

**CR 95 / 115 OPENFILE**

# **NORTH STAR RESOURCES NL**

## **WARREGO WEST PROJECT EL 8247**

**ANNUAL REPORT  
23/11/93 to 23/11/94**

**1: 250,000 - TENNANT CREEK**

**Compiled by : G. Sakalidis  
A. Romanoff  
Date Submitted : November 1994**

**Distribution : NT Department of  
Mines and Energy**

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## **1. SUMMARY**

This report summarises the first year of exploration carried out on EL 8247, Warrego West, for Tennant Creek-style gold and copper deposits.

At Tennant Creek, gold and copper mineralisation occurs in association with hydrothermally altered ironstone lodes in sheared Proterozoic Warramunga Group sedimentary rocks. The gold is associated with sulphides and oxides of iron and copper, generally with chloritic alteration envelopes.

The presence of variable amounts of magnetite in the lodes has made them detectable by magnetic surveying.

Several large ore bodies in the region were initially detected by aeromagnetic and ground magnetic surveys.

EL 8247 lies over a western peripheral zone of the Tennant Creek field where extensive soil cover has inhibited earlier exploration. The area was selected on the basis of interesting aeromagnetic signatures, possibly indicative of extensions or remnants under cover of Warramunga Group rocks.

North Star Resources NL identified a total of 17 magnetic targets within EL 8247 by digitising and processing data from old detailed and regional aeromagnetic surveys.

All 17 targets were recovered on the ground by ground magnetic surveys during the year.

Ten of these targets have discrete dipole signatures consistent with Tennant Creek-style mineralisation. The possibility that these signatures may be related to kimberlite diatremes is also borne in mind.

Detailed soil geochemistry and RAB drilling are planned for the second year of EL 8247 to determine the source of the ten anomalies.

## **2. INTRODUCTION**

This report summarises exploration carried out by North Star Resources NL on Exploration Licence EL 8247, Warrego West during its first year of tenure from 23 November 1993 to 22 November, 1994.

Work carried out during the year consisted of the following:

- \* Historical research and appraisal of previous exploration data.
- \* Reprocessing of AGSO aeromagnetic digital and digitised contour data, and reprocessing of detailed digitised contour data.

- \* Analysis of the reprocessed aeromagnetic imagery. Selection of exploration targets based on structural interpretation and identification of specific anomalous magnetic features.
- \* Field follow-up comprising detailed ground magnetic surveying of 17 of the targets selected above.

Expenditure during the year was \$50,470.

### **3. TENURE**

EL 8247 was granted to North Star Resources NL on 23 November 1993 for the period of six years. The annual expenditure commitment is \$30,000.

El 8247 consists of 80 blocks totalling 251 sq kms, located in the west central sector of TENNANT CREEK 1 : 250,000 sheet SE 53-14, Northern Territory, and lying some 50 km west-northwest of the town of Tennant Creek.

### **4. LOCATION AND ACCESS**

The tenement lies within the Phillip Creek pastoral lease, near it's western boundary with aboriginal freehold land of the Karlantijpa Land Trust, which also forms the western boundary of EL 8247. No pastoral activities are evident in this area of Phillips Creek station.

Access to the tenement from Tennant Creek is by the sealed Warrego Road leading to the Warrego gold mine. A maintained gravel road west from Warrego crosses the tenement in an east-west direction, and three unmaintained gravel tracks cross the tenement from north to south, including a track following the Amadeus Basin-Darwin gas pipeline. (Plate 1) To enable ground access to target areas within the main body of the tenement, a contractor from Tennant Creek was engaged to cut some 40km of access tracks, linking the target areas with the existing tracks.

The topography of the licence area consists essentially of flat peneplain covered by Quaternary soil deposits over Proterozoic and Cambrian bedrock. Some low positive relief occurs in the northern and southern sectors of the lease, in the form of low, rounded hills formed by cherts and chert breccias of the Cambrian Gum Ridge Formation which forms thin, flat-lying cover over Proterzoic rocks.

The most abundant vegetation in the area is heavy spinifex which often forms clumps 1 metre high, with scattered eucalyptus and turpentine bush. This mulga scrub occurs in areas of deep soil cover, particularly in the northeast sector of EL 8247. Large areas of vegetation are regularly destroyed by deliberate lighting of fires, leaving burned stakes (particularly of turpentine bush) that cause havoc with off-road vehicle tyres, so the preparation of access tracks is recommended as part of any exploration programme.

## **5. ABORIGINAL SITES**

Public records at the Department of Minerals and Energy indicated that EL 8247 was included in an area held under previous licences by BHP Limited during 1982, at which time the Aboriginal Sacred Sites Authority, in consultation with the Central Land Council, advised that there were no sacred sites on the area.

## **6. REGIONAL GEOLOGICAL SETTING**

The tenement area lies along the western margin of the Tennant Creek Block, and early Proterozoic intracratonic basin consisting of a polydeformed succession of sediments and minor felsic volcanics intruded by granitoids. Earlier mapping assigned the layered succession to the Warramunga Group consisting of sediments of mixed volcanoclastic origin, ranging from arenites, wackes and siltstones (including argillaceous banded ironstone known locally as hernatite shale), to terrigenous mudstones. The sediments were deposited in proximal to distal fan settings, the detritus deriving from rapid erosion of mixed volcanics facies probably uplifted in isostatic response to down-warping of a pull-apart basin into which the Warramunga rocks were deposited.

Recent mapping has subdivided the Warramunga Group into an older, more intensely deformed Warramunga Formation, and on overlying, less deformed volcano-sedimentary succession called the Flynn Subgroup. An updated geological map showing the distribution of these newly-defined units was not available at time of writing, so the old usage will be applied for the duration of this report.

## **7.0 TENNANT CREEK STYLE GOLD/COPPER/BISMUTH MINERALISATION**

Mineral deposits in the Tennant Creek field are polymetallic; gold occurring in association with sulphides of iron, copper and occasionally lead and zinc, with bismuth as a by-product. The mineralisation is associated with ironstone lodes in shears in Warrmunga Group rocks, generally with chloritic alteration haloes. The deposits are zoned, with different phases of individual deposits, or different deposits varying considerably in the content of gold or copper. All known mineralisation is however associated with the ironstone lodes, mainly quartz hematite and/or magnetite.

The ores are unquestionably of hydrothermal origin, with iron as the precipitating agent, though whether the iron pre-existed the hydrothermalism as ferruginous sediments of BIF's within the Warramunga Group, or was itself a product of early-phase hydrothermism is debated. It is likely however that both of these mechanisms have operate in the field, with ironstones not specially related to hernatite shales for example being the products of hydrothermal remobilisation from lower levels of the stratigraphy.

The presence of variable amounts of magnetic in the lodes has made these visible to magnetic surveying and major blind lodes such as Warrego and White Devil were discovered in this way. Not all deposits are magnetic however, such as Nobles Nob where high gold values are associated with brecciated quartz-hematite and hematite-

impregnated mudstone. Magnetic surveying remains an important exploration tool in the Tennant Creek field, though the likelihood of undiscovered non-magnetic deposits remains a challenge to the explorer.

## **8 EL 8247: TENEMENT GEOLOGY**

The geology of EL 8247 is largely masked by extensive Cainozoic soil cover, with minor scattered outcrops of Proterozoic granites or overlaying cherts of the Permian Gum Ridge Formation. On the basis of geophysics (aeromagnetics and gravity) the Mines Department mapping shows the licence to be essentially underlain by granite, though the internal geometry of the granite body and the position of its contacts with the Warramunga Group cannot be clearly established. Aeromagnetic data for the tenement shows areas of high magnetic relief and discrete magnetic bullseye targets which are inconsistent with granite, and may be remnants of Warramunga Group within the granite.

## **9 AIRBORNE MAGNETIC SURVEYS**

EL 8247 is one of several Exploration Licences taken up by North Star Resources NL over peripheral zones of the Tennant Creek field where extensive soil cover has inhibited earlier exploration, but magnetic signatures are present possibly indicative of extensions or remnants of Warramunga Group rocks under cover.

The areas were selected following studies of aeromagnetic maps for the Tennant Creek region compiled by the Company from public domain detailed aeromagnetic surveys. The final interpretation shown on Plate 1 was derived from the three different aeromagnetic data sets. Firstly, North Star has for some time been digitising aeromagnetic contours for all the detailed aeromagnetic surveys available in the Tennant Creek region. Plate 2 is a compilation of this data at 1 :250,000 scale. Secondly all the AGSO aeromagnetic contours have been digitised and presented at 1 : 100,000 scale (Plate 3,4). Thirdly all the digital AGSO data has been reprocessed and presented at 1 :50,000 scale (Plate 5).

## **10 AIRBORNE MAGNETIC INTERPRETATION**

Exploration success has historically been achieved in the Tennant Creek field by drilling soil covered bullseye magnetic anomalies within the Warramunga Group. The main magnetic ore bodies discovered to date include:

| Name           | Gold - Ozs | Ore tonnage<br>million tonnes | Grade g/t Au | Copper % |
|----------------|------------|-------------------------------|--------------|----------|
| Warrego        | 1,154,000  | 4.70                          | 7.60         | 2.10     |
| Gecko          | 81,000     | 3.30                          | 0.09         | 4.30     |
| White          | 667,000    | 1.40                          | 15.00        |          |
| Devil/Eldorado |            |                               |              |          |
| TC8            | 45,700     | 0.08                          | 17.60        |          |
| Juno           | 790,000    | 0.45                          | 57.50        | 0.30     |

Interpretation of the aeromagnetic data sets for EL 8247 led to seventeen targets being selected on the basis of their structural and magnetic similarities to the pipe-like magnetic dipole signatures exhibited by Tennant Creek ore bodies. These targets, numbered T1 to T17 inclusive, are shown on accompanying Plate 1.

Most of the targets lie within interpreted granite based on earlier (1978) mapping by the BMR. Work completed by BHP - Utah in 1982 refutes this as anomalous copper in siltstones with magnetic expression was intersected by drilling in the centre of the interpreted mapping (Open File Item CR 82/289 - Darwin). BHP's work was in conjunction with testing of bullseye anomalies for kimberlite affinities a possibility also borne in mind by this Company's exploration.

Targets T1 - T6, and T15 - T16 lie in a transition zone between the interpreted granite and Warramunga Group sediments to the east, with no explained cause for their distinctive magnetic character.

## **11. GROUND MAGNETIC SURVEYS**

Detailed ground magnetic surveys of the 17 aeromagnetic target areas were completed during the 1994 field season utilising two Geometrics G-856AX proton procession magnetometers. One was set up as base station to monitor diurnal variation, the other for taking readings at 10m intervals along lines 100m apart over each target area. Precise east-west baselines were located by GPS over the targets centres, using the last four or five digits of the AMG co-ordinate system as local grid co-ordinates. North-south lines were run from the baselines by pace-and-compass traversing.

Each day's data was downloaded to a field computer, corrected for diurnal variation; a copy of the reduced data then forwarded to the Perth office for printout and evaluation. All data was processed by Magdata Consultants who produced stacked profiles and contours for all the anomalies. (Plates 6 to 20)

## **12. GROUND MAGNETIC INTERPRETATION**

The processed ground magnetic data for the 17 completed targets are appended to this report.

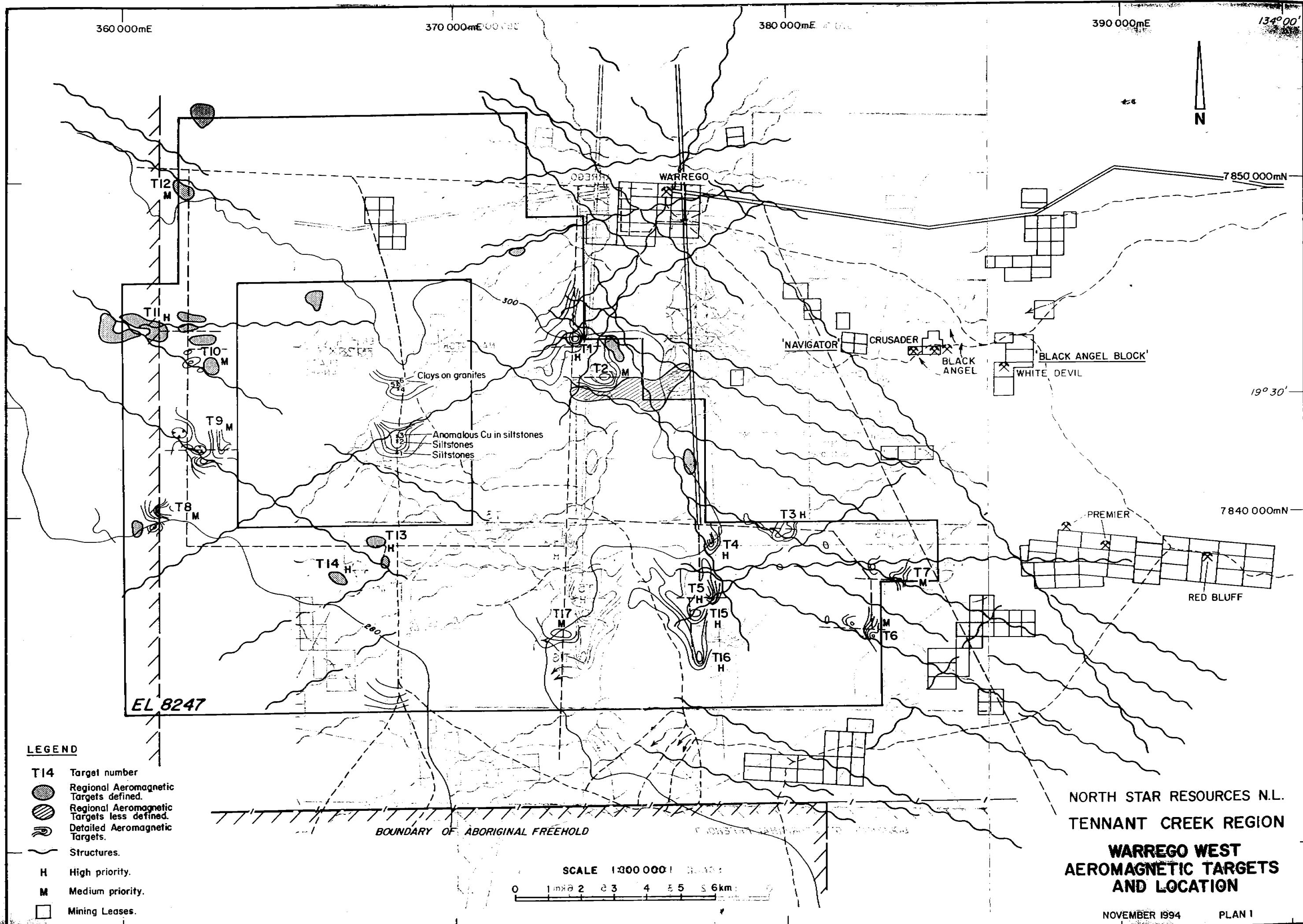
Ten discrete magnetic bulls eye and dipole-like anomalies have been selected from the original 17 targets as worthy of follow-up. These targets consisting of T1 - T5, T7 - T8, T11 - T12 and T15 remain unexplained by the previous geological interpretation, and warrant evaluation by drill testing to depths between 50 to 100m to determine the magnetic causative body for its economic potential.

### **13. CONCLUSIONS**

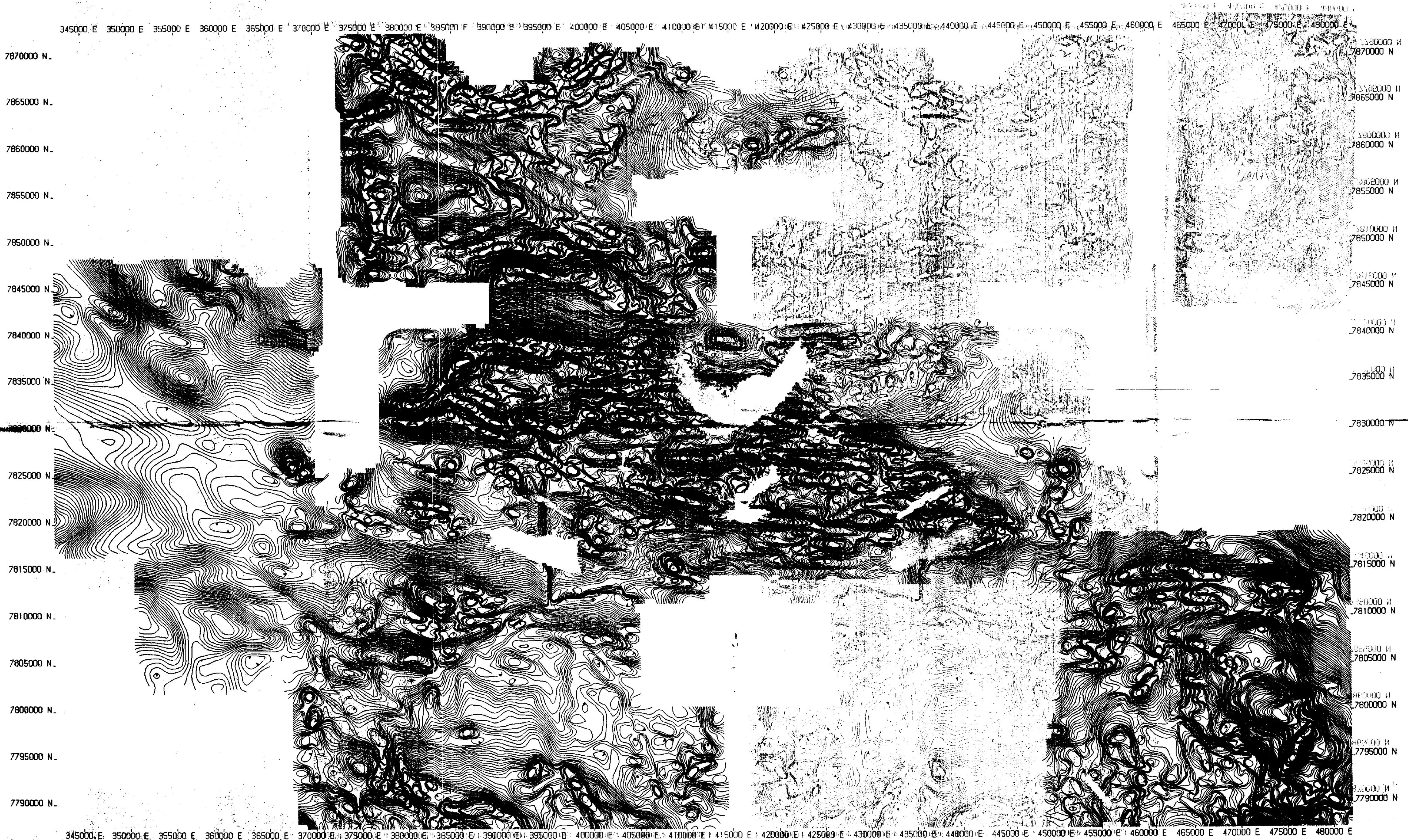
Detailed follow-up of 17 aeromagnetic targets has successfully resulted in 10 of these being identified as worthy of drill testing. This will form the basis for annual expenditure of the second year of tenure.

### **14. EXPENDITURE**

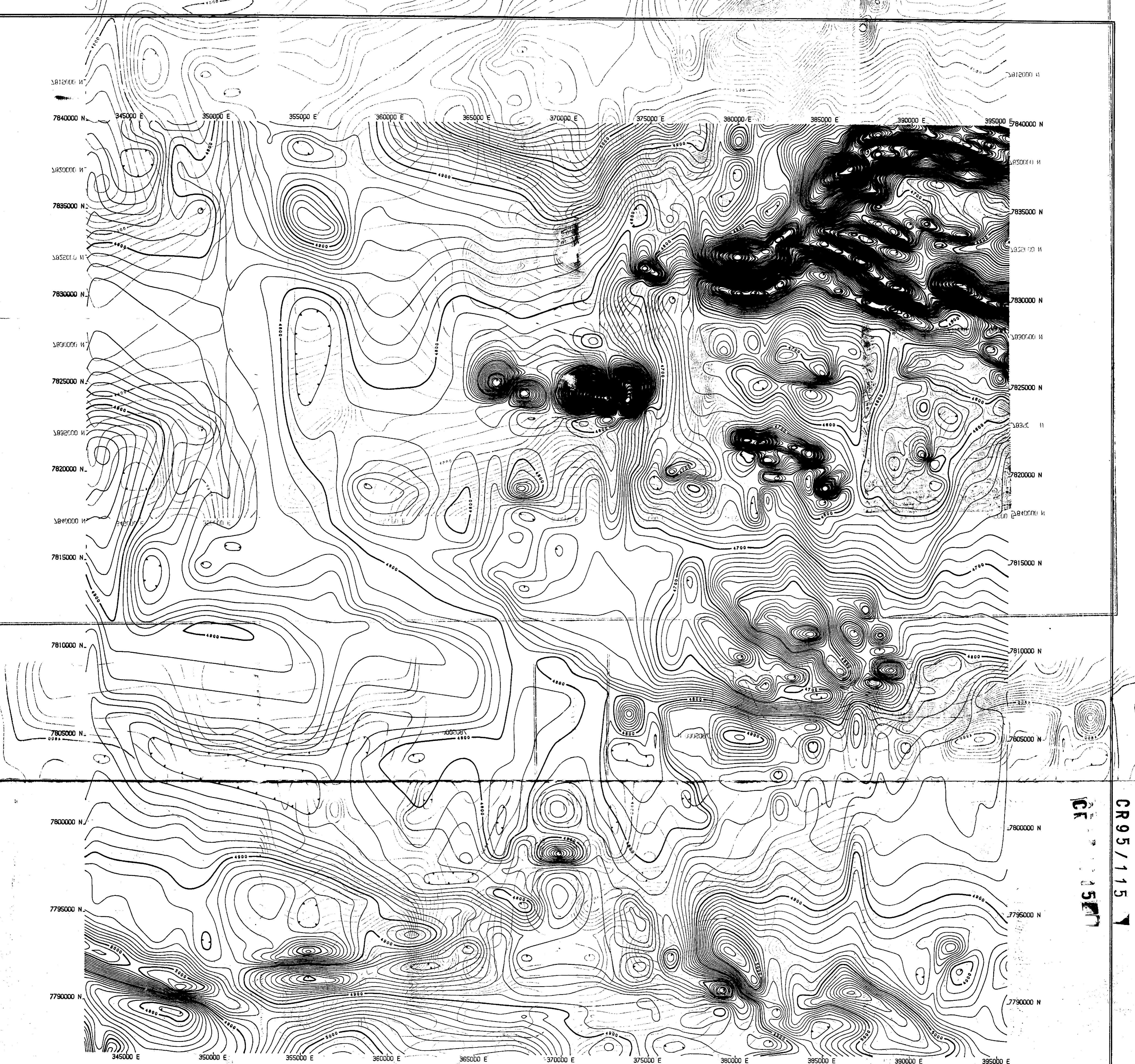
|                              | \$                  |
|------------------------------|---------------------|
| Geological & Field Assistant | 9,470               |
| Geophysical Field Work       | 11,560              |
| Geophysical Processing       | 7,460               |
| Equipment Hire               | 7,900               |
| Gridding & Access            | 7,620               |
| Accommodation & Meals        | 3,500               |
| Vehicle Hire                 | 1,800               |
| Drafting                     | 1,160               |
|                              | <hr/> <u>50,470</u> |



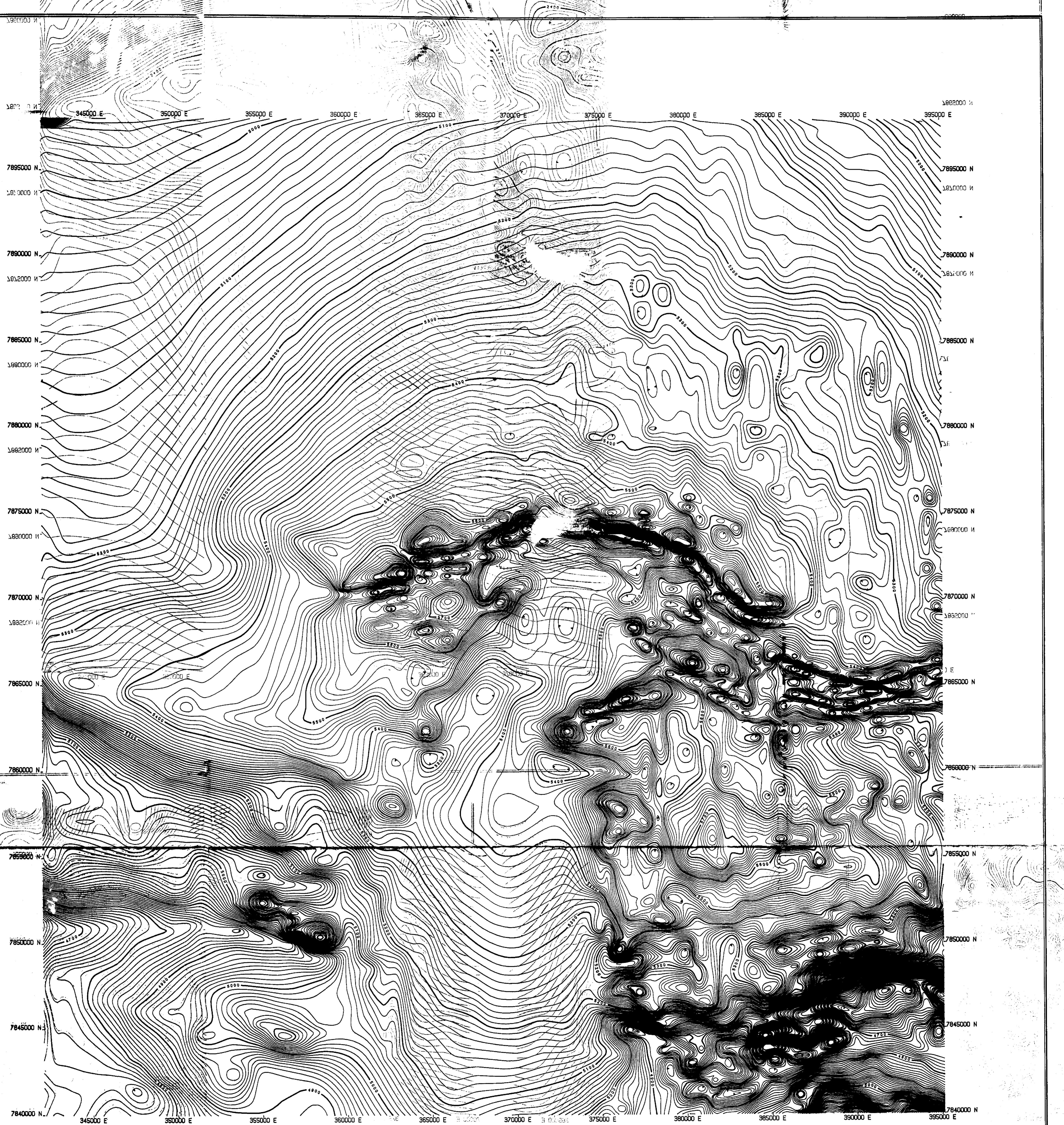
CR 95 / 115

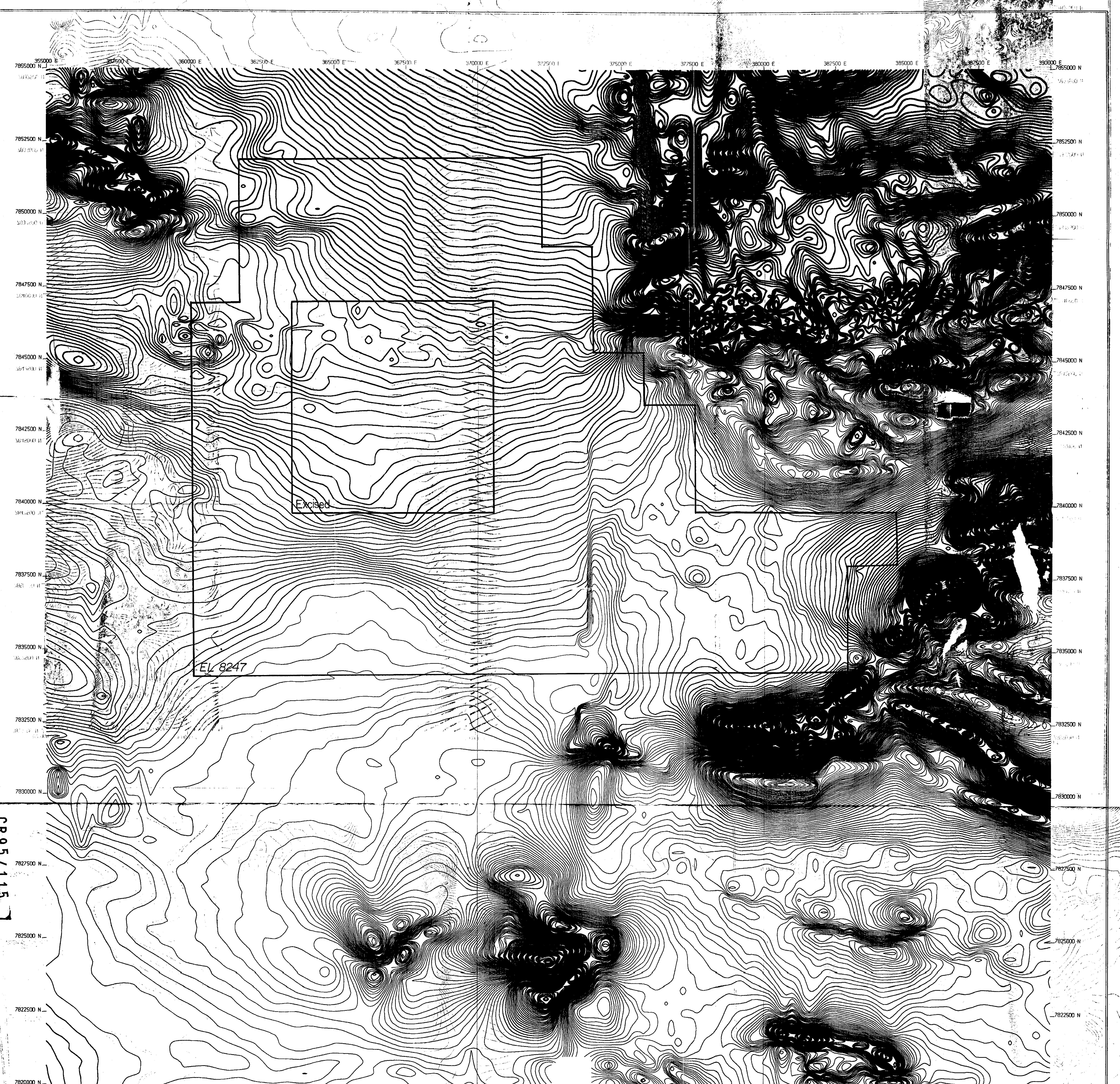


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SR 95 / 115



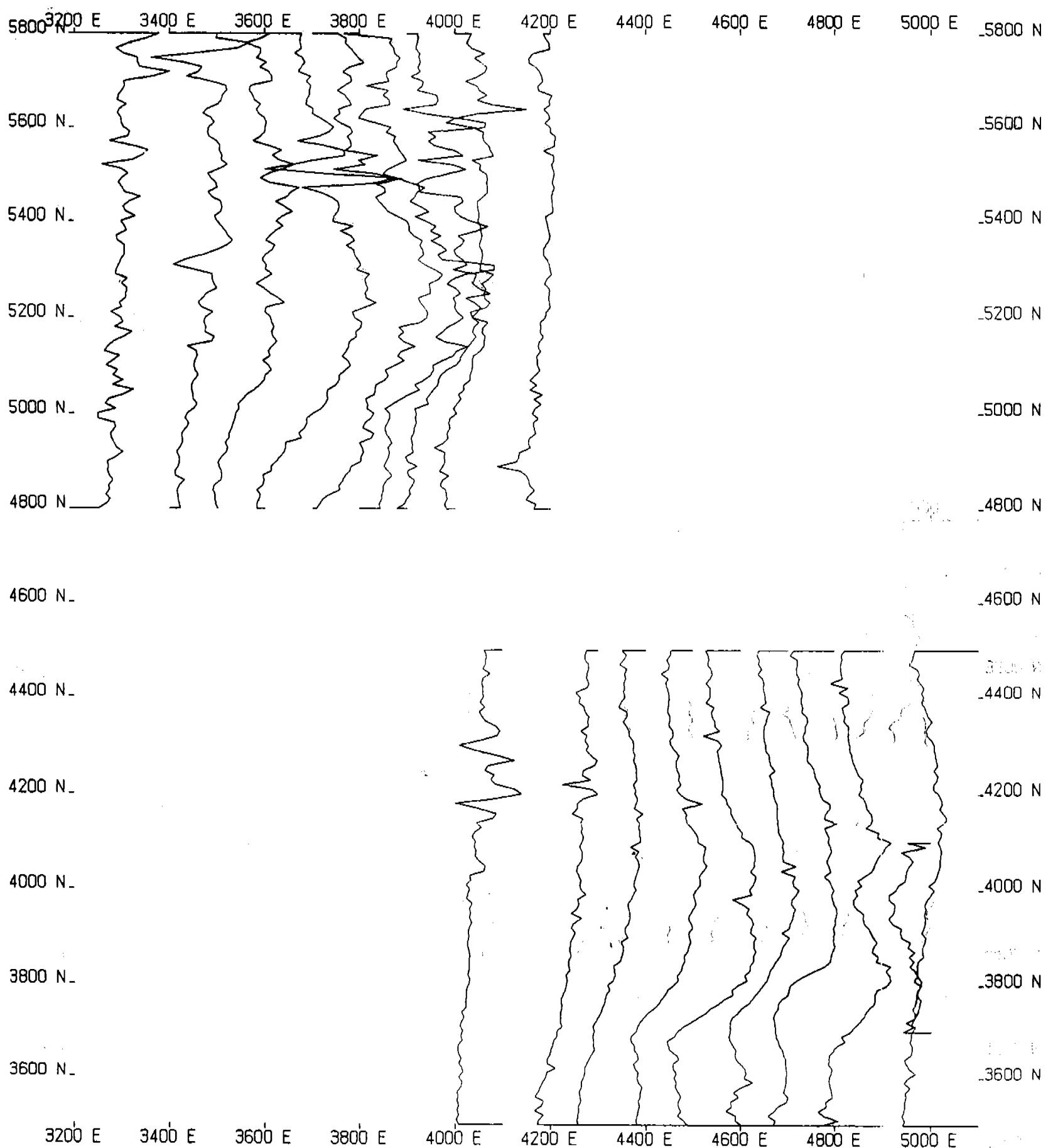


NORTH STAR RESOURCES NL  
WARREGO REGION  
ASIO AEROMAGNETICS  
CONTOUR INTERVAL 5 NT  
PLATE 5  
MAGDATA CONSULTANTS

Scale 1:50000

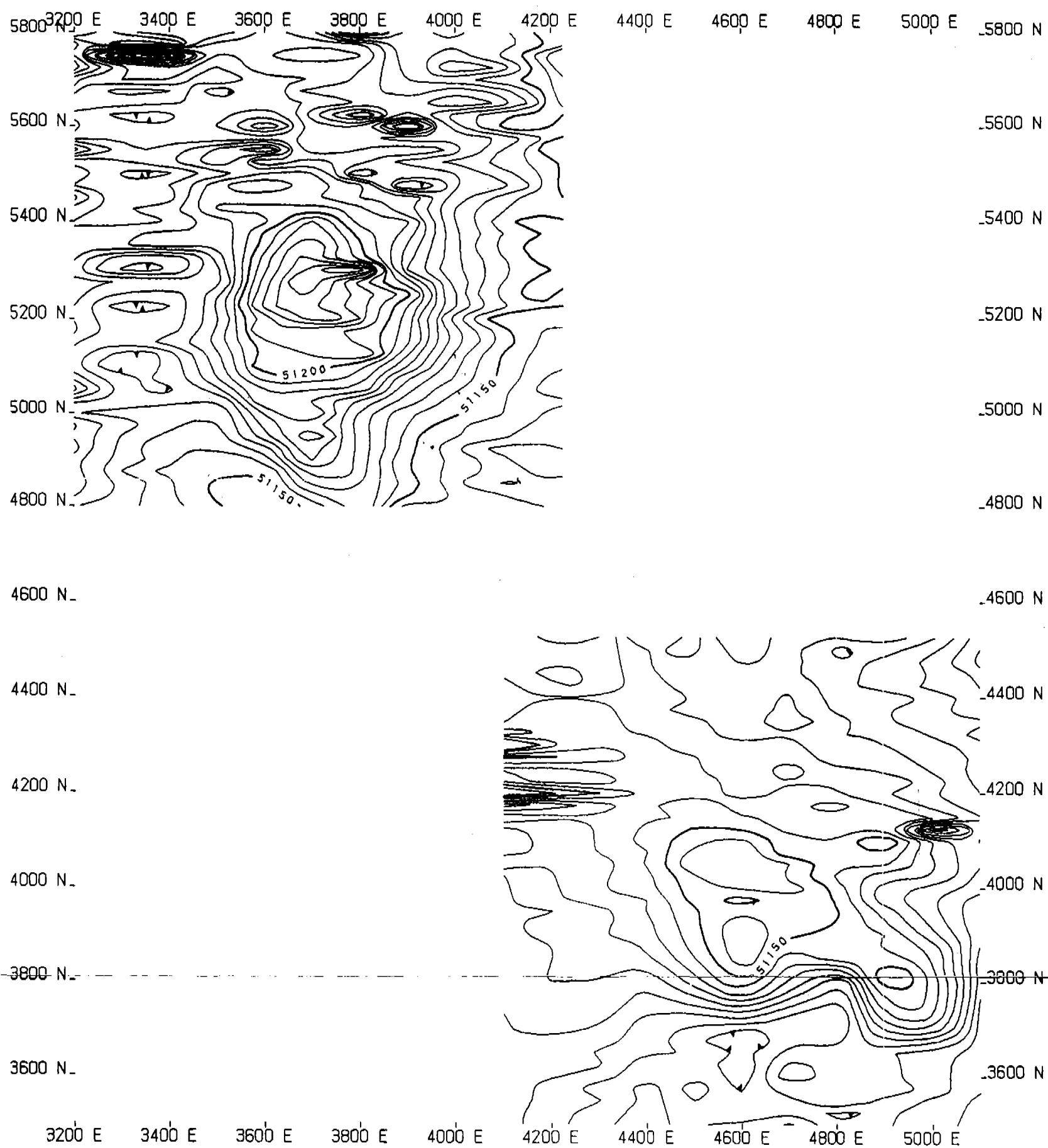
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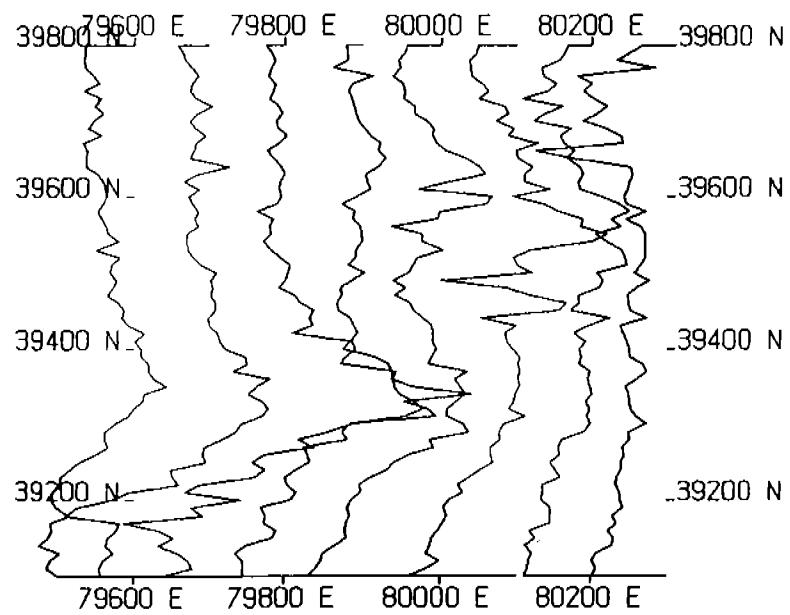
| COLOUR | CONTOUR RANGES | C. I. |
|--------|----------------|-------|
| PURPLE | 2550-3350nT    | 5.0nT |
| BLUE   | 3350-3650nT    | 5.0nT |
| GREEN  | 3650-3750nT    | 5.0nT |
| BROWN  | 3750-3950nT    | 5.0nT |
| YELLOW | 3950-4150nT    | 5.0nT |
| ORANGE | 4150-4350nT    | 5.0nT |
| RED    | 4350-4550nT    | 5.0nT |
| MAROON | 4550-4850nT    | 5.0nT |



|   |
|---|
| NORTH STAR RESOURCES NL   |
| WARREGO WEST PROJECT  |
| PLATEAU ANOMALIES WWT1, WWT2<br>GROUND MAGNETIC PROFILES<br>BASE LEVEL 51150nT VERTICAL SCALE 30nT/CM |
| MAGDATA CONSULTANTS   |

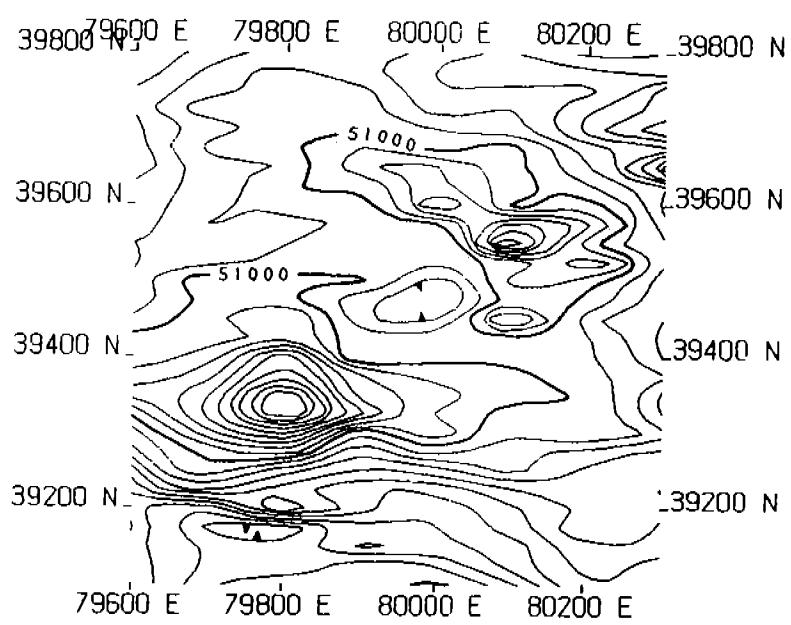
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NORTH STAR RESOURCES NL  
WARREGO WEST PROJECT  
ANOMALY WWT3 PLATE 7A  
GROUND MAGNETIC PROFILES  
BASE LEVEL 51000nT VERTICAL SCALE 30nT  
MAGDATA CONSULTANTS

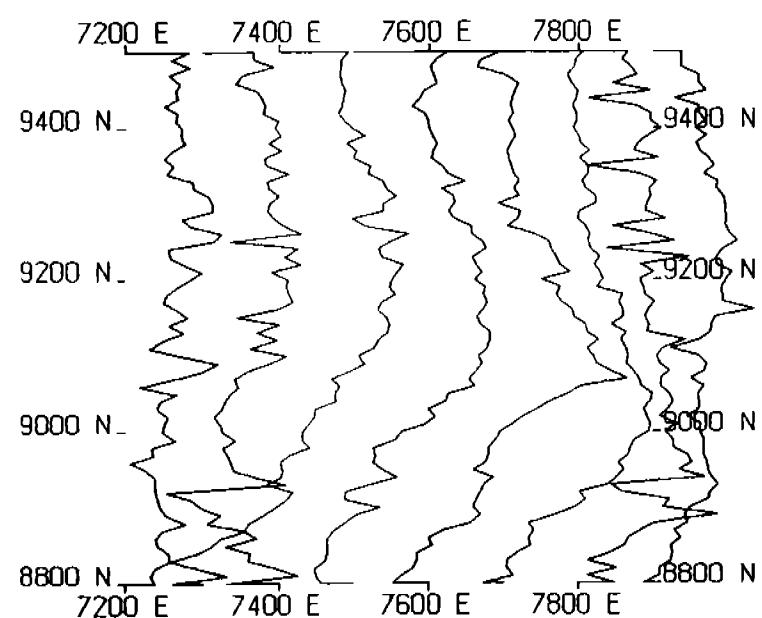
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NORTH STAR RESOURCES NL  
WARREGO WEST PROJECT  
ANOMALY WWT3 PLATE 78  
GROUND MAGNETIC CONTOURS  
CONTOUR INTERVAL 5nT  
MAGDATA CONSULTANTS

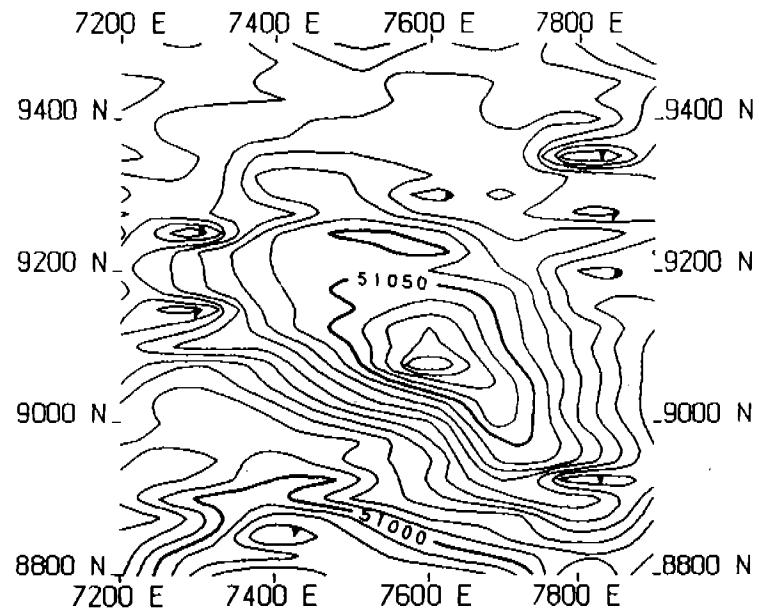
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106



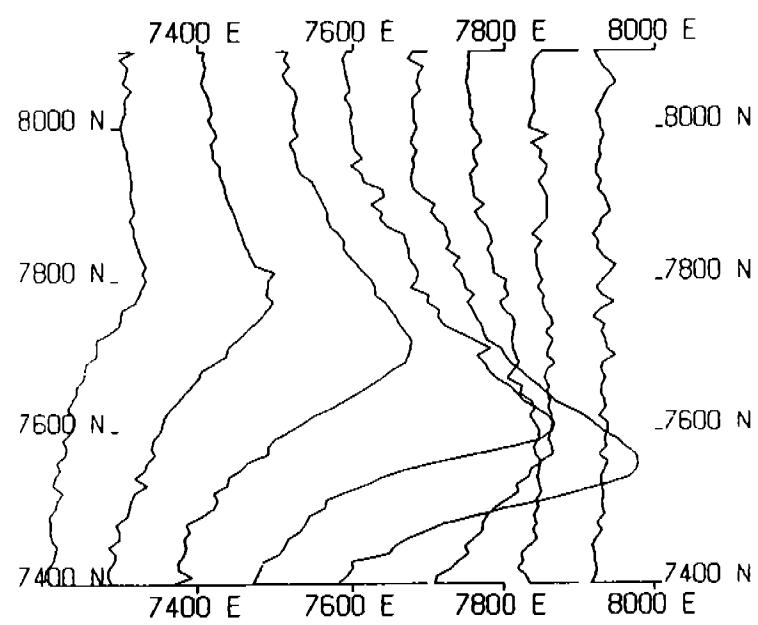
NORTH STAR RESOURCES NL  
WARREGO WEST PROJECT  
ANOMALY WWT4 PLATE 7A  
GROUND MAGNETIC PROFILES  
BASE LEVEL 51000nT VERTICAL SCALE 30nT/CM  
MAGDATA CONSULTANTS

Scale 1:10000  
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(metres)



NORTH STAR RESOURCES NL  
WARREGO WEST PROJECT  
ANOMALY WWT4 PLATE 8B  
GROUND MAGNETIC CONTOURS  
CONTOUR INTERVAL 5nT  
MAGDATA CONSULTANTS

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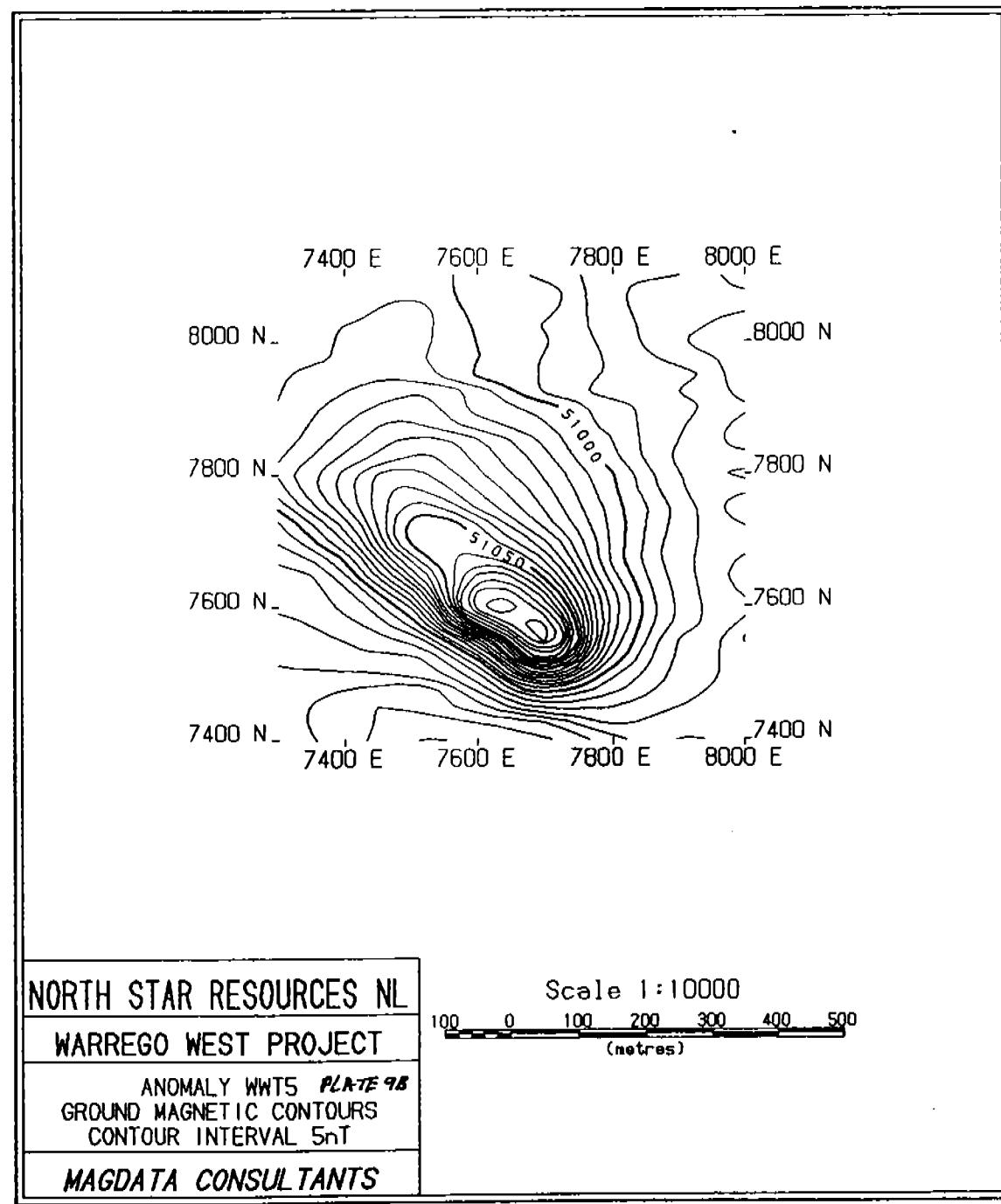
NORTH STAR RESOURCES NL

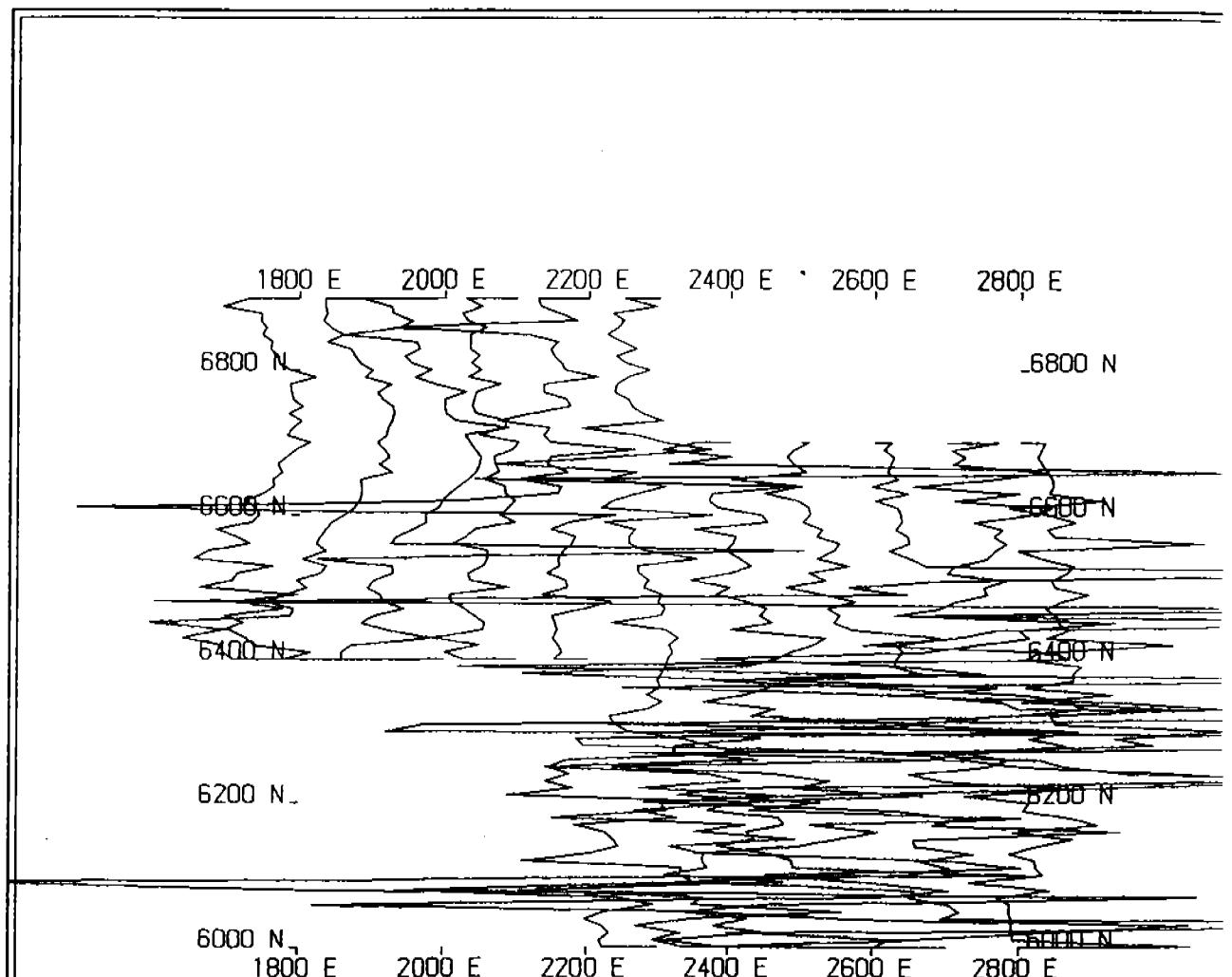
WARREGO WEST PROJECT

ANOMALY WNT5 PLATE 9A  
GROUND MAGNETIC PROFILES  
BASE LEVEL 51000nT VERTICAL SCALE 30nT/CM

MAGDATA CONSULTANTS

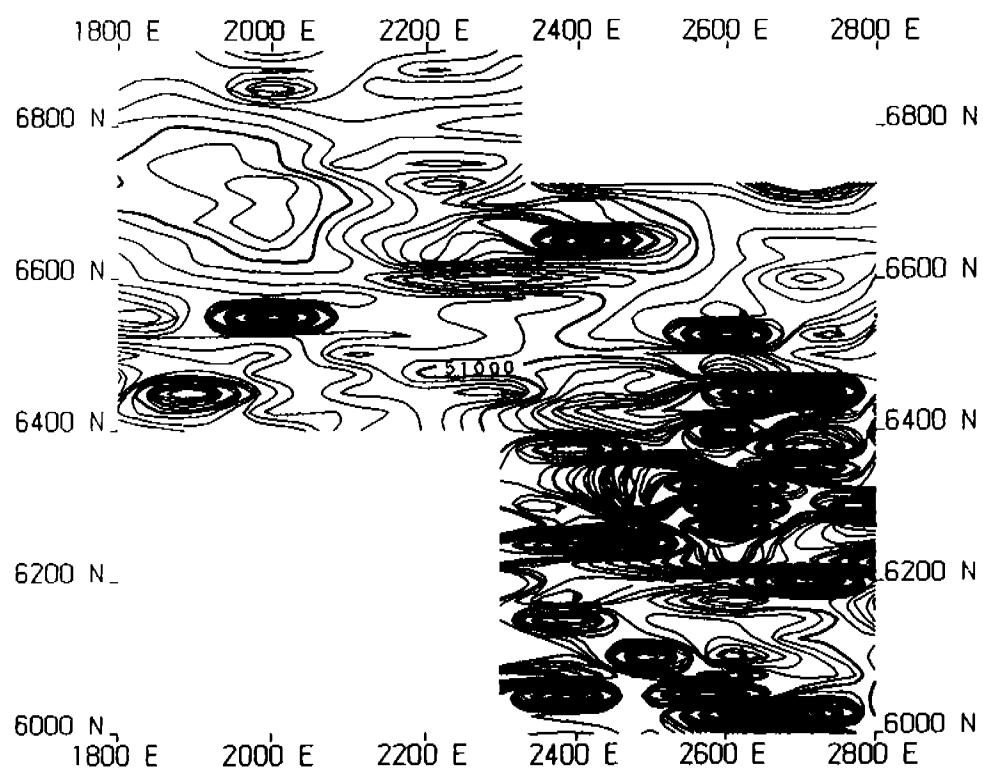
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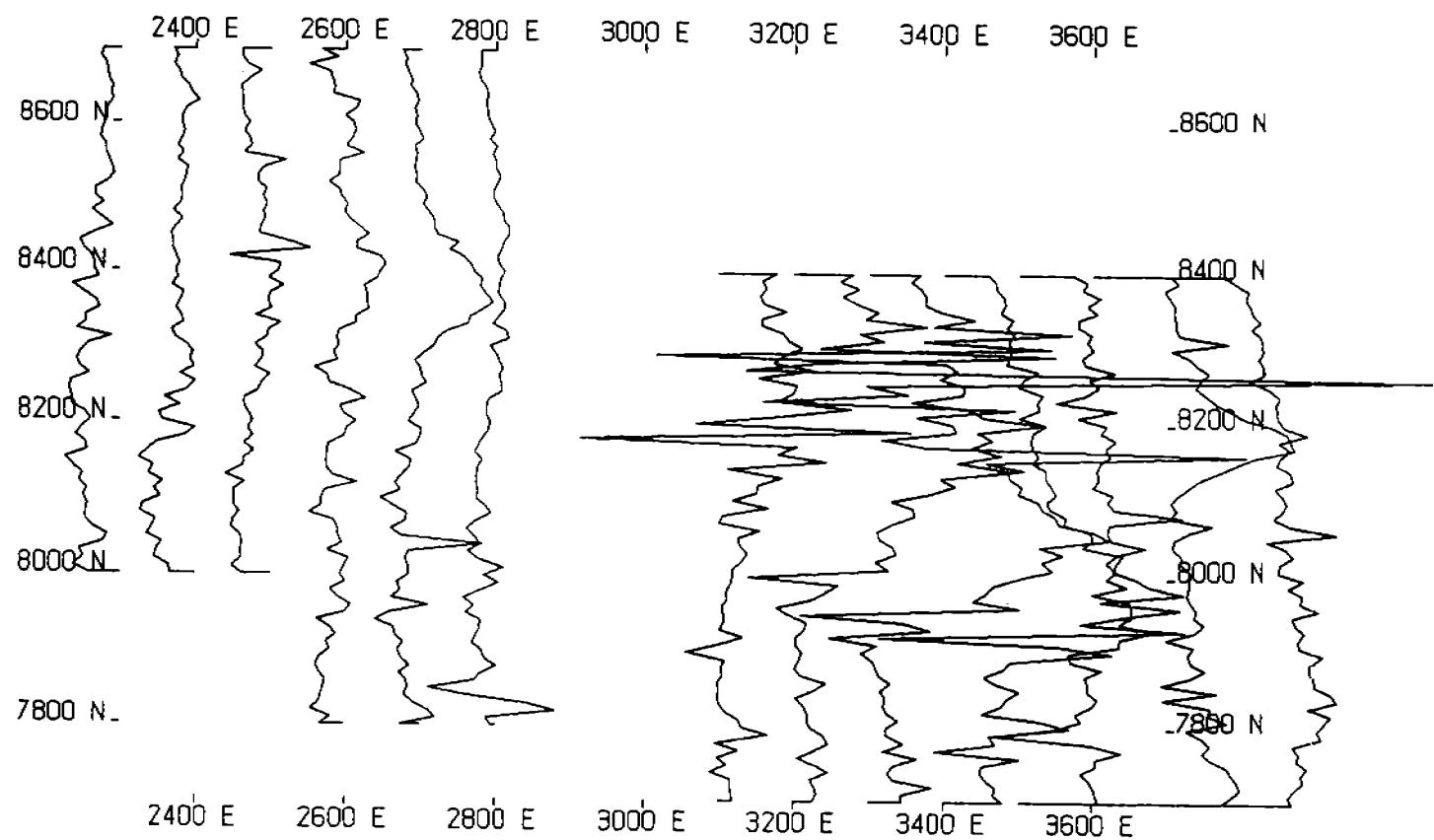
|   |
|---|
| NORTH STAR RESOURCES NL                   |
| WARREGO WEST PROJECT                      |
| ANOMALY WWT6 PLATE 10A                    |
| GROUND MAGNETIC PROFILES                  |
| BASE LEVEL 51000nT VERTICAL SCALE 30nT/CM |
| MAGDATA CONSULTANTS                       |

Scale 1:10000  
 100 0 100 200 300 400 500  
 (metres)



|                          |
|--------------------------|
| NORTH STAR RESOURCES NL  |
| WARREGO WEST PROJECT     |
| ANOMALY WWT6 PLATE 108   |
| GROUND MAGNETIC CONTOURS |
| CONTOUR INTERVAL 5nT     |
| MAGDATA CONSULTANTS      |

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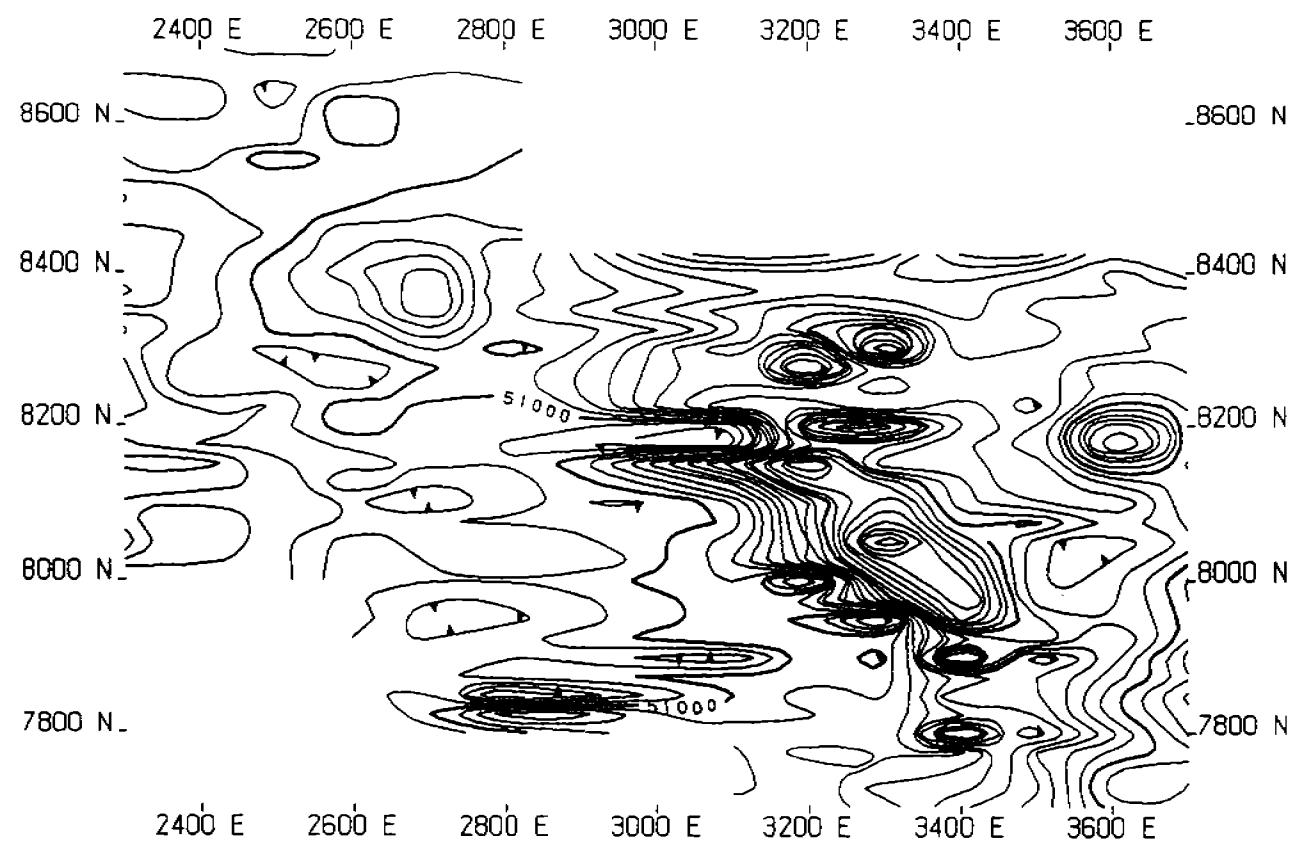


NORTH STAR RESOURCES NL  
WARREGO WEST PROJECT  
ANOMALIES WWT7EAST, WWT7WEST  
GROUND MAGNETIC PROFILES  
BASE LEVEL 51000nT VERTICAL SCALE 30nT/CM

MAGDATA CONSULTANTS

PLATE II A

Scale 1:10000  
100 0 100 200 300 400 500  
(metres)



NORTH STAR RESOURCES NL

WARREGO WEST PROJECT

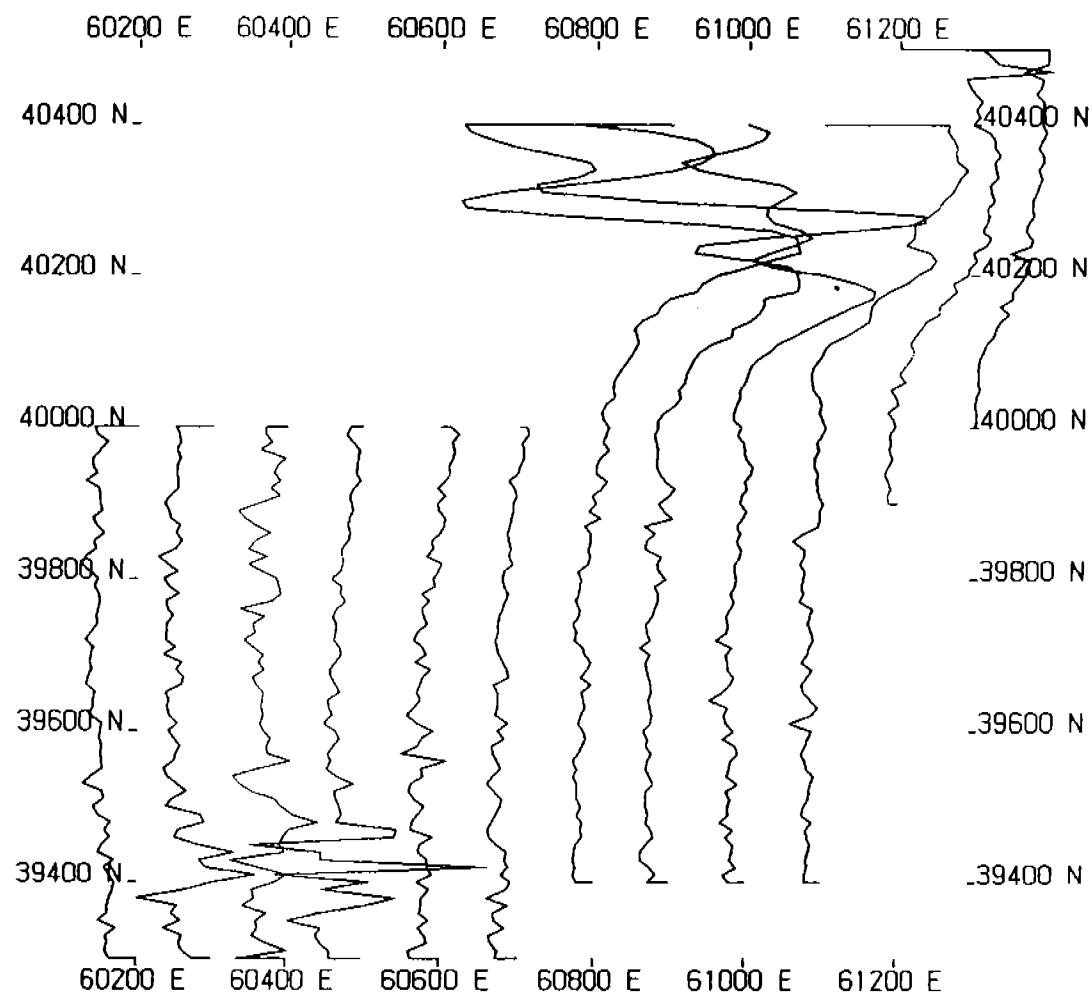
ANOMALIES WWT7EAST, WWT7WEST  
GROUND MAGNETIC CONTOURS  
CONTOUR INTERVAL 5nT

MACDATA CONSULTANTS

PLATE #8

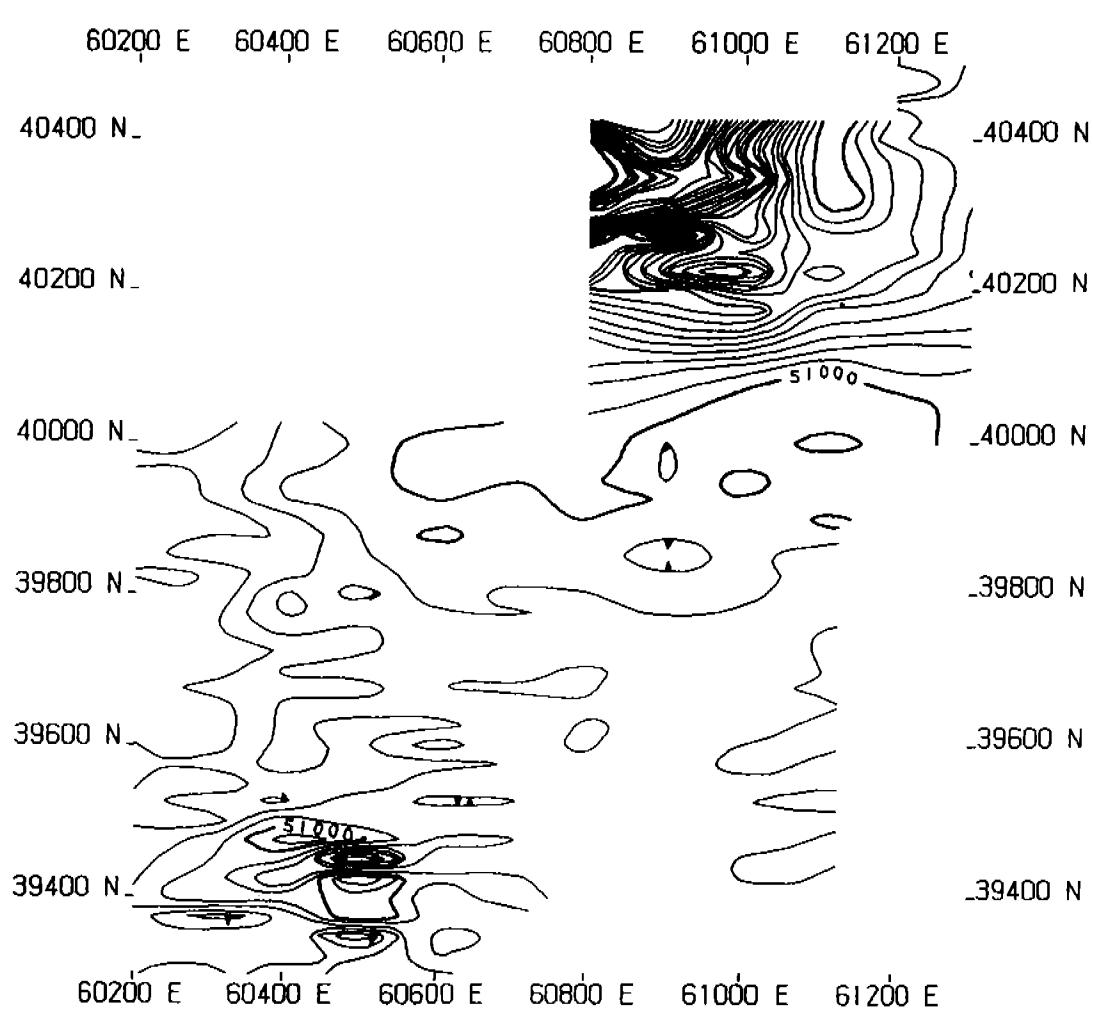
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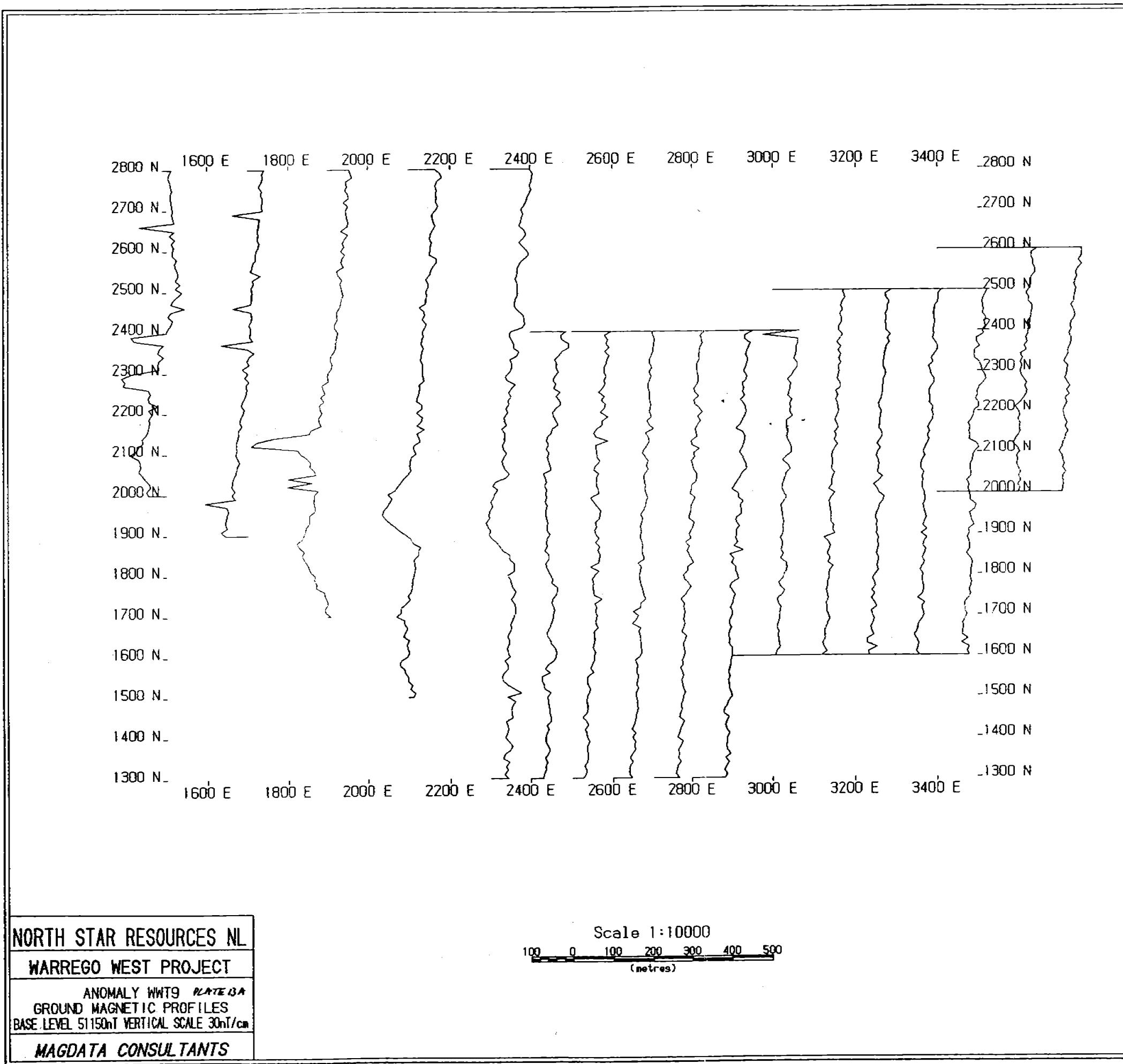
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| NORTH STAR RESOURCES NL  |
| WARREGO WEST PROJECT   |
| ANOMALY WWTB PLATE II A<br>GROUND MAGNETIC PROFILES<br>BASE LEVEL 51000nT VERTICAL SCALE 30nT/CM |
| MAGDATA CONSULTANTS  |

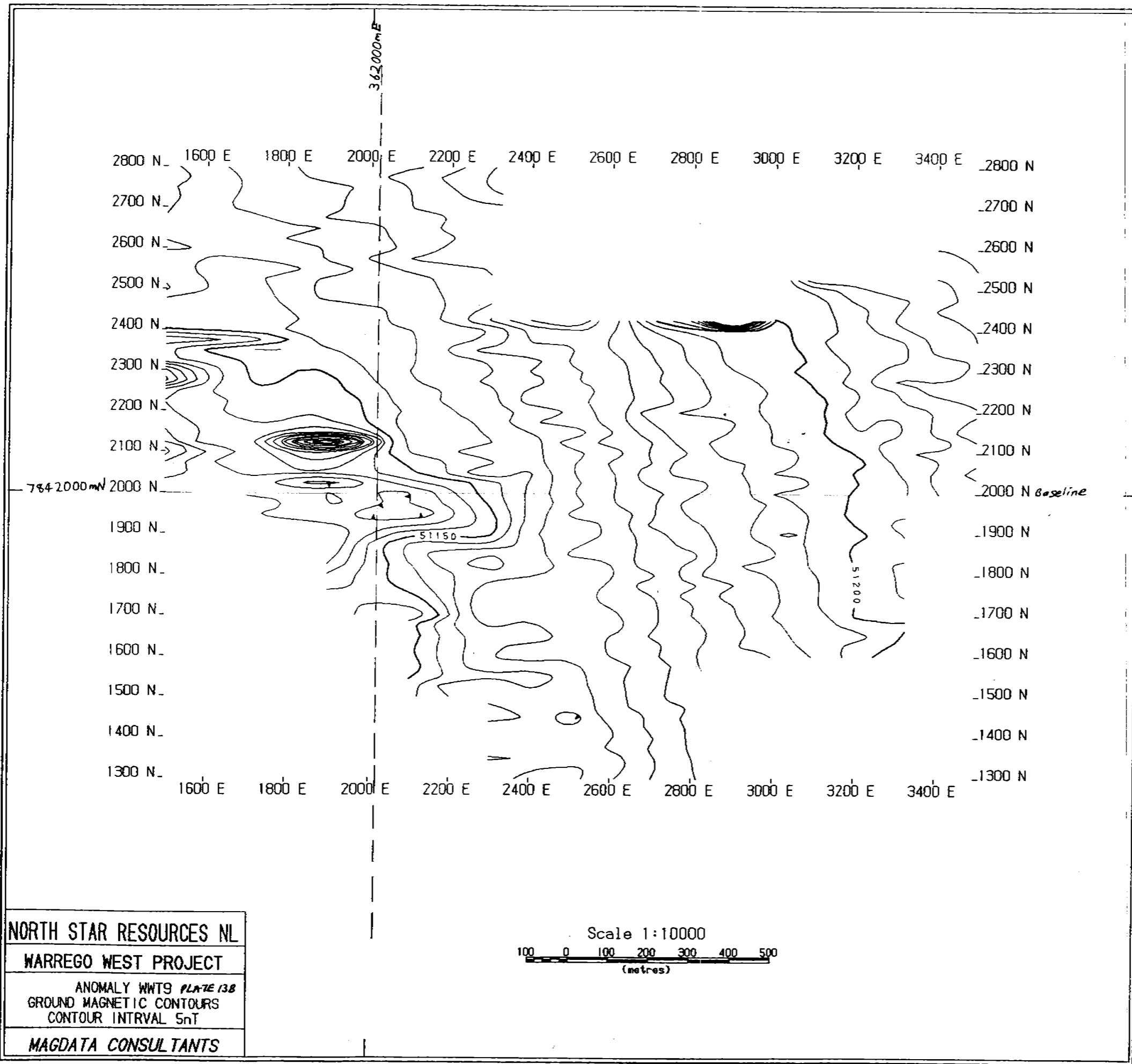
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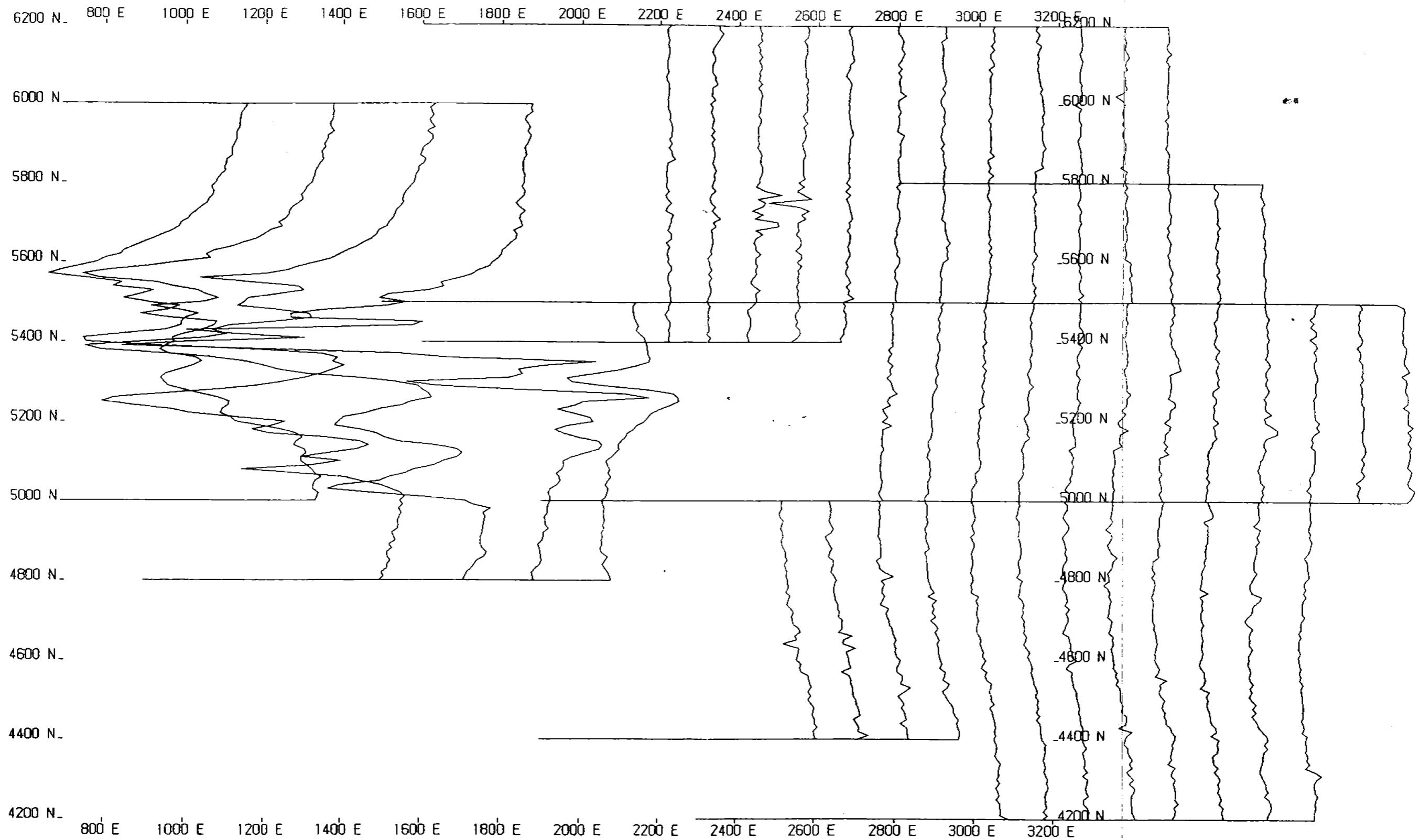


NORTH STAR RESOURCES NL  
WARREGO WEST PROJECT  
ANOMALY WWT8 MATE 128  
GROUND MAGNETIC CONTOURS  
CONTOUR INTERVAL 5nT  
MAGDATA CONSULTANTS

Scale 1:10000  
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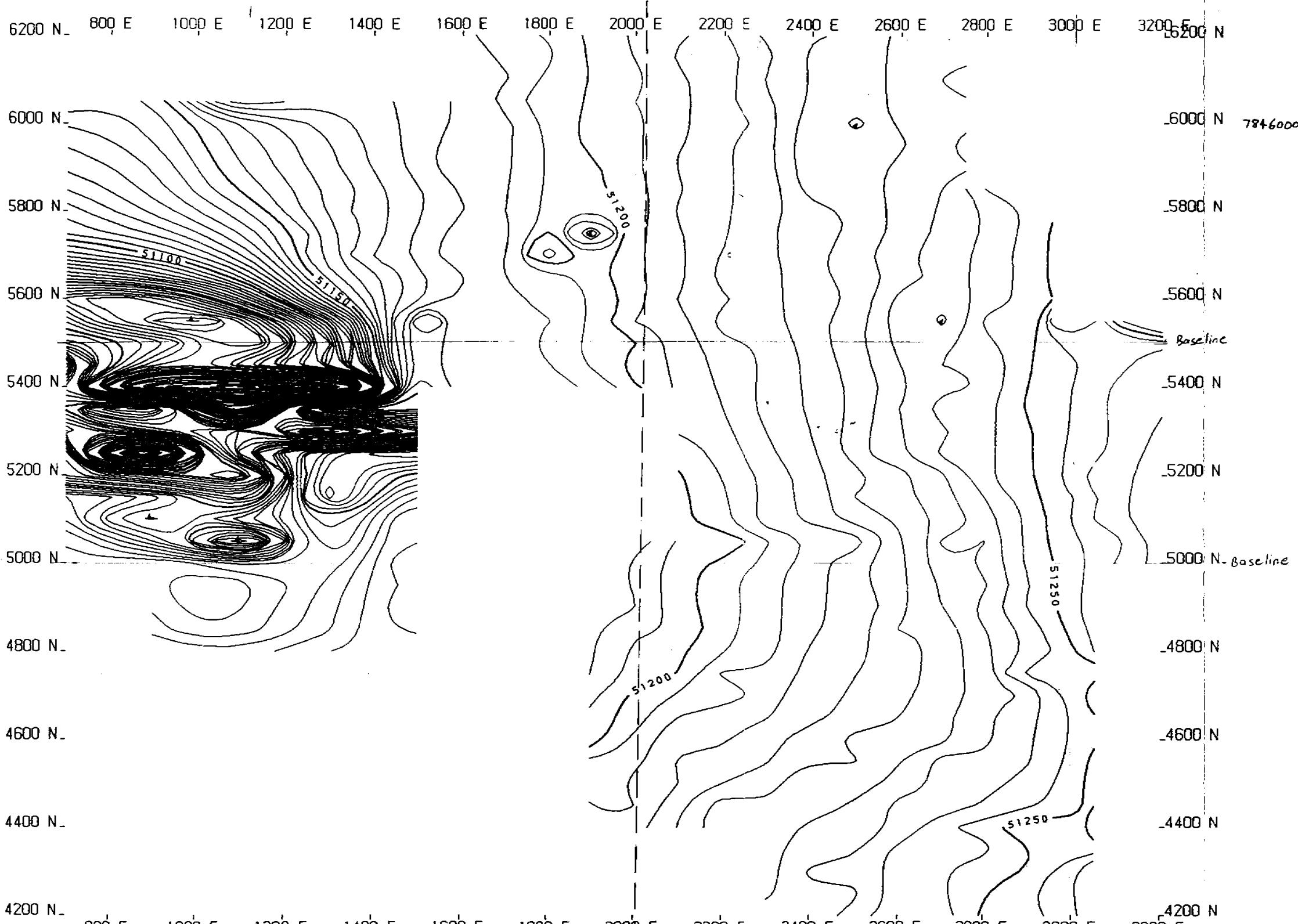






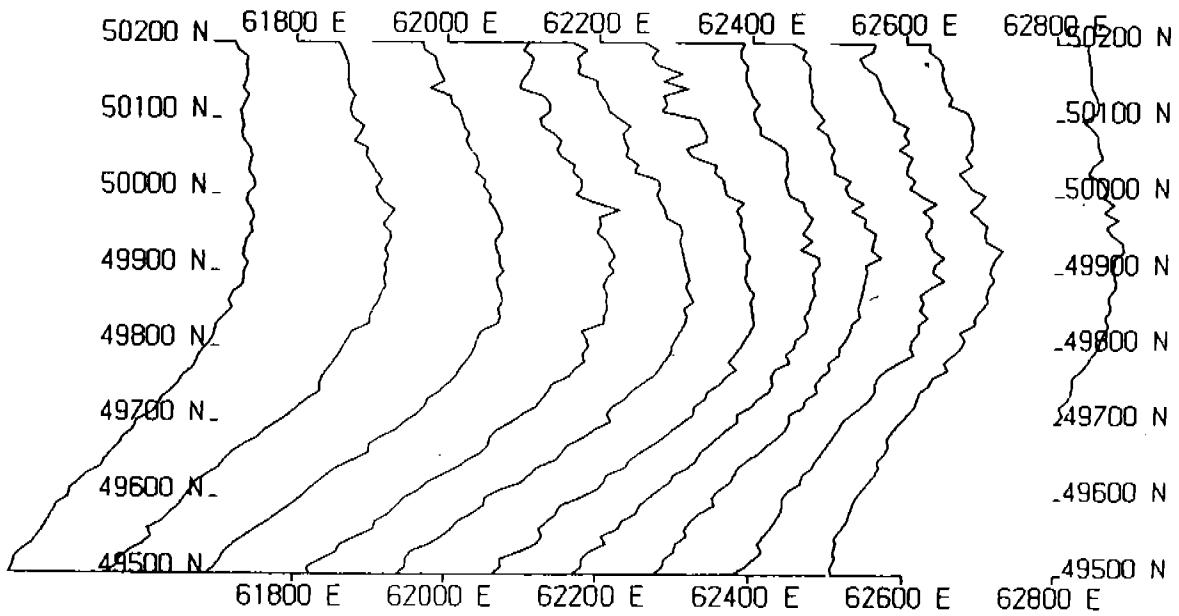
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| NORTH STAR RESOURCES NL                  |
| WARREGO WEST PROJECT                     |
| GROUND MAGNETIC STACKED PROFILES         |
| ANOMALIES T10, T11                       |
| BASE LEVEL 5100nT VERTICAL SCALE 30nT/CM |
| MAGDATA CONSULTANTS                      |

Scale 1:10000  
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 (metres)



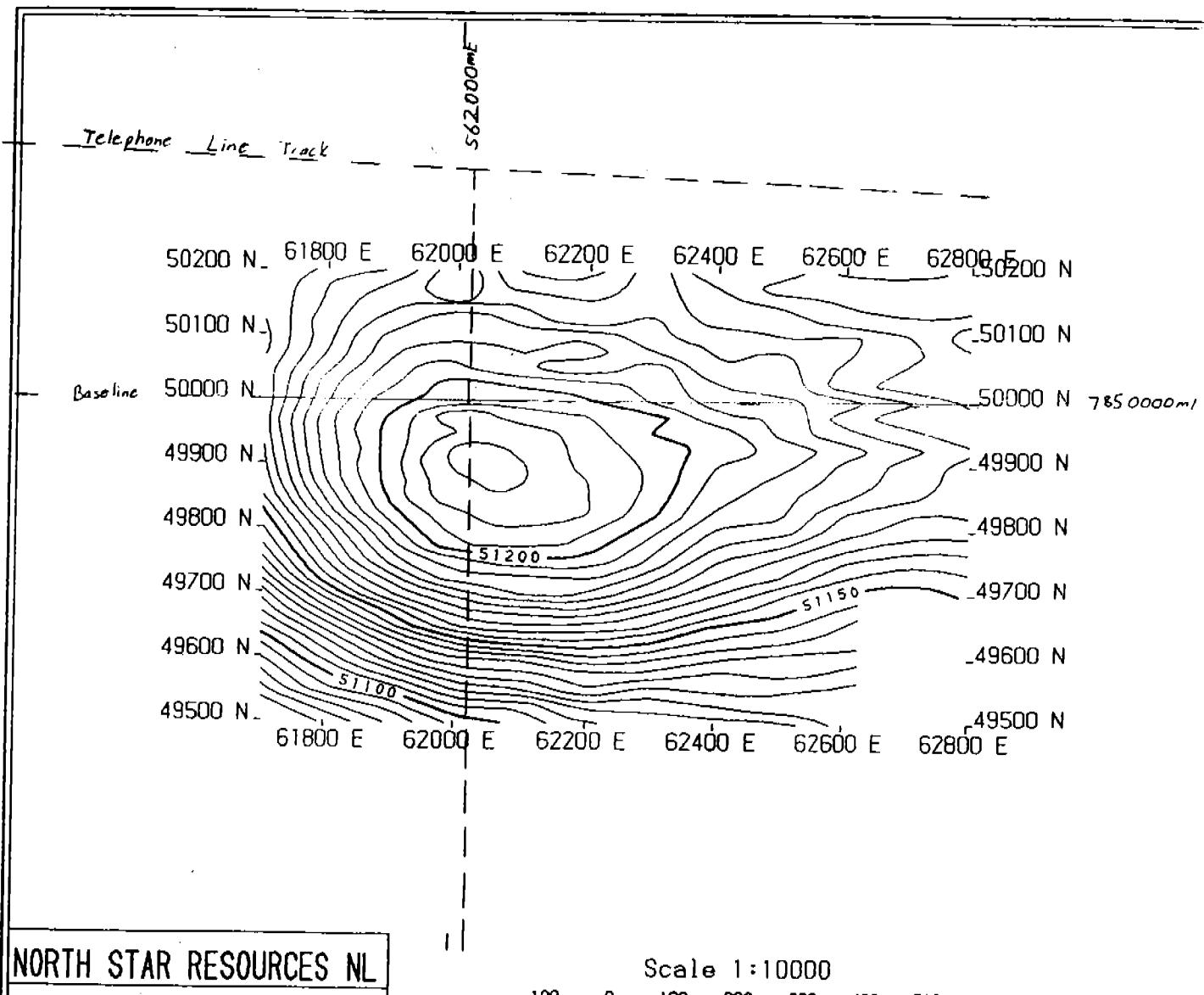
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| NORTH STAR RESOURCES NL  |
| WARREGO WEST PROJECT   |
| GROUND MAGNETIC CONTOURS<br>ANOMALIES T10, T11<br>CONTOUR INTERVAL 5nt |

PLATE 148



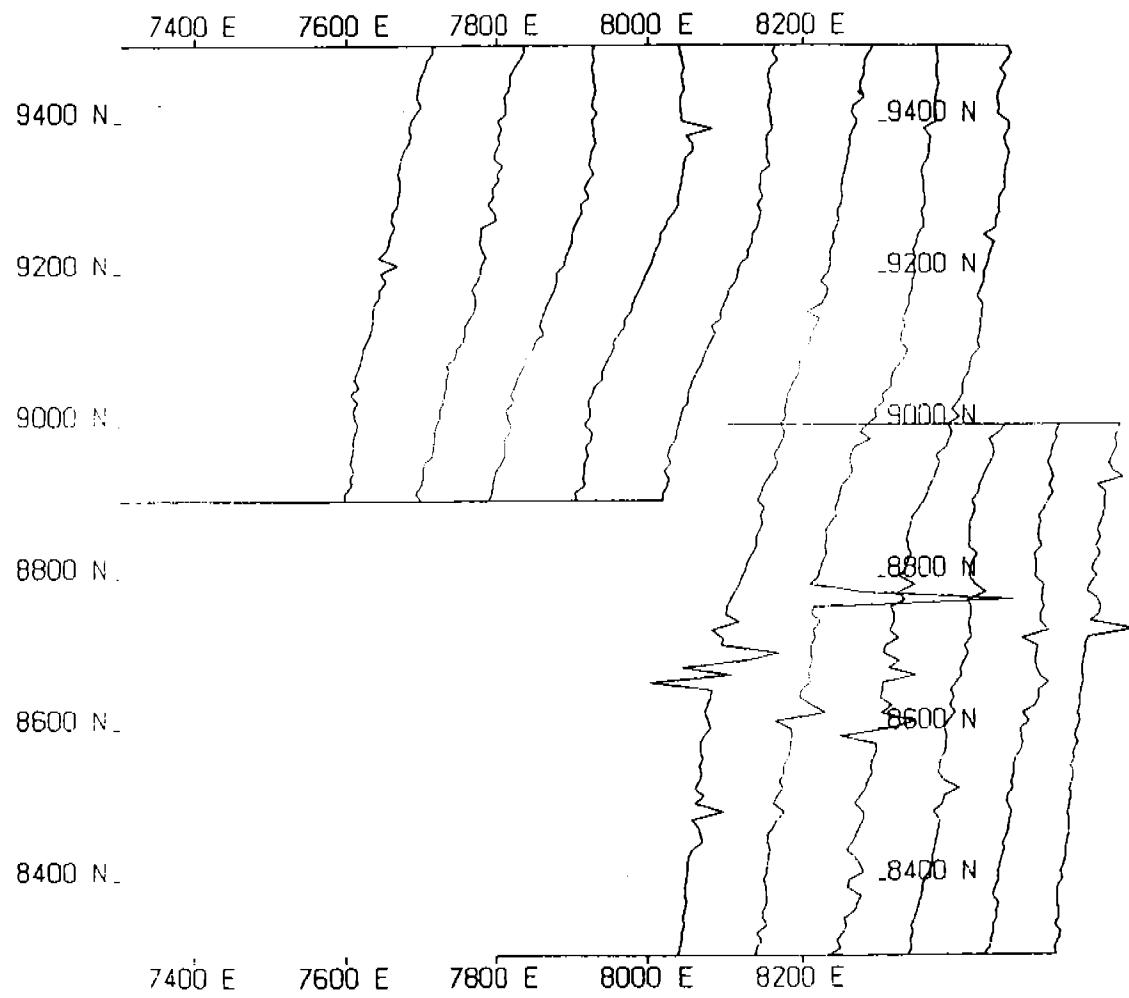
NORTH STAR RESOURCES NL  
WARREGO WEST PROJECT  
ANOMALY WWT12 PLATE 15A  
GROUND MAGNETIC PROFILES  
BASE LEVEL 51150nT VERTICAL SCALE 30nT/CM  
MAGDATA CONSULTANTS

Scale 1:10000  
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(metres)



|                          |
|--------------------------|
| NORTH STAR RESOURCES NL  |
| WARREGO WEST PROJECT     |
| ANOMALY WHT12 PLATE 15B  |
| GROUND MAGNETIC CONTOURS |
| CONTOUR INTERVAL 5nT     |
| MAGDATA CONSULTANTS      |

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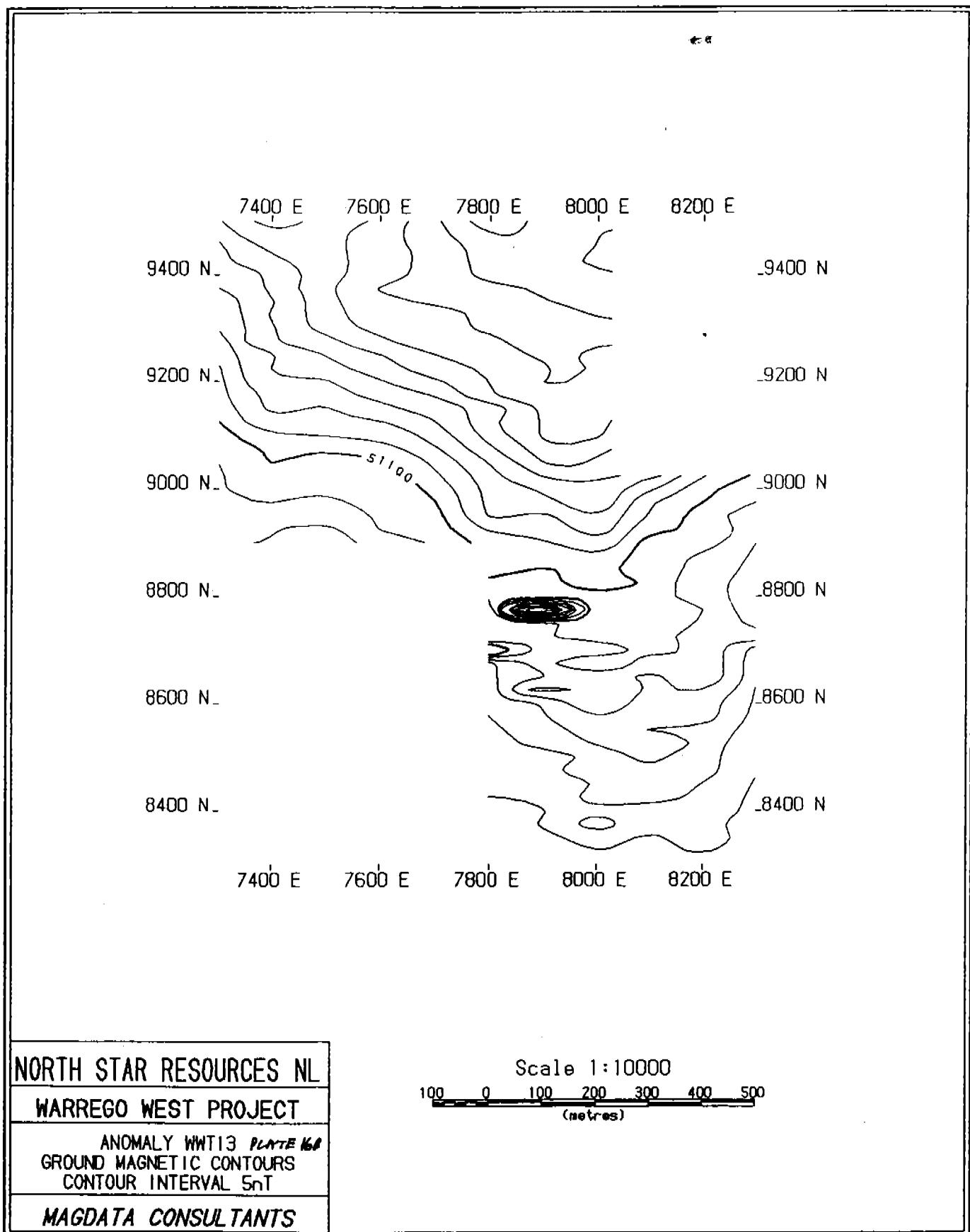
**NORTH STAR RESOURCES NL**

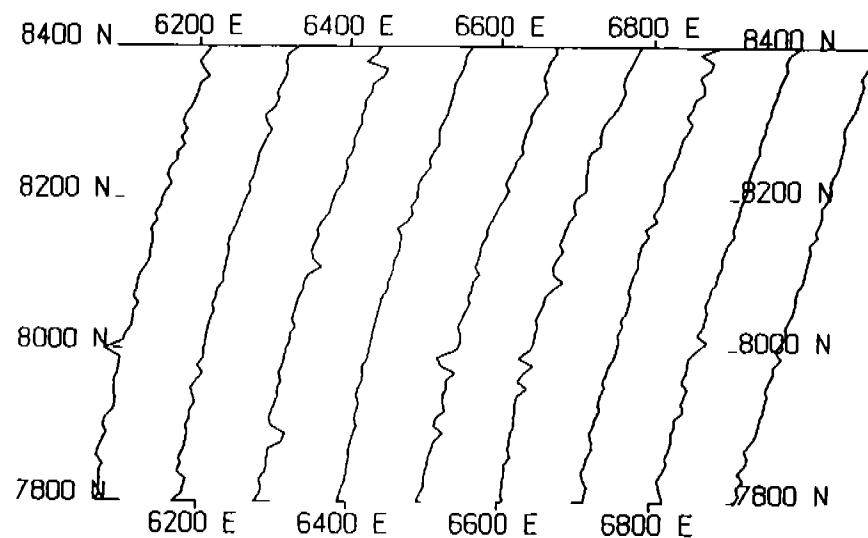
**WARREGO WEST PROJECT**

ANOMALY WWT13 PLATE 16A  
GROUND MAGNETIC PROFILES  
BASE LEVEL 51000nT VERTICAL SCALE 30nT/CM

**MAGDATA CONSULTANTS**

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(metres)





NORTH STAR RESOURCES NL

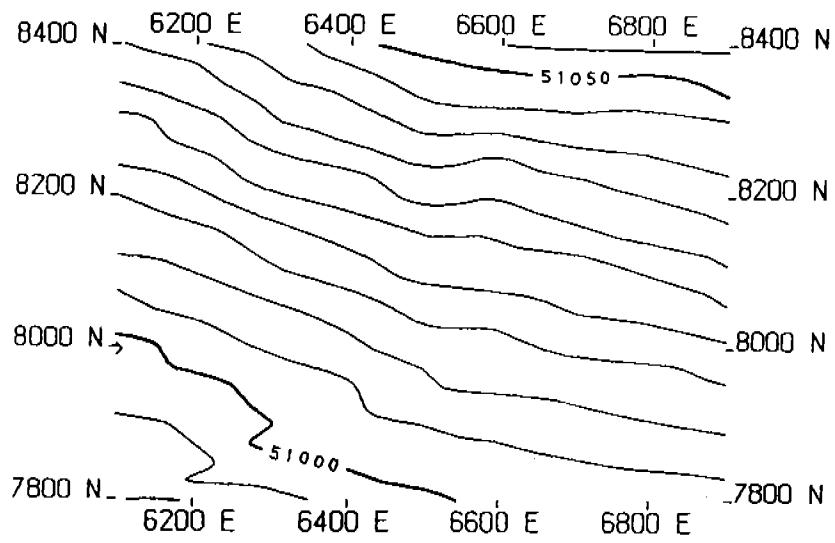
WARREGO WEST PROJECT

ANOMALY WWT14 PLATE 17A  
GROUND MAGNETIC PROFILES  
BASE LEVEL 51000HT VERTICAL SCALE 30NT/CM

MAGDATA CONSULTANTS

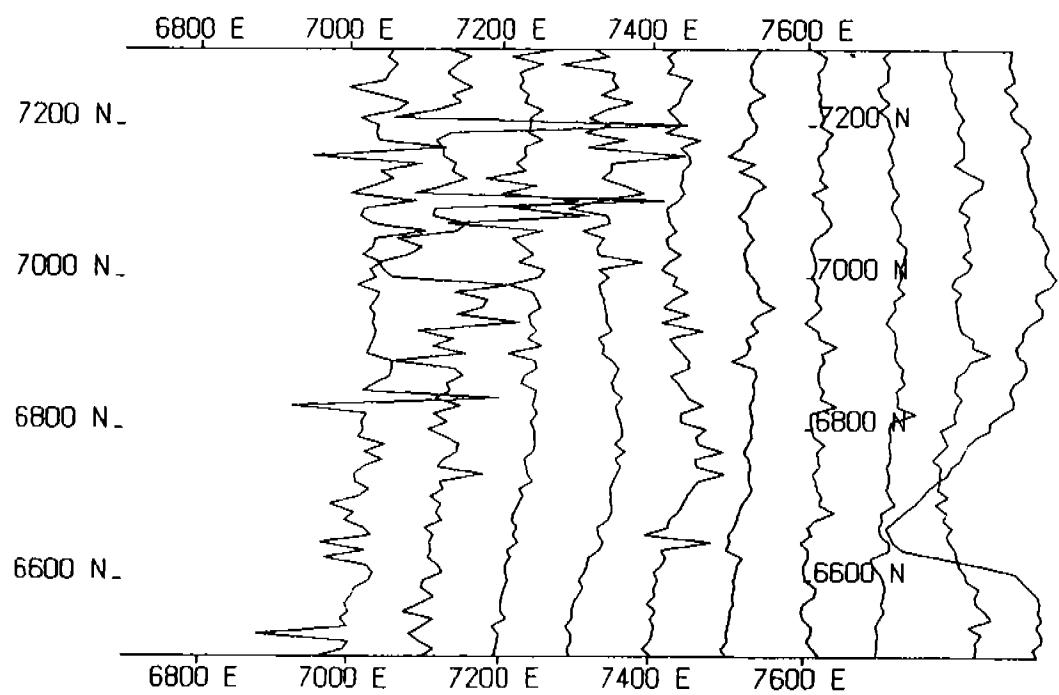
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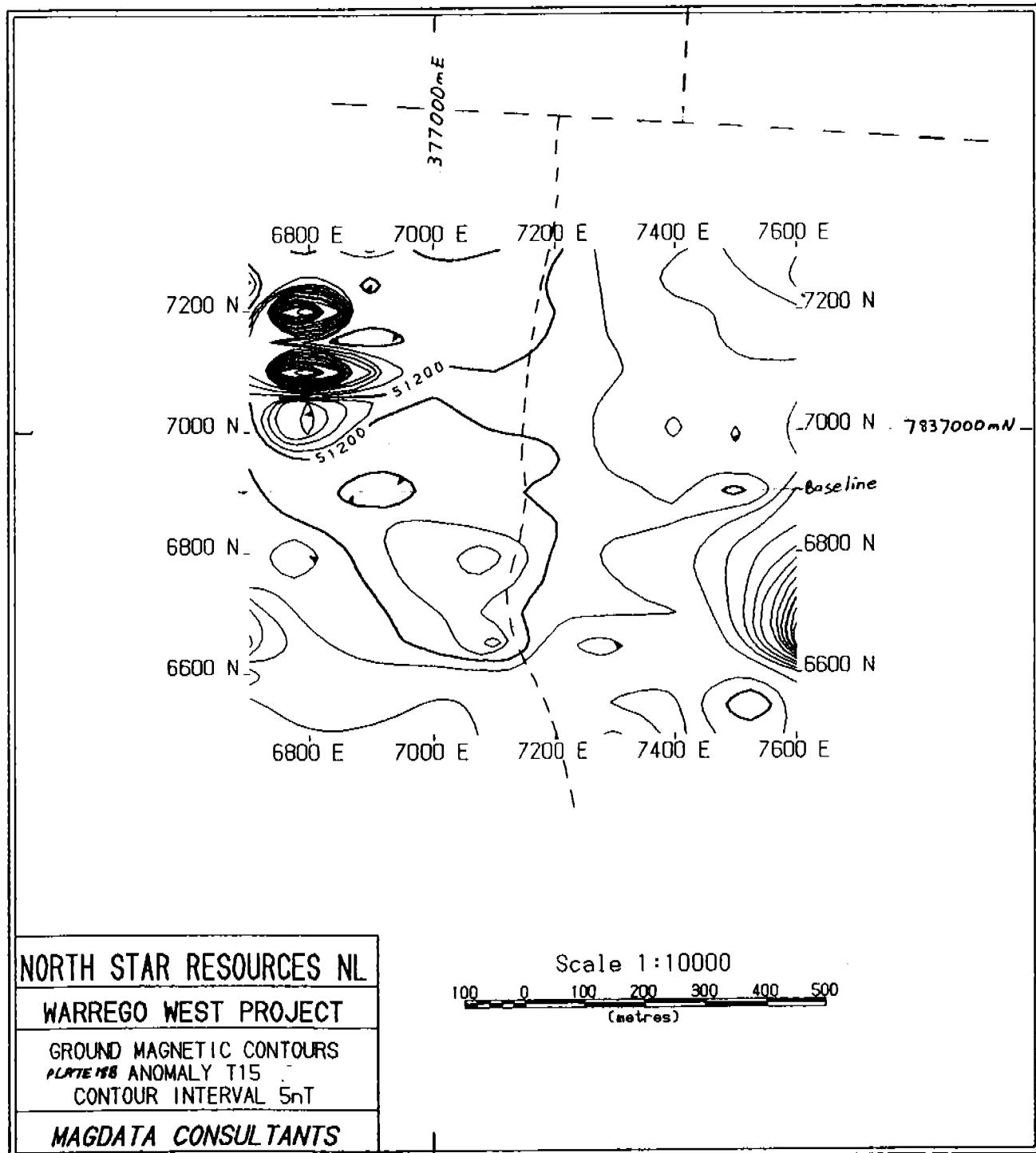
NORTH STAR RESOURCES NL  
WARREGO WEST PROJECT  
ANOMALY WNT14 DATE 1/88  
GROUND MAGNETIC CONTOURS  
CONTOUR INTERVAL 5nT  
MAGDATA CONSULTANTS

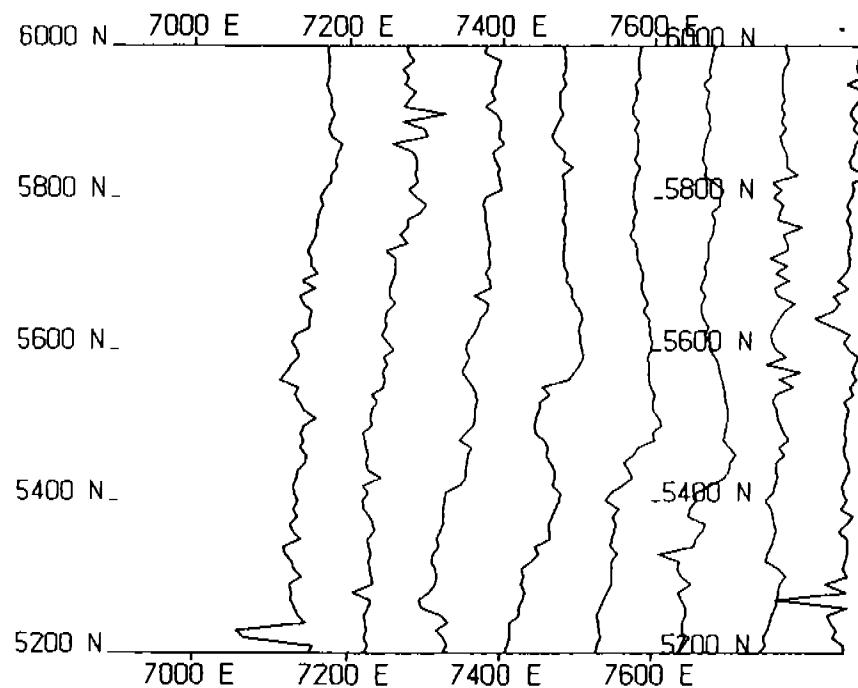
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(metres)



NORTH STAR RESOURCES NL  
WARREGO WEST PROJECT  
GROUND MAGNETIC STACKED PROFILES  
PLATE MA ANOMALIES T15  
BASE LEVEL 51100nT VERTICAL SCALE 30nT/CM  
MAGDATA CONSULTANTS

Scale 1:10000  
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(metres)





NORTH STAR RESOURCES NL

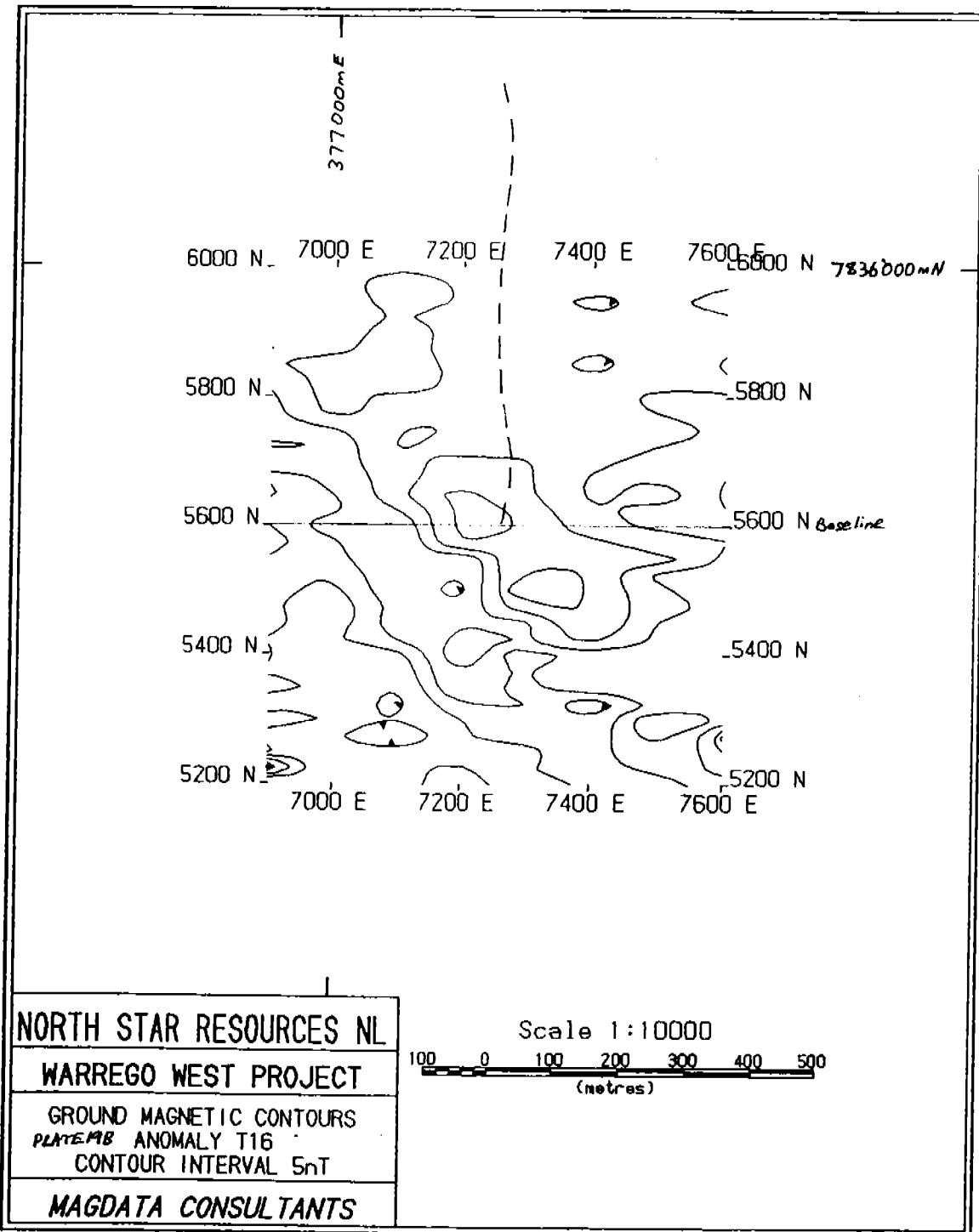
WARREGO WEST PROJECT

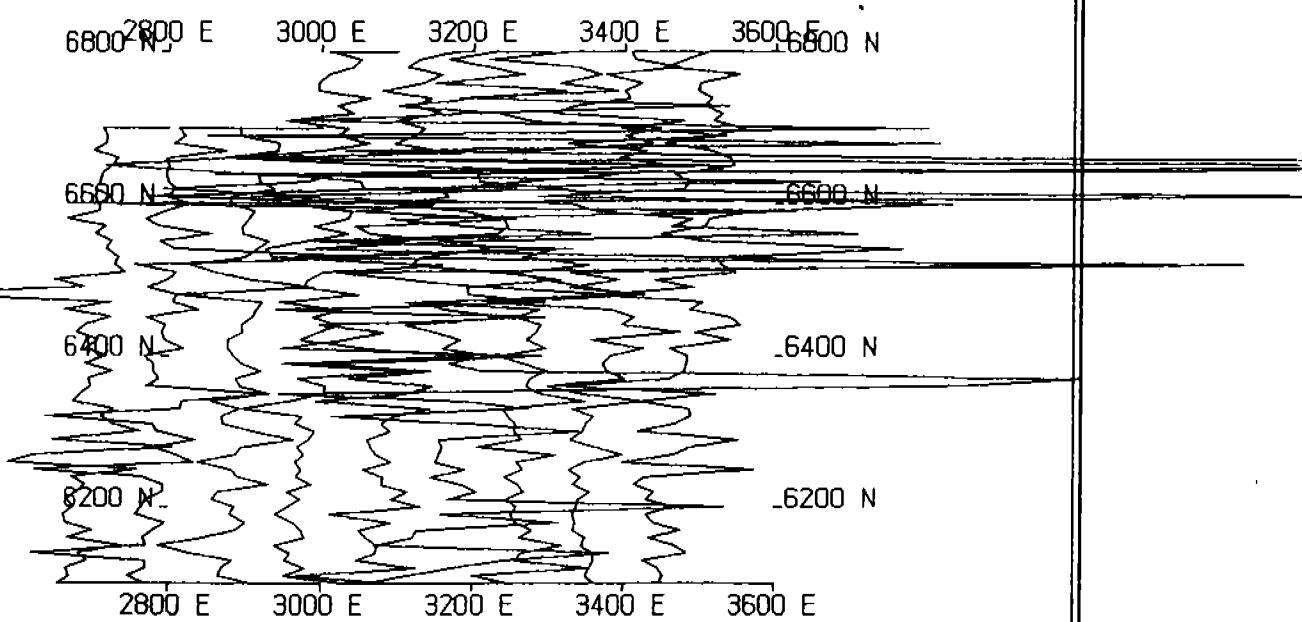
GROUND MAGNETIC PROFILES  
PLATEMA ANOMALY T16  
BASE LEVEL 51100nT VERTICAL SCALE 30nT/CM

MAGDATA CONSULTANTS

Scale 1:10000

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(metres)





NORTH STAR RESOURCES NL  
WARREGO WEST PROJECT  
GROUND MAGNETIC PROFILES  
PLATE 20A ANOMALY T17  
BASE LEVEL 51100nT VERTICAL SCALE 30nT/CM  
MAGDATA CONSULTANTS

Scale 1:10000  
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(metres)

