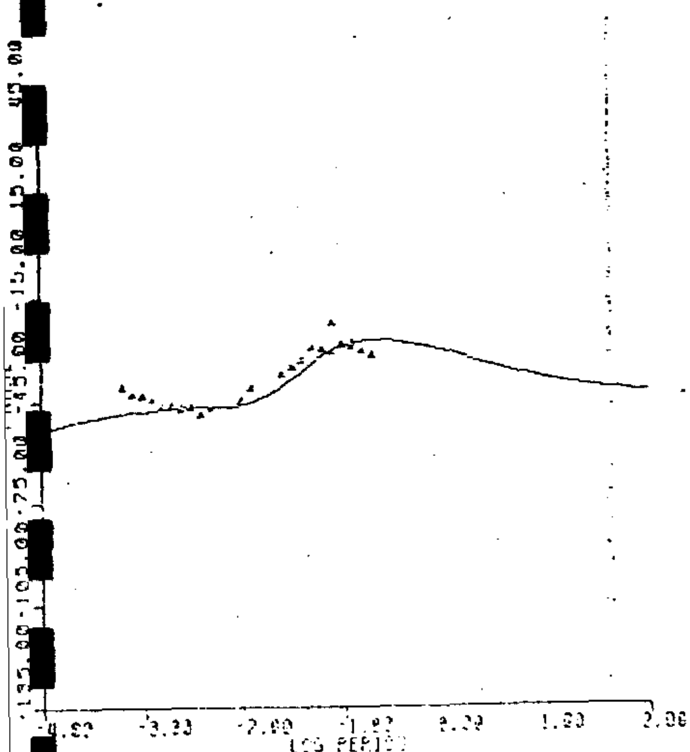
FIGURE 16

SHELL TASMANIA 8 XY JNT WITH DC SOUNDIN G 5 ANIS -3



SHELL TASMANIA 8 YX JOINT WITH DC SOUNDING 5 ANIS -3





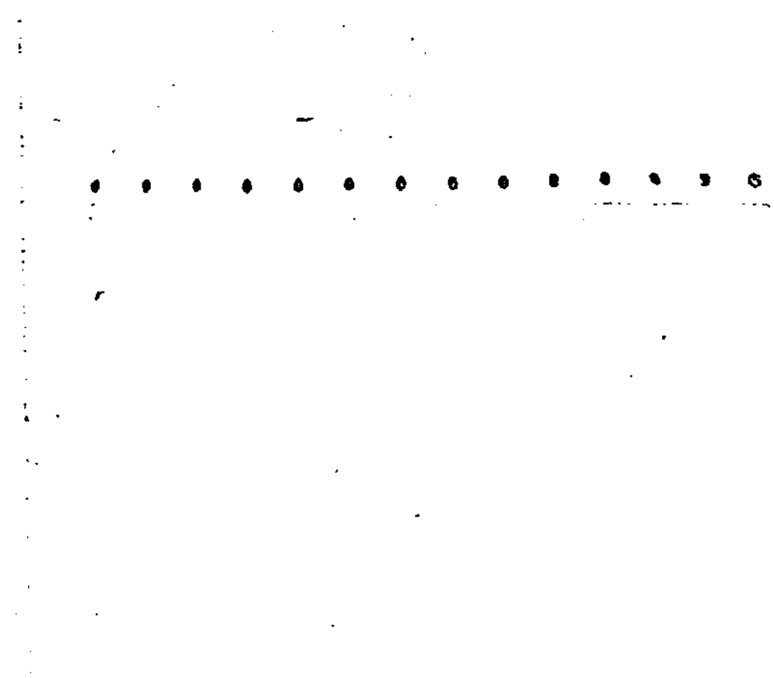


FIGURE 17

509140

LIST OF PLANS

Drawing No.	Title	Scale
D/MZ 02/048	E.L. 36/79 - Loongana - Geology	1:50,000
D/MZ 02/074	E.L. 36/79 - Loongana - Residual Aeromagnetic Contours	1:50,000
D/MZ 02/015	Airborne Magnetic Anomaly 4041/2 - Reconnaissance Ground Magnetics	1:2,500
D/MZ 02/016	Airborne Magnetic Anomaly 4041/4 - Reconnaissance Ground Magnetics	1:2,500
D/MZ 02/017	Airborne Magnetic Anomaly 4041/5 - Reconnaissance Ground Magnetics	1:2,500
D/MZ 02/018	Airborne Magnetic Anomaly 4041/6 - Reconnaissance Ground Magnetics	1:2,500
D/MZ 02/019	Airborne Magnetic Anomaly 4041/4 - Reconnaissance Ground Magnetics	1:2,500
D/MZ 02/020	Airborne Magnetic Anomaly 4141/5 - Reconnaissance Ground Magnetics	1:2,500
D/MZ 02/021	Airborne Magnetic Anomaly 4141/6 - Reconnaissance Ground magnetics	1:2,500
D/MZ 02/001	Nietta South Anomaly 4241/1 - Preliminary Ground Check	1:2,500
D/MZ 02/067	Aeromagnetic Anomaly 4141/2 - Initial Ground Check	1:2,500
D/MZ 02/068	Aeromagnetic Anomaly 4041/8 - Initial Ground Check	1:2,500
D/MZ 02/069	Aeromagnetic Anomaly 4041/1 - Initial Ground Check	1:2,500
D/MZ 02/093	Challenger II Prospect - Geology	1:2,500
D/MZ 02/094	Challenger II Prospect - Soil Geochemistry - Lead	1:2,500
D/MZ 02/095	Challenger II Prospect - Soil Geochemistry - Zinc	1:2,500
D/MZ 02/096	Challenger II Prospect - Soil Geochemistry - Iron	1:2,500
D/MZ 02/097	Challenger II Prospect - Soil Geochemistry - Manganese	1:2,500
D/MZ 02/051	Challenger II Prospect - Ground Magnetics	1:2,500
D/MZ 02/049	Challenger II - Line 19000N - DDH CD 1	1:2,500
D/MZ 02/054	Blythe River 4042/4 - Soil Geochemistry & Geology - Northern Sheet	1:2,500
D/MZ 02/036	Blythe River 4042/4 - Ground Magnetics - Northern Sheet	1:2,500
D/MZ 02/042	Blythe River 4042/4 - Magnetic Profiles - Northern Sheet	1:2,500
D/MZ 02/038	Blythe River 4042/4 - Magnetic Profile - Line 4100E Northern Sheet	1:2,500
D/MZ 02/041	Blythe River 4042/4 - Soil Geochemistry - Northern Sheet	1:2,500
D/MZ 02/037	Blythe River 4042/4 - Ground Magnetics - Southern Sheet	1:2,500
D/MZ 02/043	Blythe River 4042/4 - Magnetic Profiles - Southern Sheet	1:2,500

LEGEND
Quaternary
Alluvium
Talus
Permo-Carboniferous
Sandstone, siltstone, tillite
Devono-Silurian
Bell shale
Florence sandstone
Magnetite rich skarn
Ordovician
Limestone
Sandstone
Conglomerate
Cambrian
Limestone, mudstone
Acid / intermediate volcanics and sediments
Igneous Rocks
Tertiary basalt
Devonian granite - Housetop granite
KEY
Highway
Road
River
Emu Bay Railway
Electrical sounding location
Drill hole location
Landsat interpretation (Huntings)
Circular Feature
Aeromagnetic Anomaly
Input Anomaly
AMT Site
MOUNT HOUSETOP
LOYETEA PEAK
BLYTHE RIVER ANOMALY (4042/4)
CHALLENGER TWO PROSPECT
DDH CD1 (197·8 m)
TULIP CREEK PROSPECT
NIETTA
NARRAWA
SOUTH NIETTA
TWO HUMMOCKS
BLACK MARSH
CHALLENER ONE PROSPECT
MOUNT TOR
BLACK BLUFF
GUILDFORD
TALBOTS LAGOON
LEVEN RIVER
LOONGANA ROAD
WILMOT RIVER
BLYTHE RIVER
GUILDFORD RIVER
WEY RIVER
509141
5 cm
The Shell Company of Australia Limited
METALS DIVISION
E.L. 36/79 LOONGANA
GEOLOGY
83-2045
Scale : 1:50 000
FIG. No.
REPORT No.
ENCL. No.
DRG. No. D/M202/048
DATE 5-8-83
AUTHOR J.J. LAWTON
DRAWN H.L.H.
OFFICE DEVONPORT

509142

5 cm

N

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METALS DIVISION

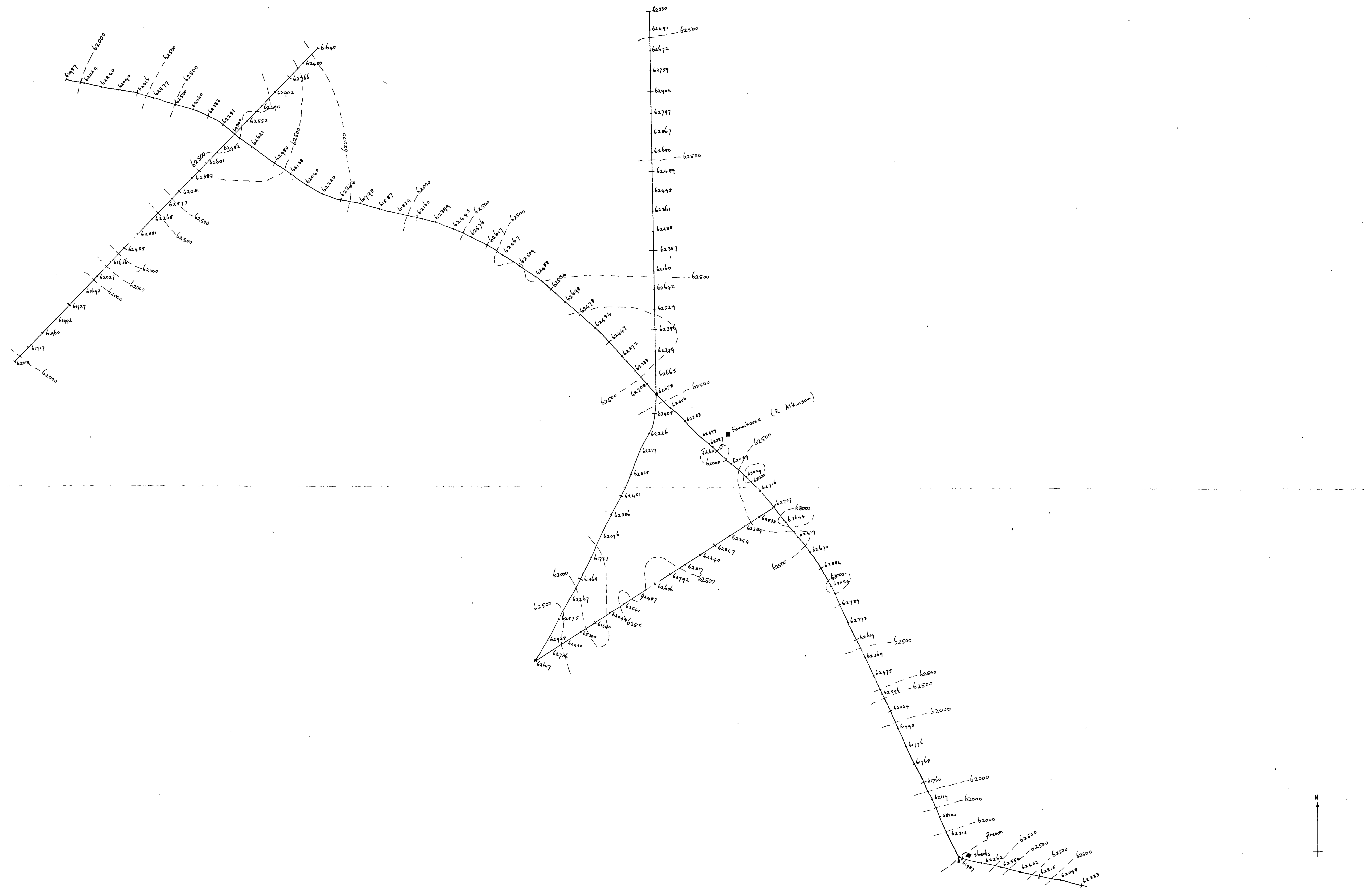
E.L. 36/79 LOONGANA
RESIDUAL AEROMAGNETIC
CONTOURS

83-2045
Vol 2

SCALE	1: 50 000	DATE	19 – 8 – 82
AUTHOR	J. J. LAWTON	DRAWN	H. L. S.
OFFICE	DEVONPORT	REP.No.	
ENCL No.		DRG No.	D/MZ02/074

02

1685



509143

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METALS DIVISION

LOONGANA E.L. 36/79
AIRBORNE MAGNETIC ANOMALY
4041 / 2
RECONNAISSANCE GROUND MAGNETICS
85-2045 Vol 2.

Scale : 1:2500

FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ 02/015
DATE 24-3-81	AUTHOR G. OAKES
DRAWN G O.	OFFICE DEVONPORT

1685 03

509144

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METALS DIVISION

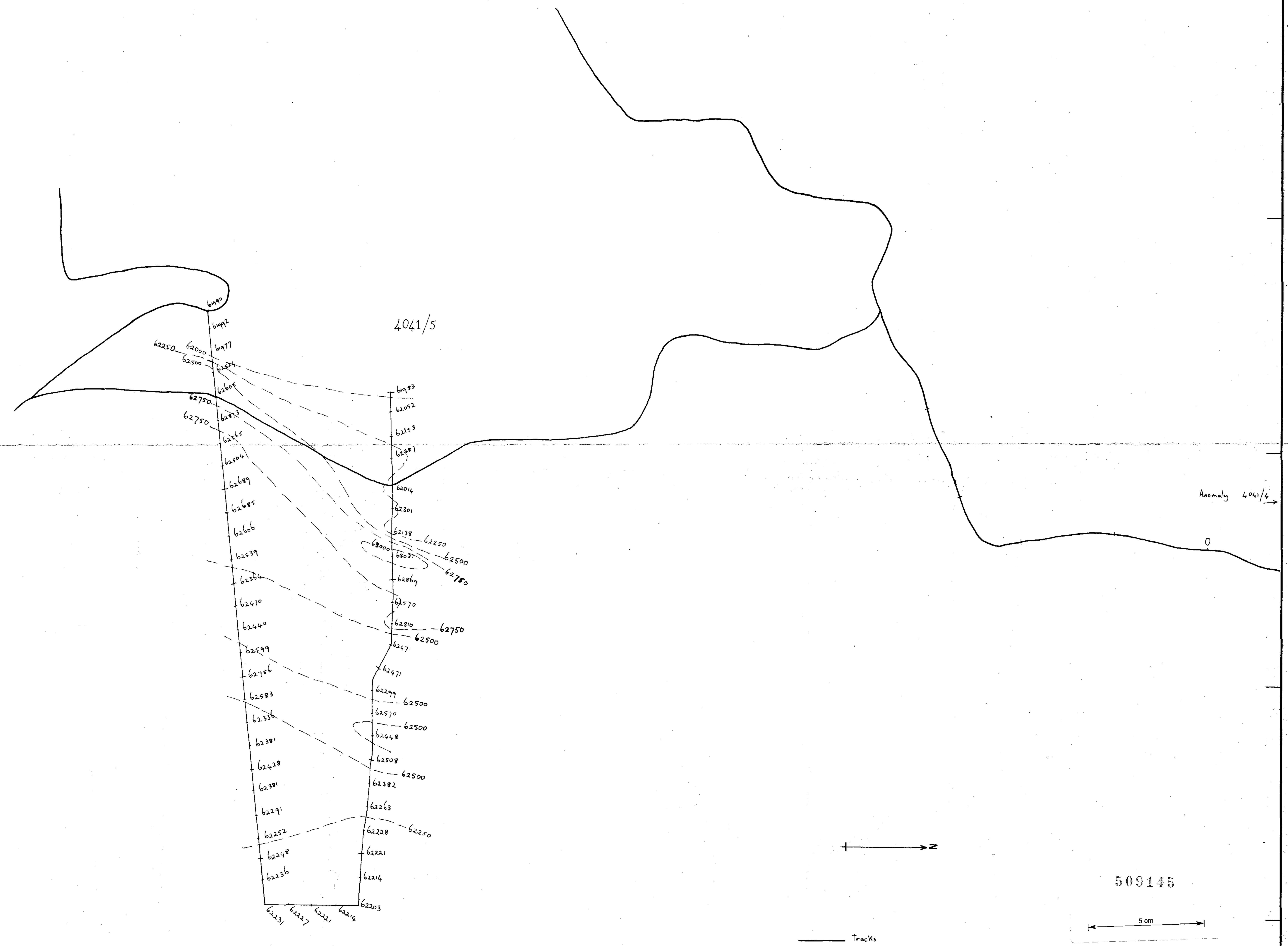
LOONGANA E.L. 36/79
AIRBORNE MAGNETIC ANOMALIES
4041/3 & 4041/4
RECONNAISSANCE GROUND MAGNETICS
83-RO45 Vol. 2.

Scale 1:2500

FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ 02/016
DATE 24-3-81	AUTHOR G. OAKES
DRAWN G. OAKES	OFFICE DEVONPORT

04

1685



509145

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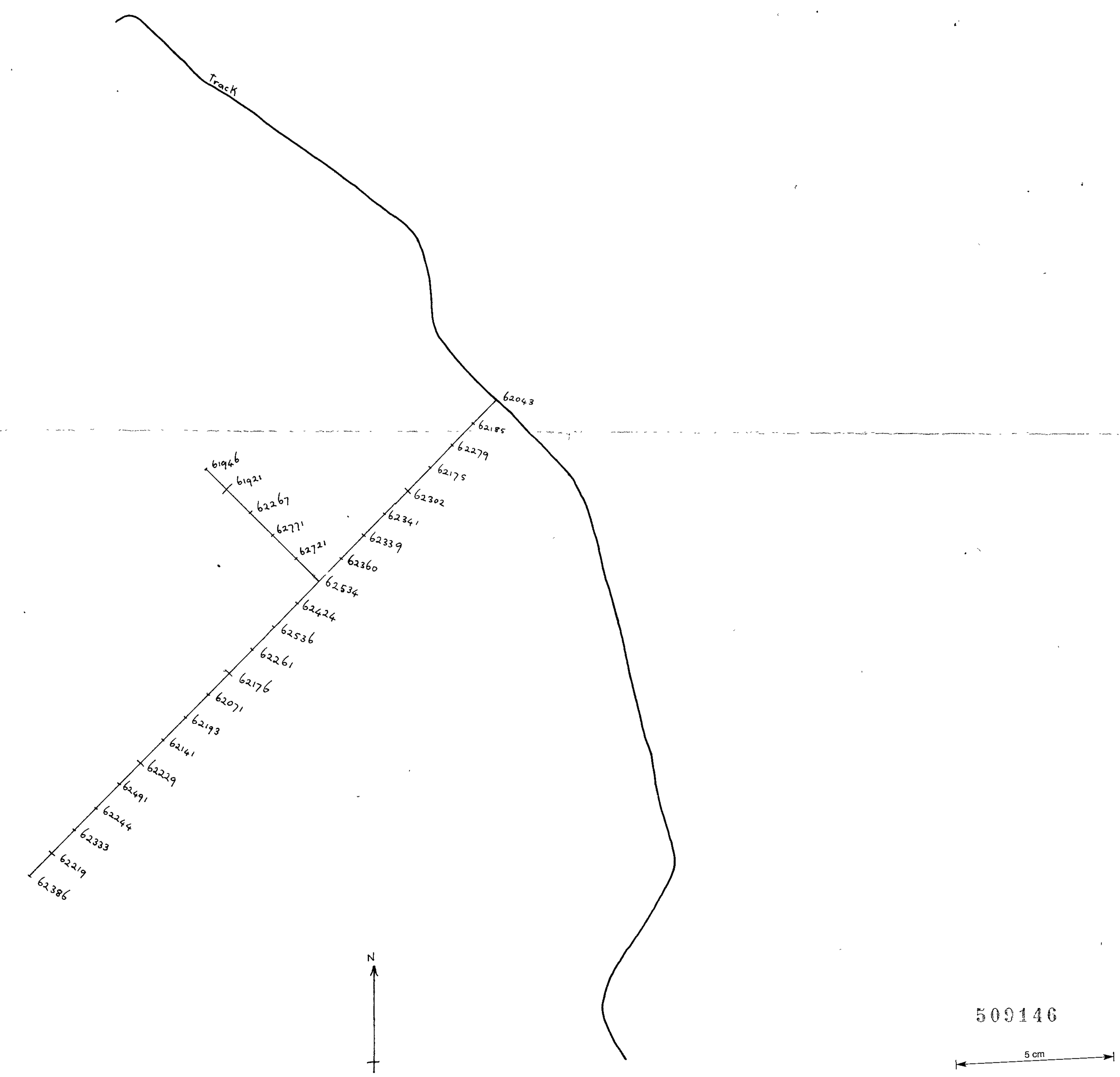
METALS DIVISION

LOONGANA E.L. 36/79
AIRBORNE MAGNETIC ANOMALY
4041/5
RECONNAISSANCE GROUND MAGNETICS
85-2045
Scale : 1:2500 Vol 2.

FIG. No.	REPORT No.
ENCL. No.	DRG. No. 0/MZ 02/017
DATE 24-3-81	AUTHOR G. OAKES
DRAWN G. OAKES	OFFICE DEVONPORT

05

1685



509146

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METALS DIVISION

LOONGANA E.L. 36/79

AIRBORNE MAGNETIC ANOMALY 4041/6

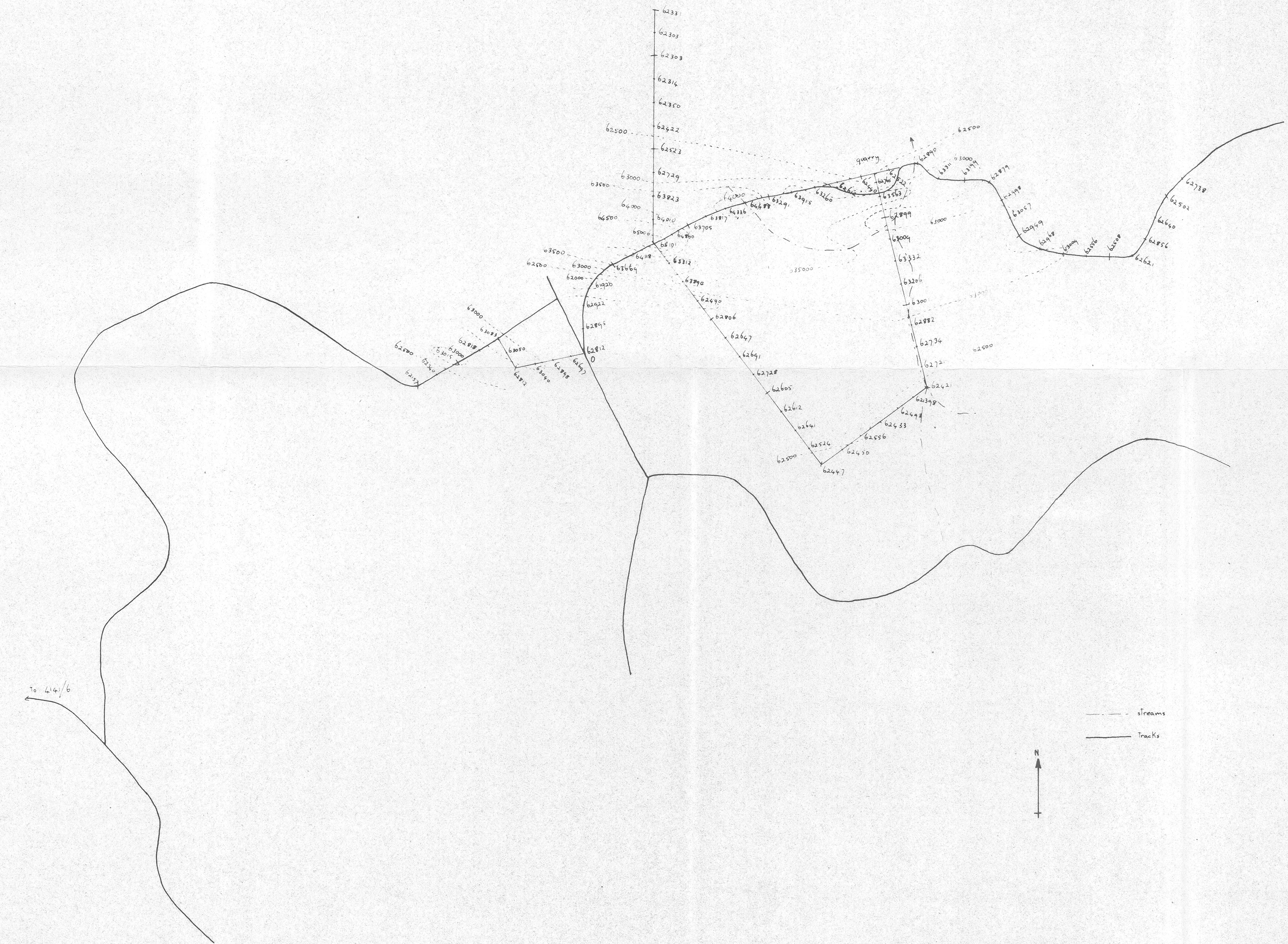
RECONNASSANCE GROUND MAGNETICS

85-2045

Scale : 1:2500 ' Vol 2

FIG. No.	REPORT No.
ENCL. No.	DRG. No. D MZ02 018
DATE 24-3-81	AUTHOR G OAKES
DRAWN G. OAKES	OFFICE DEVONPORT

1685. 06



509147

5 cm

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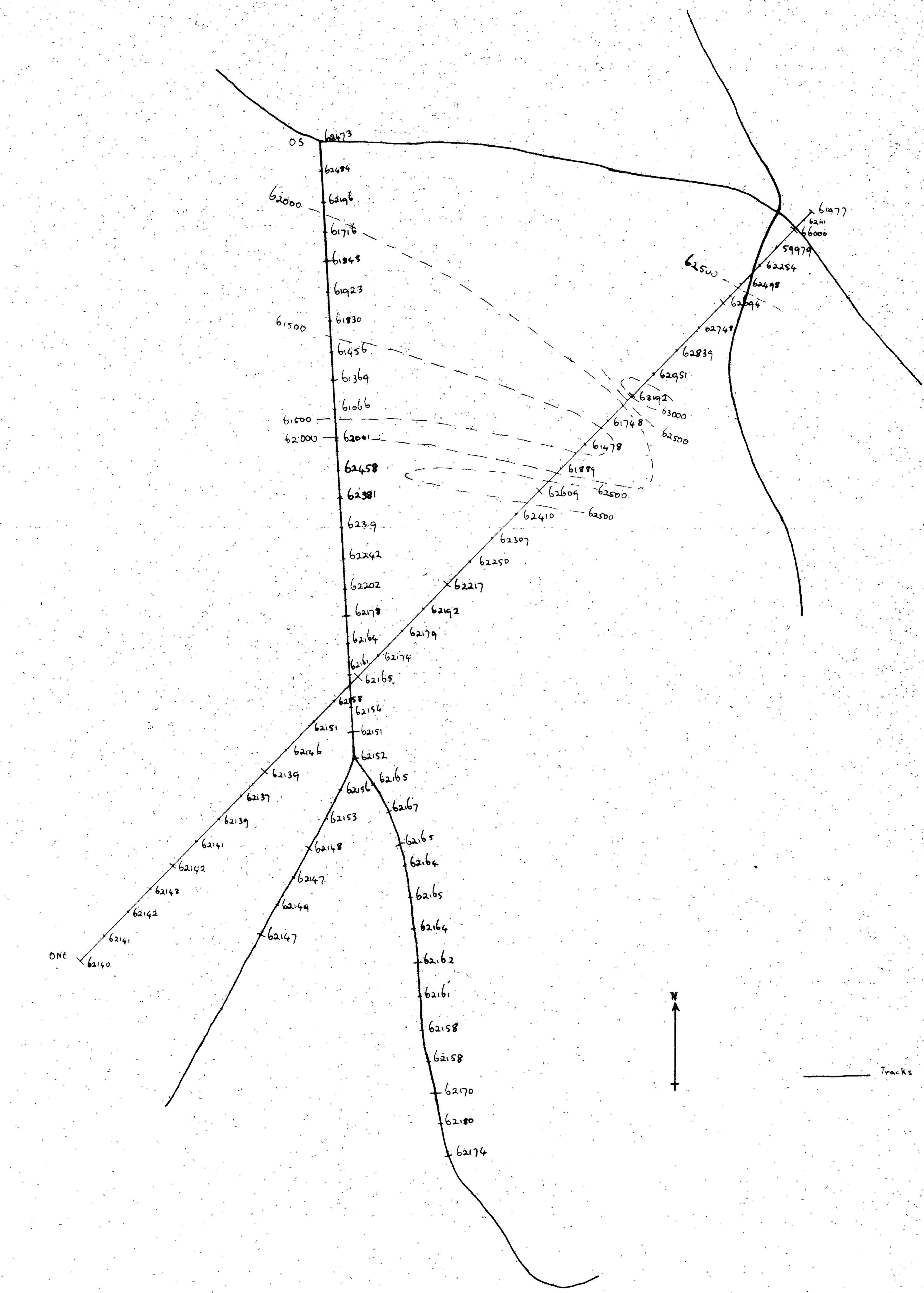
LOONGANA E.L. 36/79 AIRBORNE MAGNETIC ANOMALY 4141/4 83-2045 Vol 2 RECONNAISSANCE GROUND MAGNETICS	
Scale 1:2500	
FIG. No.	REPORT No.
ENCL. No	DRG. No. D/MZ.02/019
DATE 30.3.81	AUTHOR G. OAKES
DRAWN G. OAKES	OFFICE DEVONPORT

07



509148

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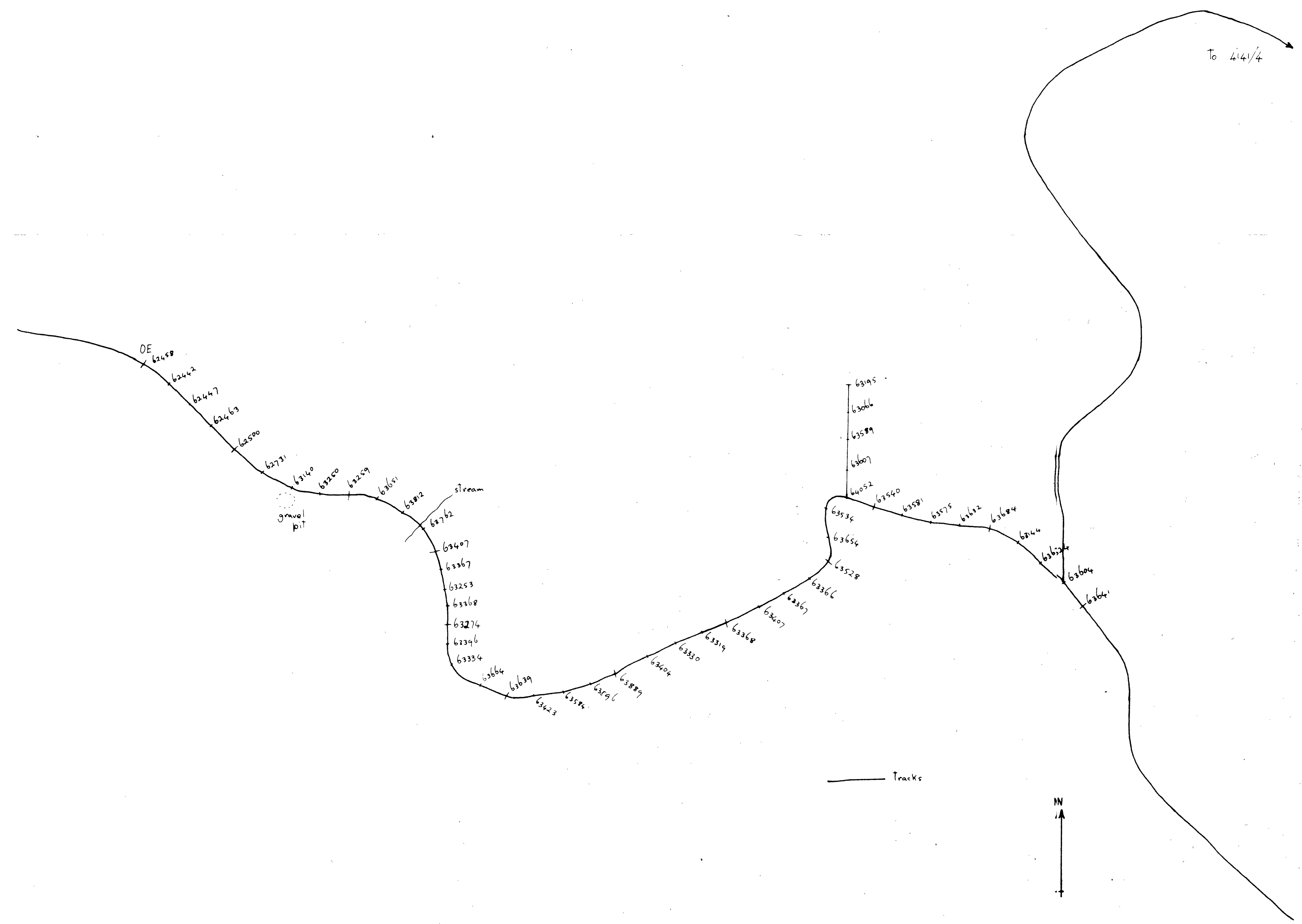
METALS DIVISION

LOONGANA E.L.36/79
AIRBORNE MAGNETIC ANOMALY
4141 / 5
RECONNAISSANCE GROUND MAGNETICS
83-2045 vol. 2.

Scale 1:2500

FIG No	REPORT No
ENGL. No	DRG No D/MZ 02/020
DATE 30 3 81	AUTHOR G OAKES
DRAWN G. OAKES	OFFICE DEVONPORT

08



509149

5 cm

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METALS DIVISION

LOONGANA E.L. 36/79
AIRBORNE MAGNETIC ANOMALY
4141 / 6
RECONNAISSANCE GROUND MAGNETICS
83-2045 Vol.2

Scale 1: 2500

FIG. No		REPORT No	
ENCL. No		DRG. No.	D / MZ02 / 021
DATE	30-3-81	AUTHOR	G. OAKES
DRAWN	G. OAKES	OFFICE	DEVONPORT

09

GROUND CHECK DATA

GEOMETRICS ANOMALY	:	06608 / T67N
LOCATION	:	5417250N / 424800E
OUTCROP GEOLOGY	:	Red basaltic soil, common basalt outcrop.
MAGNETIC SUSCEPTIBILITY	:	350 - 550 x 10^{-6} cgs units.

509150

5 cm

ANOMALY 4241/1

83-2045 vol. 2

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METALS DIVISION

LOONGANA E.L. 36/79

NIETTA SOUTH ANOMALY

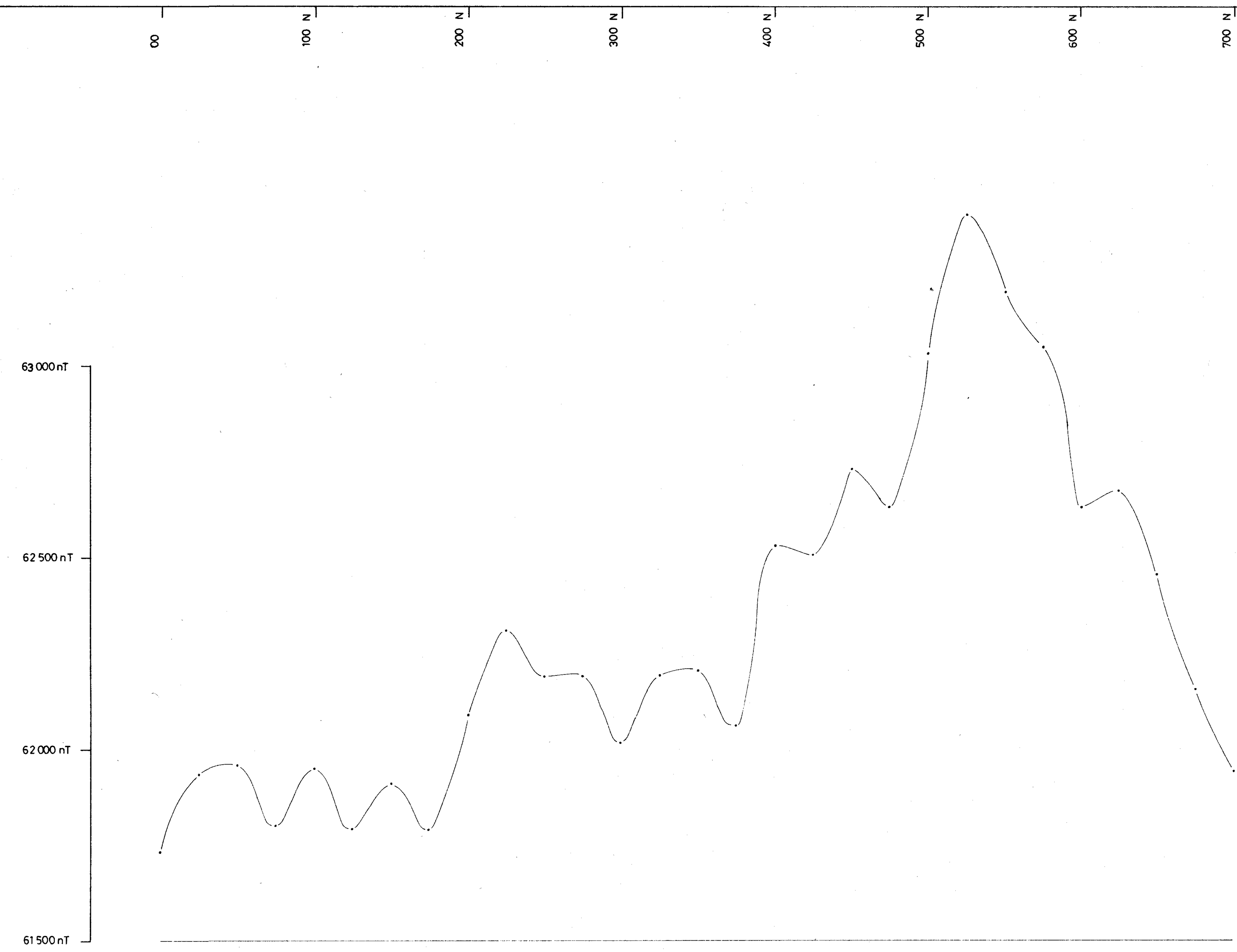
PROTON PRECESSION MAGNETOMETRY
LINE 2000N
PRELIMINARY GROUND CHECK

Scale : 1cm = 100nT (magnetics)
1 : 2500 (horizontal axis)

FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ 02/001
DATE 1st SEPT. 1980	AUTHOR I.J. BUCHHORN
DRAWN O. HEDDITCH	OFFICE DEVONPORT

10

MAGNETICS

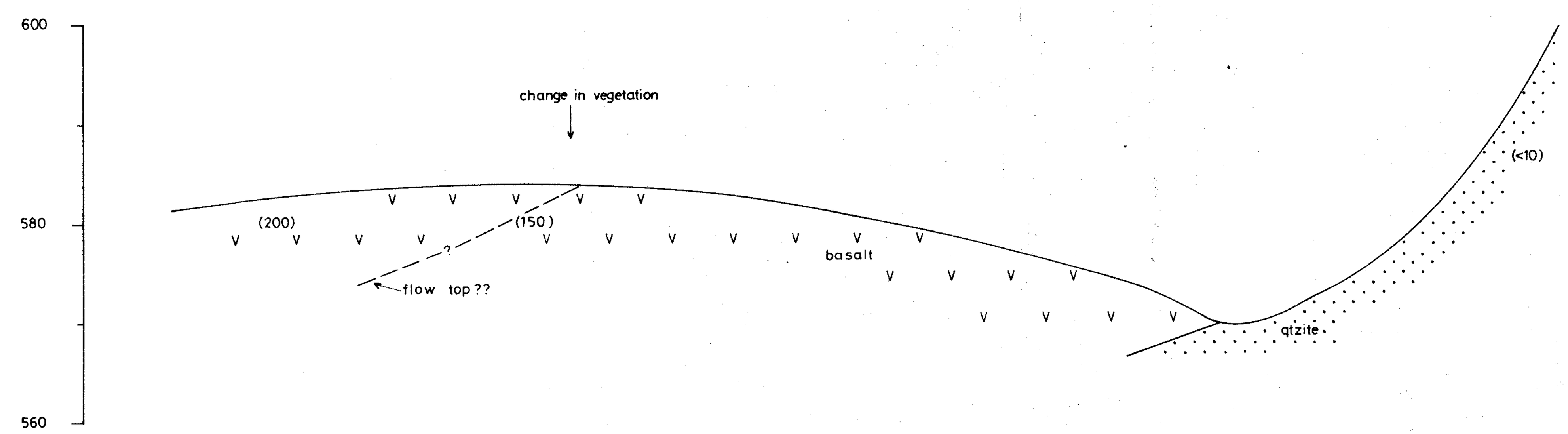


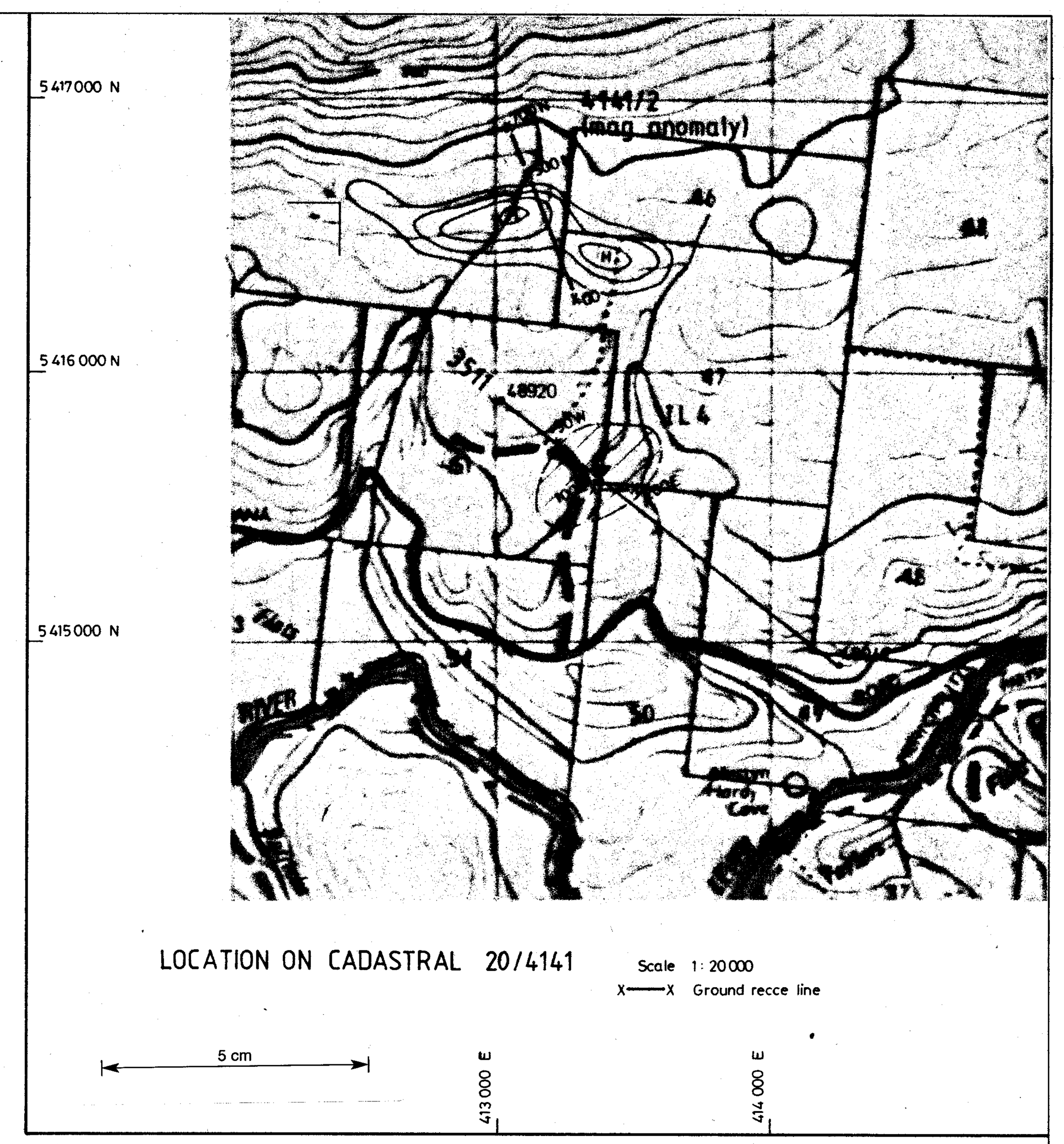
APPROX. TOPOGRAPHY

Metres A.S.L.

Numbers in brackets are magnetic susceptibility in units of 10^{-5} S.I.

Most likely explanation of magnetic anomaly is a basalt sheet, flat-lying or dipping shallowly South.





LOCATION ON CADASTRAL 20/4141

Scale 1: 20 000

X——X Ground recce line

5 cm

509151

5 cm

0 100 200M

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METALS DIVISION

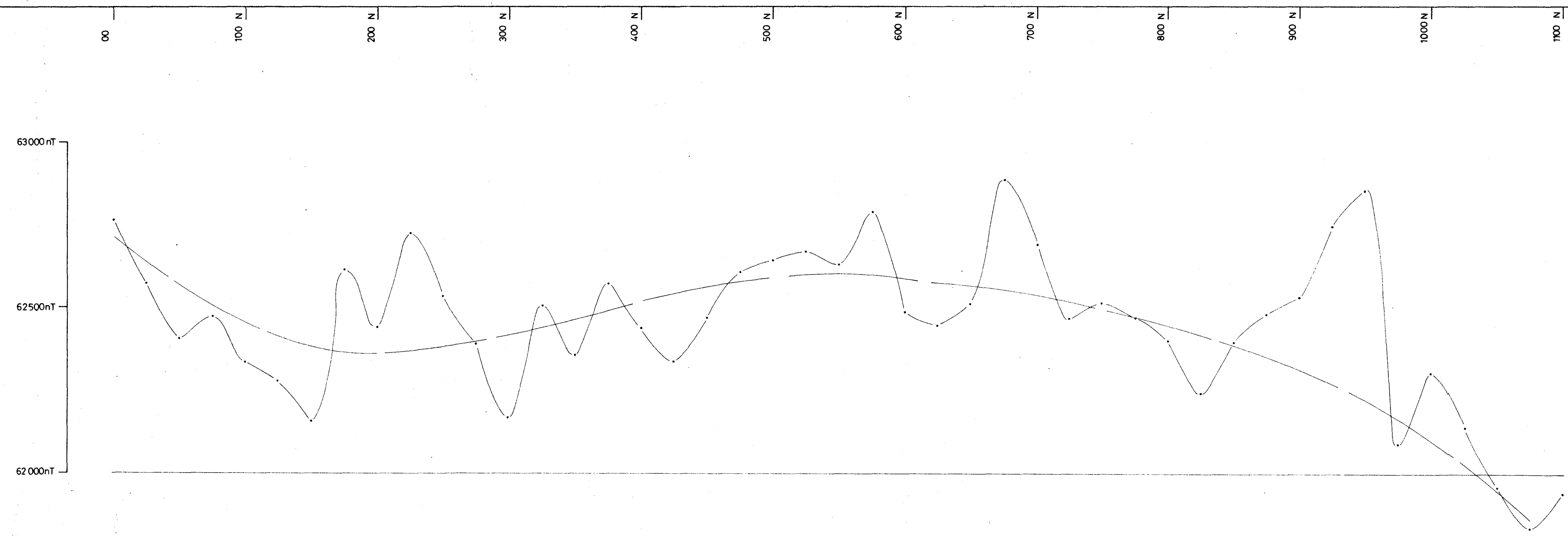
E.L. 36/79 LOONGANA
AEROMAGNETIC ANOMALY 4141/2
INITIAL GROUND CHECK

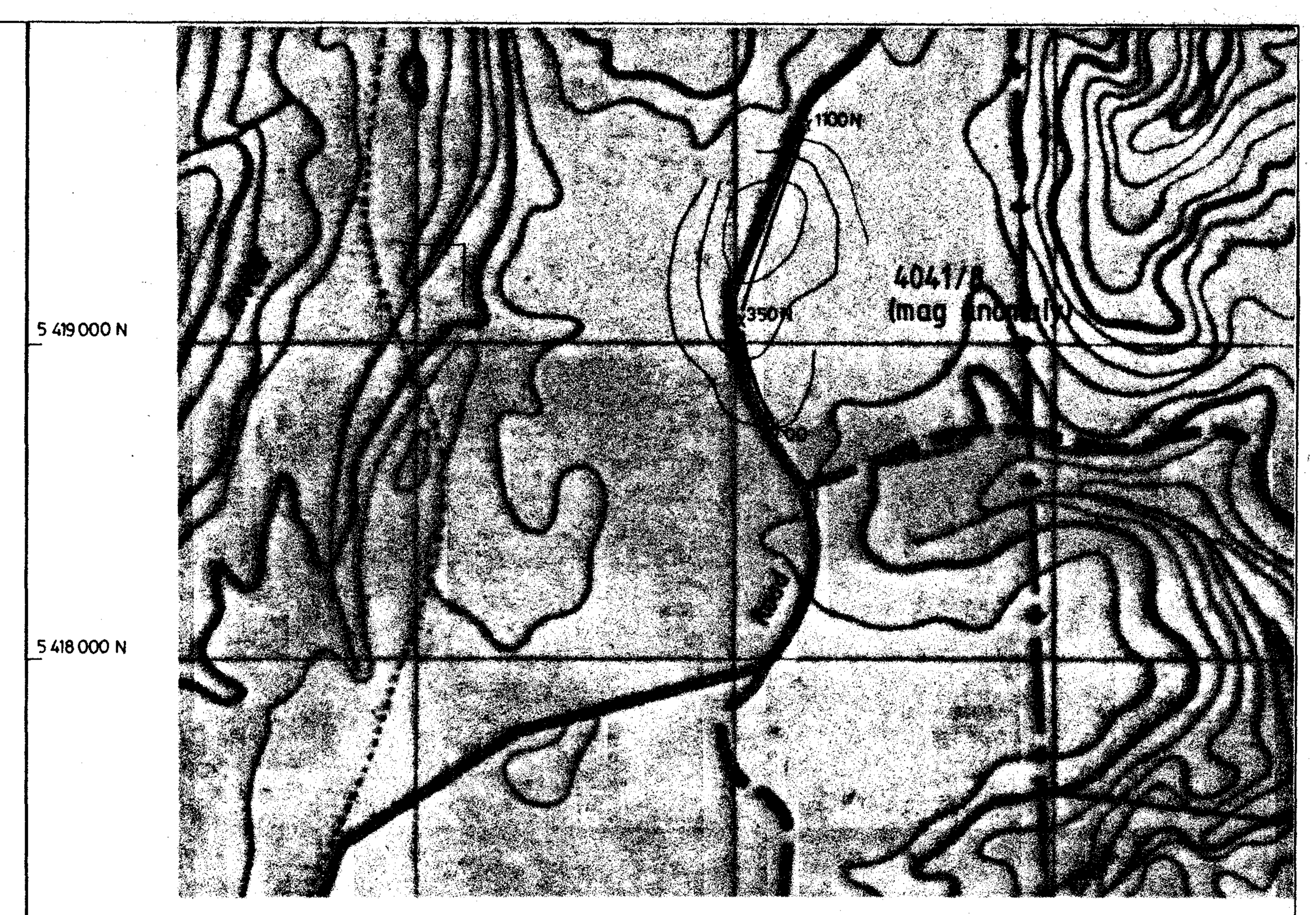
83-2045 Vol.2

SCALE	1: 2500	DATE	5-8-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP.No.	
ENCL.No.		DRG No.	D/MZ02/067

11

MAGNETICS





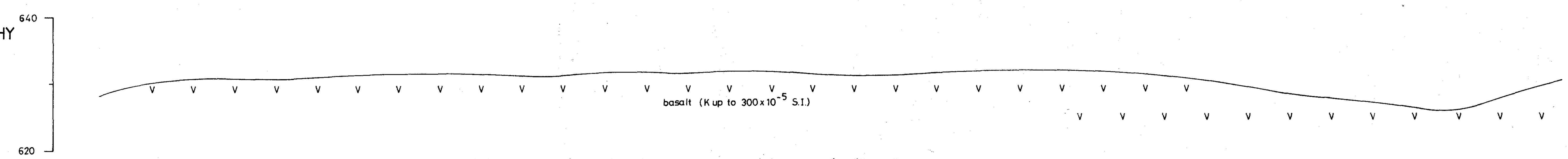
LOCATION ON CADASTRAL 20/4041

Scale 1: 20000

X——X Ground recce lines

402 000 E
403 000 E
404 000 E

APPROX. TOPOGRAPHY



N.B. Typical basalt hash; with broad low-frequency component probably representing different flows.

509152

5 cm

0 100 200 M

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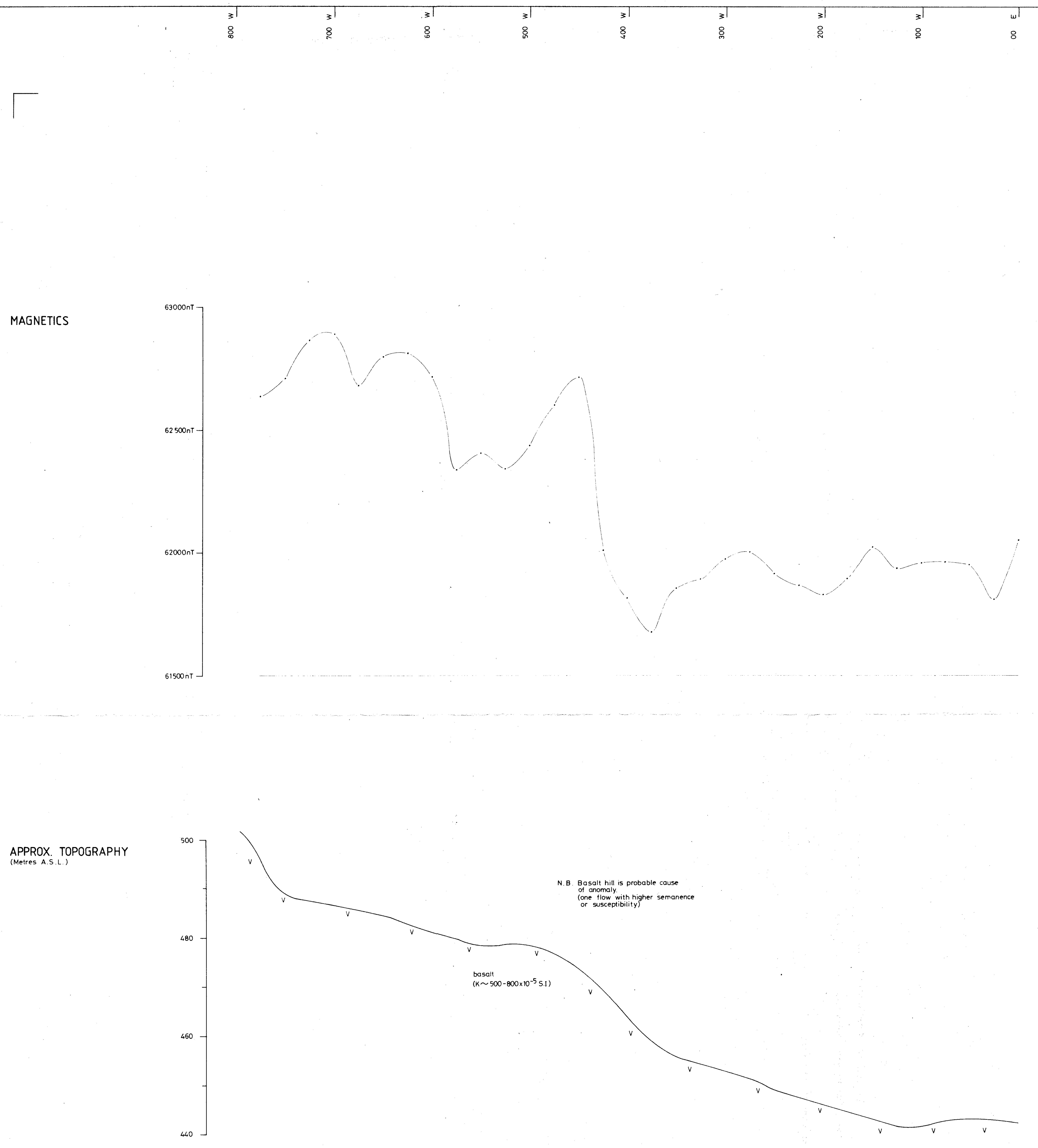
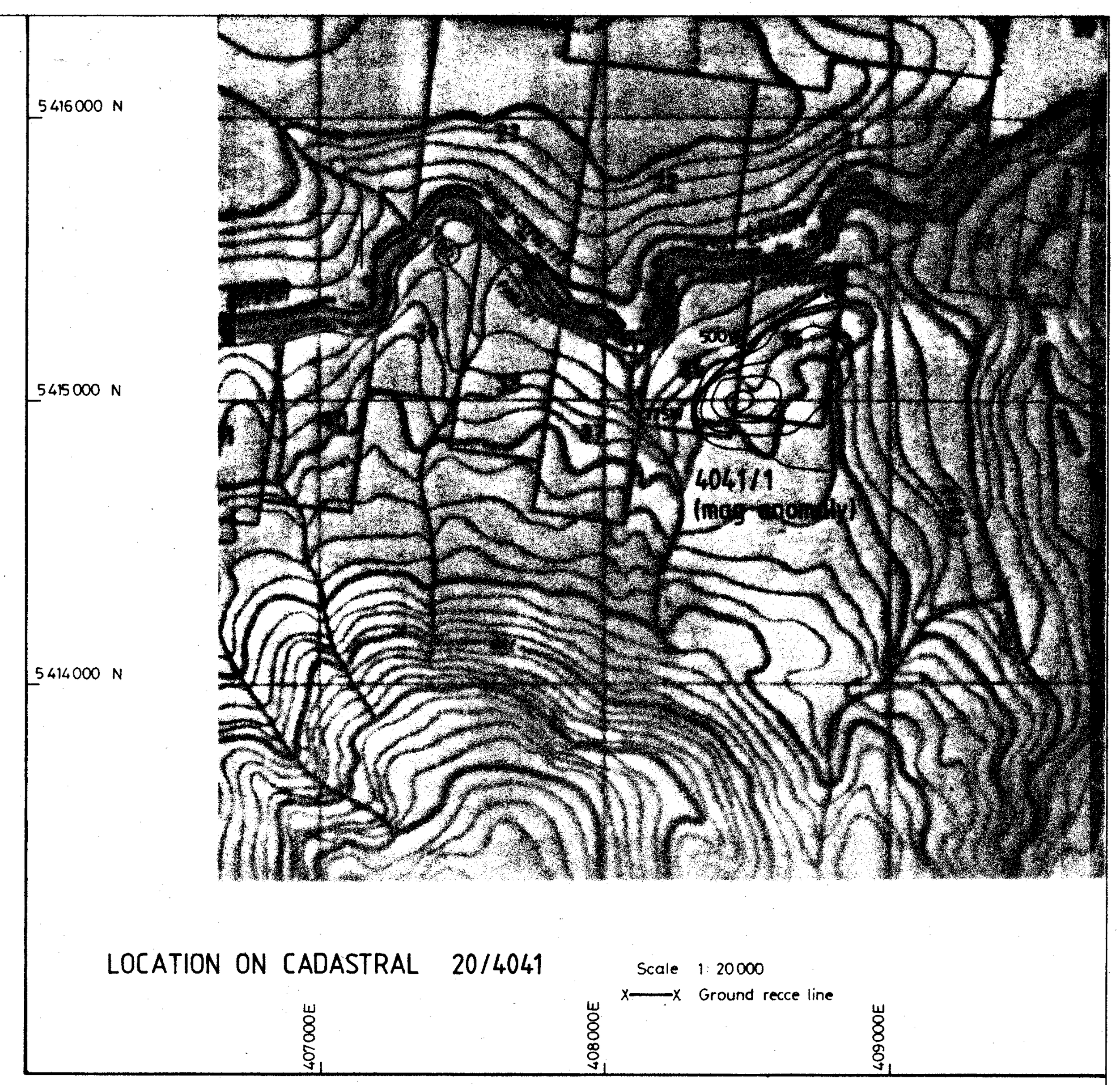
METALS DIVISION

E.L. 36/79 LOONGANA
AEROMAGNETIC ANOMALY 4041/8
INITIAL GROUND CHECK

83-2045 Vol. 2

SCALE	1 : 2500	DATE	5-8-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP. No.	
ENCL. No.		DRG. No.	D/M202/068





509153

5 cm

0 100 200 M

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METALS DIVISION

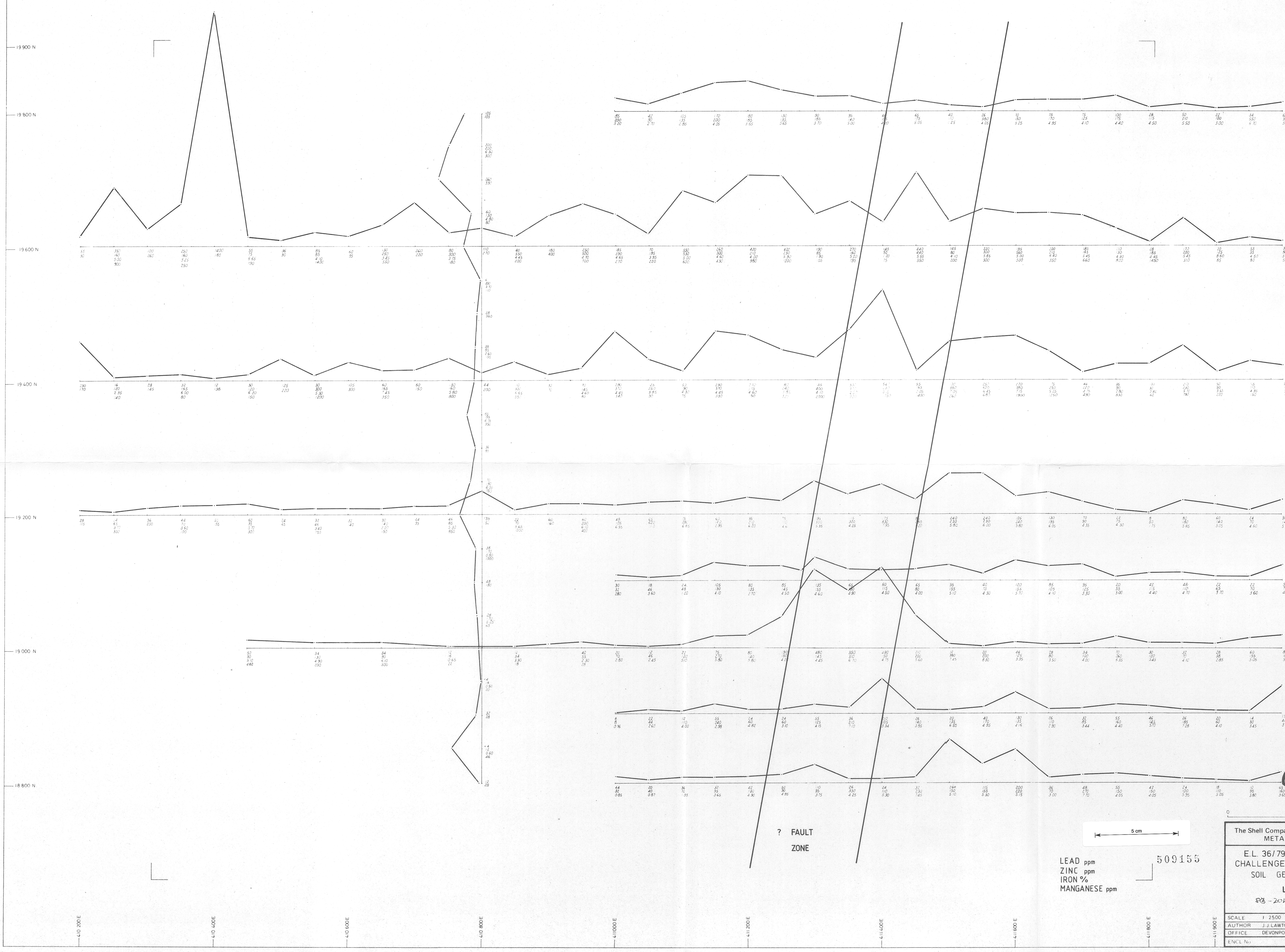
E.L. 36/79 LOONGANA
AEROMAGNETIC ANOMALY 4041/1
INITIAL GROUND CHECK
83-2045 Vol. 2

SCALE	1: 2500	DATE	5-8-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP No.	
ENCL No.		DRG No.	D/M202/069

13

1687


LEGEND
xt crystal tuff
lt lithic tuff
vt vitric tuff
ag agglomerate
sh shale
sltst siltstone
sst sandstone
Q quartz
F feldspar
S sericite
chlor chlorite
Ar argillite
pk pink
yl yellow
wh white
gy grey
gn green
mv mauve
sdy sandy
crs coarse
f fine grained
vf very fine grained
lam laminated
gran granular
stream sediment sample Pb, Zn, Cu, ppm
petrological sample
NNE Fault zone
Inferred boundary of porphyritic trachyte
? FAULT ZONE
Massive Porphyritic Trachyte with Q vesic.
2741 Porph. Trachyte
2739 Porph. Trachyte
2740 Felsic lava with Xenoliths
2744 Sheared Lithic Andesitic tuff
2742 Sheared Porph Trachyte
2743 Porph. Trachyte
2746 Porph. Trachyte
2745, 2747, 2748 Altered ? Trachytic Lava Breccia.
star picket
DDH CD1 -60°
509154
The Shell Company of Australia Limited
METALS DIVISION
E.L. 36/79 LOONGANA
CHALLENGER TWO PROSPECT
GEOLOGY
83-2045 vol2
From Bedrock Auger Chips And Rare Outcrop
SCALE 1:2500
DATE 29-10-80
AUTHOR I. J. BUCHHORN
DRAWN J.L.L.
OFFICE DEVONPORT
REP No.
ENCL No.
DRG No. D/MZ02/93
19 900 N
19 800 N
19 600 N
19 400 N
19 200 N
19 000 N
18 800 N
410 200 E
410 400
410 600 E
410 800 E
411 000 E
411 200 E
411 400 E
411 600 E
411 800 E
411 900 E
0 100 200 m
5 cm
14
1687



509155

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METALS DIVISION

E.L. 36/79 LOONGANA
CHALLENGER TWO PROSPECT
SOIL GEOCHEMISTRY

LEAD

83-2045 Vol 3

SCALE	1:2500	DATE	20-6-82
AUTHOR	J.J. LAWTON	DRAWN	D. HEDDITCH
OFFICE	DEVONPORT	REP. No.	
ENCL. No.		DRG. No.	D/MZ02/94

15

19 900 N
19 800 N
19 600 N
19 400 N
19 200 N
19 000 N
18 800 N
410 200 E
410 400 E
410 600 E
410 800 E
411 000 E
411 200 E
411 400 E
411 600 E
411 800 E
411 900 E
? FAULT
ZONE
N
509156
0
100
200M
5 cm
LEAD ppm
ZINC ppm
IRON %
MANGANESE ppm
The Shell Company of Australia Limited
METALS DIVISION
E.L. 36/79 LOONGANA
CHALLENGER TWO PROSPECT
SOIL GEOCHEMISTRY
ZINC
83-2045 Vol 2
SCALE 1:2500
DATE 20-6-82
AUTHOR J.J LAWTON
DRAWN G. HEDDITCH
OFFICE DEVONPORT
REP No
ENCL No
DRG No D/M202/95

509157

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
CHALLENGER TWO PROSPECT
SOIL GEOCHEMISTRY
IRON

83-2045 Vol: 2

SCALE	1 : 2500	DATE	20 · 6 · 82
AUTHOR	J.J LAWTON	DRAWN	O HEDDITCH
OFFICE	DEVONPORT	REP No	
ENCL No		DRG No	D/MZ02/96

1687

17

The Shell Company of Australia Limited METALS DIVISION	
E.L. 36/79 LOONGANA CHALLENGER TWO PROSPECT SOIL GEOCHEMISTRY MANGANESE 83-2048 vol 2	
SCALE 1:2500	DATE 20-6-82
AUTHOR J.J LAWTON	DRAWN O MEDDITCH
OFFICE DEVONPORT	REP No.
ENCL No.	DRG No. D/MZ02/97

1687

18

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
CHALLENGER TWO PROSPECT
GROUND MAGNETICS

93-2045 vol2

Scale : 1:2500

FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ02/051
DATE 15-12-81	AUTHOR J.J. LAWTON
DRAWN H.L.H.	OFFICE DEVONPORT

1688


The Shell Company of Australia Limited
METALS DIVISION
LOONGANA E.L. 36/79
CHALLENGER TWO
LINE 19000 N - DDH CD1
83-2004 5 Vol 2.
Scale 1cm = 100nT VERTICAL
1 : 2500 HORIZONTAL
FIG. No.
REPORT No.
ENCL. No.
DRG. No. D/MZ02/049
DATE 13-11-81
AUTHOR J.J. LAWTON
DRAWN H.L.H.
OFFICE DEVONPORT
509160
8891
20
TOPOGRAPHY - GEOLOGY
200 Metres
150 Metres
100 Metres
DDH CD1
197.8M
susceptibility (x10⁻⁶c.g.s)
chargeability (ms)
SOIL GEOCHEMISTRY
Cu - ppm.
Pb - ppm.
Zn - ppm.
Fe - %
Mn
Fe, Mn (x10)
Cu, Pb, Zn.
MAGNETICS - GRAVITY
63 000 nT
62 500 nT
62 000 nT
411 000 E
411 200 E
411 400 E
411 600 E
411 800 E
412 000 E
APPARENT CHARGEABILITY
APPARENT RESISTIVITY
5 cm
11 000 E
11 100 E
11 200 E
11 300 E
11 400 E
11 500 E
11 600 E
11 700 E
11 800 E
11 900 E
12 000 E

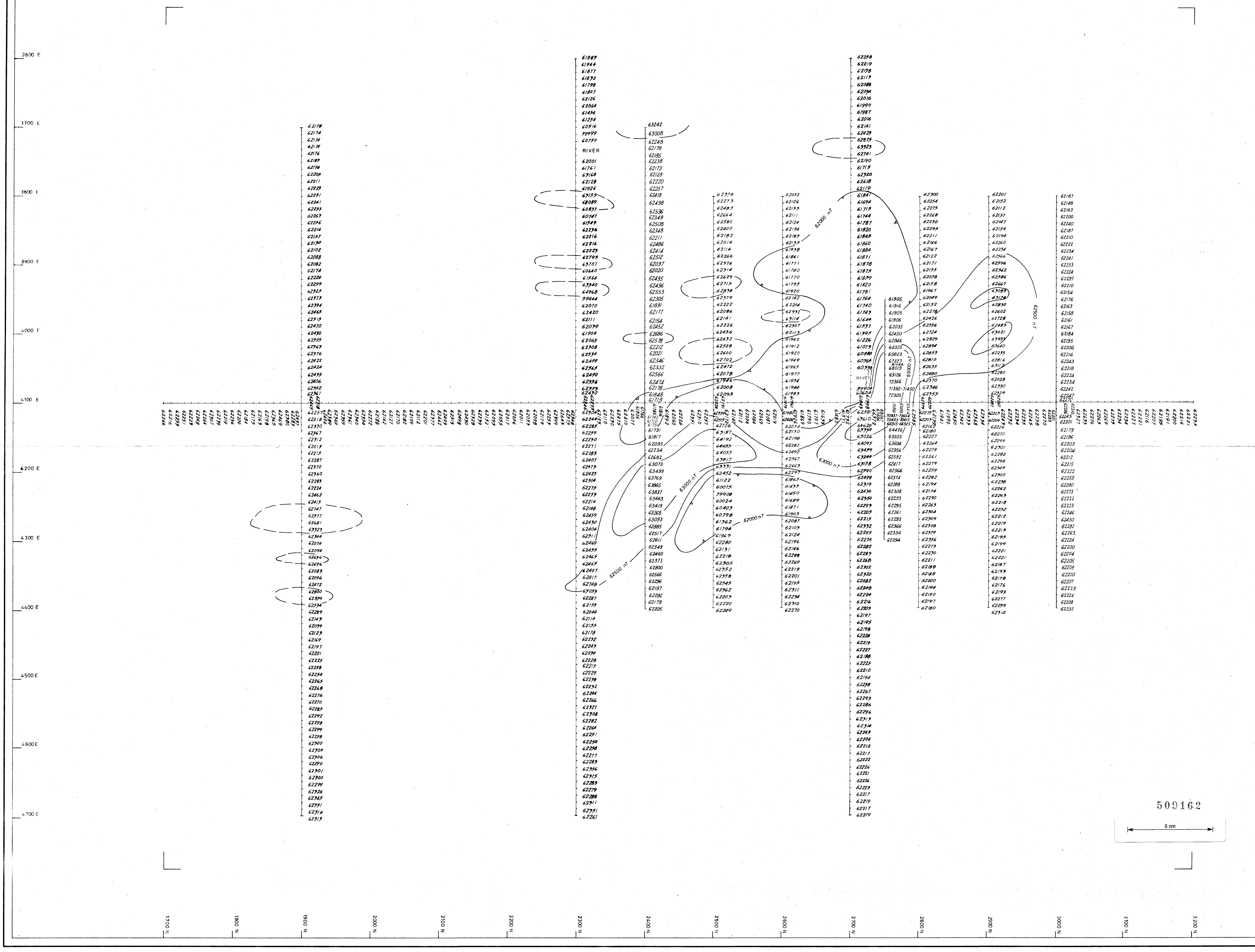
The Shell Company of Australia Limited
METALS DIVISION

E.L.36/79 LOONGANA
BLYTHE RIVER 4042/4
SOIL GEOCHEMISTRY
& GEOLOGY
NORTHERN SHEET

83-2045
vol 2.

Scale 1 2500

FIG No	REPORT No.
ENCL No	DRG No. D/MZ02/054
DATE 8-9-81	AUTHOR J.J. LAWTON.
DRAWN H L H	OFFICE DEVONPORT



509162

5 cm

0 100 200M

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
BLYTHE RIVER 4042/4
GROUND MAGNETICS
NORTHERN SHEET 83-2045 Vol 2

Scale 1:2500

FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ02/036
DATE 8-9-81	AUTHOR J.J. LAWTON
DRAWN H.L.H.	OFFICE DEVONPORT

22

509163

0 100 200 M

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
BLYTHE RIVER 4042/4
MAGNETIC PROFILES
Northern Sheet

83-2045
Vol 2

Scale : 1cm = 250 nT VERTICAL, 1 : 2500 HORIZONTAL

FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ02/042
DATE 11-9-81	AUTHOR J.J. LAWTON.
DRAWN H.L.H.	OFFICE DEVONPORT.

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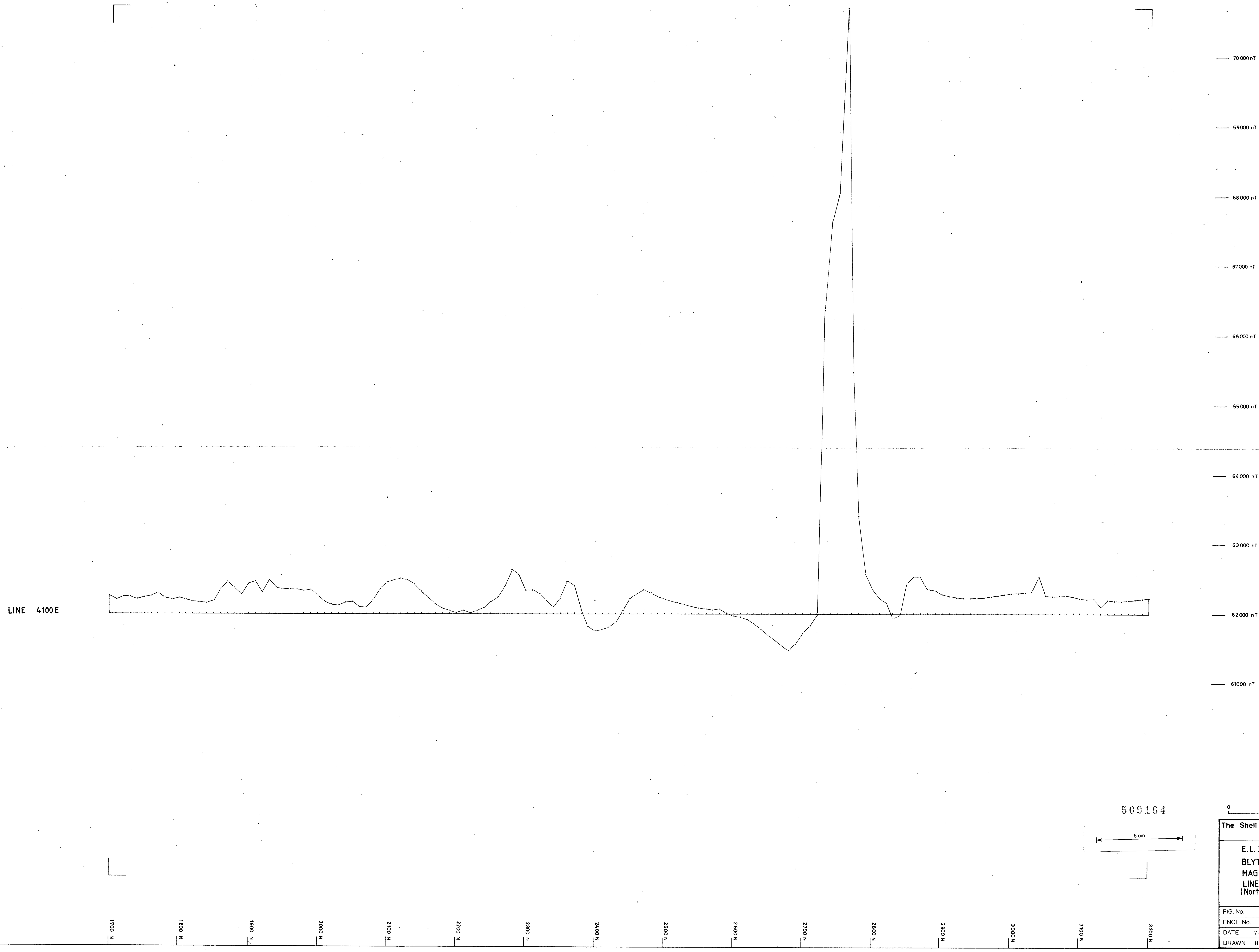
1688



509164

0 100 200 M

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA 83-2045
BLYTHE RIVER 4042/4 Vol. 2
MAGNETIC PROFILE
LINE 4100 E
(Northern sheet)

Scale : 1cm = 250 nT VERTICAL; 1 : 2500 HORIZONTAL

FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ02/038
DATE 7-9-81	AUTHOR J.J.LAWTON
DRAWN H.L.H.	OFFICE DEVONPORT

1688

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METALS DIVISION

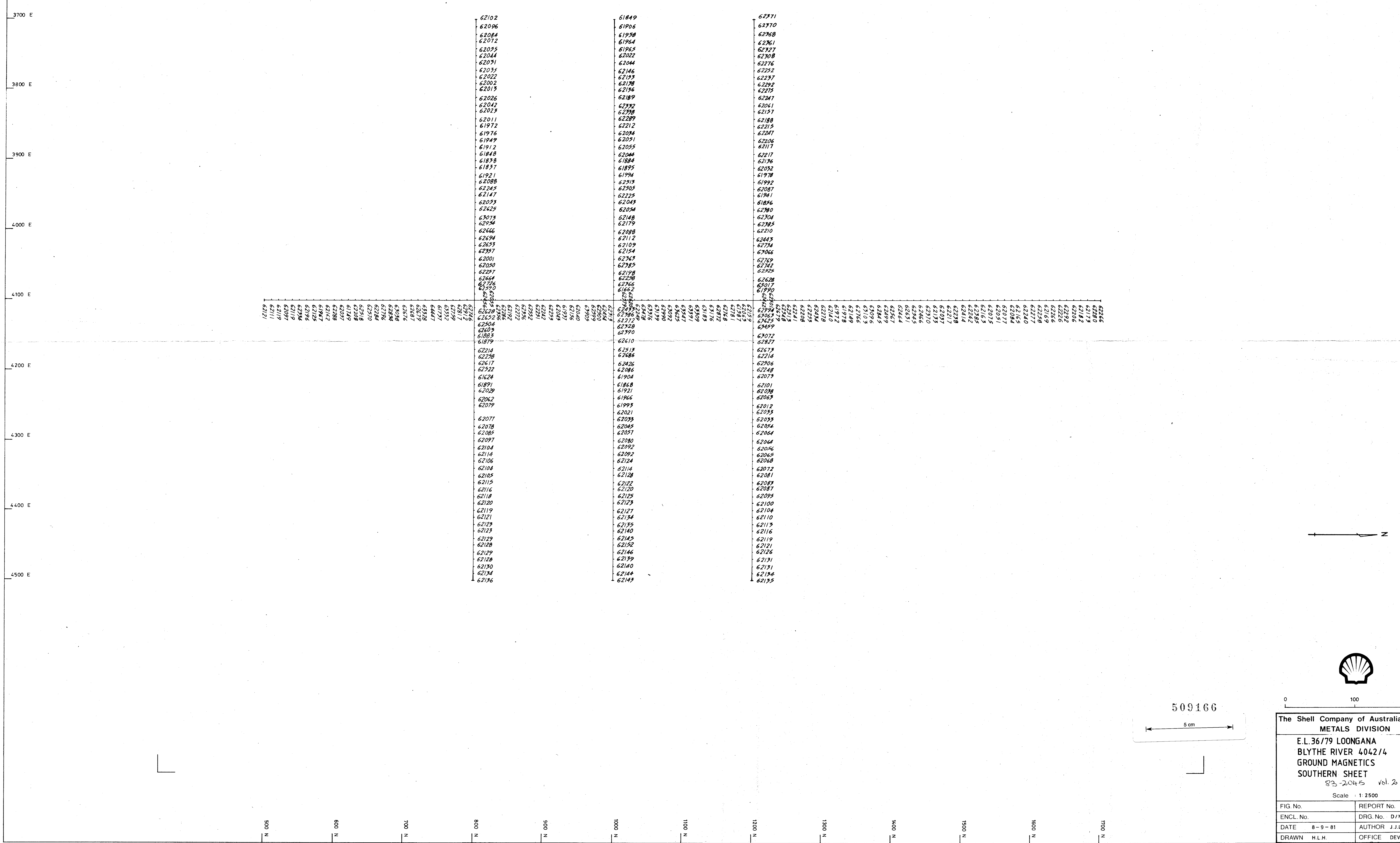
E.L.36/79 LOONGANA
BLYTHE RIVER 4042/4
SOIL GEOCHEMISTRY
NORTHERN SHEET

83-2045
Vol2.

1689

Scale 1:2500

FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ02/041
DATE 8-9-81	AUTHOR J.J.LAWTON
DRAWN H.L.H.	OFFICE DEVONPORT.



509166

The Shell Company of Australia Limited
METALS DIVISION

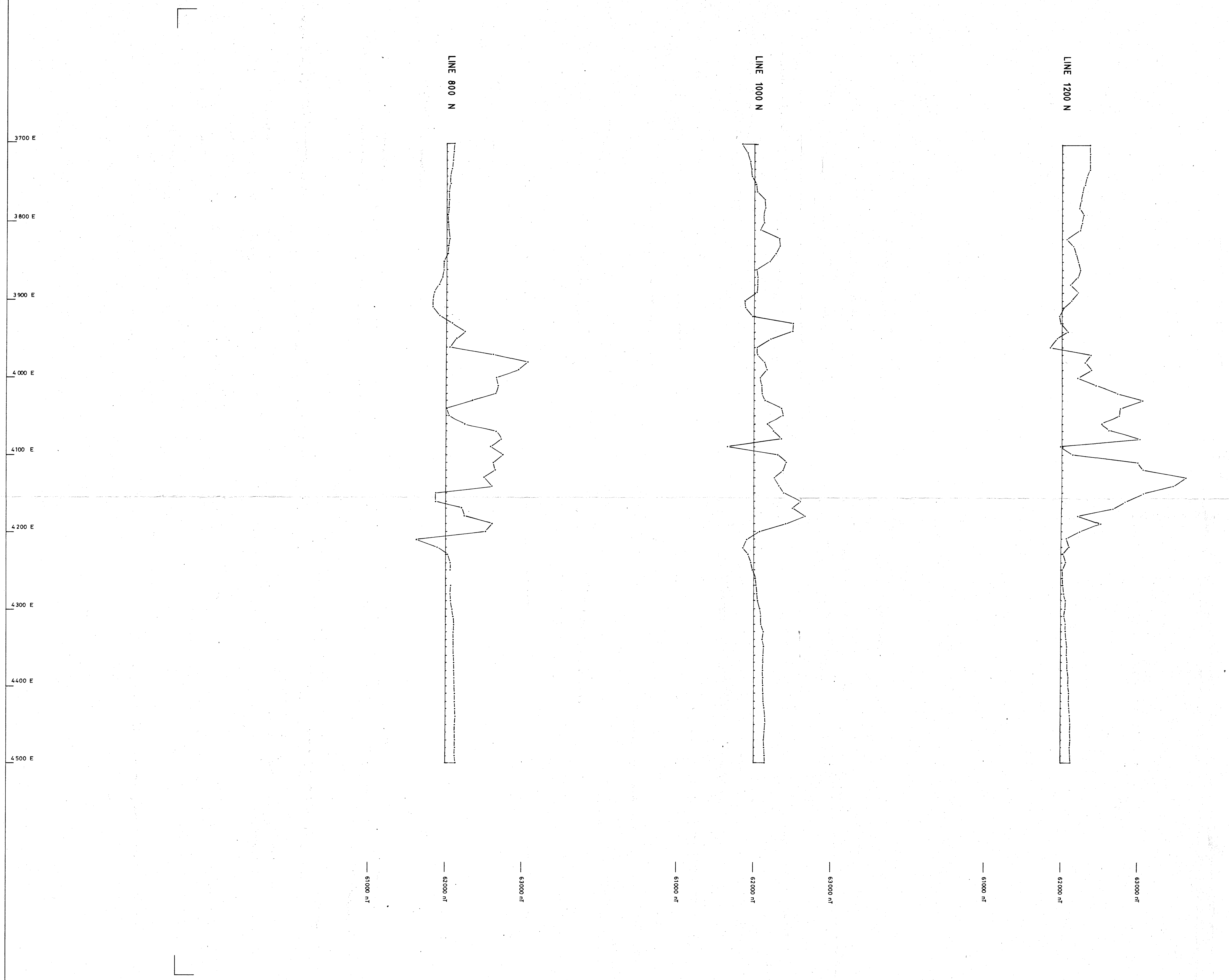
E.L.36/79 LOONGANA
BLYTHE RIVER 4042/4
GROUND MAGNETICS
SOUTHERN SHEET
83-2045 Vol. 2

Scale : 1:2500

FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ02/037
DATE 8-9-81	AUTHOR J.J.LAWTON.
DRAWN H.L.H.	OFFICE DEVONPORT.

1689

26



509167

5 cm

0 100 200 M

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
BLYTHE RIVER 4042/4
MAGNETIC PROFILES 83-2045
Southern Sheet vol. 2

Scale 1cm = 250nT VERTICAL
1: 2500 HORIZONTAL

FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ02/043
DATE 11-9-81	AUTHOR J.J.LAWTON
DRAWN H.L.H.	OFFICE DEVONPORT.

1689

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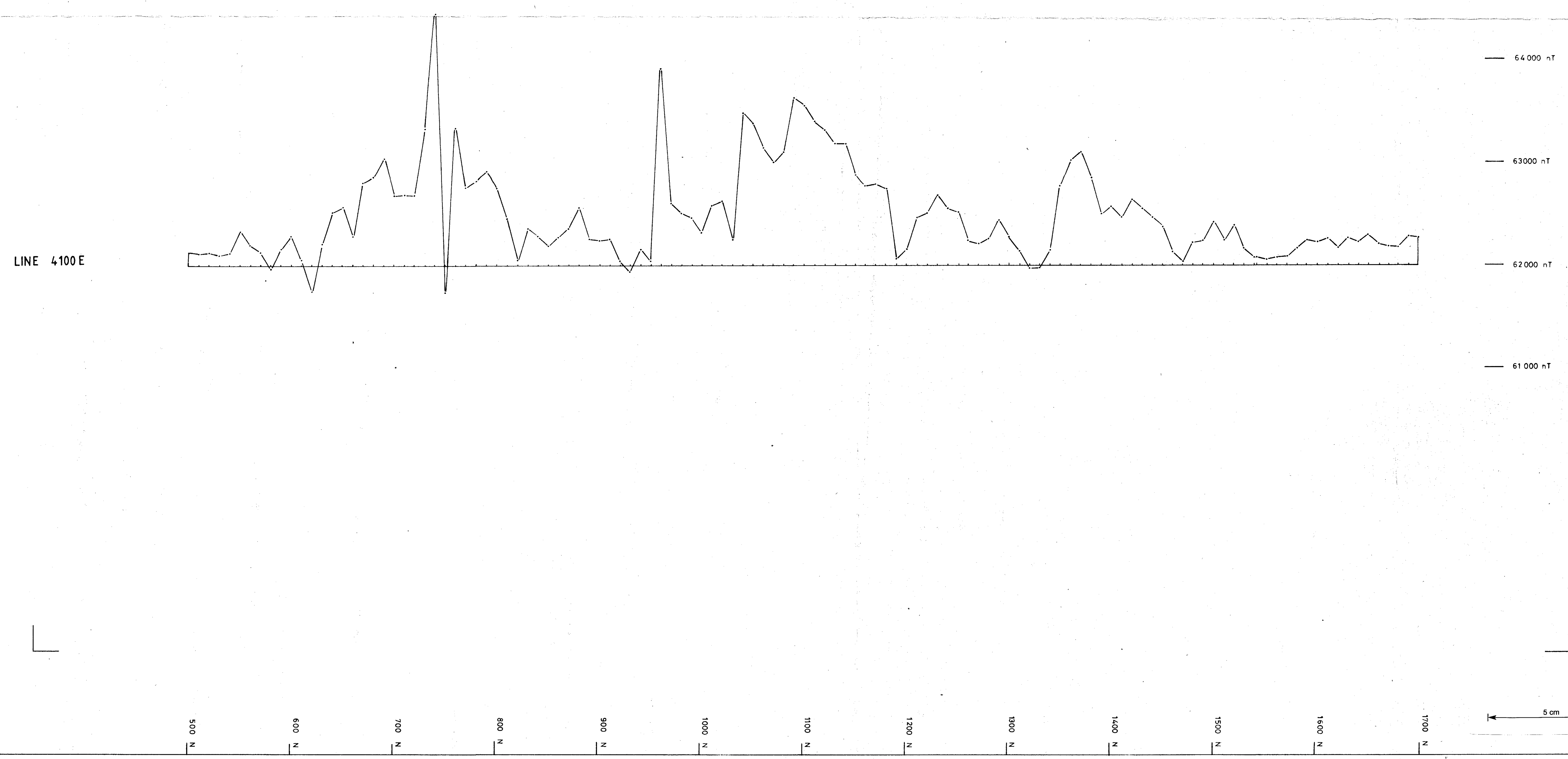
509168

Drawing No.	Title	Scale
D/MZ 02/039	Blythe River 4042/4 - Magnetic Profile - Line 4100E Southern Sheet	1:2,500
D/MZ 02/040	Blythe River 4042/4 - Soil Geochemistry - Southern Sheet	1:2,500
D/MZ 02/055	Blythe River 4042/4 - Line 2700N - Geology & Geochemistry	1:250
D/MZ 02/075	Blythe River 4042/4 - Line 2750N - Costean Geology & Geochemistry	1:250
D/MZ 02/025	Tulip Creek - Geology	1:2,500
D/MZ 02/026	Tulip Creek - Soil Geochemistry	1:2,500
D/MZ 02/023	Tulip Creek - Magnetic Contours	1:2,500
D/MZ 02/024	Tulip Creek - Magnetic Values	1:2,500
D/MZ 02/086	Loongana Input - Channel 3	1:20,000
D/MZ 02/107	Loongana, Tasmania - EM Anomaly Map - Sheet 20/3942	1:20,000
D/MZ 02/108	Loongana, Tasmania - EM Anomaly Map - Sheet 20/4042	1:20,000
D/MZ 02/109	Loongana, Tasmania - EM Anomaly Map - Sheet 20/4142	1:20,000
D/MZ 02/110	Loongana, Tasmania - EM Anomaly Map - Sheet 20/3941	1:20,000
D/MZ 02/111	Loongana, Tasmania - EM Anomaly Map - Sheet 20/4041	1:20,000
D/MZ 02/112	Loongana, Tasmania - EM Anomaly Map - Sheet 20/4141	1:20,000
D/MZ 02/058	INPUT Anomaly 4041/IL 1 - Initial Ground Check	1:2,500
D/MZ 02/060	INPUT Anomaly 3941/IL 3 - Initial Ground Check	1:2,500
D/MZ 02/066	INPUT Anomaly 4141/IL 4 - Initial Ground Check	1:2,500
D/MZ 02/062	INPUT Anomaly 4042/IL 5 - Initial Ground Check	1:2,500
D/MZ 02/056	INPUT Anomaly 4041/IL 6 - Initial Ground Check	1:2,500
D/MZ 02/057	INPUT Anomaly 4041/IL 7 - Initial Ground Check	1:2,500
D/MZ 02/065	INPUT Anomaly 4041/IL 8 - Initial Ground Check	1:2,500
D/MZ 02/063	INPUT Anomaly 4041/IL 9 - Initial Ground Check	1:2,500
D/MZ 02/061	INPUT Anomaly 3941/IL10 - Initial Ground Check	1:2,500
D/MZ 02/059	INPUT Anomaly 3941/IL11 - Initial Ground Check	1:2,500
D/MZ 02/079	IL 1 - Dempster Creek - Line OE - Max-min & Ground Magnetics	1:2,500
D/MZ 02/080	IL 1 - Dempster Creek - Line 200W - Max-min & Ground Magnetics	1:2,500
D/MZ 02/081	IL 1 - Dempster Creek - Line 400W - Max-min, Ground Magnetics & IP/Resistivity	1:2,500
D/MZ 02/085	IL 1 - Black Marsh Road - Line 200E - Max-min & Ground Magnetics	1:2,500
D/MZ 02/083	IL 3 - Rabbit Plains Road - Line 200S - Max-min & Ground Magnetics	1:2,500
D/MZ 02/082	IL 3 - Rabbit Plains Road - Line 00N - Max-min, Ground Magnetics & IP/Resistivity	1:2,500
D/MZ 02/084	IL 3 - Rabbit Plains Road - Line 200N - Max-min & Ground Magnetics	1:2,500



509169

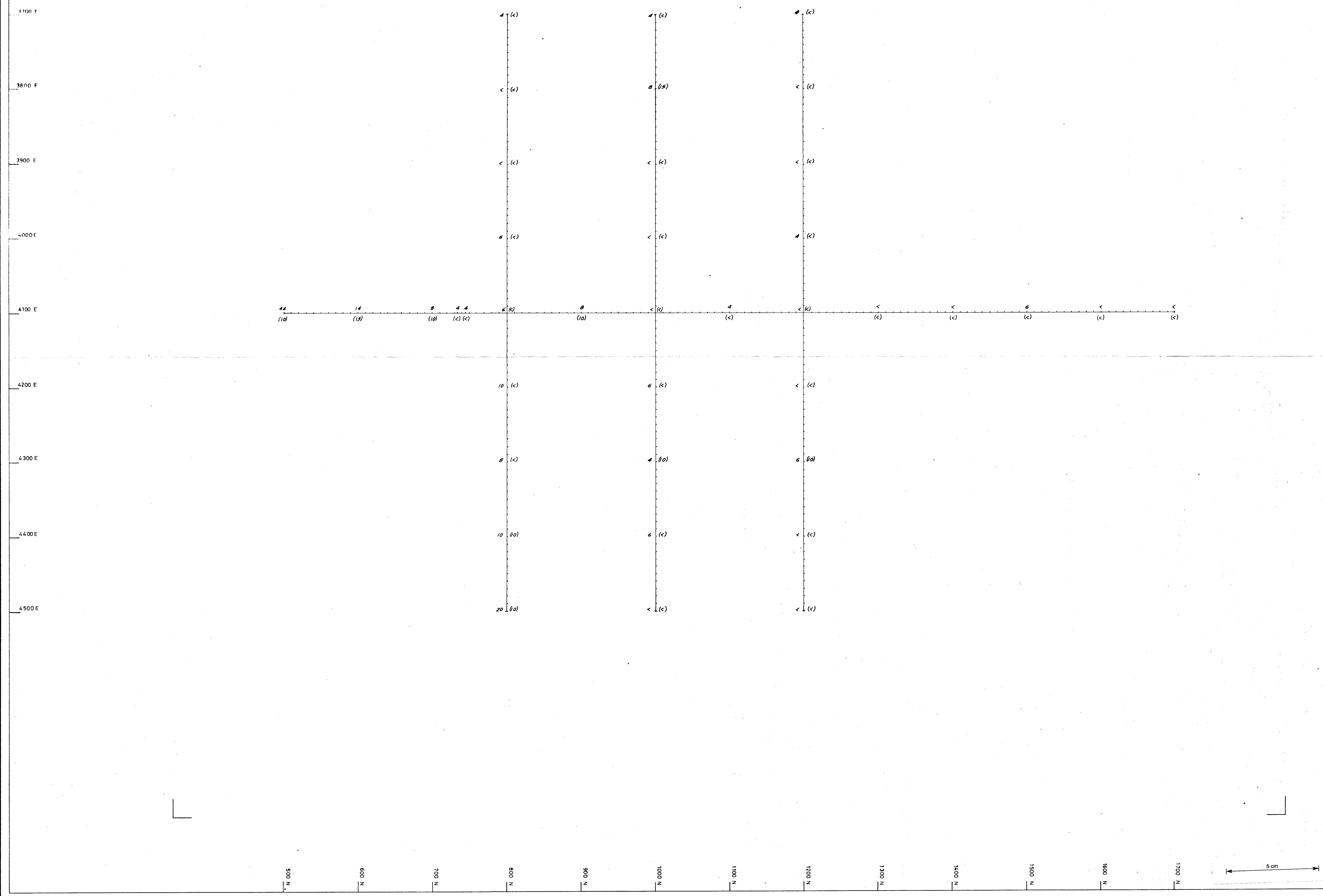
0 100 200M

The Shell Company of Australia Limited METALS DIVISION	
E.L. 36/79 LOONGANA BLYTHE RIVER 4042/4 MAGNETIC PROFILE LINE 4100 E (Southern Sheet) Scale 1cm = 250nT VERTICAL, 1:2500 HORIZONTAL	
FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ02/039
DATE 7-9-81	AUTHOR J.J.LAWTON.
DRAWN H.L.H.	OFFICE DEVONPORT.

83-2045 Vol 2

1029

28



N

Sn = Analyses in ppm.
(W) = Analyses in ppm.

509170

0 100 200M

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
BLYTHE RIVER 4042/4
SOIL GEOCHEMISTRY
SOUTHERN SHEET

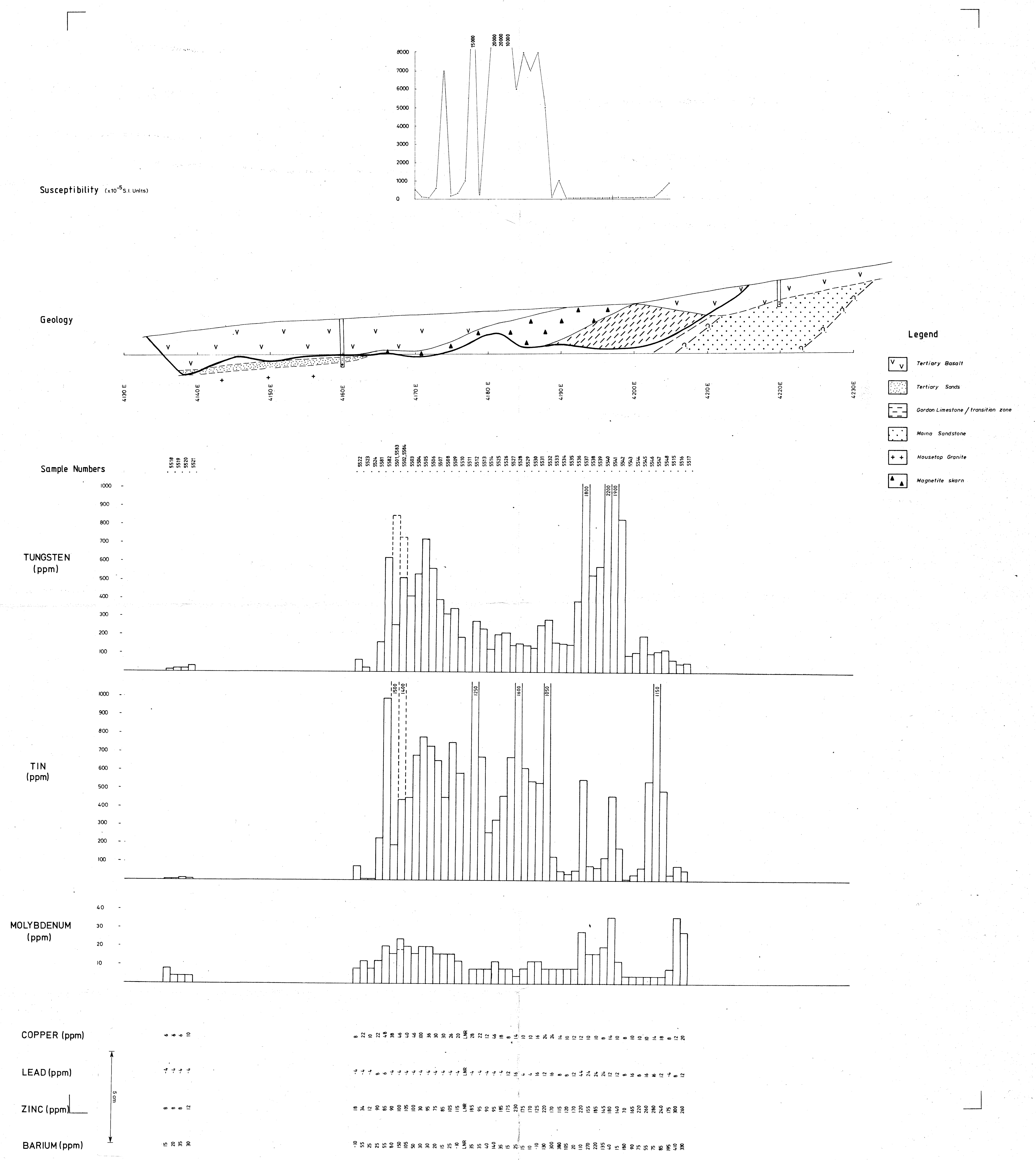
83-2045
Vol 2.

Scale 1:2500

FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ02/040
DATE 7-9-81	AUTHOR J.J. LAWTON.
DRAWN H.L.H.	OFFICE DEVONPORT.

1687

29



509171

The Shell Company of Australia Limited
METALS DIVISION

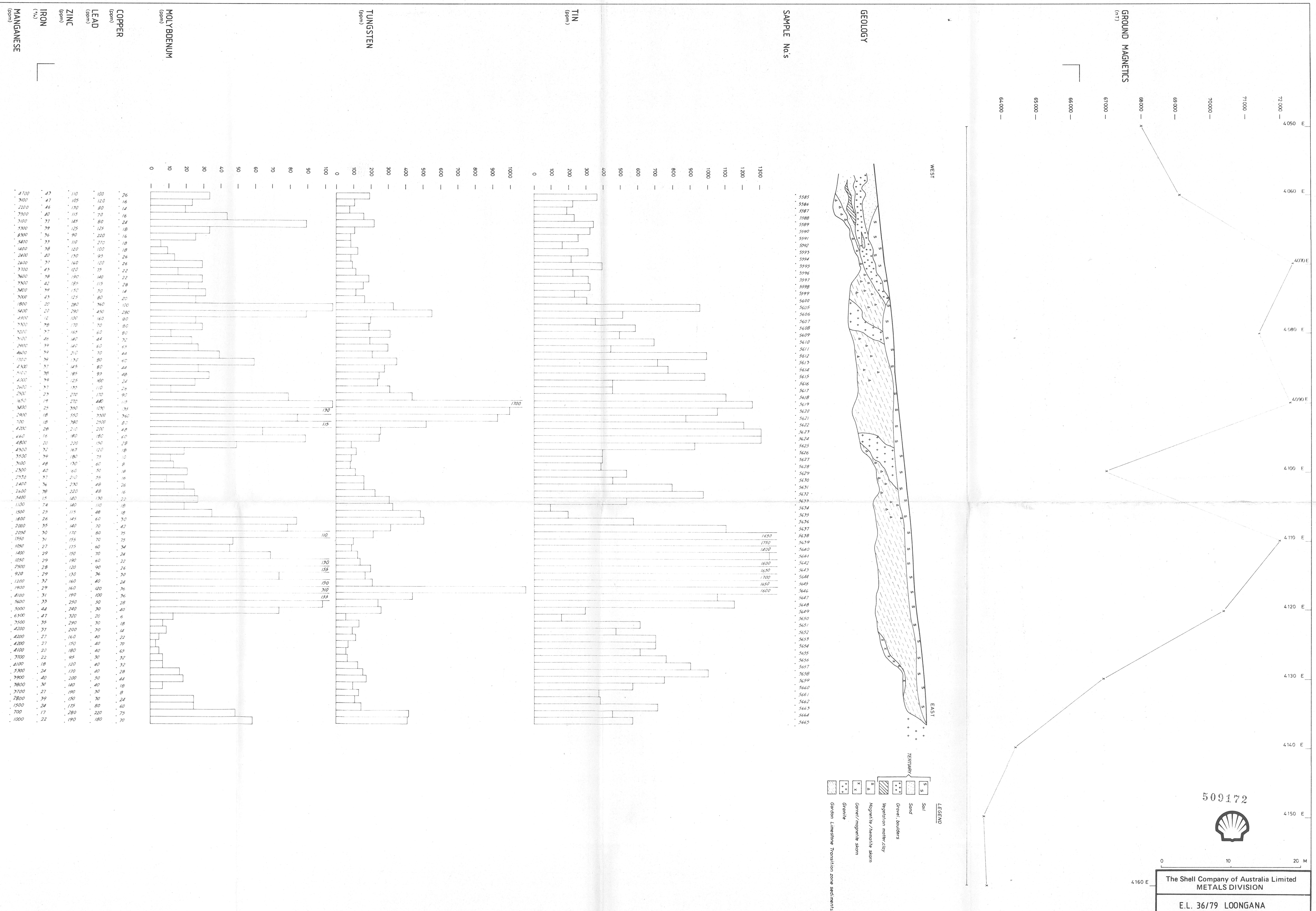
EL 36/79 LOONGANA
BLYTHE RIVER 4042/4
LINE 2700 N
GEOLOGY AND GEOCHEMISTRY

93-2046 Vol.2

SCALE	1:250	DATE	2-6-82
AUTHOR	J.J. LAWTON	DRAWN	H.L.H.
OFFICE	DEVONPORT	REF No.	
ENCL No.		DRG No.	D/M202/055

30

1689



0 10 20 M

4160 E

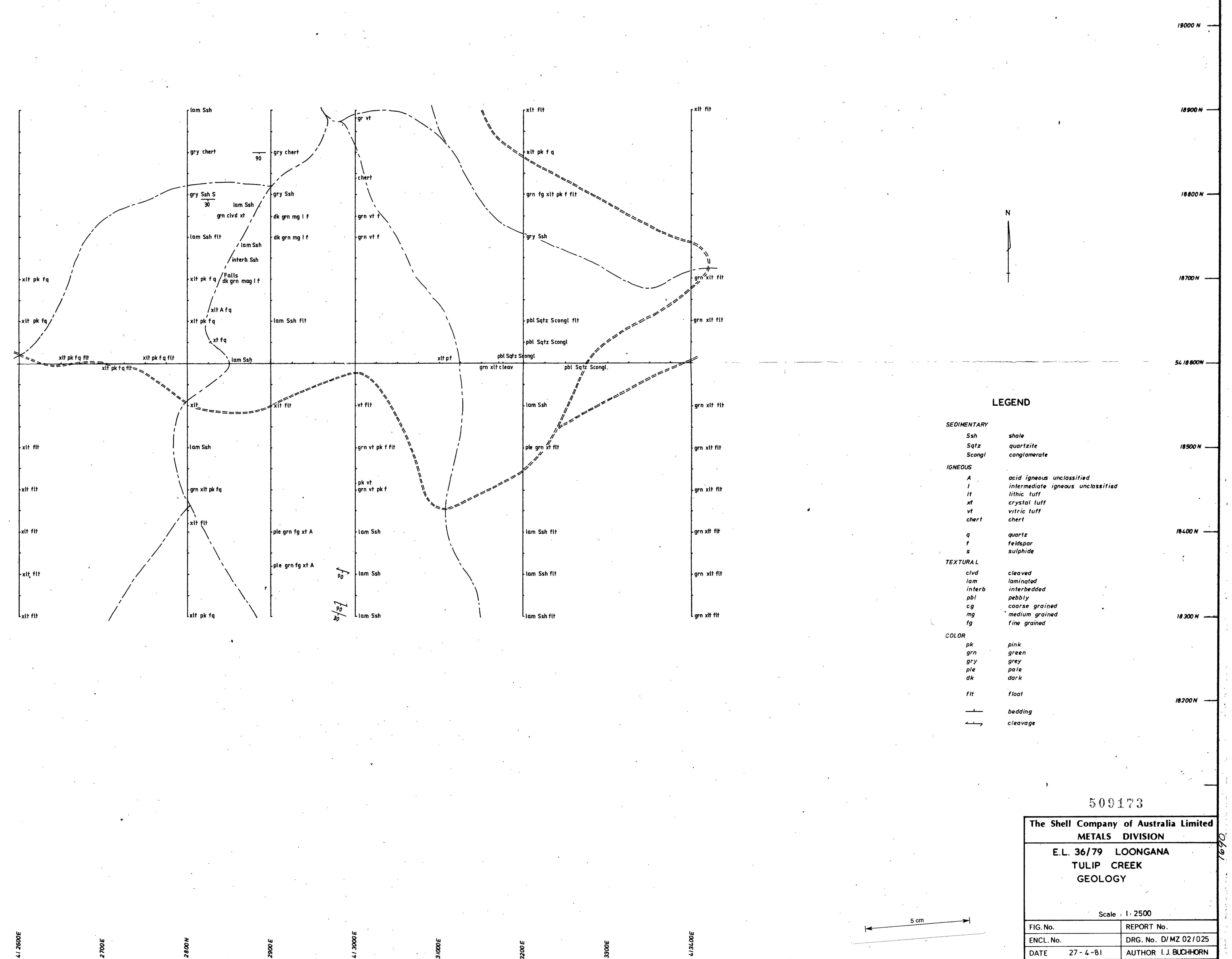
The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
BLYTHE RIVER 4042/4
LINE 2750 N
COSTEAN GEOLOGY &
GEOCHEMISTRY

SCALE	1: 250	DATE	7-9-82
AUTHOR	J.J. LAWTON	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP.No.	
ENCL No.		DRG No	D/MZ02/075

31

1690



LEGEND

SEDIMENTARY	
Ssh	*shale*
Sqtz	*quartzite*
Scongl	*conglomerate*
IGNEOUS	
A	*acid igneous unclassified*
I	*intermediate igneous unclassified*
lt	*lithic tuff*
xt	*crystal tuff*
vt	*vitric tuff*
chert	*chert*
q	*quartz*
f	*feldspar*
s	*sulphide*
TEXTURAL	
clvd	*cleaved*
lam	*laminated*
interb	*interbedded*
pbl	*pebbly*
cg	*coarse grained*
mg	*medium grained*
fg	*fine grained*
COLOR	
pk	*pink*
grn	*green*
gry	*grey*
ple	*pale*
dk	*dark*
flt	*float*
(symbol)	*bedding*
(symbol)	*cleavage*

509173

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
TULIP CREEK
GEOLOGY

Scale : 1 : 2500

FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ 02/025
DATE 27-4-81	AUTHOR I.J BUCHHORN
DRAWN O. HEDDITCH	OFFICE DEVONPORT

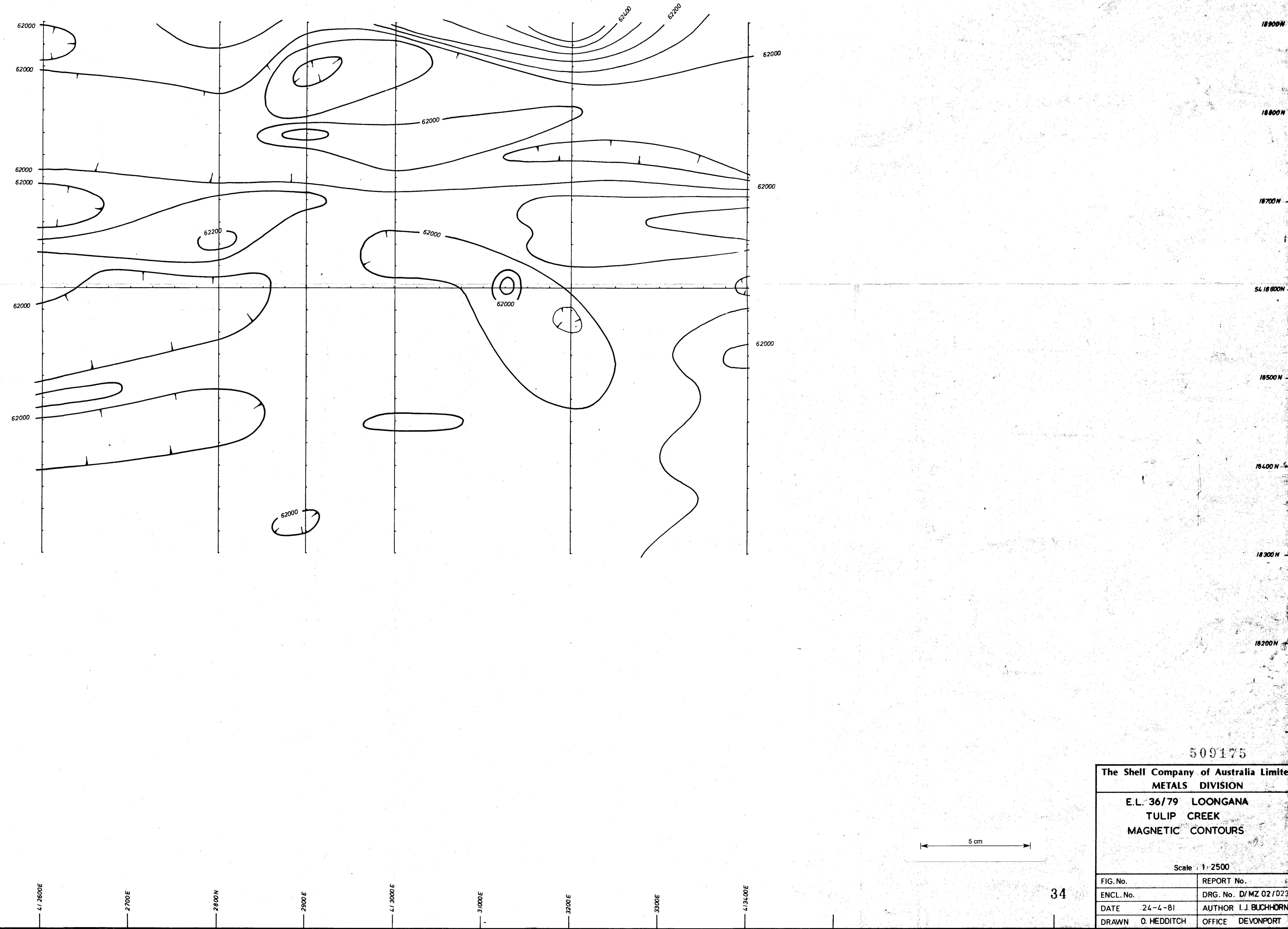
509174

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
TULIP CREEK
SOIL GEOCHEMISTRY

Scale : 1 : 2500

FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ 02/026
DATE 28-4-81	AUTHOR I.J. BUCHHORN
DRAWN O. HEDDITCH	OFFICE DEVONPORT



509175

The Shell Company of Australia Limited **METALS DIVISION**	
E.L. 36/79 LOONGANA TULIP CREEK MAGNETIC CONTOURS Scale : 1 : 2500	
FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ 02/023
DATE 24-4-81	AUTHOR I. J. BUCHHORN
DRAWN O. HEDDITCH	OFFICE DEVONPORT

509176

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
TULIP CREEK
MAGNETIC VALUES

Scale 1 : 2500

FIG. No.	REPORT No.
ENCL. No.	DRG. No. D/MZ 02/024
DATE 24-4-81	AUTHOR I.J. BUCHHORN
DRAWN O. HEDDITCH	OFFICE DEVONPORT

1690

5 cm

509177

SHELL COMPANY OF AUSTRALIA
METALS DIVISION

LOONGANA
INPUT

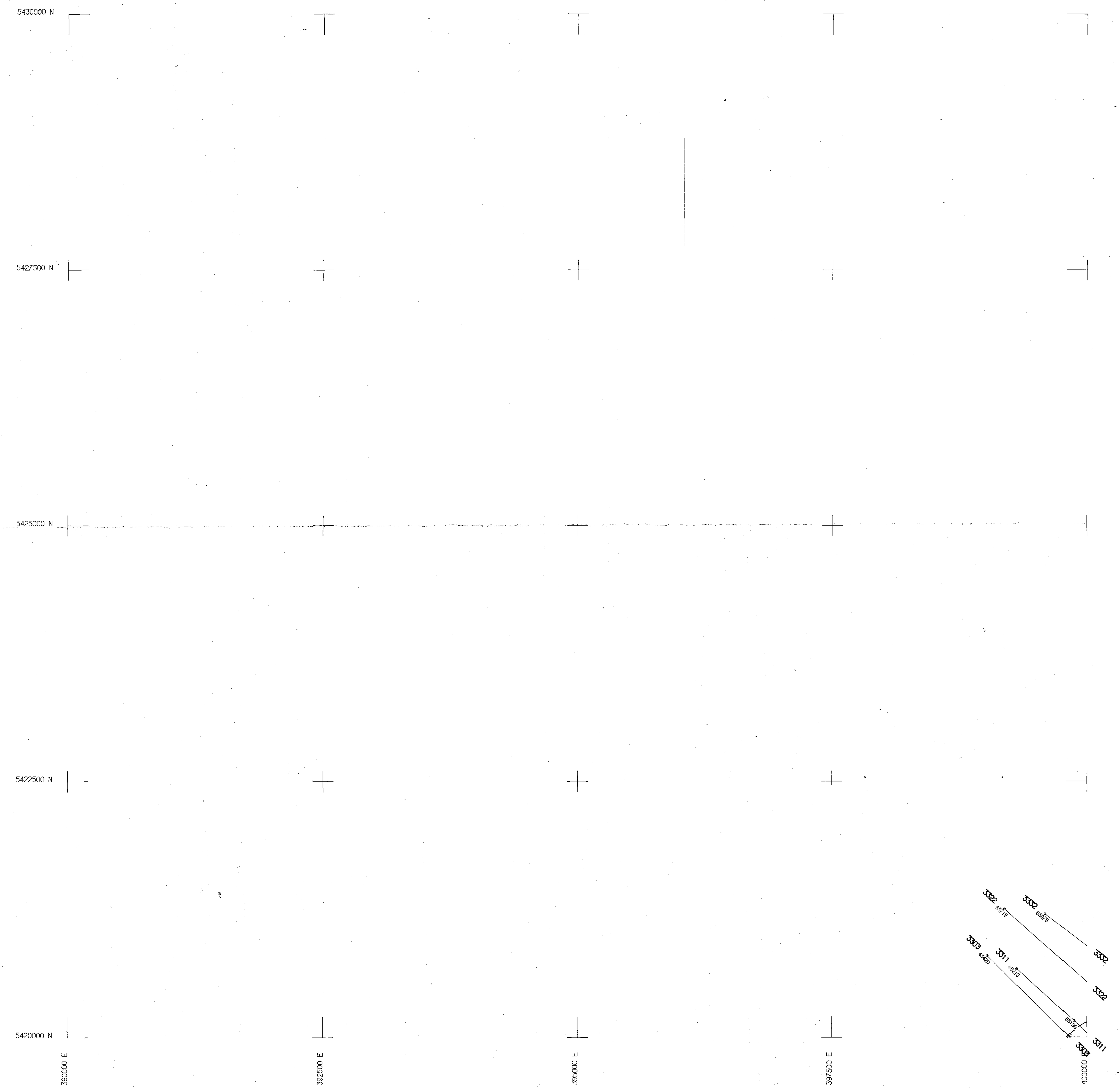
CHANNEL 3

SCALE: 1 : 20000.

FIG.NO:	REPT.NO:
ENCL.NO:	DRG.NO: D/MZ02/086
DATE:	AUTHOR:
DRAWN:	OFFICE:

36

1690



AIRBORNE SURVEY SPECIFICATIONS

EM SYSTEM :	INPUT MARK V Channel centres:500,700,900,1200, 1600 and 2100 microseconds after transmitter switch off.
EM RECORDING INTERVAL :	0.2 sec (approx 13 metres)
MAGNETOMETER :	Geometrics G803 ,sensitivity 1.0nT.
MAG RECORDING INTERVAL :	1.0 sec (approx 60 metres)
DATA RECORDING :	Geoterrex Madacs system,digital to mag tape
NOMINAL SPEED :	mean ground speed 220 km per hour.
NOMINAL TERRAIN CLEARANCE :	Mag and spectrometer in aircraft at 120m. EM transmitter in aircraft at 120m. EM detector in bird at 40m.
FLIGHT PATH RECORD :	Geocam continuous 35mm tracking camera
NOMINAL LINE SPACING :	Traverses 300m SE-NW, tie lines not flown

E.M. ANOMALY MAP

Sheet 20/3942

Grid notation refers to Australian Map Grid

Path recovery digitized from 1:20000 topo maps

Large 6 channel response

6 channel response

5 channel response

4 channel response

3 channel response

2nd & 5th channel amplitudes 10/1·0

Altitudes (metres) 120

Offset magnetic anomaly 25nT

Hertz response Hz

Zone number 20/4041/IL1

Conductor boundary

Inferred boundary

20/3942	20/4042	20/4142
20/3941	20/4041	20/4141

0 1 2 Km

SCALE 1:20000

509178

5 cm

JOB NO : 83-548

Flown by GEOTERREX PTY LTD : JANUARY 1982

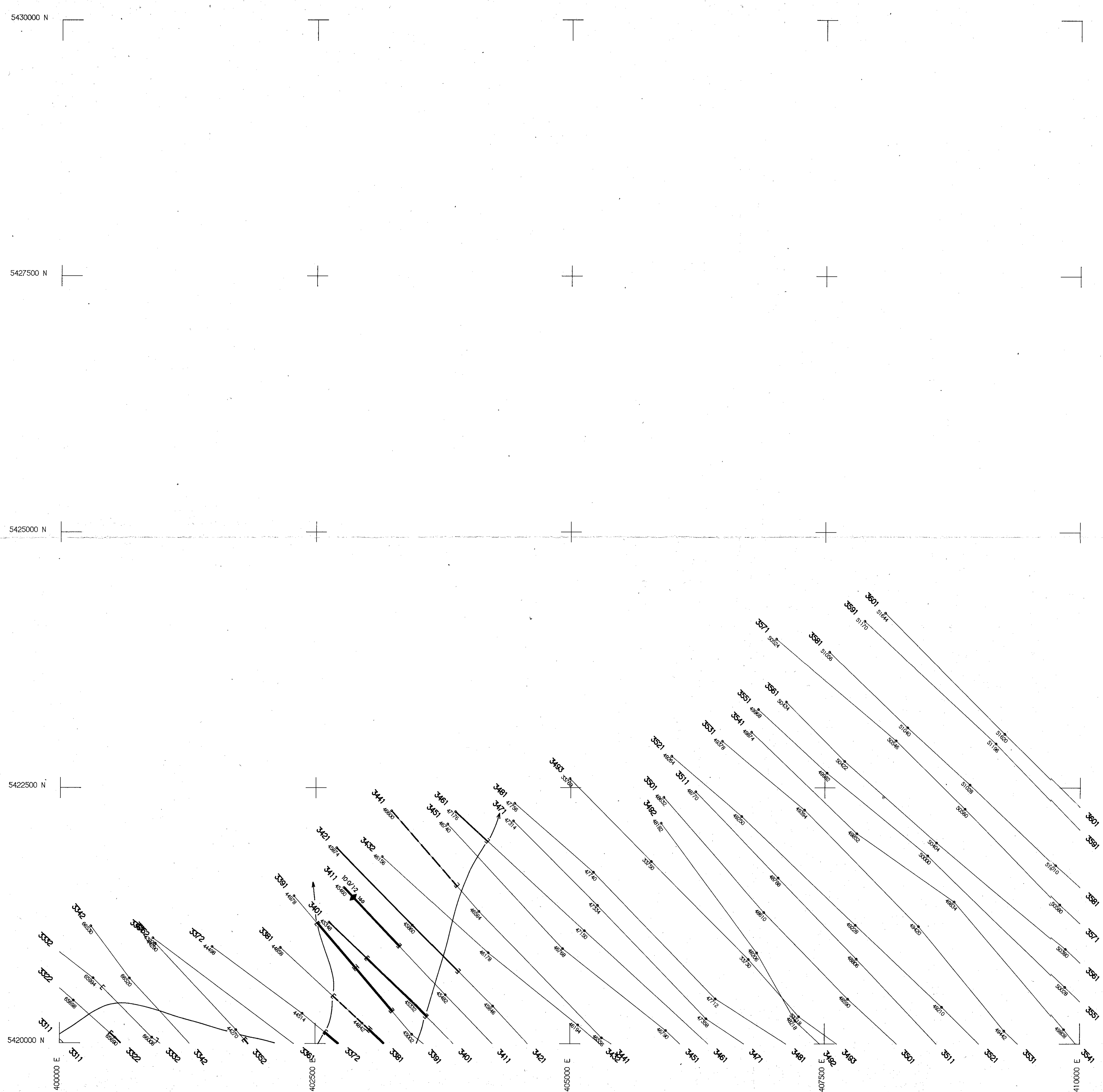
Compiled by EXPLORATION COMPUTER SERVICES PTY LTD

THE SHELL COMPANY OF AUSTRALIA LIMITED

LOONGANA , TASMANIA
E.M. ANOMALY MAP
SHEET 20/3942

PROJ NO. 0/MZ02/107 DATE: 3-MAR-82

1691



AIRBORNE SURVEY SPECIFICATIONS

EM SYSTEM :	INPUT MARK V Channel centres:500,700,900,1200, 1600 and 2100 microseconds after transmitter switch off.
EM RECORDING INTERVAL :	0.2 sec (approx 13 metres)
MAGNETOMETER :	Geometrics G803 ,sensitivity 1.0nT.
MAG RECORDING INTERVAL :	1.0 sec (approx 60 metres)
DATA RECORDING :	Geoterrex Madacs system,digital to mag tape
NOMINAL SPEED :	mean ground speed 220 km per hour.
NOMINAL TERRAIN CLEARANCE :	Mag and spectrometer in aircraft at 120m. EM transmitter in aircraft at 120m. EM detector in bird at 40m.
FLIGHT PATH RECORD :	Geocam continuous 35mm tracking camera
NOMINAL LINE SPACING :	Traverses 300m SE-NW, tie lines not flown

E.M. ANOMALY MAP
Sheet 20/4042
Grid notation refers to Australian Map Grid
Path recovery digitized from 1:20000 topo maps

Large 6 channel response
6 channel response
5 channel response
4 channel response
3 channel response
2nd & 5th channel amplitudes 10/1·0
Altitudes (metres) 120
Offset magnetic anomaly 25nT
Hertz response Hz
Zone number 20/4041/IL1
Conductor boundary
Inferred boundary

20/3942	20/4042	20/4142
20/3941	20/4041	20/4141

0 1 2 Km
SCALE 1:20000

5 cm

509179

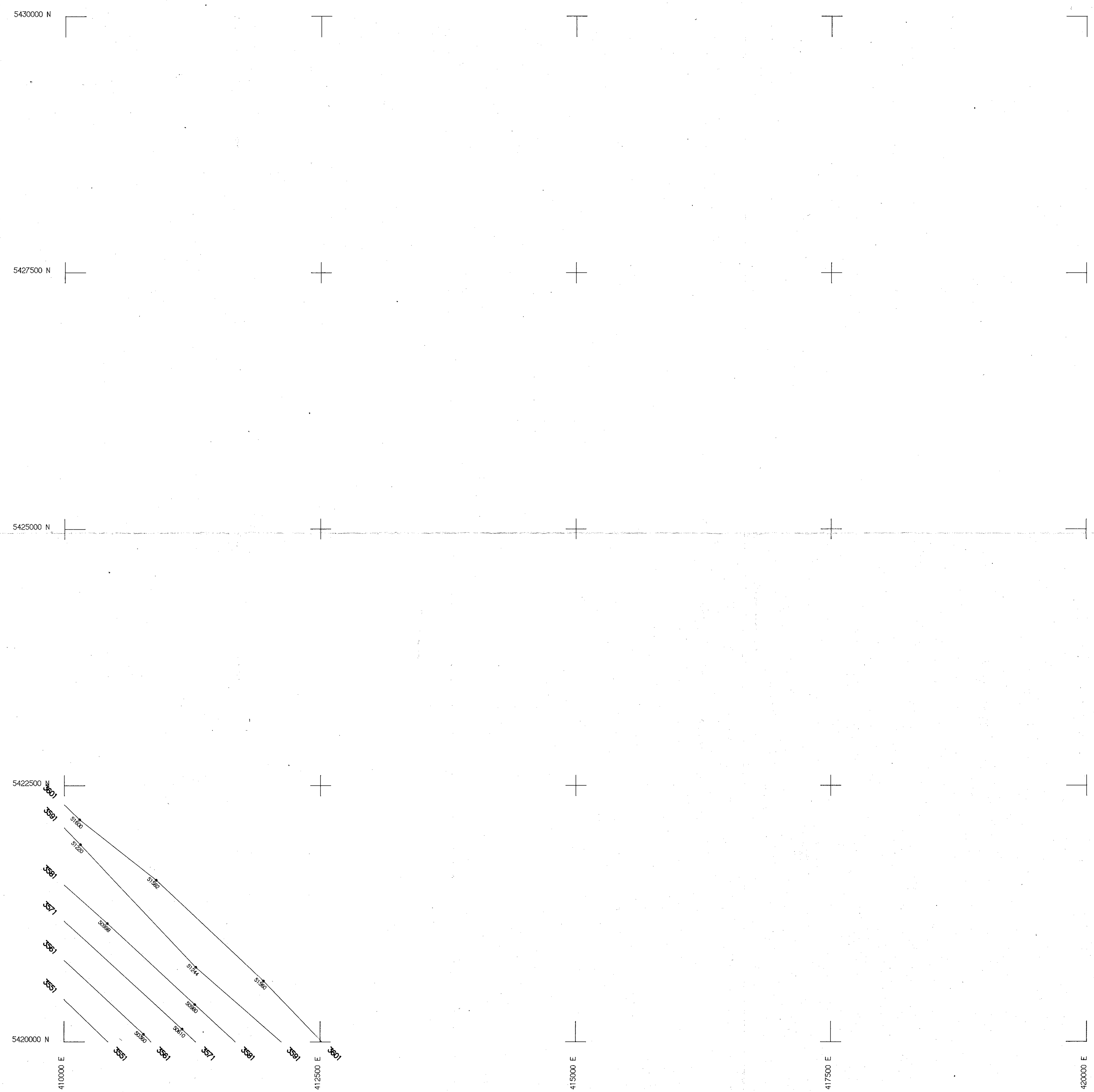
JOB NO : 83-548
Flown by GEOTERREX PTY LTD : JANUARY 1982
Compiled by EXPLORATION COMPUTER SERVICES PTY LTD

THE SHELL COMPANY
OF AUSTRALIA LIMITED

LOONGANA , TASMANIA
E.M. ANOMALY MAP
SHEET 20/4042

PROJ NO. D/MZ02/108 | DATE: 3-MAR-82

1691



AIRBORNE SURVEY SPECIFICATIONS

EM SYSTEM :	INPUT MARK V Channel centres:500,700,900,1200, 1600 and 2100 microseconds after transmitter switch off.
EM RECORDING INTERVAL :	0.2 sec (approx 13 metres)
MAGNETOMETER :	Geometrics G803 ,sensitivity 1.0nT.
MAG RECORDING INTERVAL :	1.0 sec (approx 60 metres)
DATA RECORDING :	Geoterrex Madacs system,digital to mag tape
NOMINAL SPEED :	mean ground speed 220 km per hour.
NOMINAL TERRAIN CLEARANCE :	Mag and spectrometer in aircraft at 120m. EM transmitter in aircraft at 120m. EM detector in bird at 40m.
FLIGHT PATH RECORD :	Geocam continuous 35mm tracking camera
NOMINAL LINE SPACING :	Traverses 300m SE-NW, tie lines not flown

E.M. ANOMALY MAP

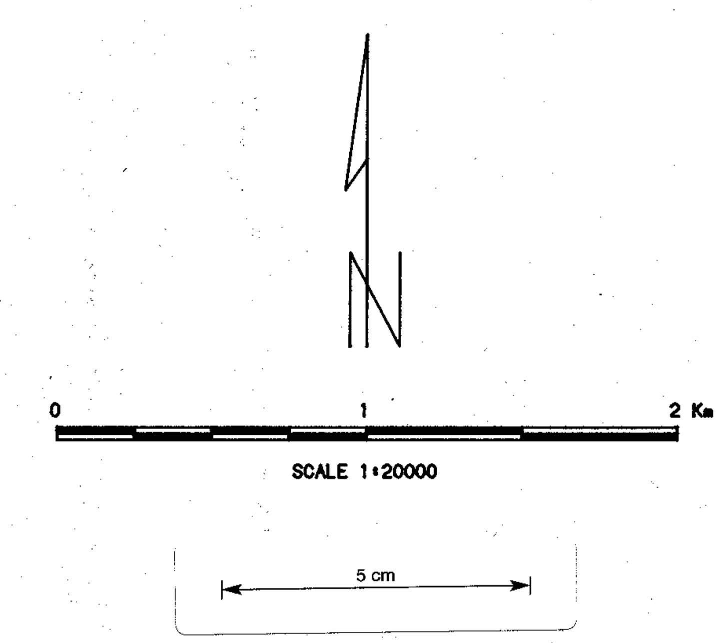
Sheet 20/4142

Grid notation refers to Australian Map Grid

Path recovery digitized from 1:20000 topo maps

Large 6 channel response
6 channel response
5 channel response
4 channel response
3 channel response
2nd & 5th channel amplitudes 10/1·0
Altitudes (metres) 120
Offset magnetic anomaly 25nT
Hertz response Hz
Zone number 20/4041/IL1
Conductor boundary
Inferred boundary

20/3942	20/4042	20/4142
20/3941	20/4041	20/4141



509180

JOB NO : 83-548
Flown by GEOTERREX PTY LTD : JANUARY 1982
Compiled by EXPLORATION COMPUTER SERVICES PTY LTD

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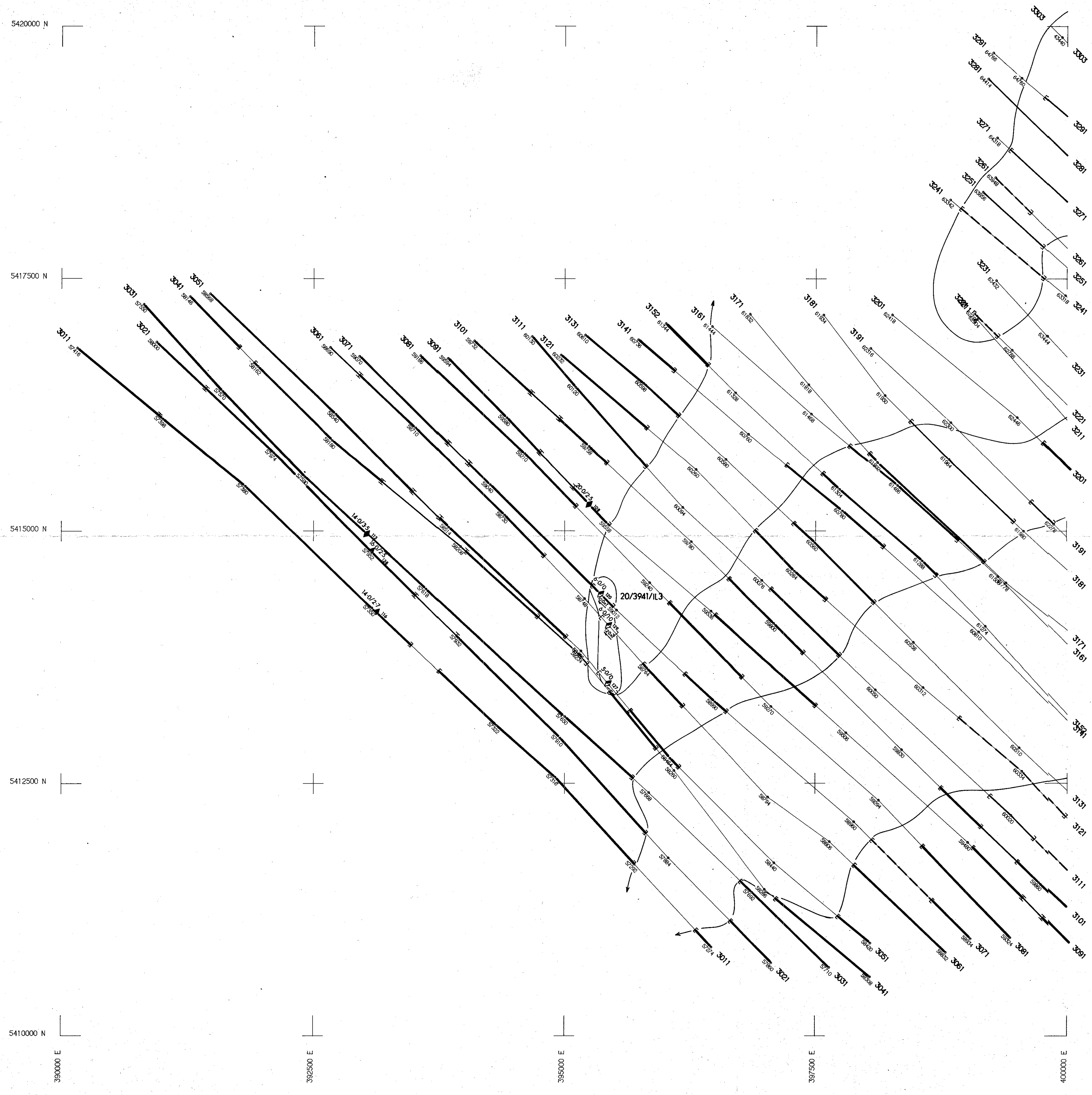
OF AUSTRALIA LIMITED

LOONGANA , TASMANIA
E.M. ANOMALY MAP
SHEET 20/4142

PROJ NO. D/MZ02/109 | DATE: 3-MAR-82

1691



AIRBORNE SURVEY SPECIFICATIONS

EM SYSTEM :	INPUT MARK V Channel centres:500,700,900,1200, 1600 and 2100 microseconds after transmitter switch off.
EM RECORDING INTERVAL :	0.2 sec (approx 13 metres)
MAGNETOMETER :	Geometrics G803 ,sensitivity 1.0nT.
MAG RECORDING INTERVAL :	1.0 sec (approx 60 metres)
DATA RECORDING :	Geoterrex Madacs system,digital to mag tape
NOMINAL SPEED :	mean ground speed 220 km per hour.
NOMINAL TERRAIN CLEARANCE :	Mag and spectrometer in aircraft at 120m. EM transmitter in aircraft at 120m. EM detector in bird at 40m.
FLIGHT PATH RECORD :	Geocam continuous 35mm tracking camera
NOMINAL LINE SPACING :	Traverses 300m SE-NW, tie lines not flown

E.M. ANOMALY MAP
Sheet 20/3941
Grid notation refers to Australian Map Grid
Path recovery digitized from 1:20000 topo maps

Large 6 channel response
6 channel response
5 channel response
4 channel response
3 channel response
2nd & 5th channel amplitudes 10/1·0
Altitudes (metres) 120
Offset magnetic anomaly 25nT
Hertz response Hz
Zone number 20/4041/IL1
Conductor boundary
Inferred boundary

20/3942	20/4042	20/4142
20/3941	20/4041	20/4141

N

0 1 2 Km
SCALE 1:20000

5 cm

509181

JOB NO : 83-548
Flown by GEOTERREX PTY LTD : JANUARY 1982
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OF AUSTRALIA LIMITED

LOONGANA , TASMANIA
E.M. ANOMALY MAP
SHEET 20/3941

PROJ NO. D/MZ02/110 DATE: 3-MAR-82

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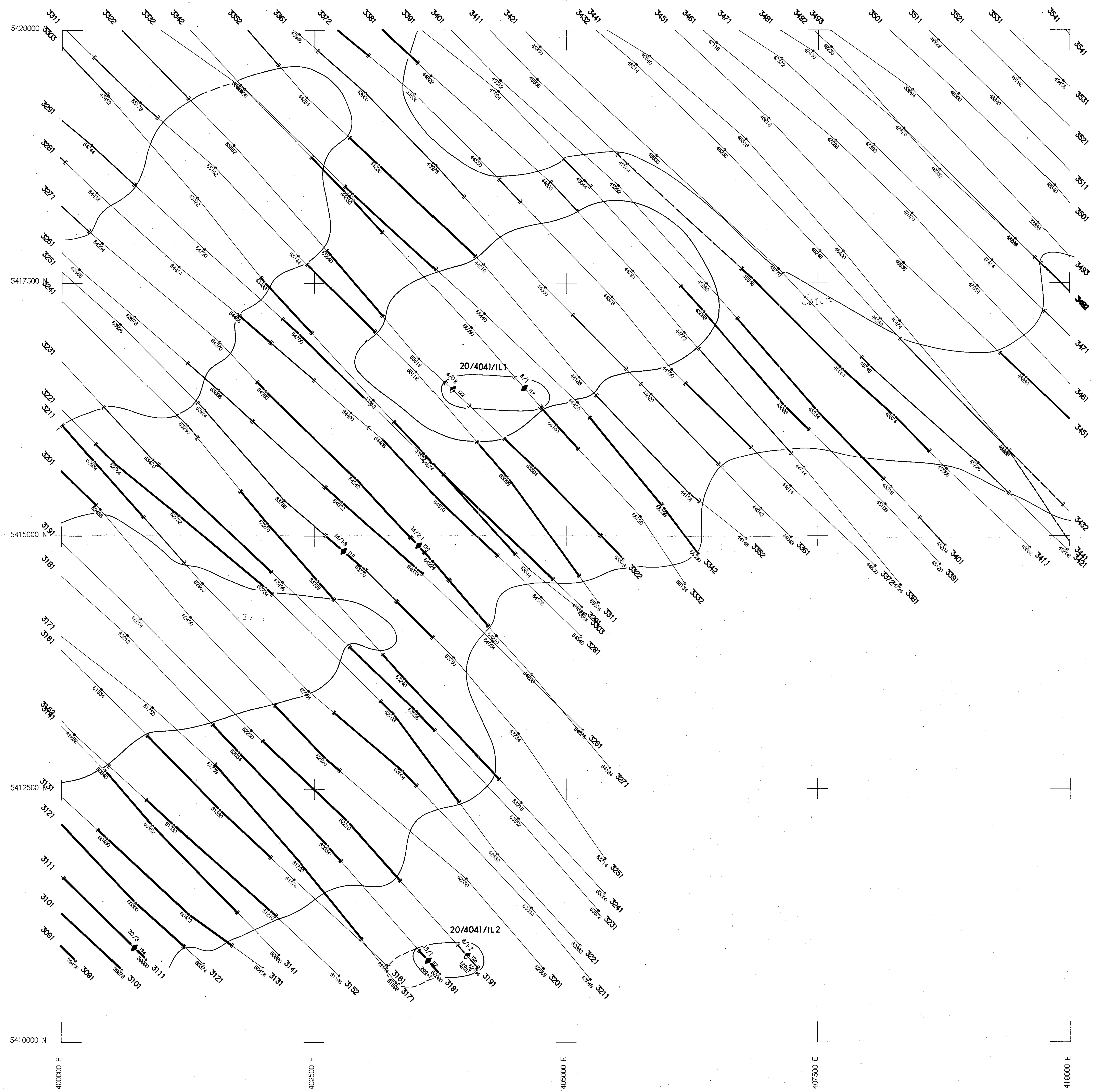
1691



AIRBORNE SURVEY SPECIFICATIONS

EM SYSTEM :	INPUT MARK V Channel centres:500,700,900,1200, 1600 and 2100 microseconds after transmitter switch off.
EM RECORDING INTERVAL :	0.2 sec (approx 13 metres)
MAGNETOMETER :	Geometrics G803 ,sensitivity 1.0nT.
MAG RECORDING INTERVAL :	1.0 sec (approx 60 metres)
DATA RECORDING :	Geoterrex Madacs system,digital to mag tape
NOMINAL SPEED :	mean ground speed 220 km per hour.
NOMINAL TERRAIN CLEARANCE :	Mag and spectrometer in aircraft at 120m. EM transmitter in aircraft at 120m. EM detector in bird at 40m.
FLIGHT PATH RECORD :	Geocam continuous 35mm tracking camera
NOMINAL LINE SPACING :	Traverses 300m SE-NW, tie lines not flown

E.M. ANOMALY MAP
Sheet 20/4041
Grid notation refers to Australian Map Grid
Path recovery digitized from 1:20000 topo maps

Large 6 channel response
6 channel response
5 channel response
4 channel response
3 channel response
2nd & 5th channel amplitudes 10/1·0
Altitudes (metres) 120
Offset magnetic anomaly 25nT
Hertz response Hz
Zone number 20/4041/IL1
Conductor boundary
Inferred boundary

20/3942	20/4042	20/4142
20/3941	20/4041	20/4141

0 1 2 Km
SCALE 1:20000

5 cm

509182

JOB NO : 83-548
Flown by GEOTERREX PTY LTD : JANUARY 1982
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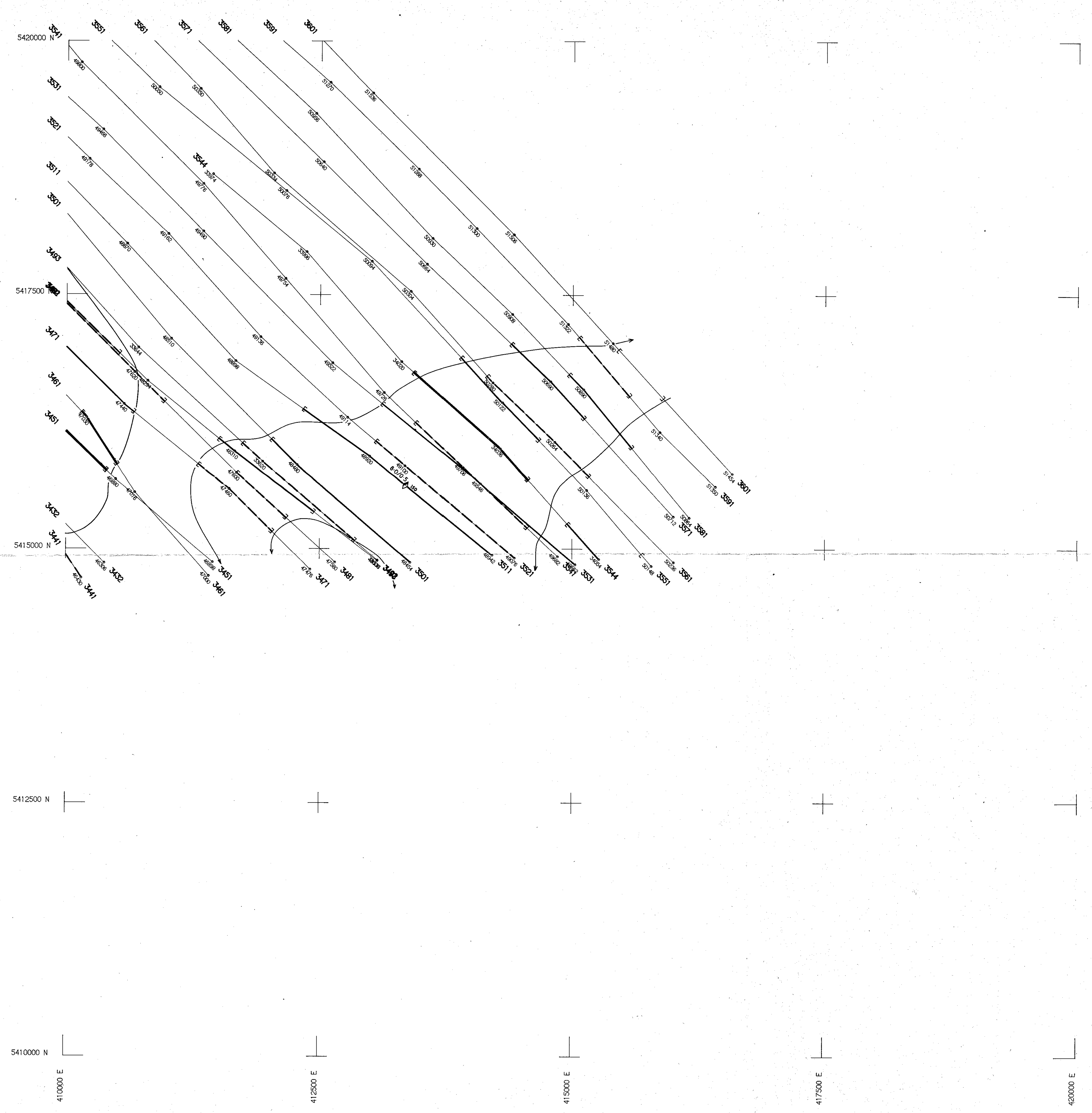
THE SHELL COMPANY
OF AUSTRALIA LIMITED

LOONGANA , TASMANIA
E.M. ANOMALY MAP
SHEET 20/4041

PROJ NO. 0/MZ02/111 DATE: 3-MAR-82

1691



AIRBORNE SURVEY SPECIFICATIONS

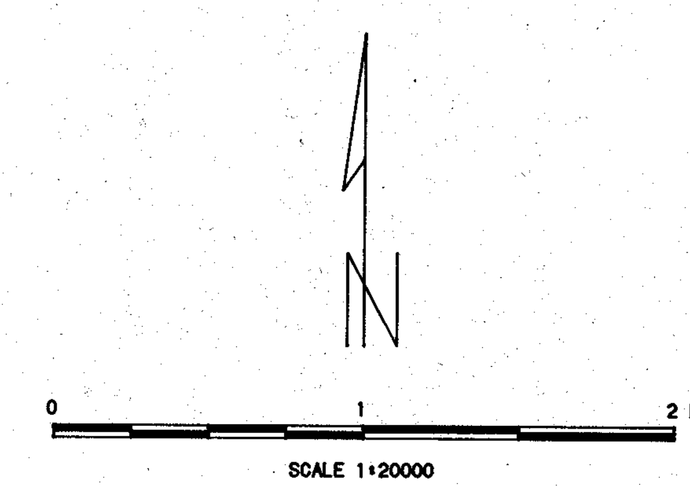
EM SYSTEM :	INPUT MARK V Channel centres:500,700,900,1200, 1600 and 2100 microseconds after transmitter switch off.
EM RECORDING INTERVAL :	0.2 sec (approx 13 metres)
MAGNETOMETER :	Geometrics G803 ,sensitivity 1.0nT.
MAG RECORDING INTERVAL :	1.0 sec (approx 60 metres)
DATA RECORDING :	Geoterrex Madacs system,digital to mag tape
NOMINAL SPEED :	mean ground speed 220 km per hour.
NOMINAL TERRAIN CLEARANCE :	Mag and spectrometer in aircraft at 120m. EM transmitter in aircraft at 120m. EM detector in bird at 40m.
FLIGHT PATH RECORD :	Geocam continuous 35mm tracking camera
NOMINAL LINE SPACING :	Traverses 300m SE-NW, tie lines not flown

E.M. ANOMALY MAP

Sheet 20/4141
Grid notation refers to Australian Map Grid
Path recovery digitized from 1:20000 topo maps

Large 6 channel response
6 channel response
5 channel response
4 channel response
3 channel response
2nd & 5th channel amplitudes 10/1·0
Altitudes (metres) 120
Offset magnetic anomaly 25nT
Hertz response Hz
Zone number 20/4041/IL1
Conductor boundary
Inferred boundary

20/3942	20/4042	20/4142
20/3941	20/4041	20/4141



5 cm

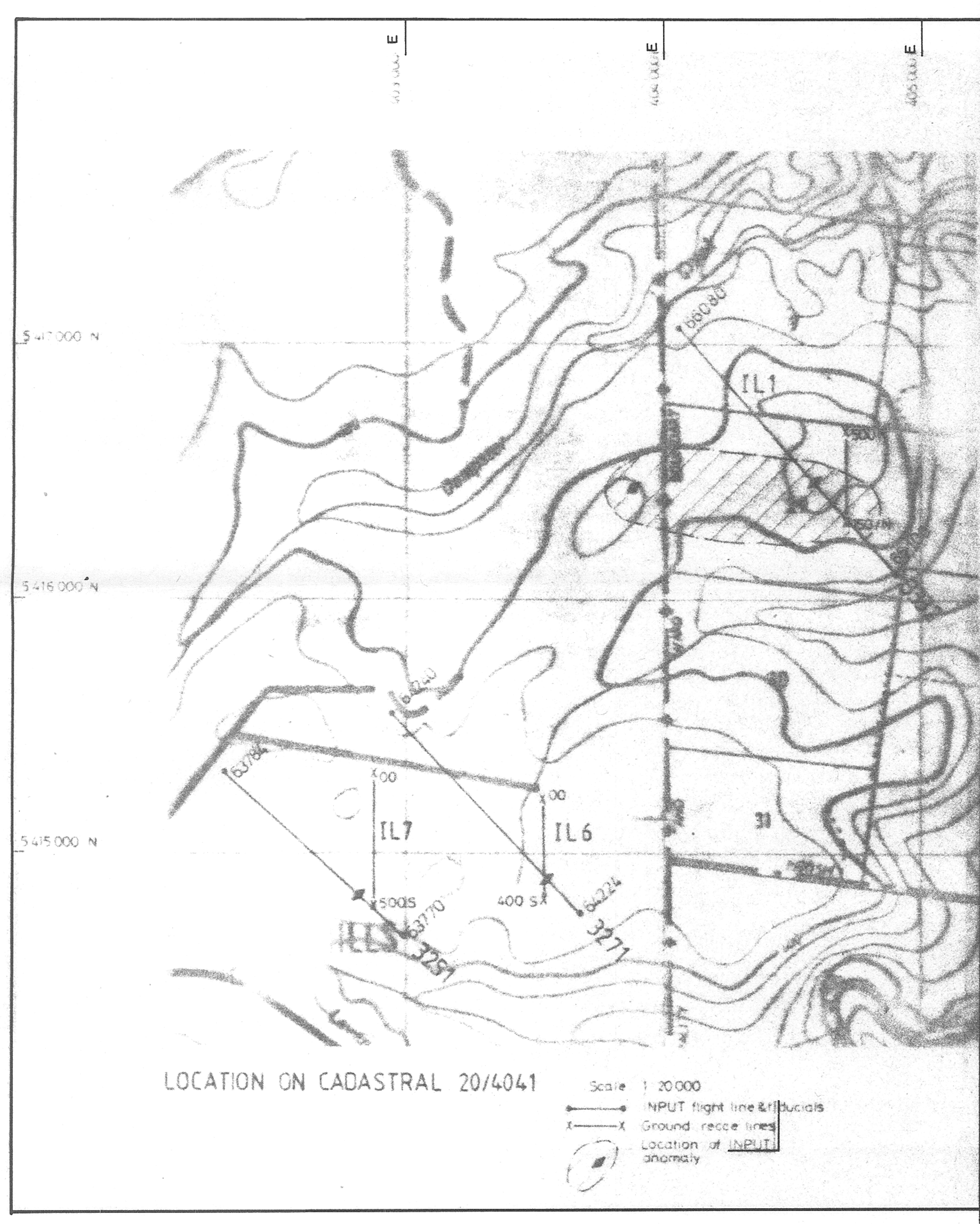
509183

JOB NO : 83-548
Flown by GEOTERREX PTY LTD : JANUARY 1982
Compiled by EXPLORATION COMPUTER SERVICES PTY LTD

THE SHELL COMPANY
OF AUSTRALIA LIMITED

LOONGANA , TASMANIA
E.M. ANOMALY MAP
SHEET 20/4141

PROJ NO. D/M202/112	DATE: 3-MAR-82



509184

0 100 200M

The Shell Company of Australia Limited METALS DIVISION	
E.L. 36/79 LOONGANA INPUT ANOMALY 4041/IL1 INITIAL GROUND CHECK	
SCALE 1:2500	DATE 30-7-82
AUTHOR G. OAKES	DRAWN H.L.H.
OFFICE DEVONPORT	REP No.
ENCL No.	DRG No. D/MZ02/058

43

5 cm

1692

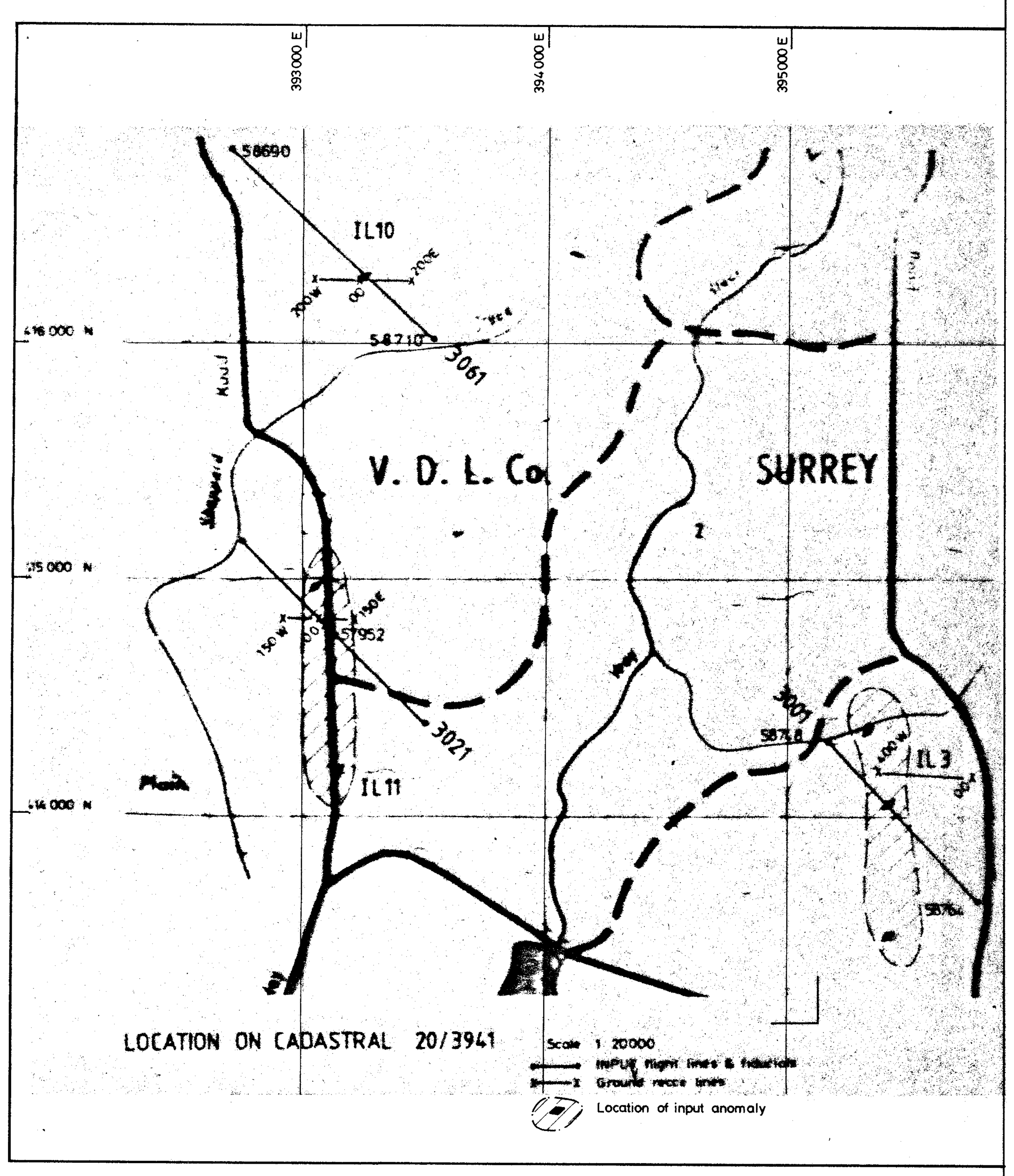
The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
INPUT ANOMALY 3941/IL3
INITIAL GROUND CHECK

SCALE	1:2500	DATE	2-8-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP No.	
ENCL No.		DRG No.	D/M202/060

509185

44



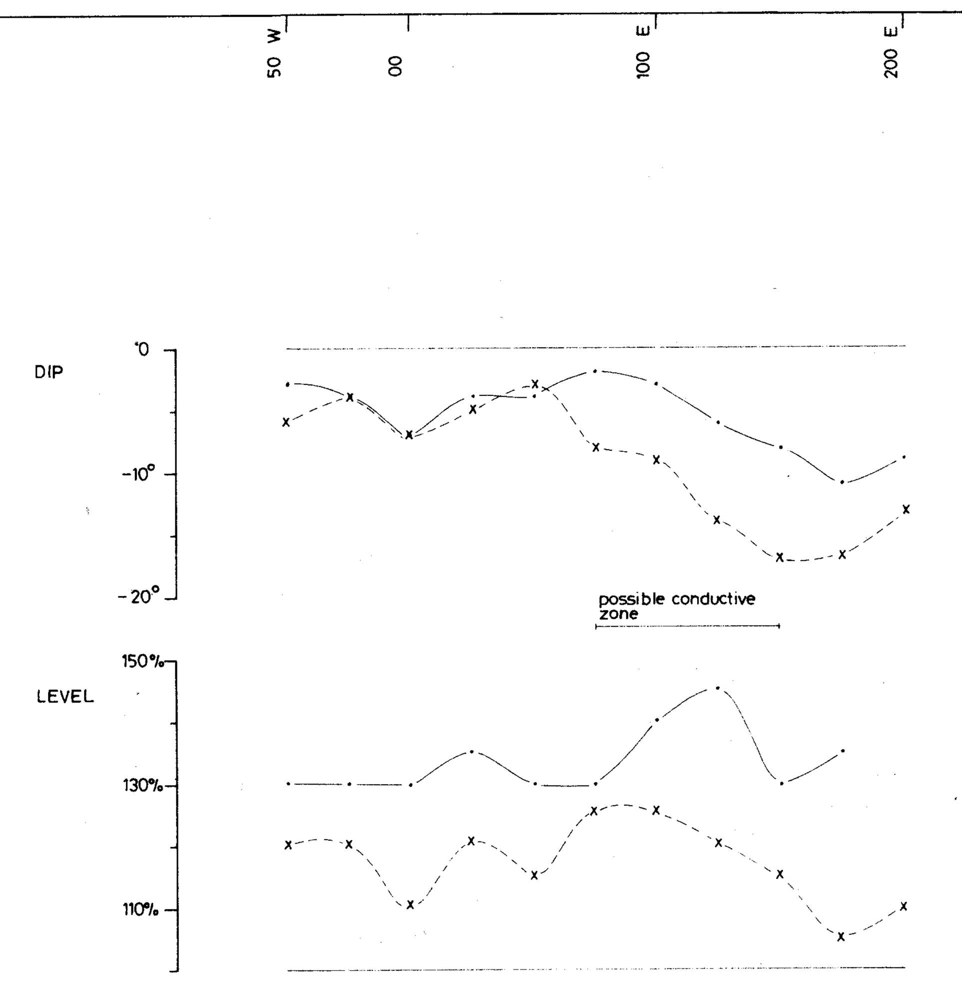
509186

The Shell Company of Australia Limited
METALS DIVISION

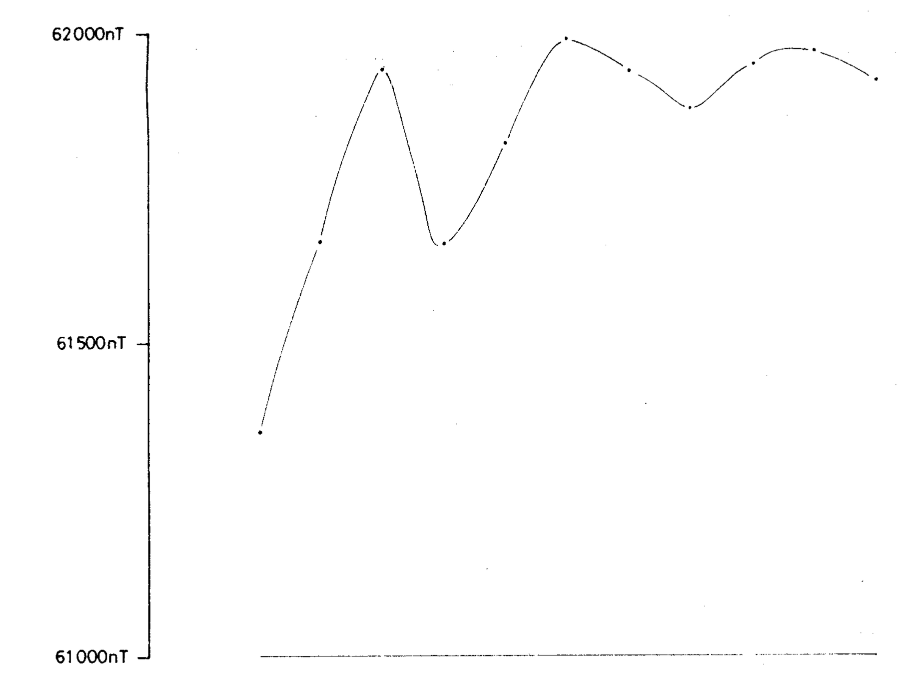
E.L. 36/79 LOONGANA
INPUT ANOMALY 4141/IL4
INITIAL GROUND CHECK

SCALE	1:2500	DATE	4-8-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP. No.	
ENCL. No.		DRG. No.	D/M202/066

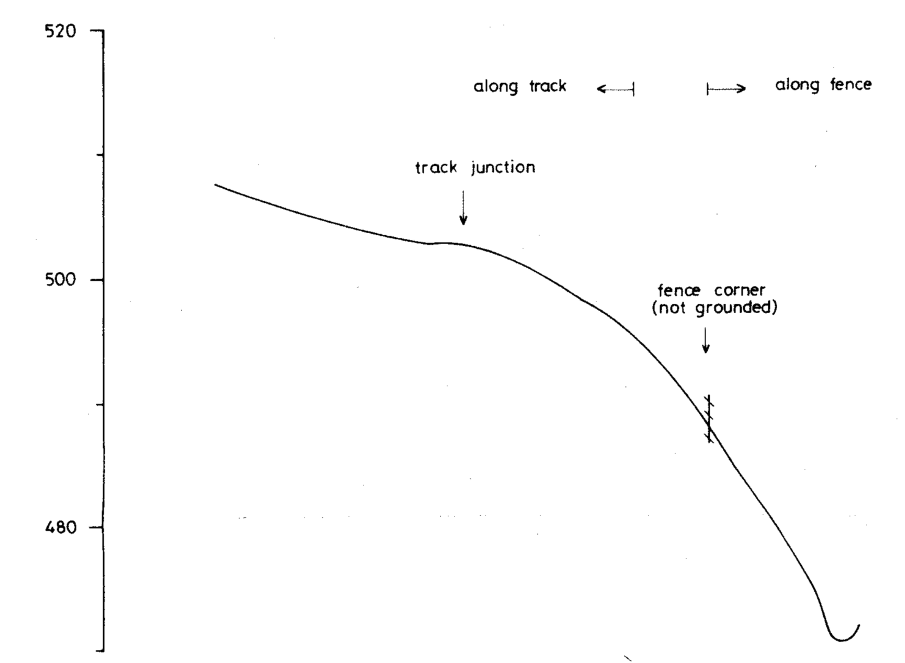
V.L.F. – EM
N.W. Cape (+ve dip to N)
Japan (+ve dip to E)



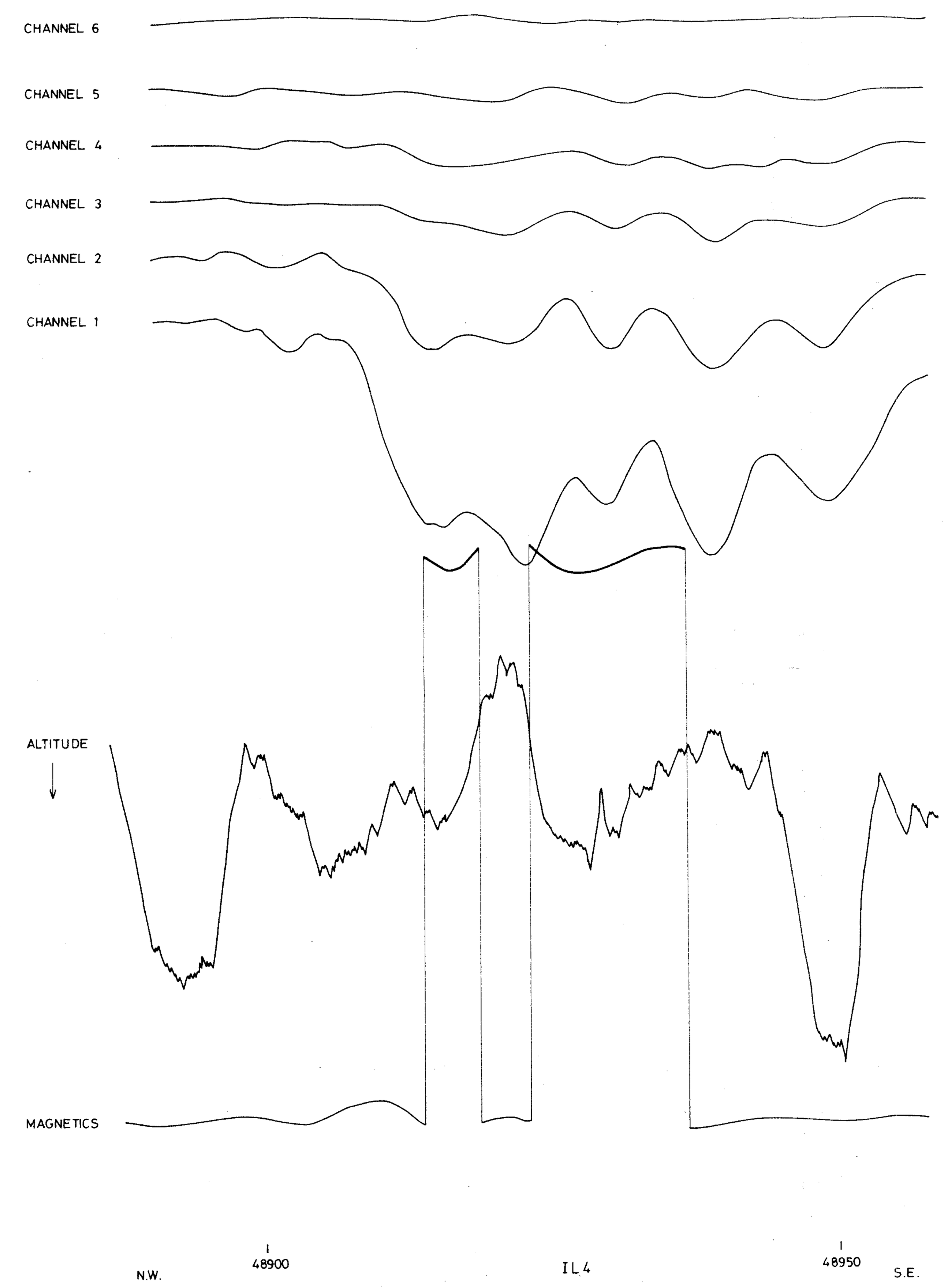
MAGNETICS

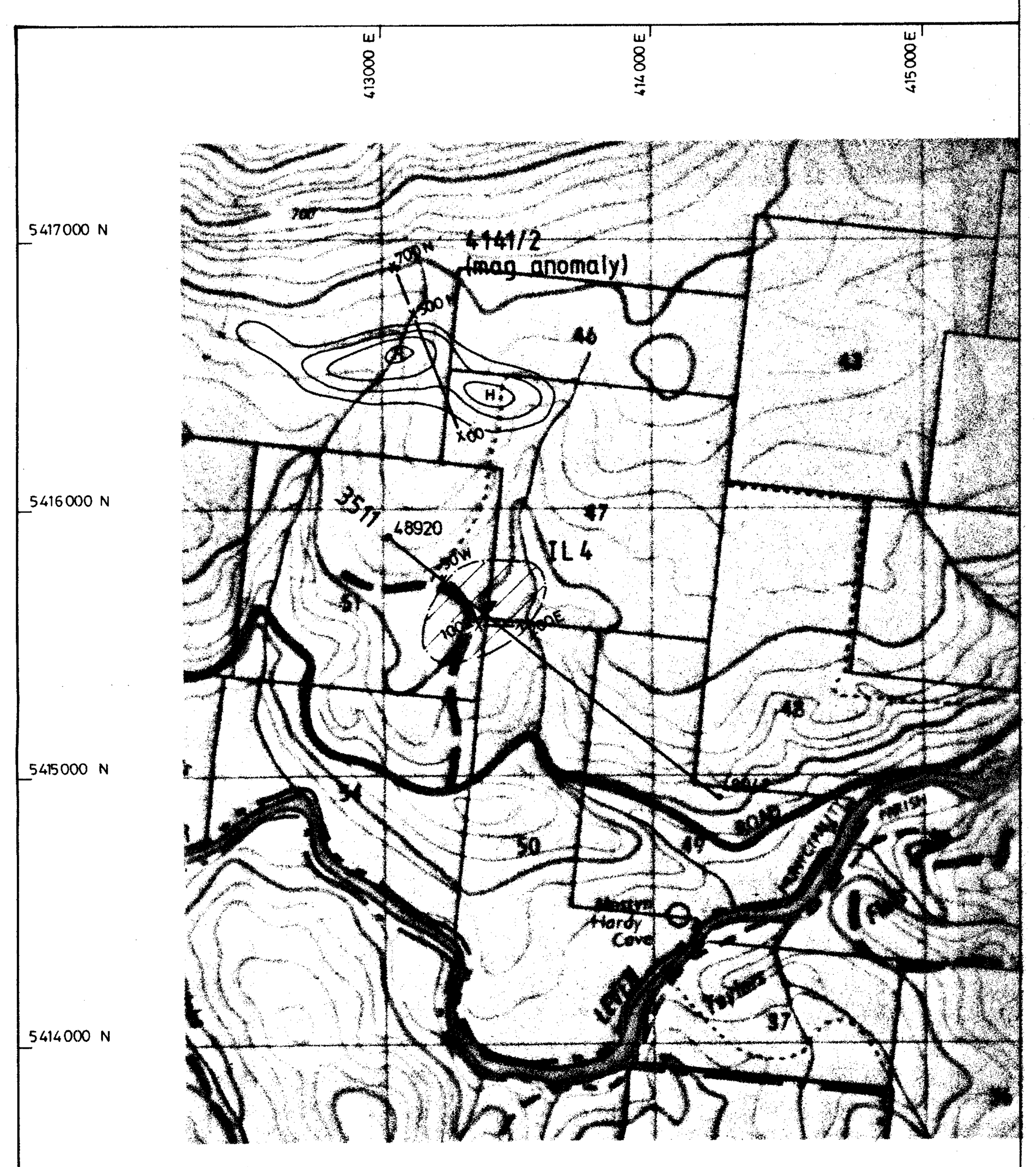


APPROX. TOPOGRAPHY & CULTURE (Metres A.S.L.)



INPUT LINE 3511





LOCATION ON CADASTRAL 20/4141

Scale 1:20 000
INPUT flight lines & fiducials
Ground recce lines
Location of INPUT anomaly

5 cm

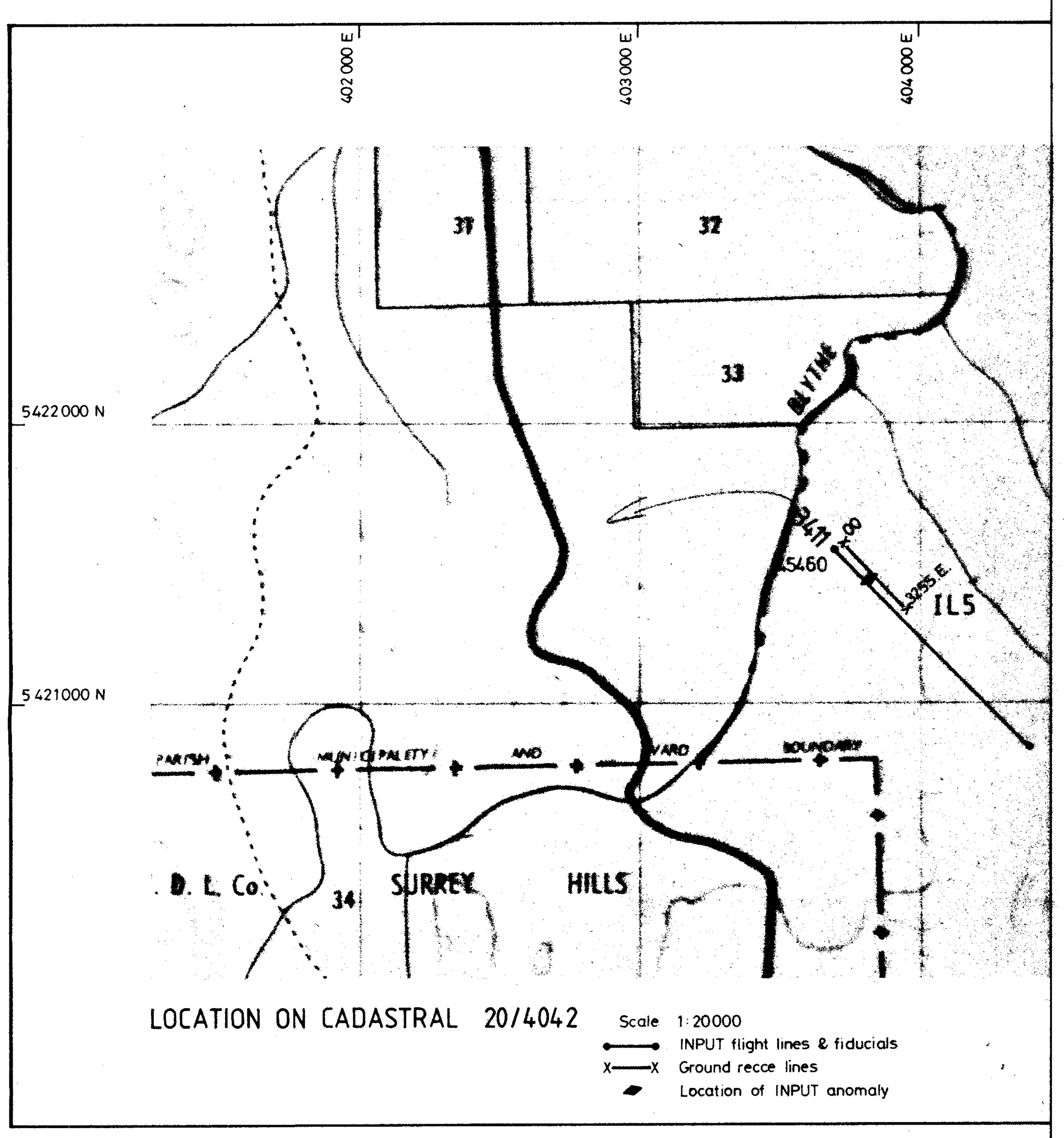
509187

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
INPUT ANOMALY 4042/IL5
INITIAL GROUND CHECK

SCALE	1:2500	DATE	3-8-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP. No.	
ENCL. No.		DRG No.	D/MZ02/062

46



LOCATION ON CADASTRAL 20/4042 Scale 1:20000
INPUT flight lines & fiducials
Ground recce lines
Location of INPUT anomaly

5 cm

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
INPUT ANOMALY 4041/IL6
INITIAL GROUND CHECK

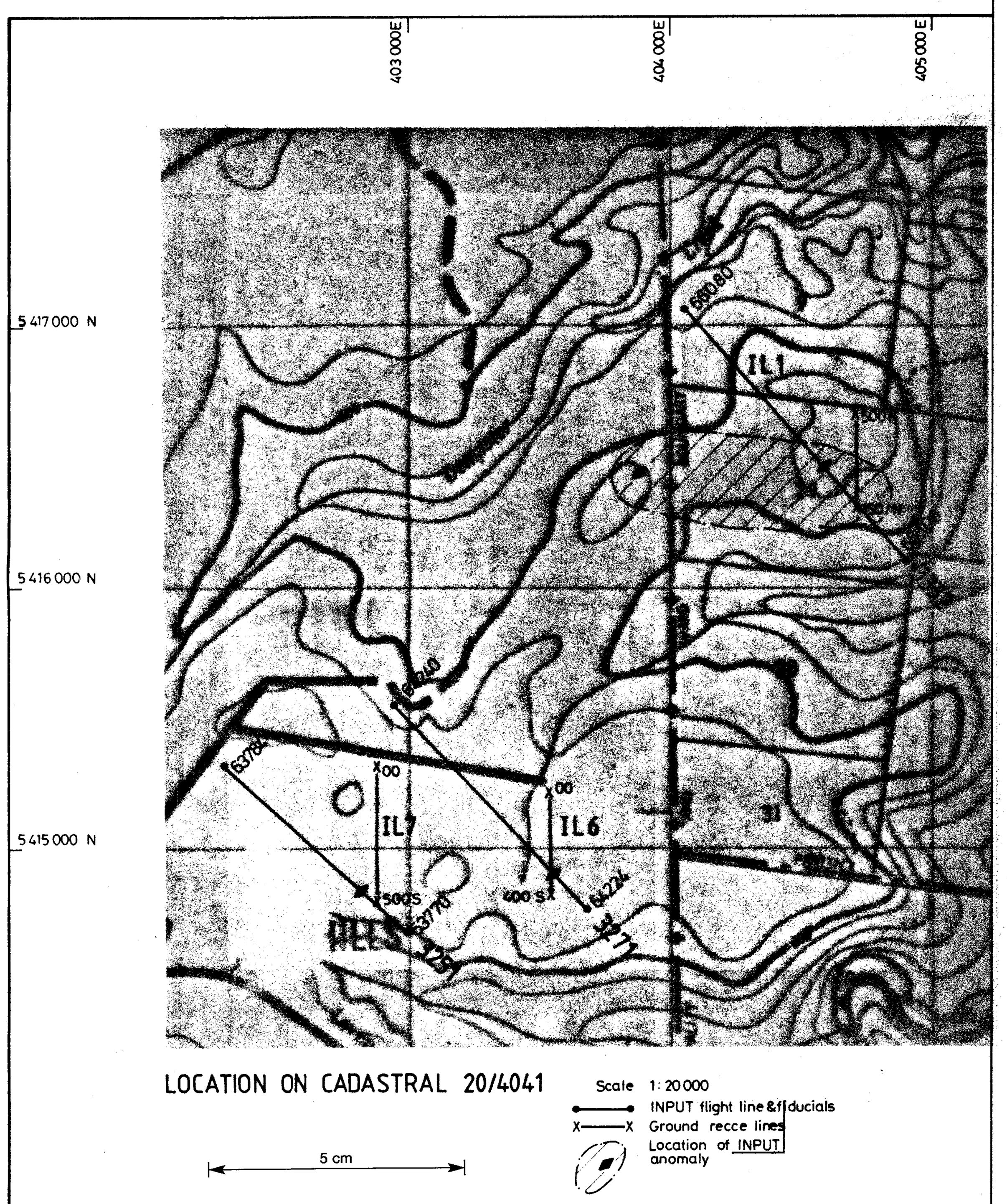
83-2045 Vol. 3

SCALE	1: 2500	DATE	29-7-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP. No.	
ENCL. No.		DRG No.	D/MZ02/056

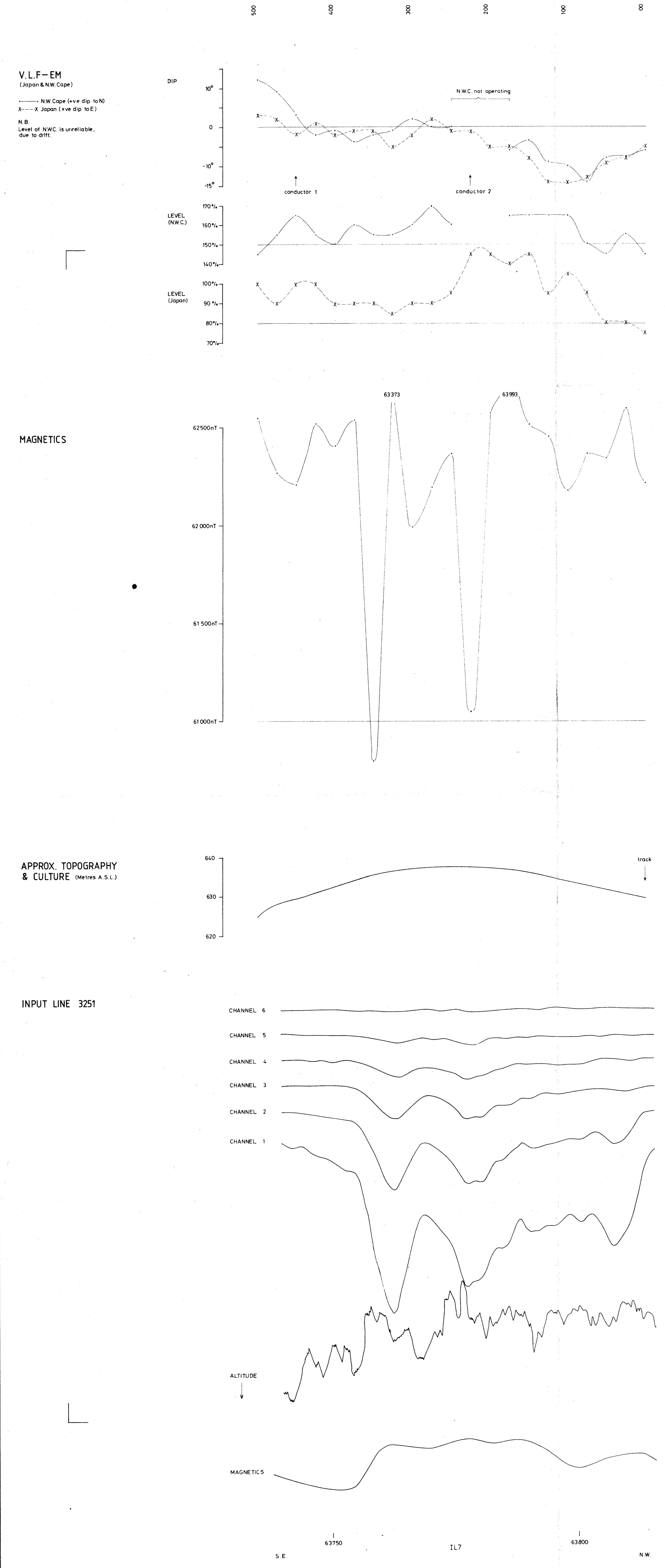
509188

1692

47



5 cm



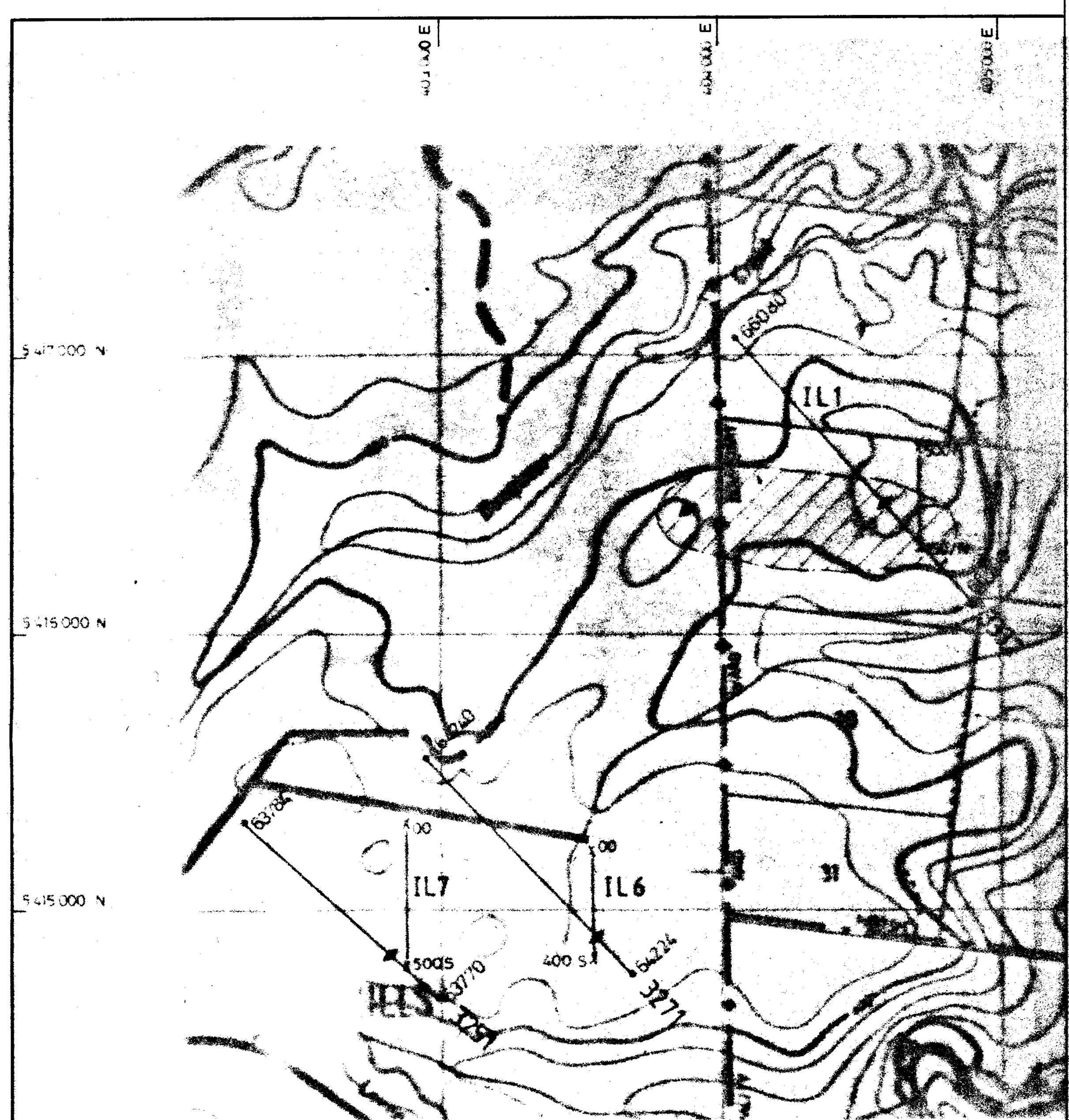
The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
INPUT ANOMALY 4041/IL7
INITIAL GROUND CHECK

88-2045 Vol.3

SCALE	1: 2500	DATE	30-7-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP. No.	
ENCL No.		DRG No	D/MZ02/057

48



LOCATION ON CADASTRAL 20/4041

Scale 1:20 000
INPUT flight line & fiducials
Ground recce lines
Location of INPUT anomaly

5 cm

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
INPUT ANOMALY 4041/IL8
INITIAL GROUND CHECK

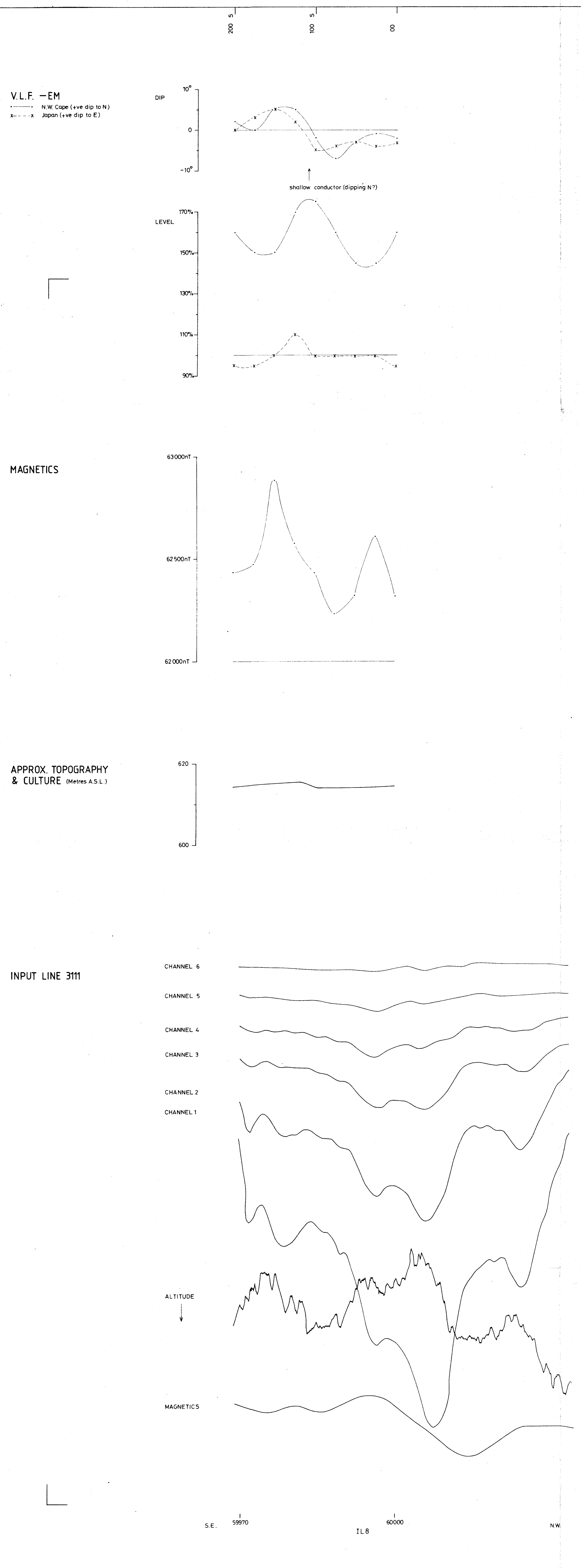
SCALE	1: 2500	DATE	4-8-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP. No.	
ENCL. No		DRG No.	D/MZ02/065

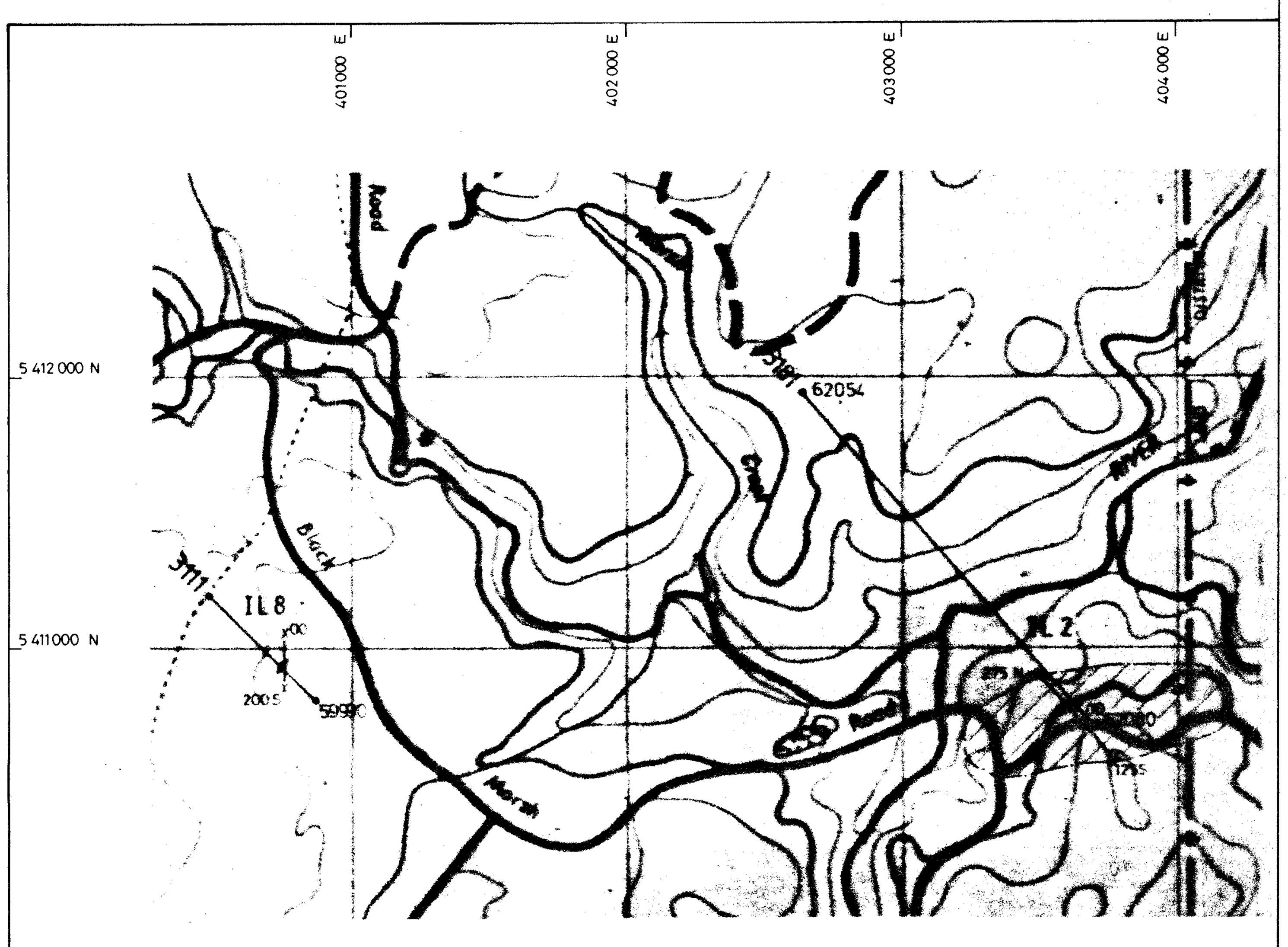
509190

83 B045 Vol 3

49

1693





LOCATION ON CADASTRAL 20/4041

Scale 1: 20000
INPUT flight lines & fiducials
Ground recce lines
Location of INPUT anomaly

5 cm

5 cm

1693

The Shell Company of Australia Limited
METALS DIVISION

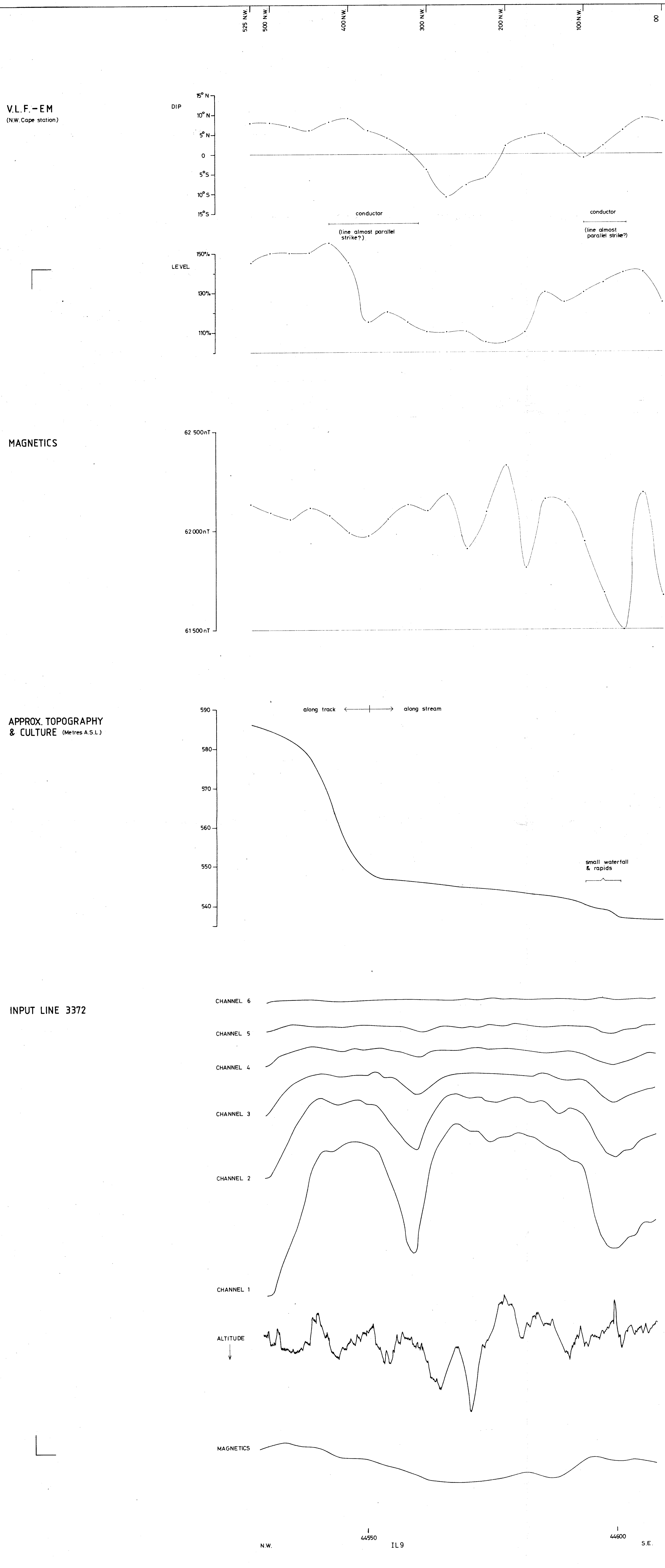
E.L. 36/79 LOONGANA
INPUT ANOMALY 4041/IL9
INITIAL GROUND CHECK

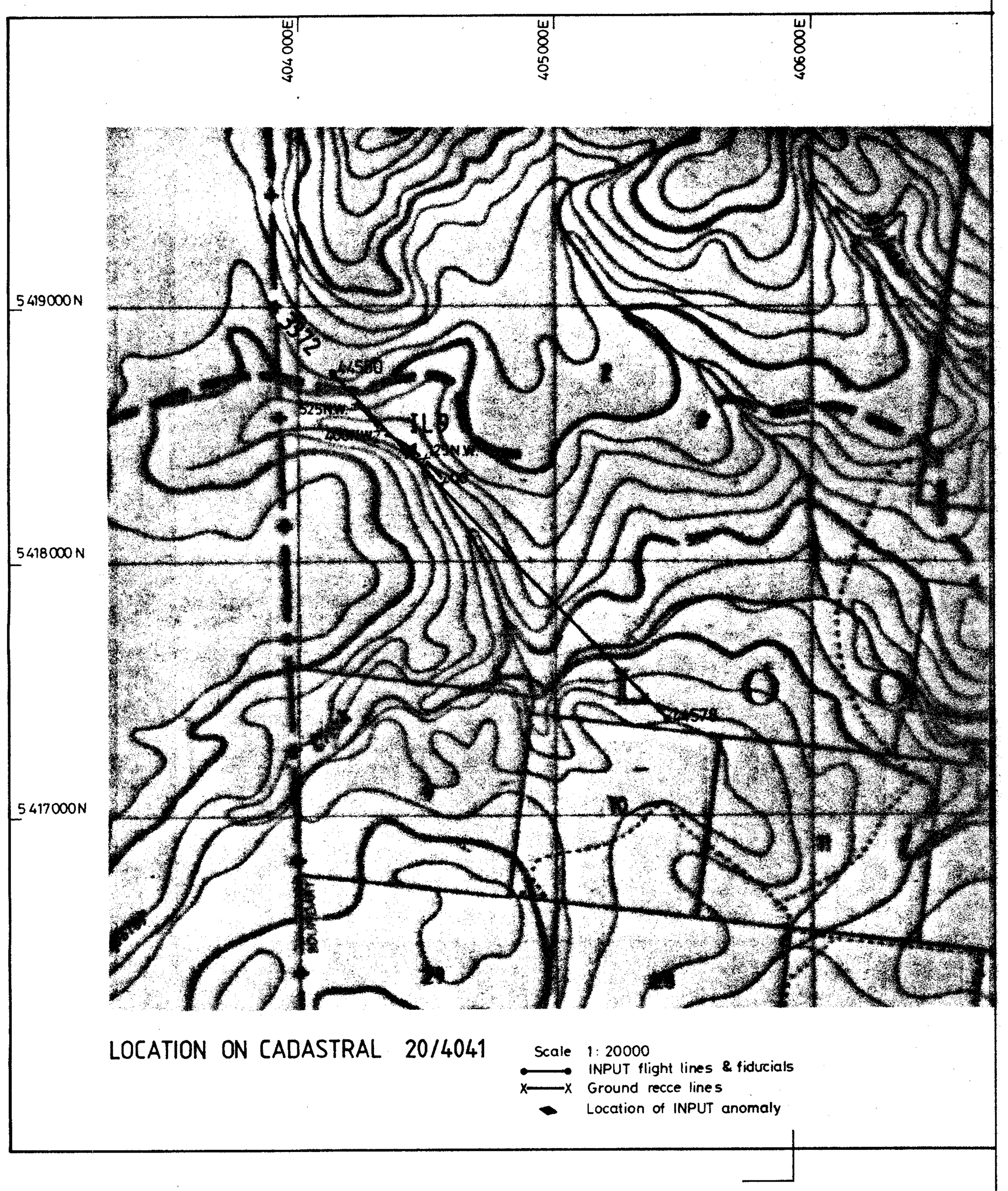
SCALE	1:2500	DATE	3-8-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP. No.	
ENCL. No.		DRG. No.	D/MZ02/063

509101

83-2045 Vol 3

50





LOCATION ON CADASTRAL 20/4041

Scale 1:20000
INPUT flight lines & fiducials
Ground recce lines
Location of INPUT anomaly

5 cm

509192

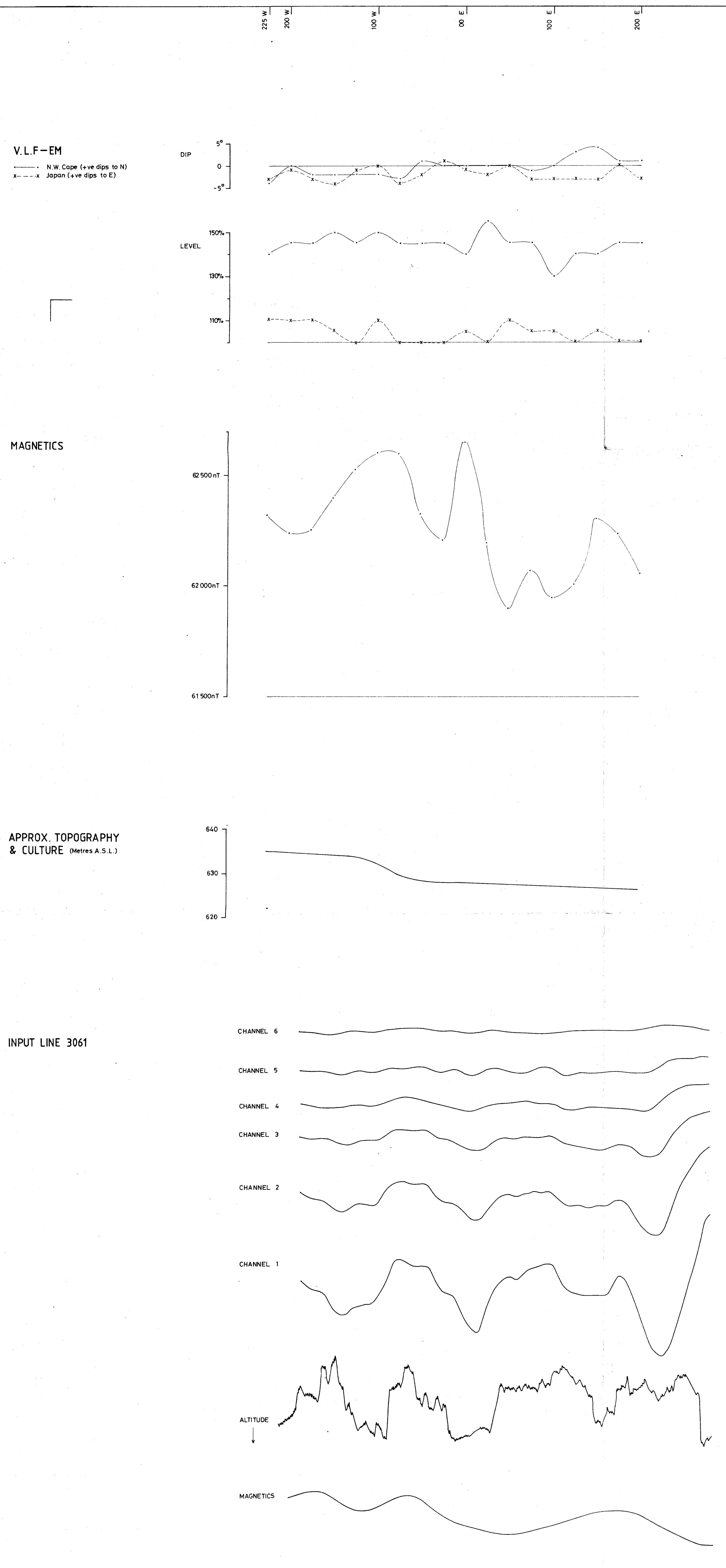
The Shell Company of Australia Limited
METALS DIVISION

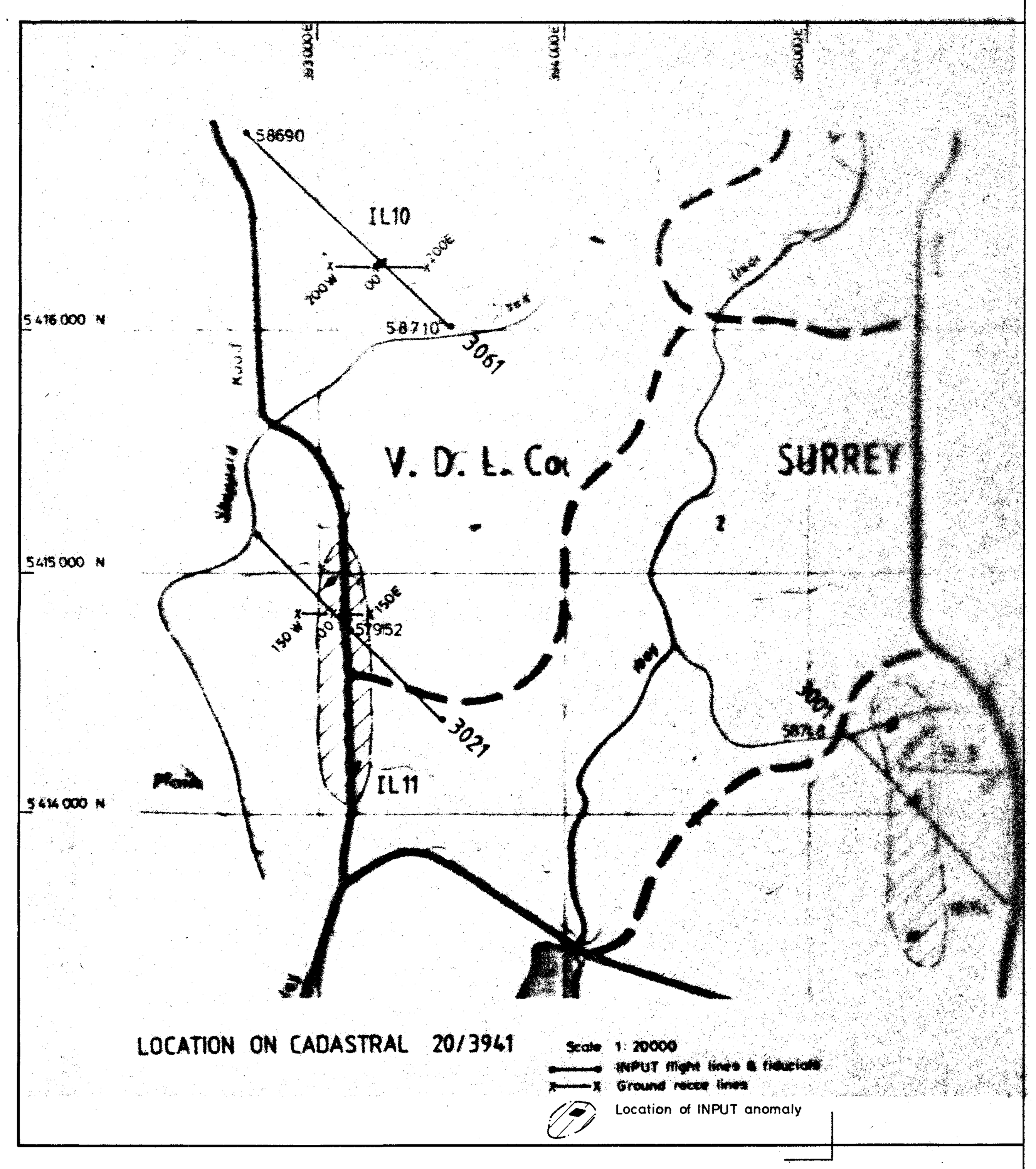
E.L. 36/79 LOONGANA
INPUT ANOMALY 3941/IL10
INITIAL GROUND CHECK

SCALE	1:2500	DATE	2-8-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP No.	
ENCL No.		DRG No.	D/M202/061

83-2045 Vol 3

51





5 cm

The Shell Company of Australia Limited
METALS DIVISION

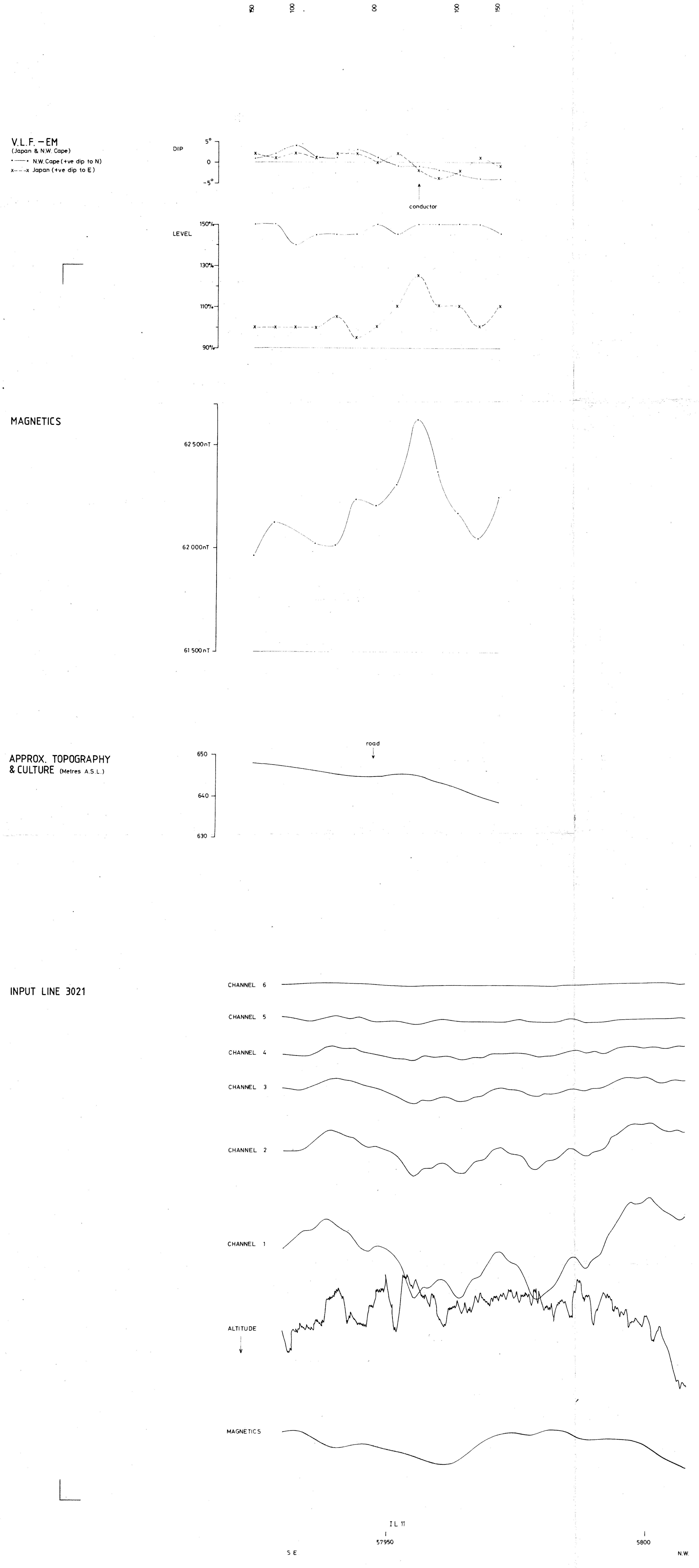
E.L. 36/79 LOONGANA
INPUT ANOMALY 3941/IL 11
INITIAL GROUND CHECK

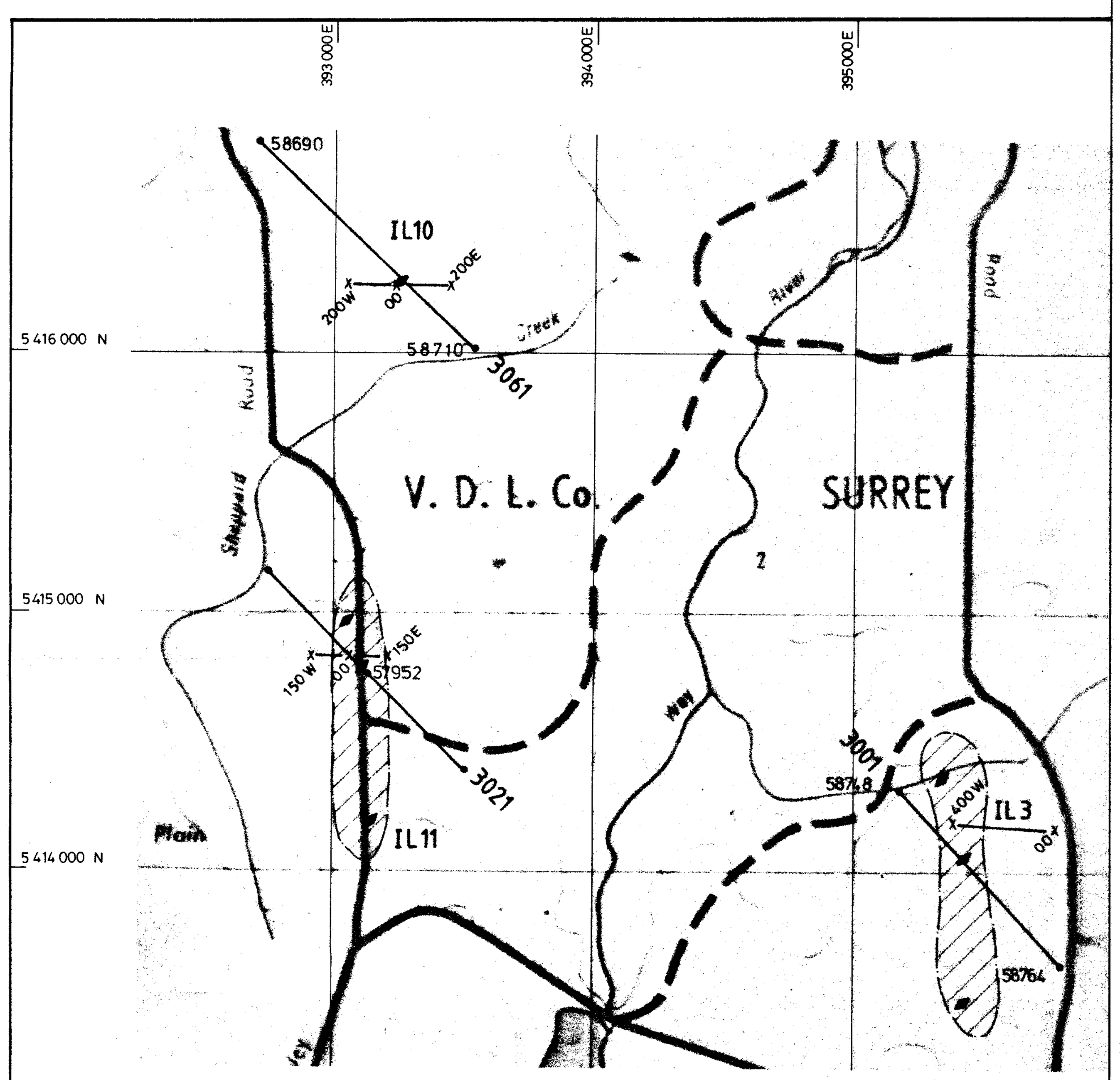
83-2045 Vol 3

SCALE	1:2500	DATE	2-8-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP No.	
ENCL No.		DRG No.	D/M202/059

509193

52

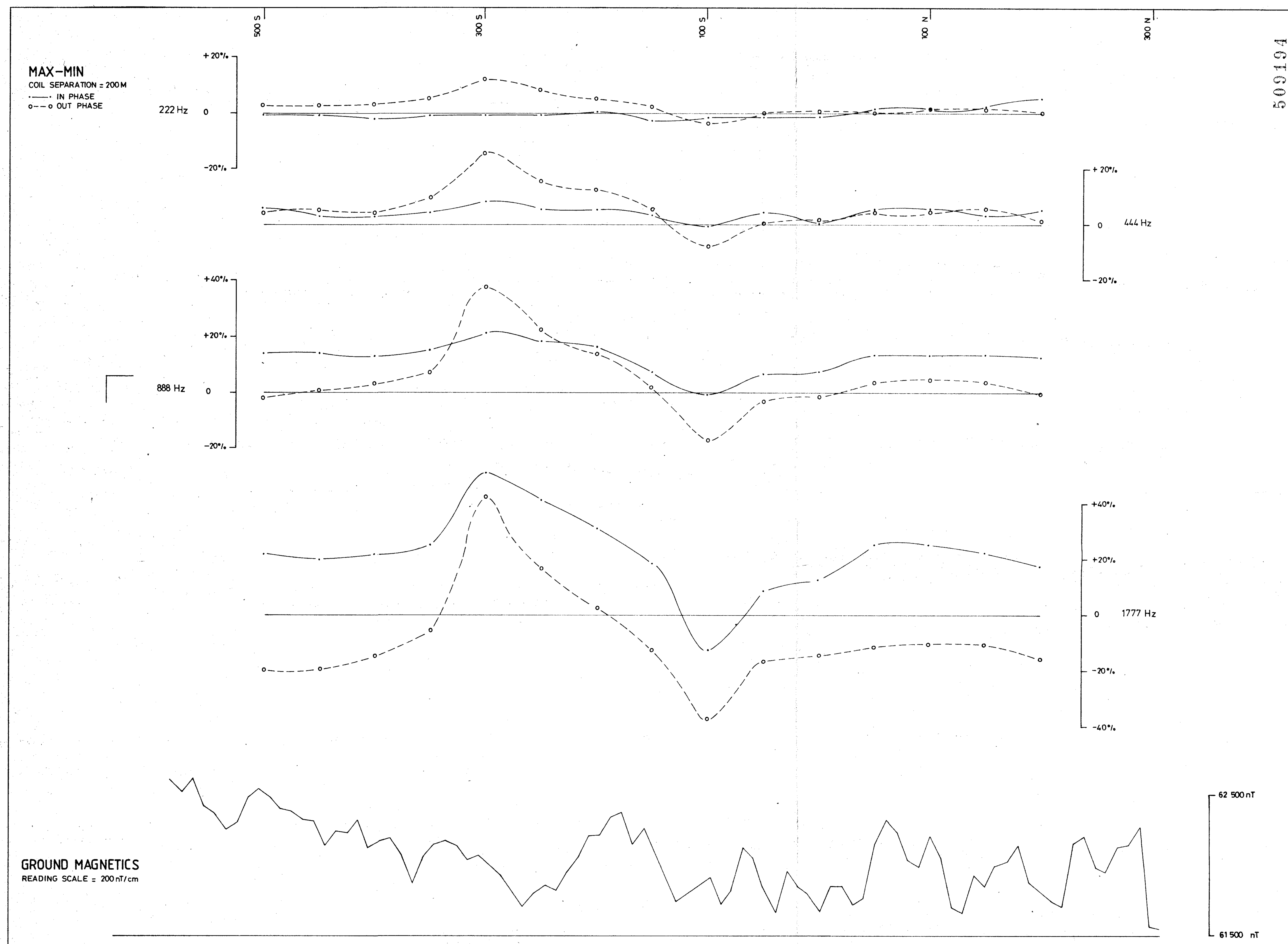




LOCATION ON CADASTRAL 20/3941

Scale 1:20000
INPUT flight lines & fiducials
Ground recce lines
Location of INPUT anomaly

5 cm



509194

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
IL1-DEMPSTER CK.-LINE 0E
-MAX-MIN
-GROUND MAGNETICS

83/2045 vol. 3

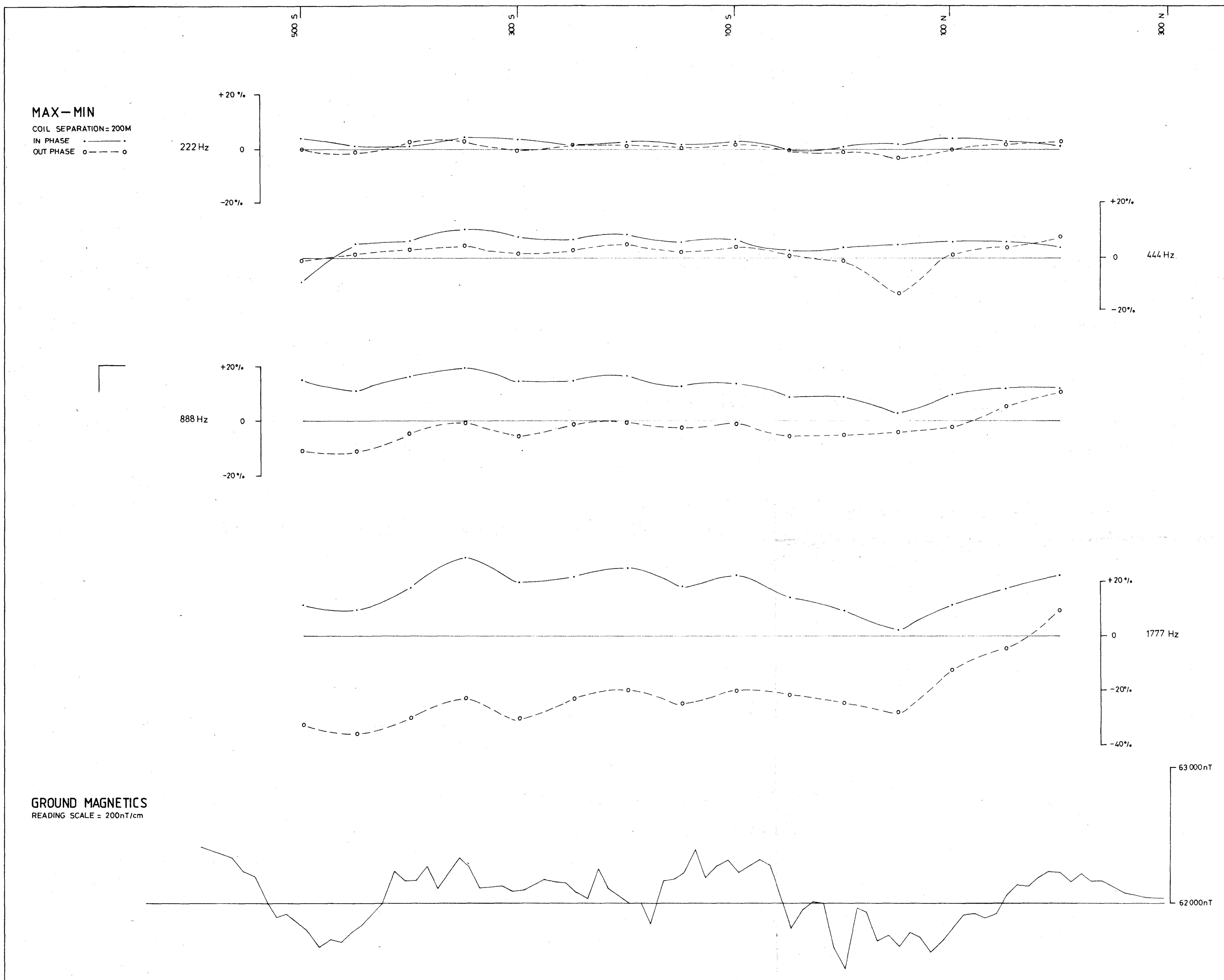
SCALE	1:2500	DATE	24-9-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP. No.	
ENCL. No.		DRG. No.	D/MZ02/079

0 100 200M

53

1693

5 cm



1693

509195

0 100 200 M

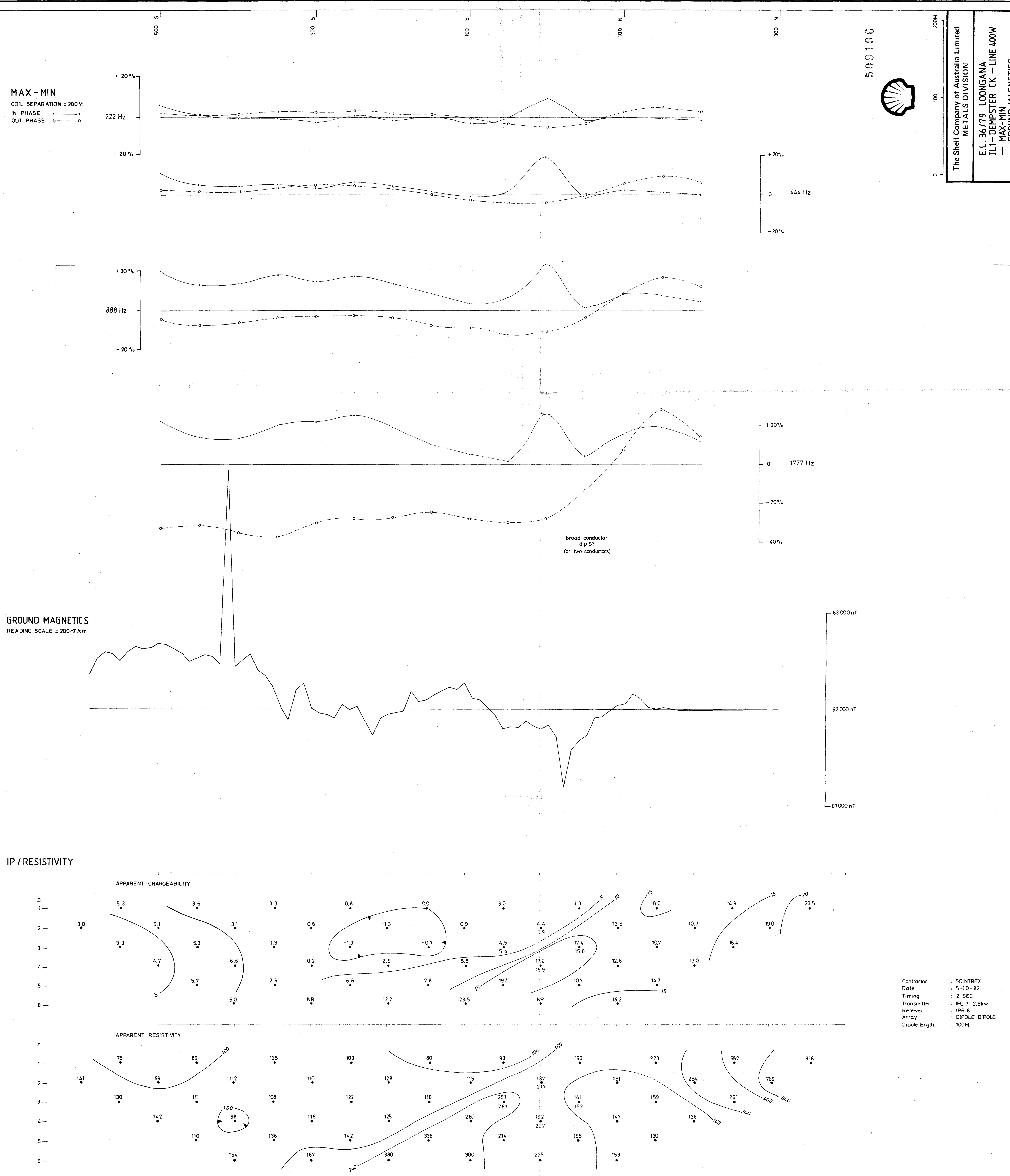
The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
IL1—DEMPSTER CK—LINE 200W
— MAX—MIN
— GROUND MAGNETICS

85-2045 vol 3

SCALE	1: 2500	DATE	27-9-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP. No.	
ENCL No		DRG No	D/MZ02/080

54



The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
IL1-DEMPSTER CK. - LINE 400W
- MAX-MIN
- GROUND MAGNETICS
- IP / RESISTIVITY

83 R045 Vol 3

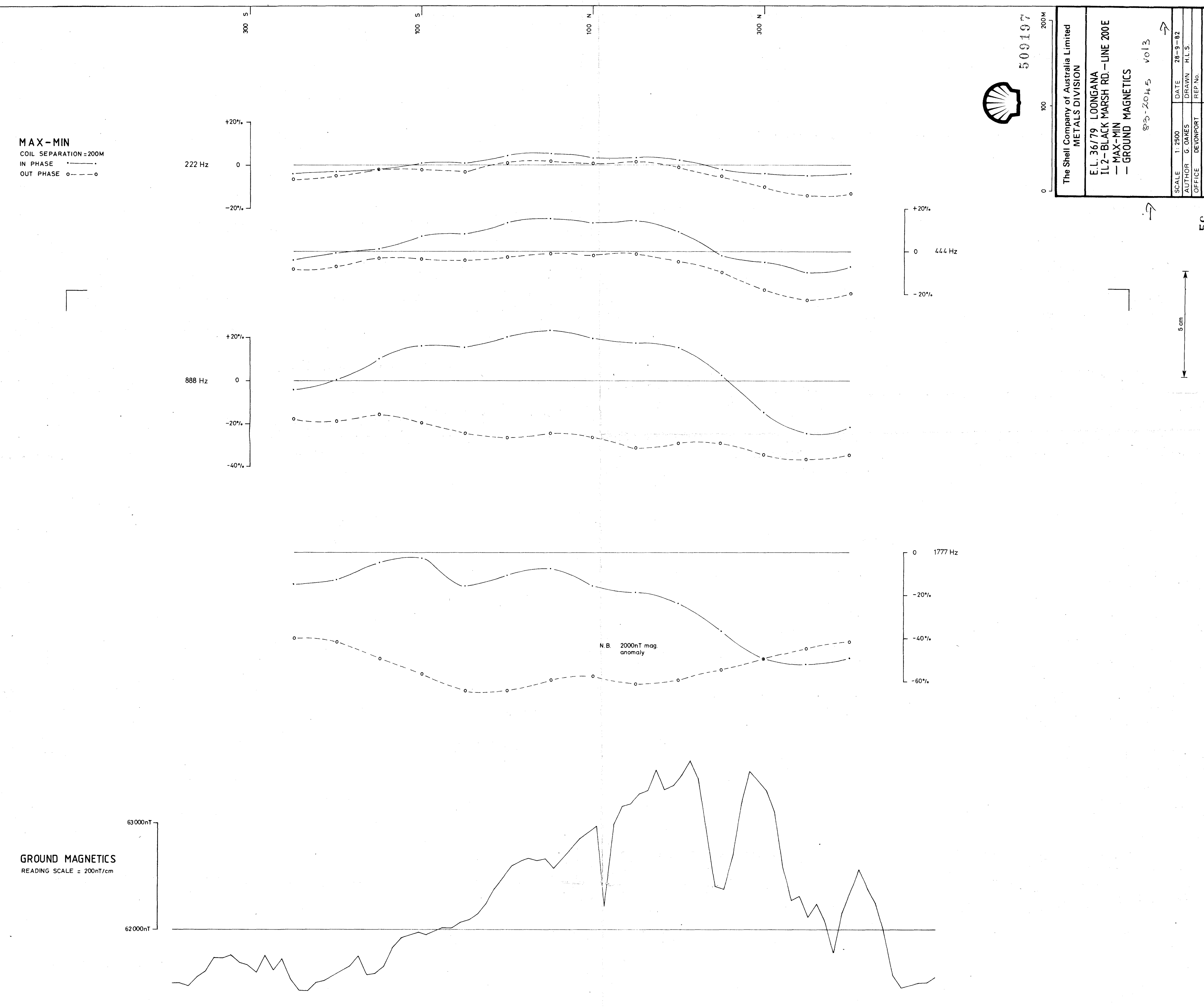
SCALE	1: 2500	DATE	27-9-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP. No.	
ENCL. No		DRG No	D/MZ02/081

509196

1694

55

Contractor	: SCINTREX
Date	: 5-10-82
Timing	: 2 SEC
Transmitter	: IPC 7 2.5kw
Receiver	: IPR 8
Array	: DIPOLE-DIPOLE
Dipole length	: 100M



1694

509197

0 100 200M

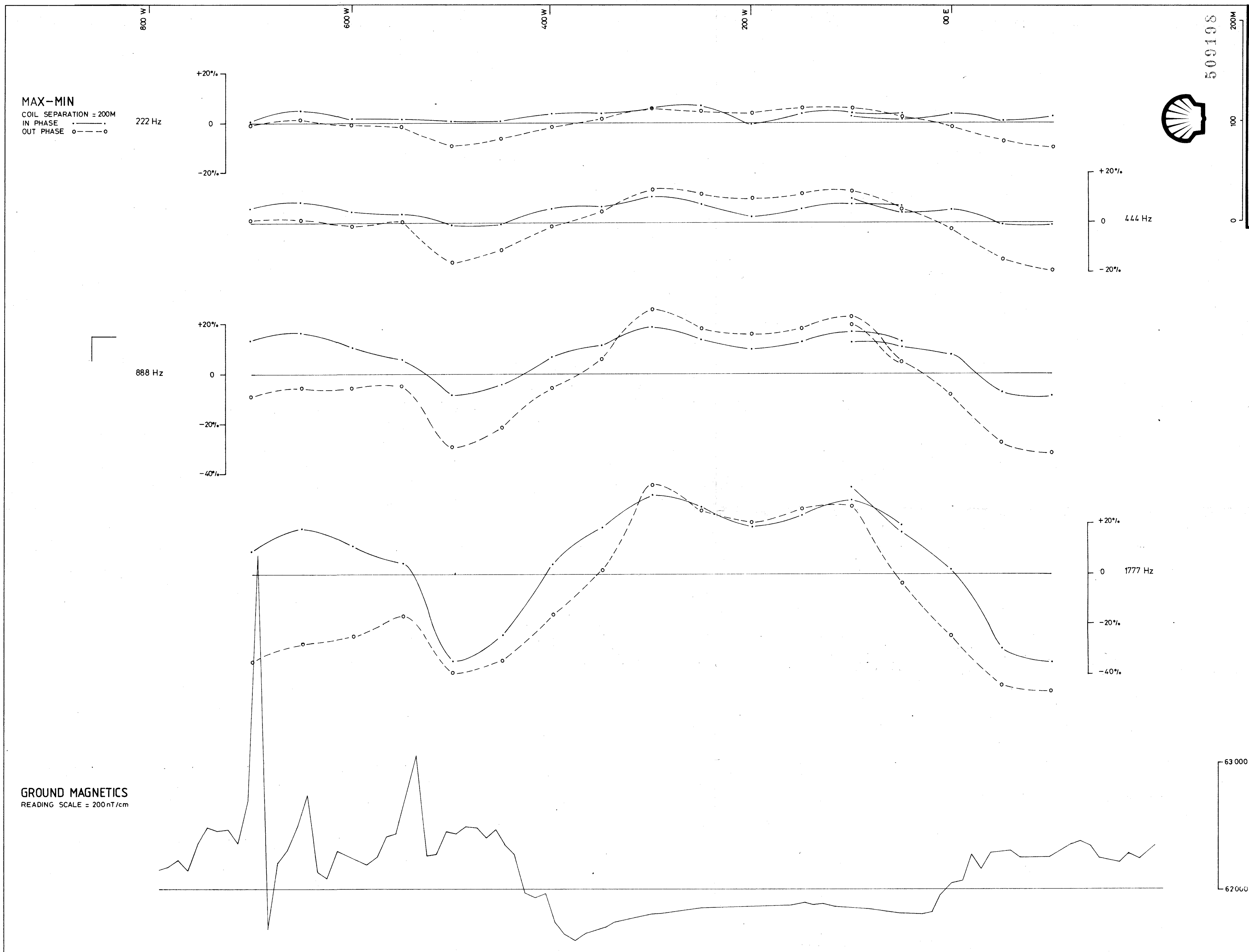
The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
IL2-BLACK MARSH RD.-LINE 200E
- MAX-MIN
- GROUND MAGNETICS

83-2045 vol3

SCALE	1:2500	DATE	28-9-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP. No.	
ENCL. No.		DRG No.	D/MZ02/085

56



509198

0 100 200M

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
IL3-RABBIT PLAINS RD.—LINE 200S
—MAX-MIN
—GROUND MAGNETICS

83-2045 vol 3

SCALE	1:2500	DATE	28-9-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP No.	
ENCL No.		DRG No.	D/MZ02/083

1694

57


1694
509199
The Shell Company of Australia Limited
METALS DIVISION
E.L. 36/79 LOONGANA
IL3 – RABBIT PLAINS RD – LINE ON
– MAX-MIN
– GROUND MAGNETICS
– IP / RESISTIVITY
83-2045 vol 3
SCALE 1: 2500
DATE 27–9–82
AUTHOR G. OAKES
DRAWN H.L.S.
OFFICE DEVONPORT
REP. No.
ENCL No.
DRG No. D/MZ02/082
58
800 W
600 W
400 W
200 W
00 E
MAX – MIN
COIL SEPARATION = 200M
IN PHASE
OUT PHASE
222 Hz
444 Hz
888 Hz
1777 Hz
GROUND MAGNETICS
READING SCALE = 200nT/cm
63 000nT
62 000nT
IP / RESISTIVITY
APPARENT CHARGEABILITY
APPARENT RESISTIVITY
Contractor : SCINTREX
Date : 5-10-82
Timing : 2 SEC
Transmitter : IPC 7 2.5kw
Receiver : IPR 8
Array : DIPOLE – DIPOLE
Dipole length : 100M
5 cm

509200

The Shell Company of Australia Limited
METALS DIVISION

E.L. 36/79 LOONGANA
IL3 – RABBIT PLAINS RD – LINE 200N
— MAX–MIN
— GROUND MAGNETICS

83-2045 Vol 3

SCALE	1: 2500	DATE	28-9-82
AUTHOR	G. OAKES	DRAWN	H.L.S.
OFFICE	DEVONPORT	REP. No.	
ENCL No		DRG No	D/MZ02/084

59