NORTH FLINDERS MINES LTD

TENNANT CREEK PROJECT

REPORT ON GECKO-CLEO GROUP

E.L.7649

FOR 12 MONTH PERIOD TO FEBRUARY 1994

M.Hatcher
R.Halfpenny
NORTH FLINDERS EXPLORATION
MARCH 1994

Report No.RH:MIH172

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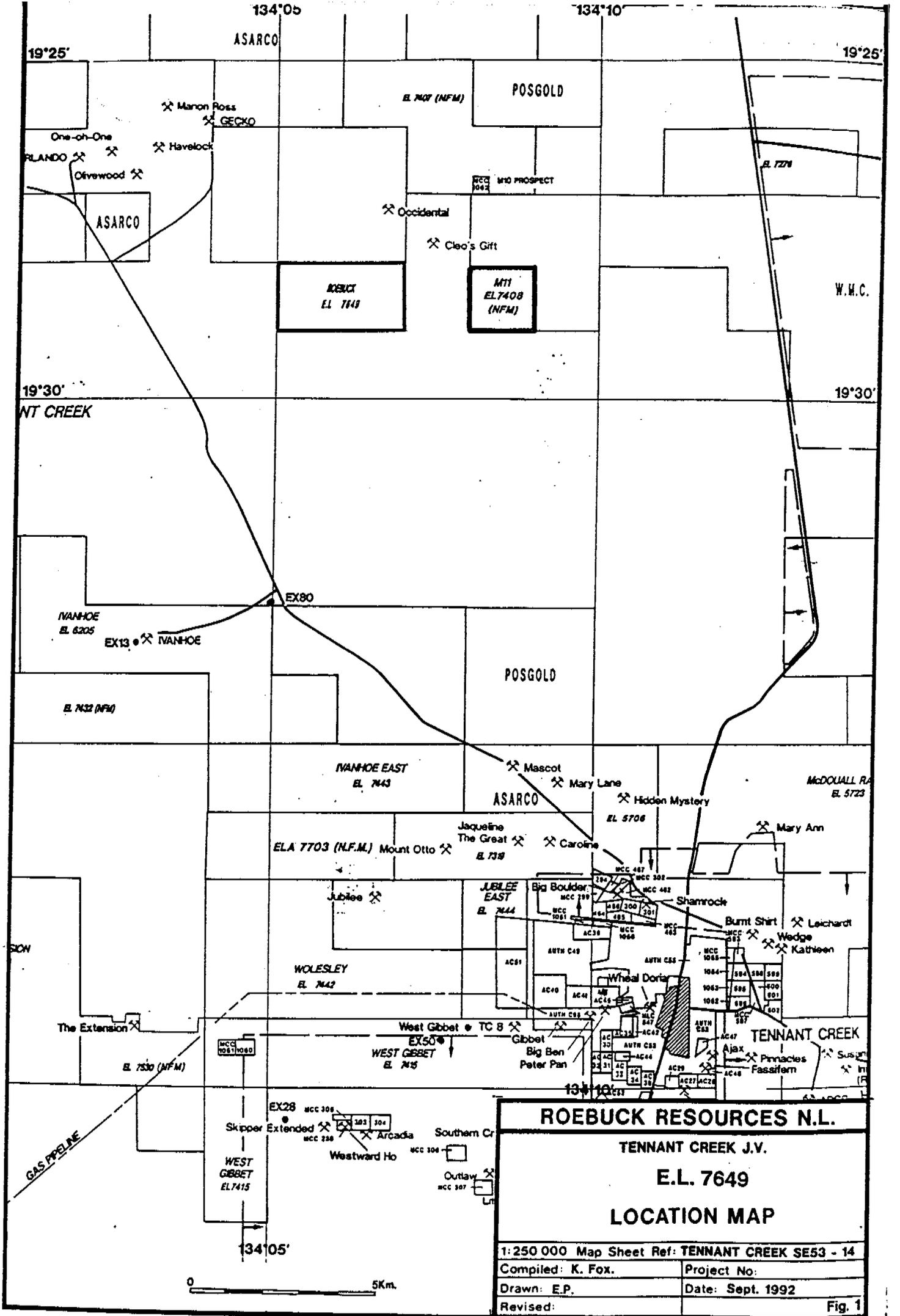

ROEBUCK RESOURCES N.L.

TENNANT CREEK J.V.

E.L. 7649

LOCATION MAP

1:250 000 Map Sheet Ref: TENNANT CREEK SE53 - 14	
Compiled: K. Fox.	Project No:
Drawn: E.P.	Date: Sept. 1992
Revised:	Fig. 1

1. INTRODUCTION

This report was prepared by North Flinders Exploration and documents exploration carried out on Exploration Licence 7649 in the 12 month period to February 1994. During the reporting period the following work programme was undertaken -

* a reassessment of the "M" Sample results.
* acquisition of the Aerodata aero-magnetic and radiometric package and an interpretation of the data,
* analysis of regional geological dataset and interpretation of bedrock geology.
* interpretation of the M28 ground magnetic anomaly.

E.L. 7649 is located approximately 24 kms north-north-west of Tennant Creek and approximately 4 km. south-east of the Gecko Mine (Fig. 1). Access is via the bitumen Gecko Road to the west of the area and then various bush tracks, which are only passable during the dry season. This report is based on the field work of NFM geologists B.Taylor, R. Halfpenny, and M. Hatcher.

2. TENEMENT DETAILS

Exploration Licence 7649 covers one graticular block and an area of approximately 3.24 sqr.Kms. In January 1994 E.L.7649 was reduced from 2 to 1 graticular blocks. The tenement was granted for a period of 3 years from the 28th Feb 1992 originally in the names of NFM and Roebuck Resources N.L. Roebuck withdrew from the tenement in 1992 and transferred its interest to NFM. The expenditure covenent for this tenement for 1993 was $8,000.

3. HISTORY AND PREVIOUS WORK

3.1. Mining History

There are no significant workings on the tenements, but E.L. 7649 is located SE of the Gecko gold-copper mine.(fig 1.)

The Gecko Deposit was discovered by Geopeko in 1967 when they drilled the Explorer 1. aeromagnetic anomaly in an area of no outcrop. A ground magnetic survey over a 1500 x 500 m. area resolved the broad Explorer 1. aeromagnetic anomaly into four separate first order magnetic anomalies, three of which were later found to be associated magnetite ironstones with significant copper and gold mineralisation. Multiple orebodies were delineated in each of the ironstones associated with the three magnetic anomalies.

Anomaly 1. was a broad 400 nT. vertical component magnetic anomaly, which was associated with the ironstone hosting the relatively deep (+200m.) No. 11 orebodies and several smaller mineralized bodies.

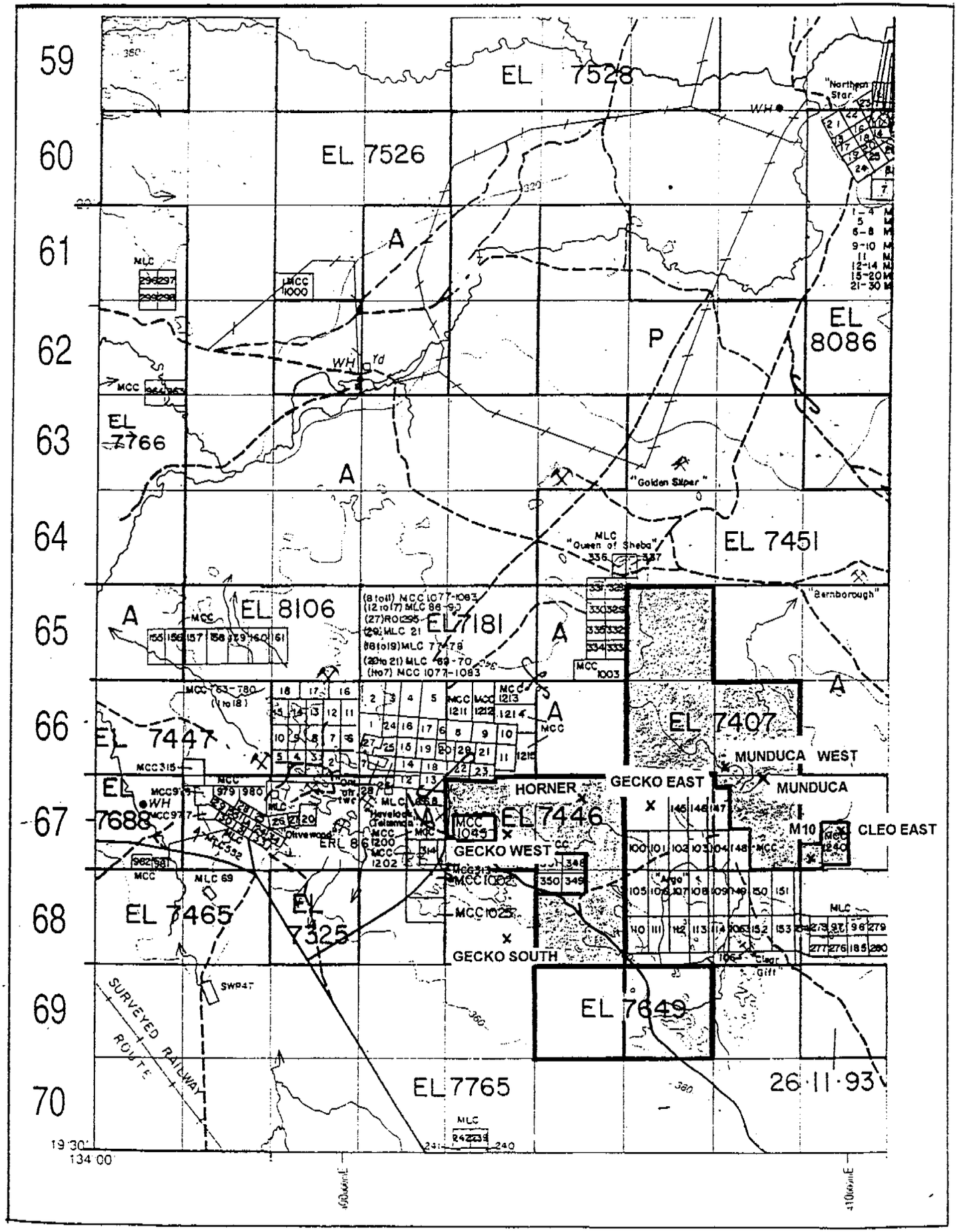

Figure 2. Gecko-Cleo Group : Tenement Map as at 12/93
1:100,000

Anomaly 2 was a 900 nT dipole vertical component ground magnetic anomaly with a steep gradient indicative of a relatively shallow source.(resource from 60 m. from surface). This anomaly hosted the No 1, 3 and 5 orebodies some of the largest and most continuous mineralized ore zones at Gecko.

Anomaly 3 was a 250 nT vertical component ground magnetic anomaly associated with No 2. and the predominantly Cu rich No 4. orebodies. An adjacent second order ground magnetic anomaly was drilled and became the K44 deposit.

Gold grades at Gecko were generally low averaging 0.7 g/t, but ranging from 2.3 g/t in orebody No. 5 to 0.06 g/t Au in oreboby No4. Copper grades averaged 3.8% Cu and bismuth was in the range 0.1 - 0.19% Bi for those orebodies on which data was published. Orebody No 4. reportedly averaged 120 g/t Ag. Surface exploration and underground development has outlined a large number of mineralized bodies within a 300 x 750m envelope which extends vertically from 60m.-310m. Individual orebodies are typically elongate or lenticular to elliptical and pod like in plan all with a pronounced east-west long axis. Several bodies have an arcuate outline typical of deposits formed by dilation jogs within shear systems. The larger Gecko orebodies are 100-150 m. long , 10-30m. wide and up to 250 m. deep. Most bodies dip steeply to the north (many are vertically dipping) and plunge steeply to the NNW or NW.

3.2. Previous Exploration

In 1988 Metana Minerals and later Placer Exploration carried out exploration in the region and the results of their work is documented in the reports -

Pearson. J. 1990 "Annual Report for Exploration Licence 5625 (Gecko Project Group) for the 12 months ending 31 st Jan 1990 Placer Exploration Ltd Report No NT5/90.

Standing. J. 1991 " Final Annual Report for Exploration Licence 5625 (Gecko Project Area) for the 12 months ending 31st January 1991.

In 1992 the NFM-Roebuck Joint Venture collected 110 "M" type soil samples on a 260 x 200 grid and drilled two lines of inclined RAB over the M28 magnetic anomaly.
The results of this survey are contained in "Annual Report on Exploration Licence E.L. 7649 (Gecko South)" by R.Halfpenny 20 th March 1993.

4. GEOLOGY

The regional geology of the Tennant Creek District has been extensively studied by many workers including Le Messurier & others (1990) who defined the Tennant Creek Inlier as consists of Early Proterozoic Warramunga Group sediments and volcanics. Unconformably overlying these rocks to the north are sediments of the Tompkinson Creek Province - the Tompkinson Creek beds and in the south the Hatches Creek Group containing sediments and voluminous felsic and mafic volcanics, form the Hatches Creek Province. The Warramunga and Hatches Creek Groups are intruded by Proterozoic igneous rocks outcropping in a southeast striking zone within the Tennant Creek District. Cambrian sediments of the Georgina Basin in the east and south and Devonian sediments of the Wiso Basin in the west unconformably overlie the Proterozoic rocks.

Several major and a number of minor masses of granite, scattered felsic and mafic sills and dykes, small irregular masses of quartz-feldspar porphyry and mafic rocks ranging from small plugs of gabbro to extensive dykes and sills of dolerite and numerous but volumetrically inconsequential lamprophyre dykes occur within the Tennant Creek Inlier (after Le Messurier & others,1990).

Lenses of medium to coarse grained quartz feldspar porphyry occur throughout the Tennant Creek area generally aligned parallel to the regional slaty cleavage. The porphyry is generally foliated except where the lenses are thick and the foliation is restricted to the margin of the body. A number of workers believe that there are at least two phases of porphyry intrusion, while others suggest much of the porphyry is sub-marine and in some instances sub-aerial volcanics. Coarse grained, biotite, lamprophyre dykes are common in the region and their lack of foliation suggests they are a relatively late feature.

Up to five phases of deformation have been identified by NFM structural geologists in the Tennant Creek area. The main folding and cleavage forming event was a North-south compression, which produced east- west trending macroscopic folds that plunge both east and west. These folds are upright, symmetric and generally tight with major steeply dipping limbs, very narrow hinge zones and small intersection angles between bedding and the axial plane cleavage. Fold wavelengths vary from several metres to several kilometres. An intense, pervasive axial plane slaty cleavage has developed.

The northwest striking Quartz Hill Fault (QHF), Mary Land Shear Zone (MLSZ)and Mount Samuel Fault Zone (MSFS) are thought to represent examples of basement faults manifested in the overlying Warramunga Group sediments.

The Au-Cu-Bi mineralisation in the Tennant Creek Goldfield and all the major mines discovered to date are spatially associated with iron oxides (Le Messurier & others,1990). The dominant alteration feature of the field is hematite or magnetite ironstones, with over 650 lodes identified in outcrop and drilling in the Tennant Creek area to date. The lodes vary in size from small pods to large bodies of over 15 million tonnes.

The lodes generally form ellipsoidal to flattened bodies within the plane of the regional cleavage, but stratabound hematite ironstones have also been noted in the cores of fold structures. The plunge of the lodes is usually steep but may be reoriented by later granite intrusion (eg Warrego), folding or faulting. Rare thin jasperoidal ironstone lodes also occur along the margins of porphyry lenses (eg northern margin of the Airport Porphyry), possibly representing contact metamorphism and iron-rich metasomatism. It appears iron has been mobile within the Warramunga sediments over a long period of time possibly beginning during diagenesis and ending during Tertiary lateritization.

Forming a halo below, adjacent to, above and in the ironstone are a number of alteration phases. The alteration phases surrounding the lode typically exhibit a vertical zonation, although these alteration phases are not necessarily associated with every ironstone. Chlorite is the most common alteration phase and forms an envelope around the ironstone. Down plunge of the lode an elongate chlorite + magnetite stringer zone is typically developed. Below this zone chlorite is dominant. The width of the chlorite halo adjacent to the lode varies from tens of centimetres to tens of metres. The chlorite-lode contact is very sharp. This contrasts with a generally diffuse chlorite-unaltered sediment contact. In the oxide zone, chlorite weathers to hematite. Towards the top of the ironstone, talc alteration and dolomite/jasper may also be formed.

The mineralisation typically exhibits a vertical zonation, albeit sometimes crude, with a gold-bismuth core enveloped by a broader copper halo. Gold is generally concentrated at the base or in the footwall of the ironstone lode and may also occur in the chlorite + magnetite stringer zone. Chlorite, muscovite, and sericite are often intergrown with gold. Bismuth is closely associated with gold, and may develop as an envelop around the margin of the gold pod. Deposits containing copper may be copper-poor or copper-rich. In copper-poor deposits (eg Juno), only a thin copper shell is developed around the margin of the gold-bismuth core with a sharp copper to gold-bismuth contact. In contrast, copper-rich deposits are characterised by a broad copper shell (eg Warrego) which overlap with the underlying gold- bismuth zones (Wedekind & others,1989).

5. EXPLORATION PROGRAMME 12 MONTHS TO FEB 1994

5.1 Geophysical Investigation

NFE acquired the Aerodata multiclient aeromagnetic and radiometric package during 1992/93. Using Geophysical Exploration Consultants Pty. Ltd. NFE produced a variety of linear and non-linear greyscale and pseudocolour magnetic images including shaddowgrams and K,Th and U colour composite images. These have been studied and interpreted including the structures associated with the E.L. 7649.

The Aerodata digital datafiles were reformatted, gridded and produced as contoured plots at 1:100,000 and 1:25,000 scale, and survey for EL 7649 is shown in Fig. 3.

NFM geophysics Peter Eagleton carried out a comprehensive analysis of the M28 magnetic anomaly and his discription of the anomaly follows:

Anomaly "M28" is a 80nT plus magnetic anomaly that is striking NW-SE with a small near surface dipolar magnetic anomaly superimposed upon it.

Four profiles were taken off the grid at a northeast to southwest orientation as shown on Fig. 4. The line numbers are displayed from 1 to 4, with crosses displaying magnetic values at the point. Figure 5 shows the magnetic profiles of the four lines with a base value of 50400nT removed. An assumed regional gradient was taken out for interpretation purposes.

The anomaly was modelled and the results are displayed in figures 9 and 11. The model shows a feature with a length of 300 meters in the northwest to southeast direction and a width of 180 meters in northwest to southwest direction and a thickness of 150 meters. The body is dipping 55 degrees to the southwest. The average depth to the top of the body is 145 meters. The susceptibility used was 0.02 SI units.

The model could represent a magnetically rich sediment unit. The thickness of the unit would be thinner if a higher susceptibility value was used. There is a fair degree of uncertainty where to put a regional gradient due to the short length of the survey lines, this introduces an added ambiguity in the interpretation.

5.2 Revaluation of M Sampling

"M" sampling is a surface geochemical sampling technique developed by prominent geochemist Nick Marshall for application in Tennant Creek. During 1992 "M" sampling was used over the western block and a portion of the eastern block. Results of the survey were dissapointing. The bedrock geochemical surveys used to test "M" sample anomalies in Tennant Creek produced inconsistant results and during 1993 the "M" sample method was reviewed.
The services of Nick Marshall (Marshall Geoscience Services) as proprietor to the 'M' sampling technique, were retained for a 10 day period in October, to review the 'M' sampling technique and results on the joint venture tenements. Marshall collected 188 samples from various geomorphic environments at Tennant Creek. The samples were assayed for Au (1ppb), Fe, Mn, Co, Bi, As, Cu, Pb, Zn and Ag. Marshall's report is being prepared, but in certain circumstances described below Marshall has suggested the results of previous "M" sample surveys including the survey of EL7649 need to be carefully evaluated.

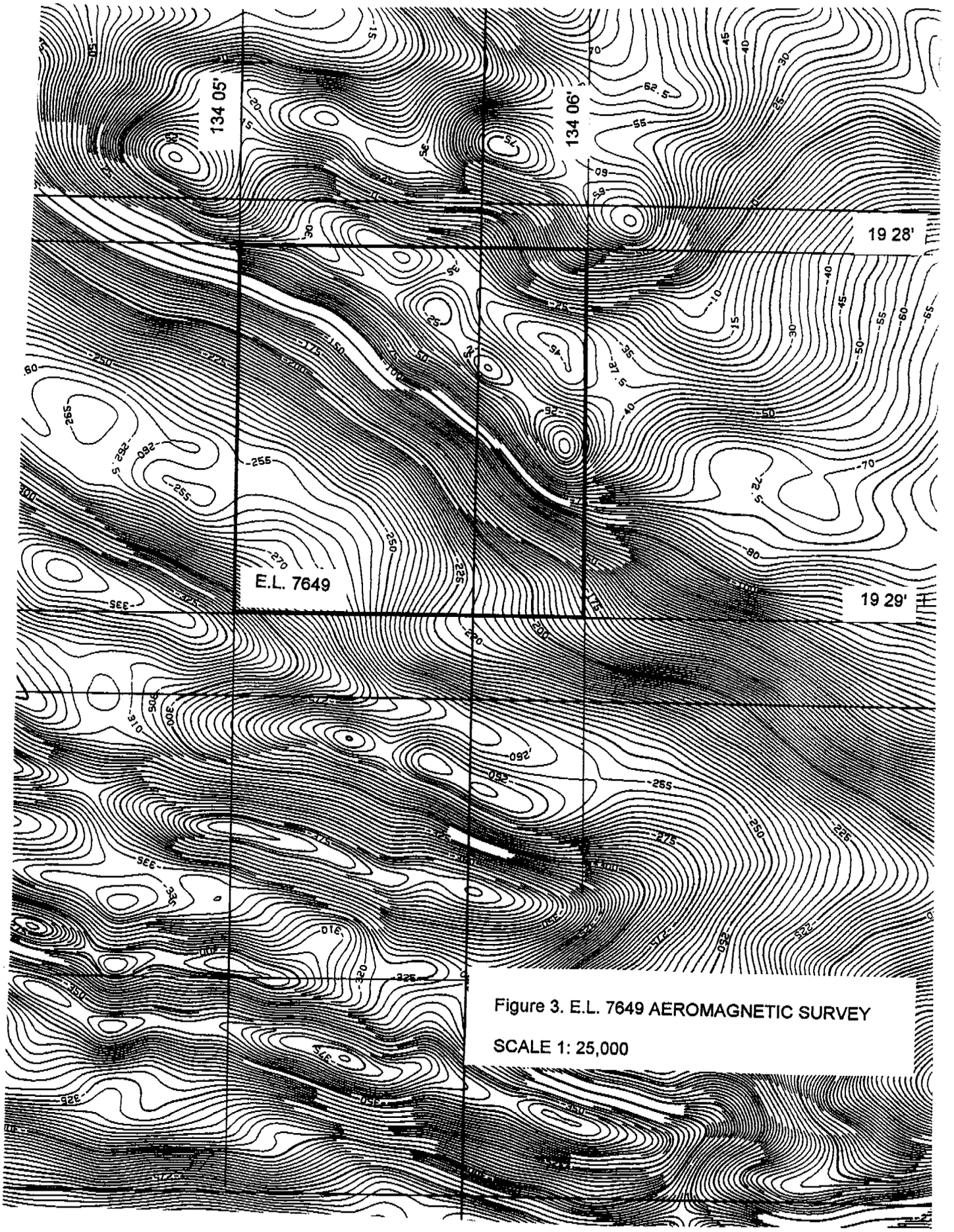

Figure 3. E.L. 7649 AEROMAGNETIC SURVEY

SCALE 1: 25,000

In several areas, which had "M" sample anomalies, Marshall had difficulty collecting a 'conventional' magnetic pisolite 'M' sample (of hydromorphic iron). He concluded that samplers had erred in some areas by collecting "magnetic dust" due to the absence of coarse magnetic pisolites. This type of material was commonly collected over granite or porphyry or in areas of thick clay cover. Marshall concluded the source of this fine magnetic dust is probably unrelated to bedrock and when assessing the reliability of an "M" sample survey it was necessary to determine whether there was a ready supply of magnetic pisolitic material.

6. EXPLORATION EXPENDITURE

ITEM	E.L. 7649 Estimated Expenditure
Assays	
Accounting	180
Contractors	0
- Drilling	0
- Geological	800
- Geophysical	2 600
- Surveying and pegging	0
- Other	0
Drafting	200
Geologist in House	750
Freight & delivery	200
Field office Rent Rates & Power	120
Lease & Hire Plant	0
Legal Fees	20
Loose Tools and Supplies	50
Mines Department Fees	50
Mining Tenements Admin.	130
Printing Stationary Maps	50
Sacred Site Surveys	350
Stamp Duty and Bank Charges	12
Sundries	0
Telephone and postage	100
Travel Accommodation & food	750
Vehicle Expenses	450
Water & Power	100
Wages -Field assistants	300
Wage Related Expenses	0
Overheads 15%	1 110
TOTAL	**$8 522**

7. CONCLUSIONS

The survey by N. Marshall has cast some doubt on the reliability of "M" Sampling results in certain circumstances.

A thorough analysis of the M28 anomaly indicates the most likely source of the anomaly is magnetic sediments.

8. RECOMMENDATIONS

An assessment of the suitability of the soil in EL 7649 for "M" Sampling will be undertaken. A complete synthesis of the regional magnetic, gravity and regional data packages will be undertaken to identify any further targets for bedrock geochemical surveys before the tenement expires in February 1995. Estimated minimum exploration expenditure is $7 500.00

9. REFERENCES

GILES, C.W., 1991. A regional Field Appraisal of the Geopeko Joint Venture Exploration Properties, Tennant Creek.

LE MESSURIER, P., WILLIAMS, B.T., & BLAKE, D.H., 1990: Tennant Creek Inlier - Regional Geology and Mineralisation, in Geology of Mineral Deposits of Australia and Papua New Guinea, Ed. F.E. Hughes, The Australian Institute of Mining and Metallurgy, Monograpgh No.14.

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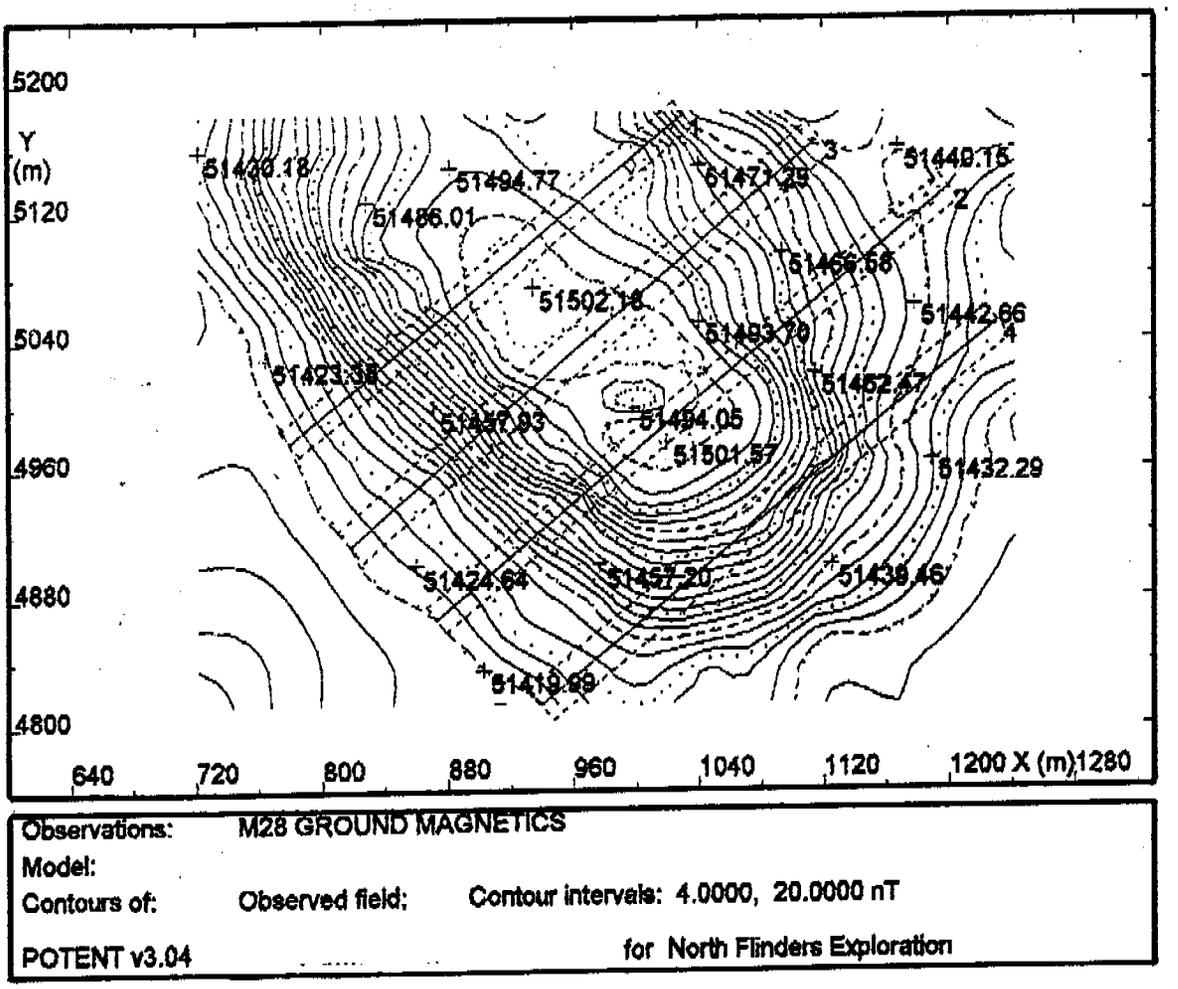
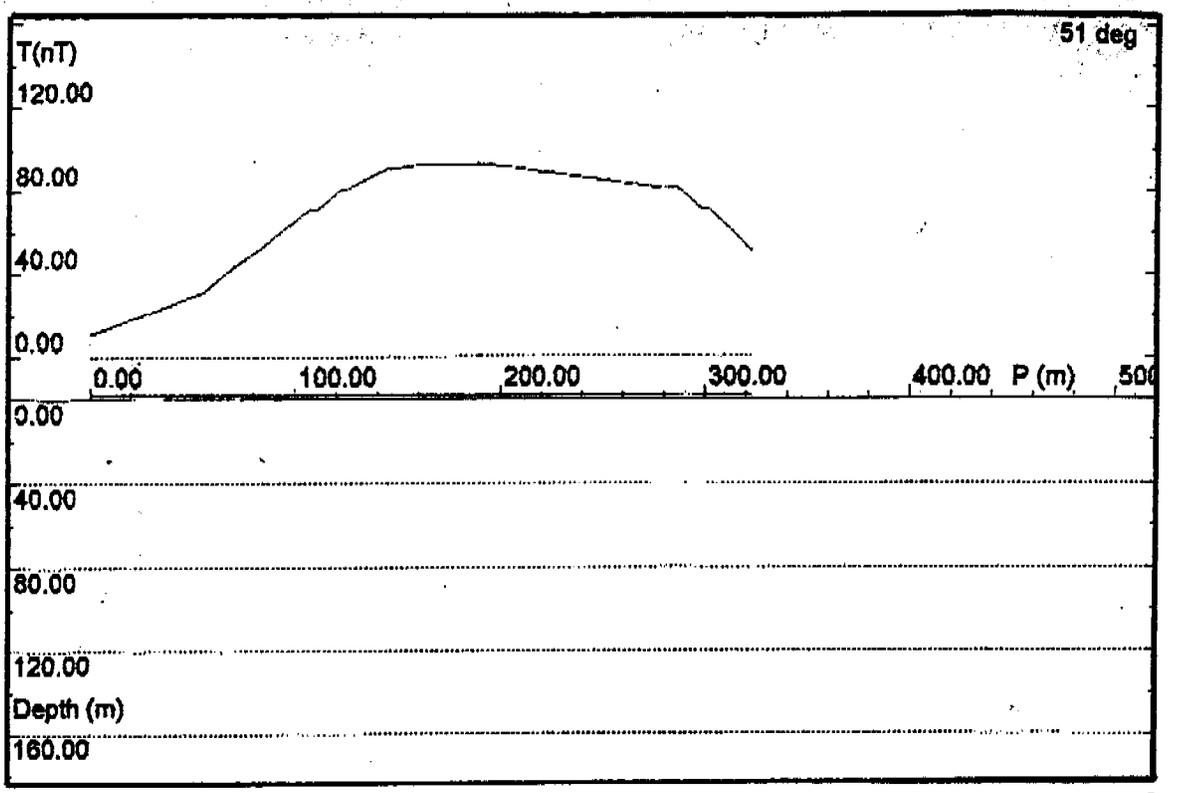
WEDEKIND, M.R., LARGE, R.R., & WILLIAMS, B.T., 1989: Controls on High-Grade Gold Mineralisation at Tennant Creek, Northern Territory, Australia, in The Geology of Gold Deposits: The Perspective in 1988, Economic Geology Monograph 6 (Eds R.R. Keays, W.H.R. Ramsey and D.I. Groves), pp 168-179 (The Economic Geology Publishing Company: El Paso, TX).

WEDEKIND, M.R., 1990: Warrego Gold-Copper-Bismuth Deposit, in Geology of the Mineral Deposits of Australia and Papua New Guinea, Ed. F.E Hughes, The Autralian Institute of Mining and Metallurgy, Monograph No.14.

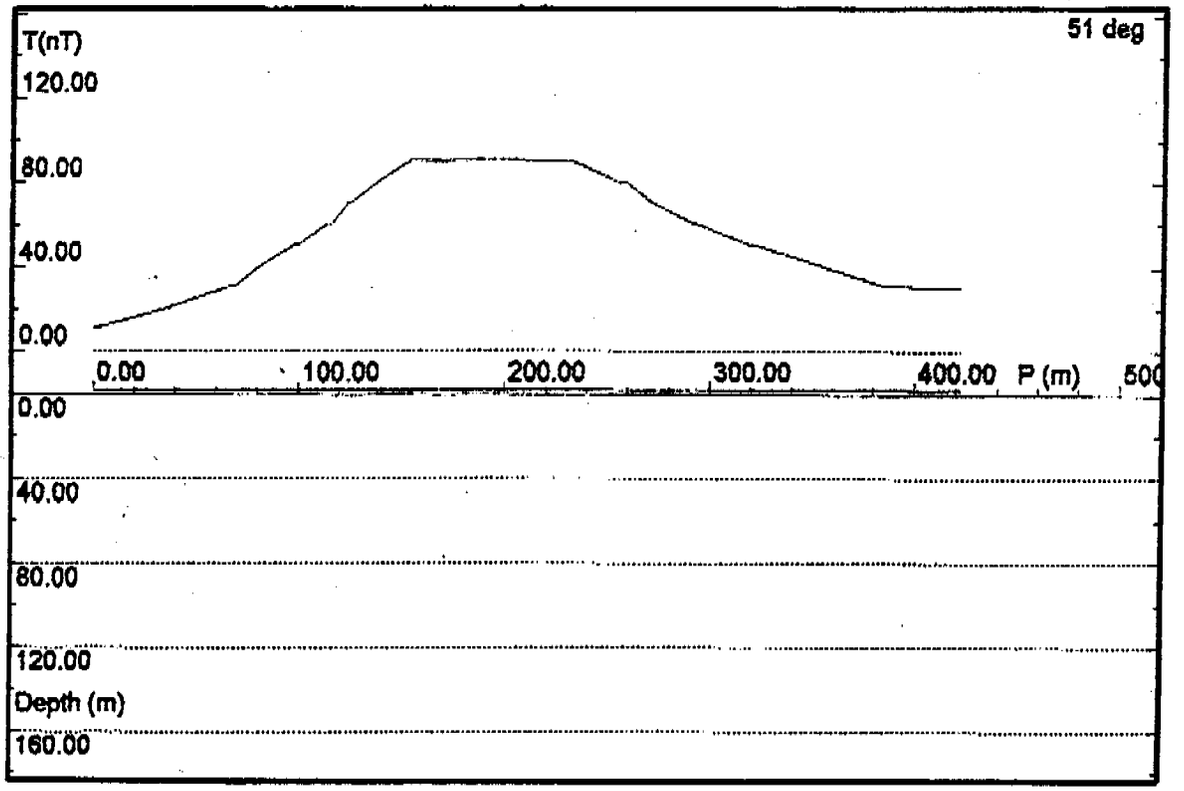


4. M28 Ground Magnetics



Observations:	M28 GROUND MAGNETICS
Profile #1;	LINE NE-SW 1
Model:	
Calculation mode:	Total Magnetic Intensity
Observed:	Calculated:
Residual:	Individual body:
POTENT v3.04	for North Flinders Exploration

5. Line NE-SW1

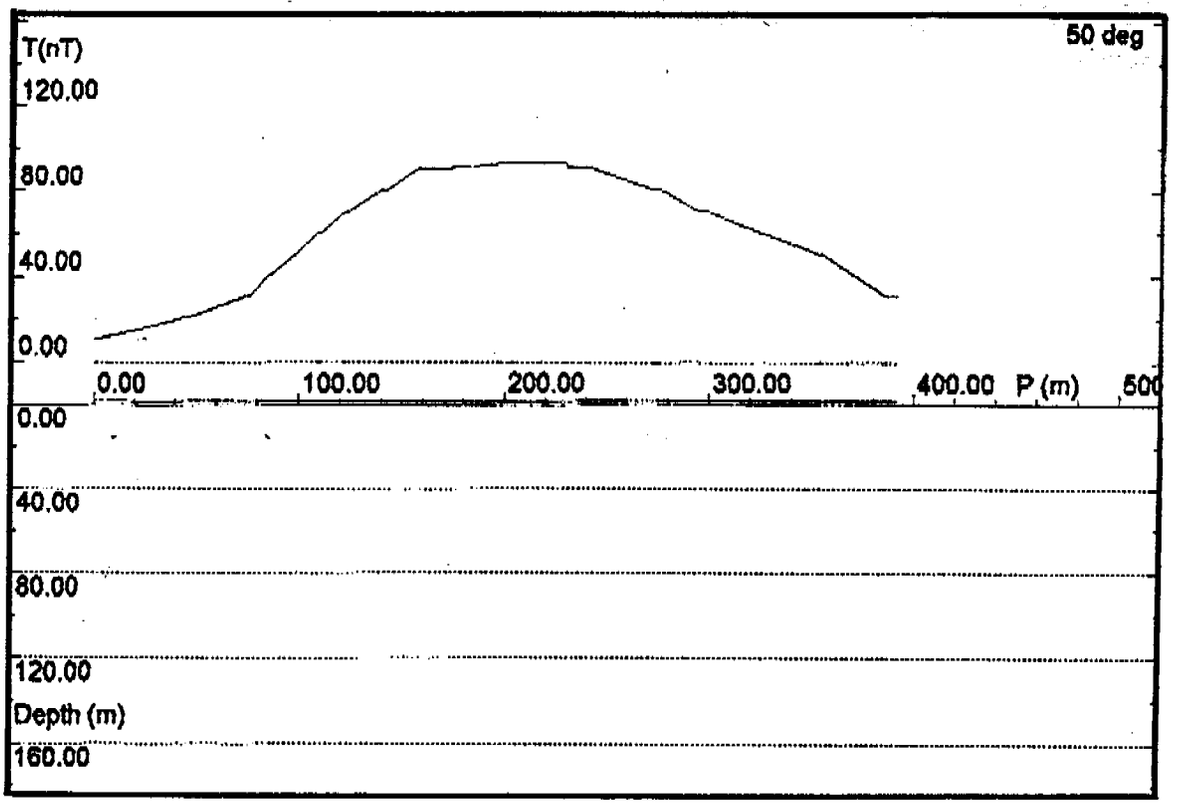


Observations: M28 GROUND MAGNETICS
Profile #2; LINE NE-SW 2
Model:
Calculation mode: Total Magnetic Intensity

Observed: ——— Calculated: .....
Residual: ..... Individual body: .....

POTENT v3.04 for North Flinders Exploration

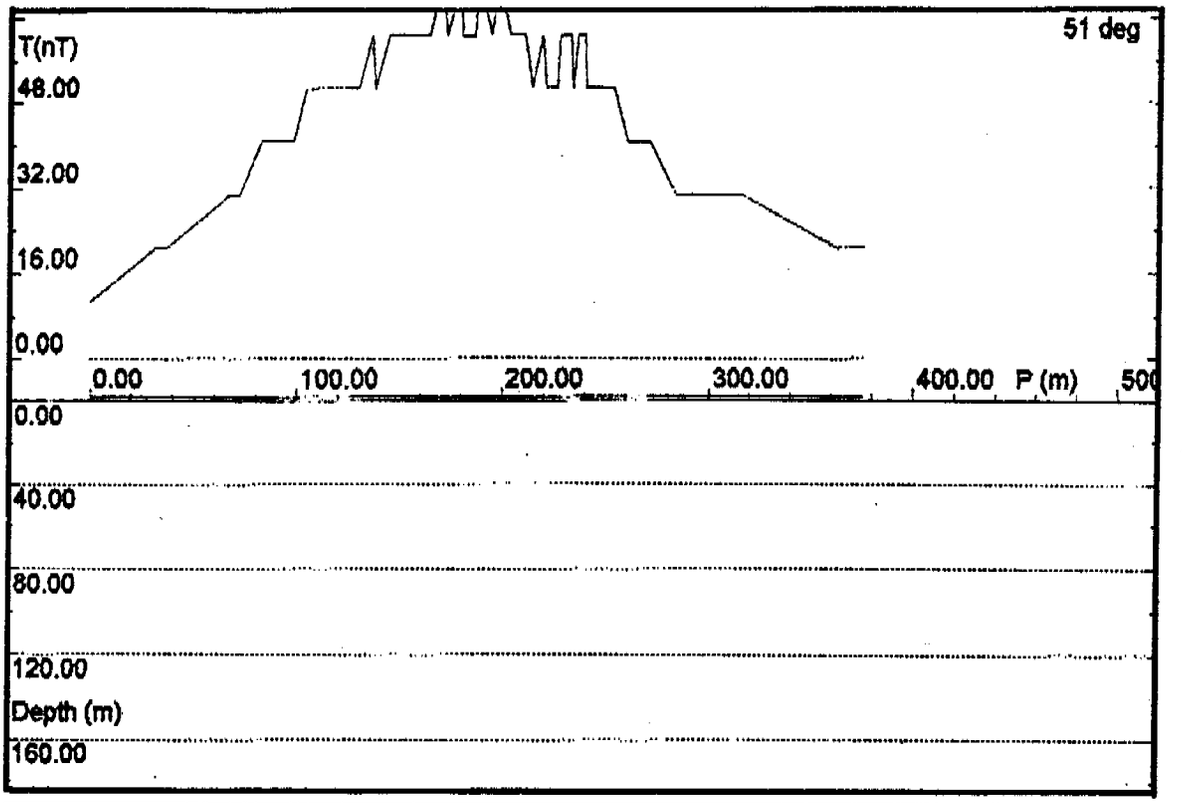
6. Line NE-SW2



Observations:	M28 GROUND MAGNETICS		
Profile #3;	LINE NE-SW3		
Model:			
Calculation mode:	Total Magnetic Intensity		
Observed:	———————	Calculated:	....
Residual:	....	Individual body:	.....

POTENT v3.04 for North Flinders Exploration

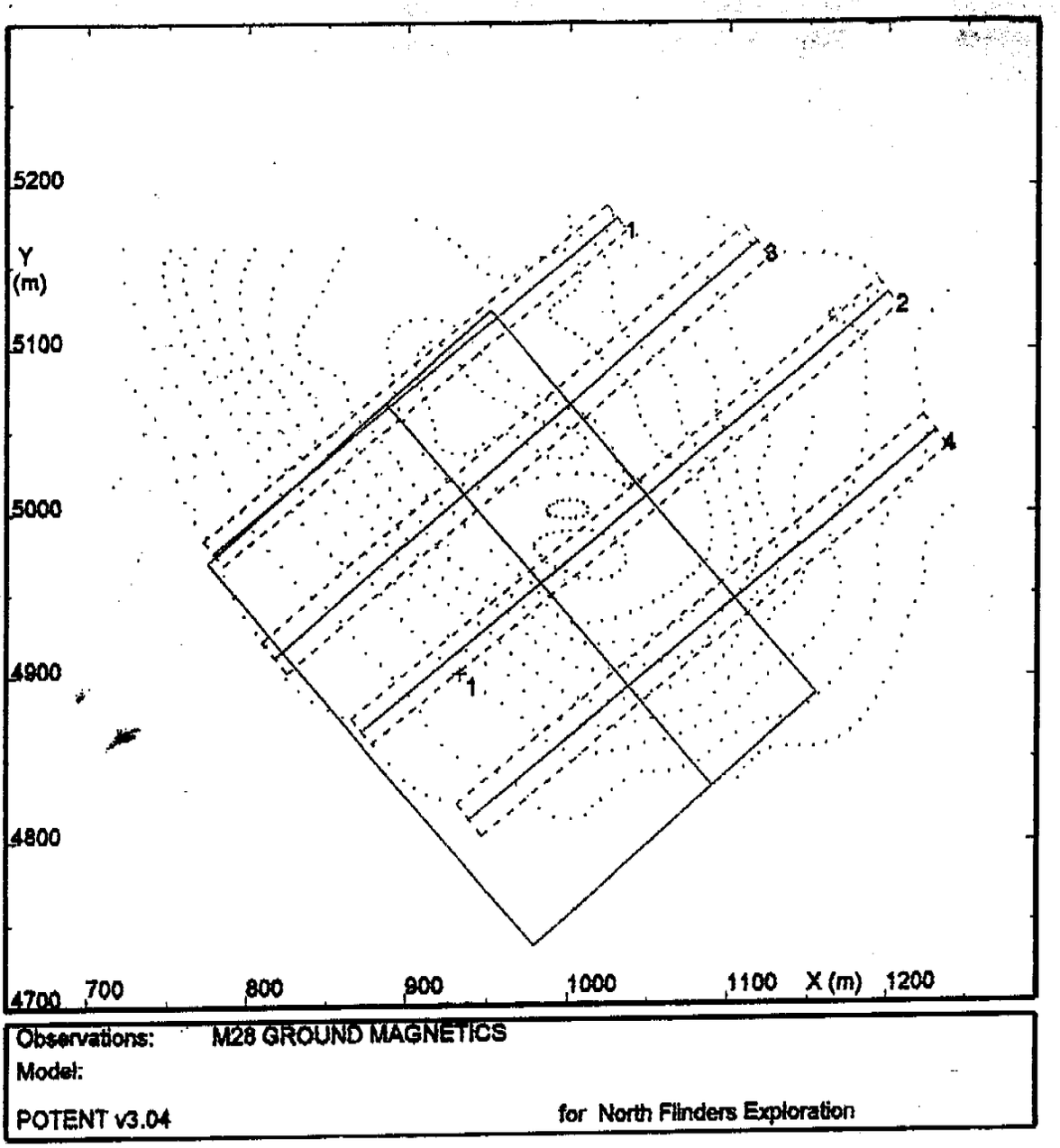
7. Line NE-SW3



Observations:	M28 GROUND MAGNETICS
Profile #4;	LINE NE-SW4
Model:	
Calculation mode:	Total Magnetic Intensity
Observed:	Calculated:
Residual:	Individual body:

POTENT v3.04 for North Flinders Exploration

8. Line NE-SW4



9. M28 Ground magnetics - Model Summary Report

POTENT v3.04 Model Summary Report
Exploration

Inducing field - Intensity = 51000
Azimuth = 5
Inclination = -51

Body type abbreviations and the shape parameters have the following significance:
Rect - RECTANGULAR PRISM - A = width, B = length, C = height

Model title:

No.	Type D	X	Y	Depth	Strike	Dip	Plunge	Susc.	A	B	C
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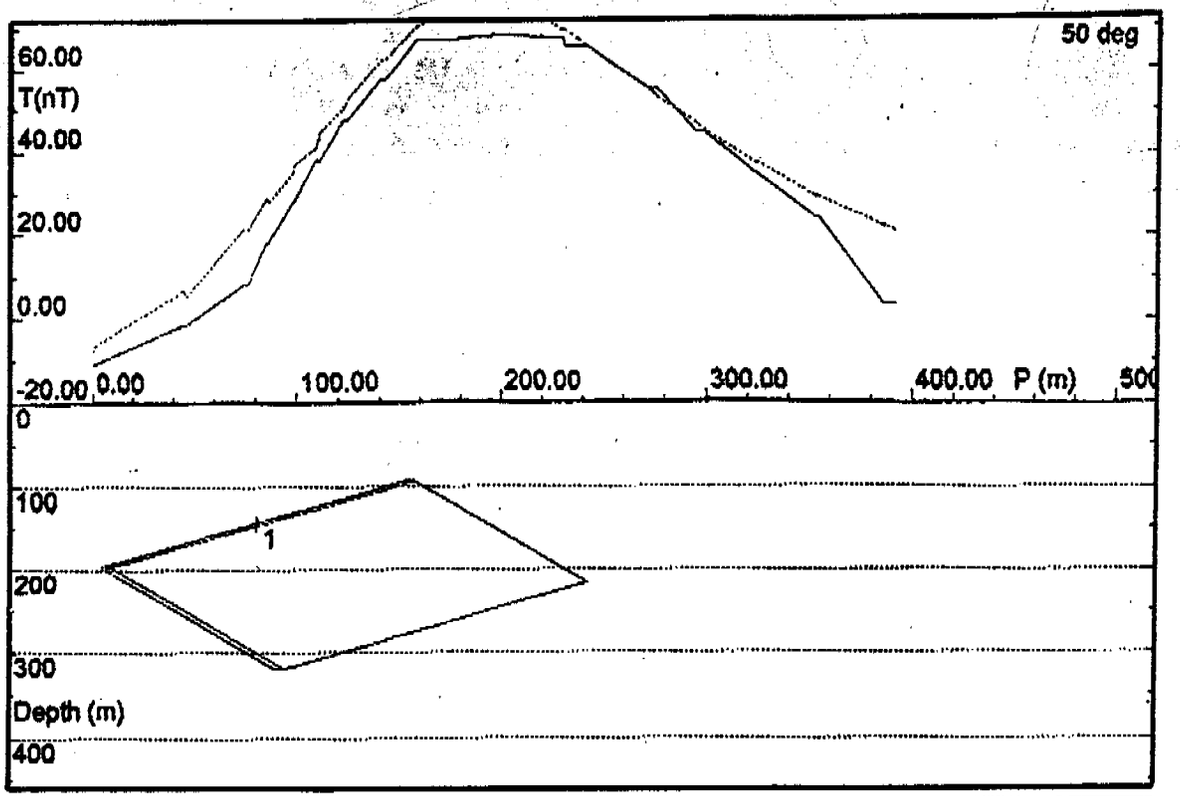

POTENT v3.04 Model Summary Report
Exploration

Inducing field - Intensity = 51000
Azimuth = 5
Inclination = -51

Body type abbreviations and the shape parameters have the following significance:
Rect - RECTANGULAR PRISM - A = width, B = length, C = height

Model title:

No.	Type	X	Y	Depth	Strike	Dip	Plunge	Susc.	A	B	C
	D	m	m	m	deg	deg	deg	SI			
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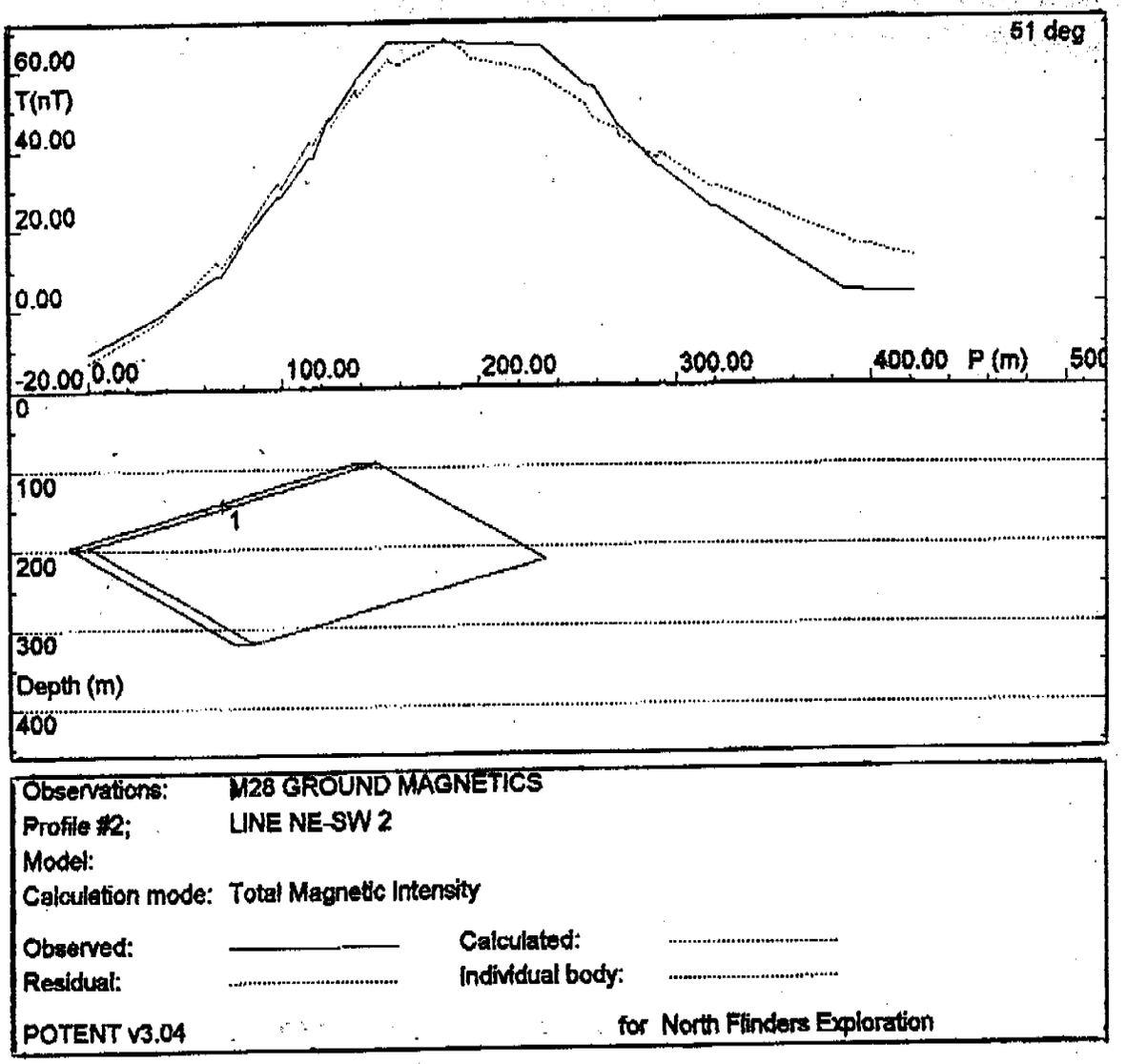

11. Line NE-SW2 - Model Summary Report

POTENT v3.04 Model Summary Report
Exploration

Inducing field - Intensity = 51000
Azimuth = 5
Inclination = -51

Body type abbreviations and the shape parameters have the following significance:
Rect - RECTANGULAR PRISM - A = width, B = length, C = height

Model title:

No.	Type	X	Y	Depth	Strike	Dip	Plunge	Susc.	A	B	C
	D	m	m	m	deg	deg	deg	SI			
1	Rect	933.22	4901.66	144.81	-41	55	0	0.020	180.00	310.0	150.0