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INTERPRETATION OF INDUCED POLARISATION SURVEYS LANGDONS HILL PROSPECT CYGNET, S.E. TASMANIA

By

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March 2004

INTRODUCTION

The Langdons Hill prospect is about 3kms south of the town of Cygnet in southeast Tasmania. It is situated on the western side of Port Cygnet Bay (Fig 1).

Interest in this prospect derives from anomalous gold geochemistry found in previous steam sediment samples and the presence of syenite intrusive rocks which can be hosts to large gold deposits.

Interpretations of geophysical data in the Cygnet region, including magnetics and gravity, have previously been undertaken by Nigel Hungerford in the years following a detailed helimag survey flown in 1998.

In order to provide drill targets an IP (Induced Polarisation) survey was carried out in February 2004 by Zonge Geophysics. The results of this survey are the subject of this interpretation report which will also include comments on the magnetics and gravity data over the prospect area.

IP SURVEY

Zonge Geophysics (based in Adelaide) were asked to quote on carrying out a gradient array IP-Resistivity survey over 13 lines with lengths varying between 1200 and 700metres for a total of about 14 line kms. Line spacing was 100m and station spacing 25m.

A gradient array survey was recommended by Nigel Hungerford on the basis of cost-effectiveness. Since the ground is resistive, good current depth penetration should be achieved and rapid surveying should be possible. Such an array should also be less effected by variable topography as occurs at Langdons which is situated on a prominent hill. 2 gradient arrays were necessary in order to cover all the survey lines. There were also some constraints in placing the current electrodes due to the presence of main roads, the coast and farmhouses.

Current electrode positions were originally recommended at:
Grid 1:
Lines 6100N, 6200N, 6300N
Current electrodes at (SW) 505410E, 5217670N; (NE) 506200E, 5218900N
Grid 2
Lines 5100N, 5200N, 5300N, 5400N, 5500N, 5600N, 5700N, 5800N, 5900N
Current electrodes at (SW) 505720E, 5217000N; (NE) 506570E, 5218410N

The current electrode locations were subsequently moved a little for safety and access reasons. Due care was taken to ensure that access to the electrodes and connecting cables was monitored and local residents informed of possible danger.

A line of 50m dipole-dipole IP was also recommended as follow-up to any interesting gradient IP anomalies. This information should help provide more accurate drill

targeting with greater target depth information. Elevation data were available to use for inverting the dipole-dipole pseudo-sections to depth sections.

Time domain measurements were made using a frequency of 0.125Hz and the standard Newmont Chargeability parameter (over window 450-1100msecs) was used for plotting the IP results. Apparent Resistivities were also calculated by Zonge.

Survey station locations and elevations were supplied by Luke Vanzino and Robert Read and these have been used to convert the grid co-ordinates of the IP survey (line and station) to AMG66 co-ordinates in order to relate the IP results to the geology, geochem, and aeromagnetics.

The IP survey was uneventful until the last days when problems occurred with the receiver which lost data due to a flat memory battery. As a result most of the gradient data on line 6300N at the western end were lost as well as all the dipole-dipole data on line 5800N. The dipole-dipole line was subsequently re-surveyed but the gradient data on line 6300N could not be retrieved.

All the geophysical data processing and imaging has been done using Geosoft's sophisticated Oasis Montaj software.

GEOLOGY

The regional geology as mapped by the Tasmanian Mines Dept is shown on Fig 1. The dark blue and purple units are Permian sediments which have been intruded by a very extensive Cretaceous syenite (red) which occasionally outcrops within these sediments. To the west and east of the Syenite Complex are Jurassic dolerites (orange).

A detailed geological map of the Langdons Prospect has been supplied by Luke Vanzino and Robert Read. This is shown on Fig 2. It can be seen that most of the grid is underlain by Permian sediments (dark and light blue) with fairly extensive outcrops of the Syenite intrusive Complex (purple).

The extent of this Syenite intrusive body is clearly defined on the regional gravity data from the Tasmanian Mines Dept as an oval shaped low gravity response of length about 4kms and width about 2kms elongated NW-SE. The Langdons grid is situated at the south-eastern end of the gravity low. However the gravity response is not well detailed because the gravity stations are too sparse (readings along main roads only).

The regional aeromagnetic image is dominated by the very strong magnetic anomaly beneath Port Cygnet Bay. However the magnetic and gravity data do suggest that the thickest part of the Syenite Complex is to the north-west of Langdons in the Kings Hill-Mt Mary area where more extensive syenite outcrops.

TOPOGRAPHY

Langdons Hill Prospect is situated over a prominent hill as shown on Fig 3.The eastern lines of the grid are near sea level whilst the western lines extend over a hill with its highest point of about 230 metres.

IP SURVEY RESULTS – GRADIENT ARRAY

The Chargeability responses across the grid are shown on Fig 4. The Resistivity responses are on Fig 5. Elevation contours (from the previous helimag survey) are shown as black contours with 10 metre intervals. Chargeability trends are shown as black lines with dots on.

Trend A

Trend A extends down a small gully and may be folded at its south-eastern end. In profile, the chargeability anomalies on the individual lines appear to mark the north-eastern edge of a region of high chargeability which may be related to an area of syenite outcrop (Fig 2). It is possible that this trend marks the altered and weakly mineralised contact of this part of the syenite intrusion with the sediments.

This trend also largely encompasses an area of more resistive response which may also be a particular syenite phase (Fig 5). The fact that the IP response is also resistive suggests that disseminated sulphides rather than massive sulphides are present within or around the syenite. Trend A is coincident with an area of low magnetic response which may indicate magnetite destruction through alteration (Fig 7). However the low magnetic response may be also due to an increase in height of the magnetic sensor over the ground due to the gully beneath. There are no anomalous gold results associated with chargeability Trend A although a 0.19ppm anomaly is close to the possible southern limb Trend A'. Arsenic is weakly anomalous in the vicinity of the north-western part of this trend (Geochemistry, Fig 6).

It should be noted that the decision to carry out the dipole-dipole survey on line 5800N was partly predicated on the coincidence, at the time, of a moderately anomalous gold sample with IP Trend A. However a subsequent re-adjustment of the GPS locations of the stations (due to an error in the datum) meant that the gold anomaly was shifted 200m to the south-west.

The gradient array response may simply be a shallow representation of a deeper mineralised system. This possibility is supported by the single dipole-dipole line along 5800N. The IP sections for this line are shown on Figs 8 (Chargeability) and 9 (Resistivity). The Dipole section (top of Fig 8) shows the chargeability of the section along line 5800N inverted from the original phase IP data and corrected for topography. The veracity of this depth section can be gauged by comparing the response calculated from the depth section ("smooth model IP") in the centre panel with that observed in the field in the bottom panel. Since there is a fairly good comparison it can be assumed that the depth section is a reasonably true representation of the chargeability attributes of the ground beneath. However a close examination does suggest that the IP sources may be a little deeper than indicated on the inverted depth section at about 80metres below ground level.

The lack of a direct correspondence between gradient IP trend A and dipole anomalies Z and Y is a little disconcerting but it is again possible that the gradient array is responding to a broad deep source which is expressed as dipole anomalies Z and Y.

(At my request Zonge edited the wider dipole n spacings which were effected by noise, thus sacrificing depth information for reliable results when doing the inversion to a depth section) The rather broad shape of the gradient IP anomalies along this trend does suggest a significant depth of burial.

There is no obvious correlation between the dipole Chargeability (Fig 8) and Resistivity (Fig 9) features on line 5800N. This suggests the lack of any significant silicification at the location of Trend A that may be related to sulphide mineralisation as expressed on the chargeability parameter.

Trend B

This gradient Chargeability IP trend is closely coincident with a topographic ridge and weakly anomalous gold and copper (Fig 6). Mapped sediments predominate along the trend but syenite may be close to surface.

The gradient IP anomaly is coincident with a dipole IP response (Fig 8) and a weak magnetic trend. The dipole Resistivity section (Fig 9) suggests silicification may be present but this feature may also be due to the presence of the hill. (High resistivities occur over hills when using dipole-dipole arrays.) A magnetic trend is also coincident (Fig 7) so the IP response could be due to disseminated magnetite. Nonetheless this trend would be worth drilling (discussed below).

Trend C

A very intense but isolated IP anomaly occurs at the southern (grid western) end of line 5200N at 4312.5E (506207mE; 5217131mN) over mapped sediments (Fig 2, Fig 4). It is close to an electric fence so the cause may be cultural since it does not occur on adjacent lines. This supposition is reinforced by the coincident intense resistivity low (Fig 5). A strong gold anomaly occurs about 200m to the north at a similar topographic level (Fig 6) but it is probably not related to the IP anomaly. Drilling is not recommended unless repeat sampling duplicates the strong gold response.

Trend D, E, F

These Chargeability trends occur in the north of the grid over mapped sediments and syenite (Fig 2). They appear to be of short strike length and occur en-echelon so may be related to fracturing or veining. They are semi-coincident with Resistivity responses (Fig 5) but have no obvious related magnetic responses (Fig 7). No particularly anomalous geochemistry is present (Fig 7) so this area is not regarded, at least geophysically, as a good drill target.

DRILL TARGETS

Trend A and B Chargeability anomalies(discussed above) are recommended for drill testing on the basis mainly of the dipole-dipole IP results on line 5800N. An interpreted geological section has been derived from the geophysical data and is shown on Fig 10. Note that this is rather speculative. Although outcrop geology is available, no dips are known. The main assumption is that the sediments are a thin veneer over the syenite intrusion and that alteration has taken place along the contact

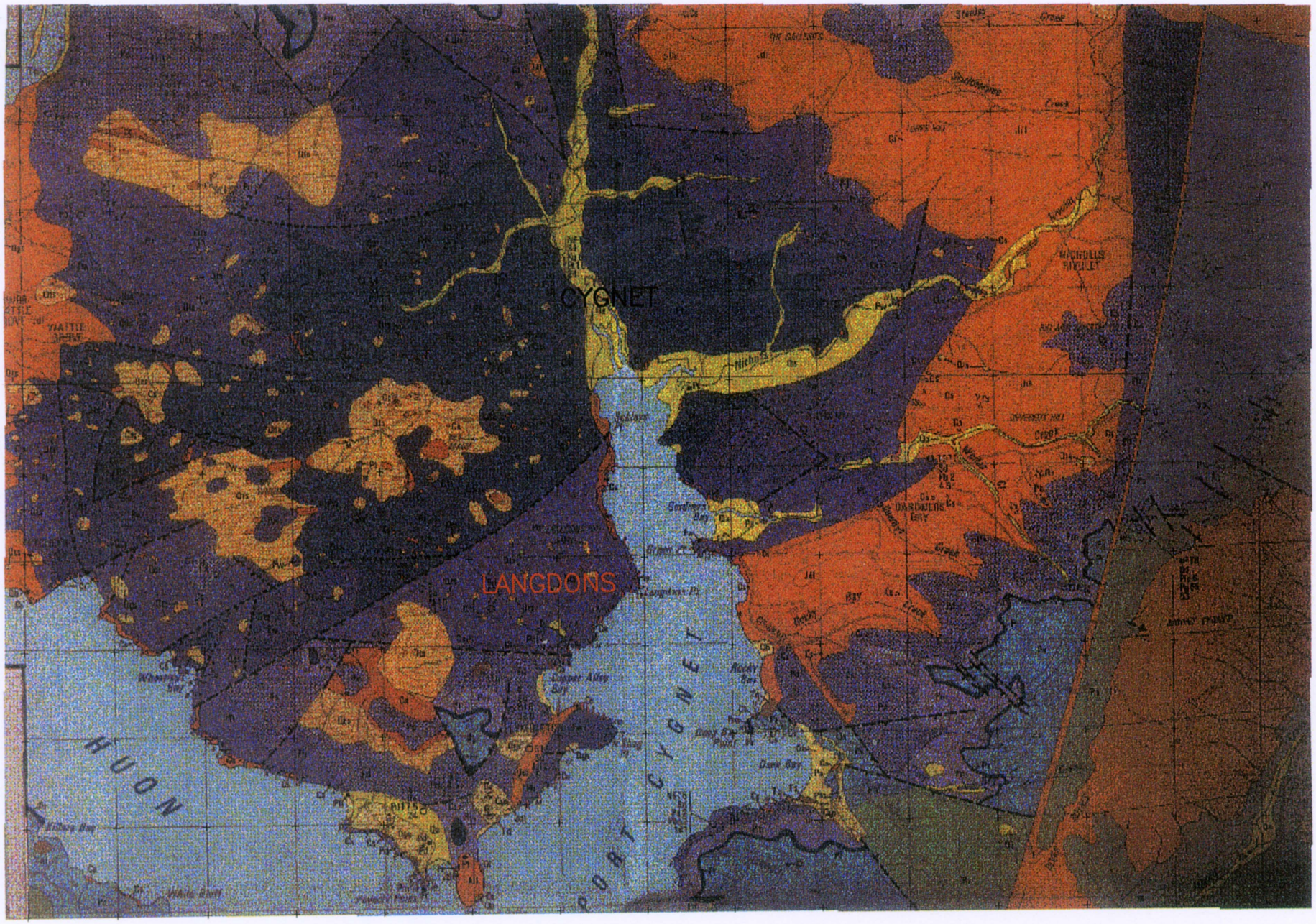
between the two lithologies. The IP responses are therefore probably due to disseminated pyrite within this alteration zone. The fault is inferred from the aeromagnetics and may explain a relationship between IP Trends A&B.

A drill hole is proposed to be collared at 4525E, 5800N (505809mE, 5217628m N; AGD 66, zone 55), at an inclination of 60deg towards grid East (ie along the survey line). Total depth to be about 250m. Judging from the elevation map, access should not be too difficult.

A possible second drill target is present at the (grid) eastern end of line 5800N to test dipole IP trends X and W (Fig 8, 10). If the first drill hole suggested above produces interesting results then this secondary drill target could be tested although the IP is of a lower tenor and there is no supporting anomalous geochem.

FURTHER WORK

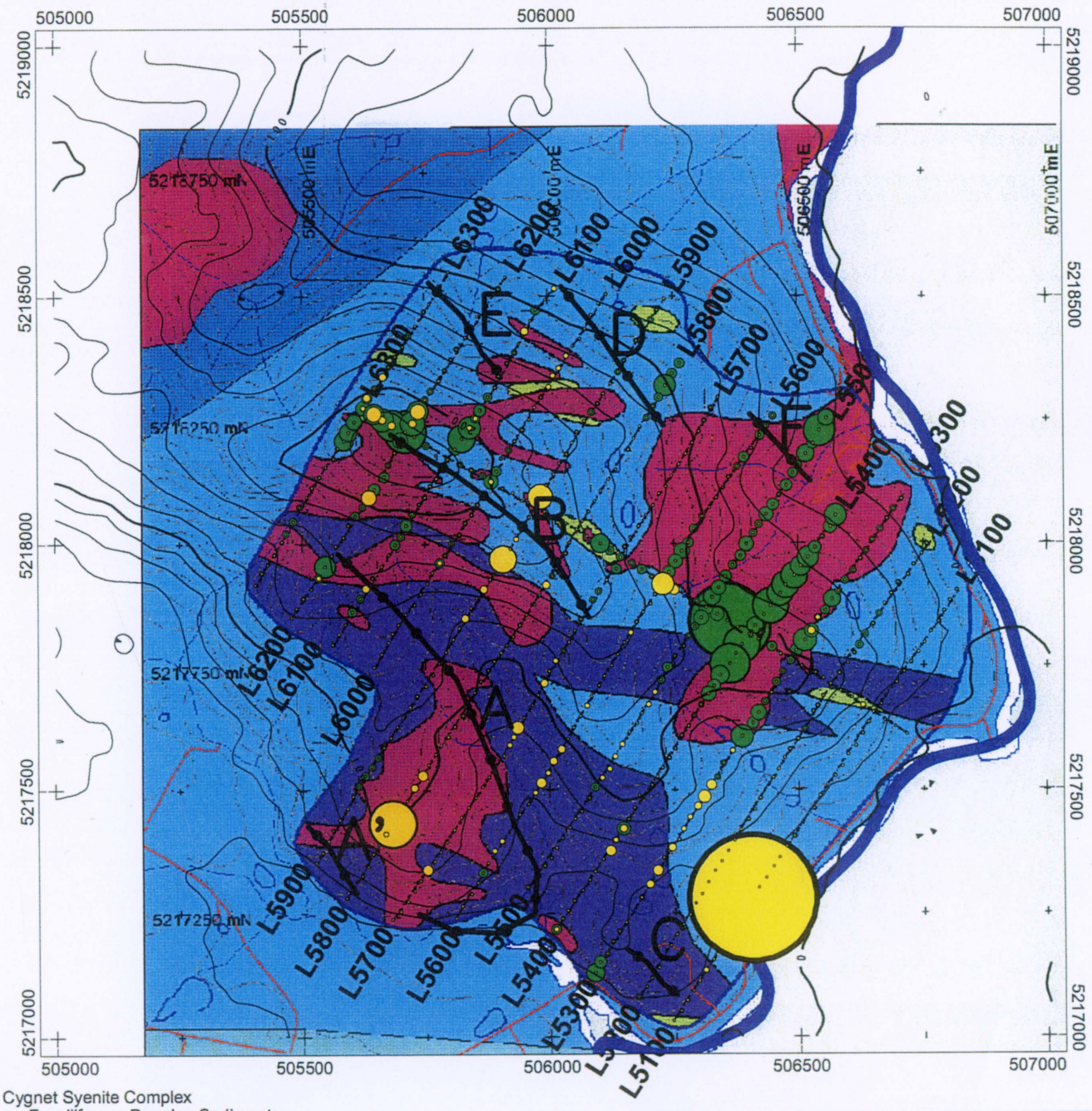
If future drilling gives encouragement for further work then a continuation of the IP survey to the north-west is recommended. This would cover other areas of syenite/sediment contact that might be mineralised.



MINES DEPARTMENT GEOLOGY

CYGNET AREA, SE TASMANIA.

FIG 1



Purple - Cygnet Syenite Complex
Dark Blue - Fossiliferous Permian Sediments
Light Blue - Undifferentiated Permian Sediments
Green - quartz-sandstone? (or alteration product? proximal to intrusives)

Scale 1:10000

100 0 100 200 300

metres

AGD66 / AMG zone 55

IP CHARGEABILITY TRENDS

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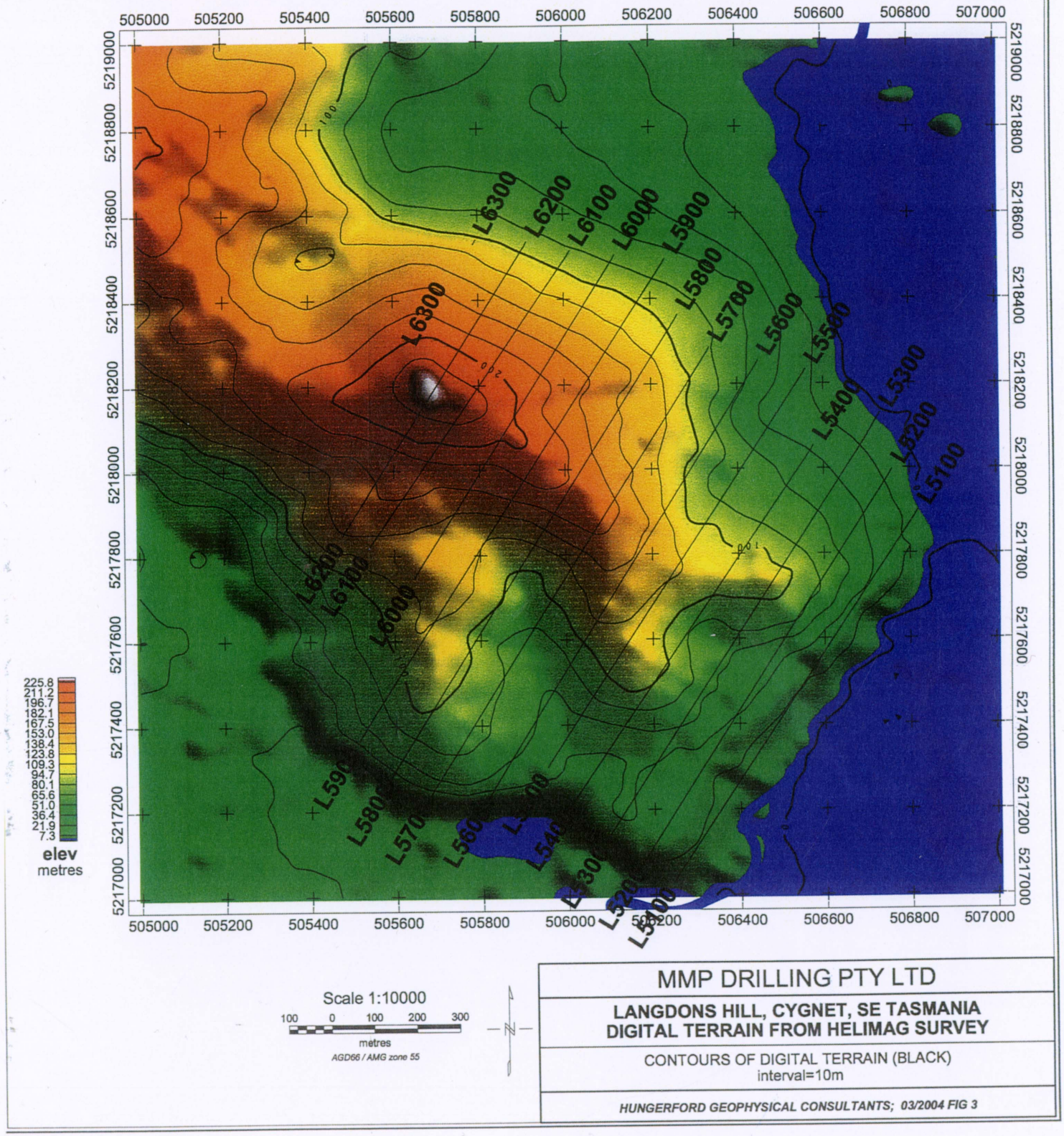
DETAILED GEOLOGY

Au (yellow): 0.02ppm/mm
Cu(green): 20ppm/mm

HUNGERFORD GEOPHYSICAL CONSULTANTS; 03/2004 FIG 2

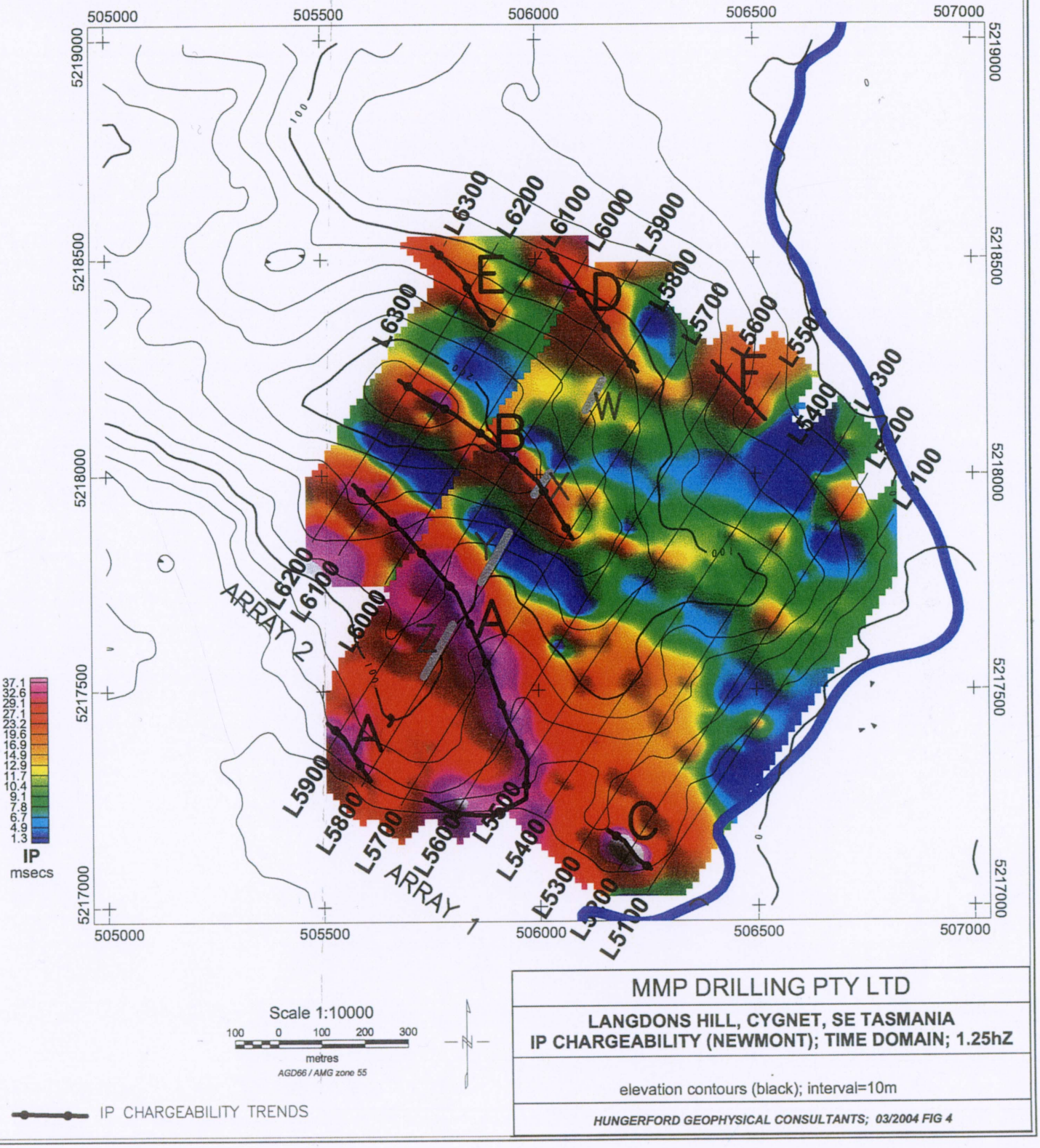


MMP DRILLING PTY LTD

LANGDONS HILL, CYGNET, SE TASMANIA
DIGITAL TERRAIN FROM HELIMAG SURVEY

CONTOURS OF DIGITAL TERRAIN (BLACK)
interval=10m

HUNGERFORD GEOPHYSICAL CONSULTANTS; 03/2004 FIG 3


505000
505500
506000
506500
507000
5219000
5218500
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5217500
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L6300
L6200
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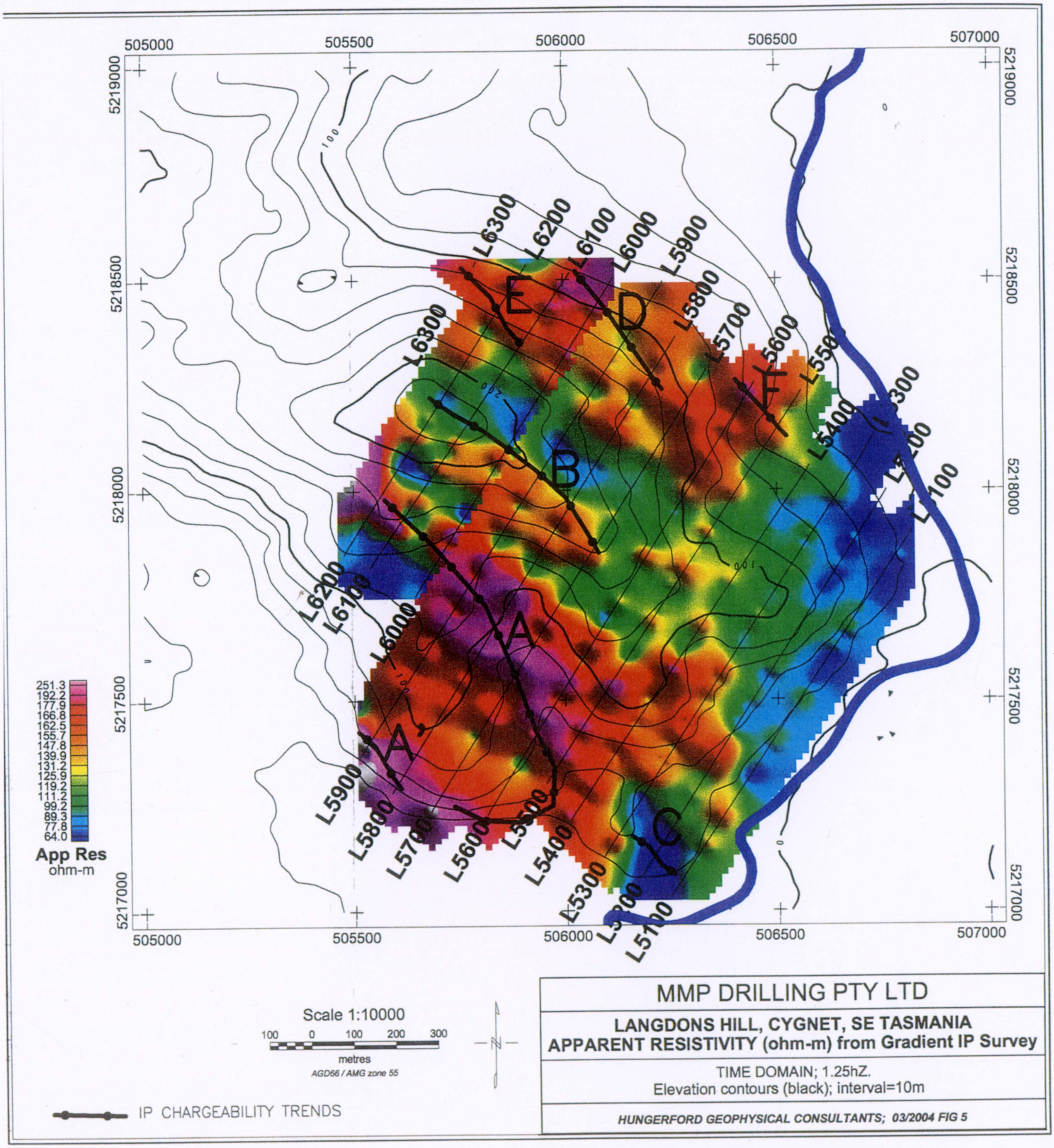
L6000
L5900
L5800
L5700
L5600
L5500
L5400
L5300
L5200
L5100
A
B
C
D
E
F
W
X
Y
Z
ARRAY 1
ARRAY 2
37.1
32.6
29.1
27.1
23.2
19.6
16.9
14.9
12.9
11.7
10.4
9.1
7.8
6.7
4.9
1.3
IP
msecs
Scale 1:10000
100 0 100 200 300
metres
AGD66 / AMG zone 55
N
IP CHARGEABILITY TRENDS
MMP DRILLING PTY LTD
LANGDONS HILL, CYGNET, SE TASMANIA
IP CHARGEABILITY (NEWMONT); TIME DOMAIN; 1.25hZ
elevation contours (black); interval=10m
HUNGERFORD GEOPHYSICAL CONSULTANTS; 03/2004 FIG 4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506500
507000
5219000
5218500
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5217500
5217000
L6300
L6200
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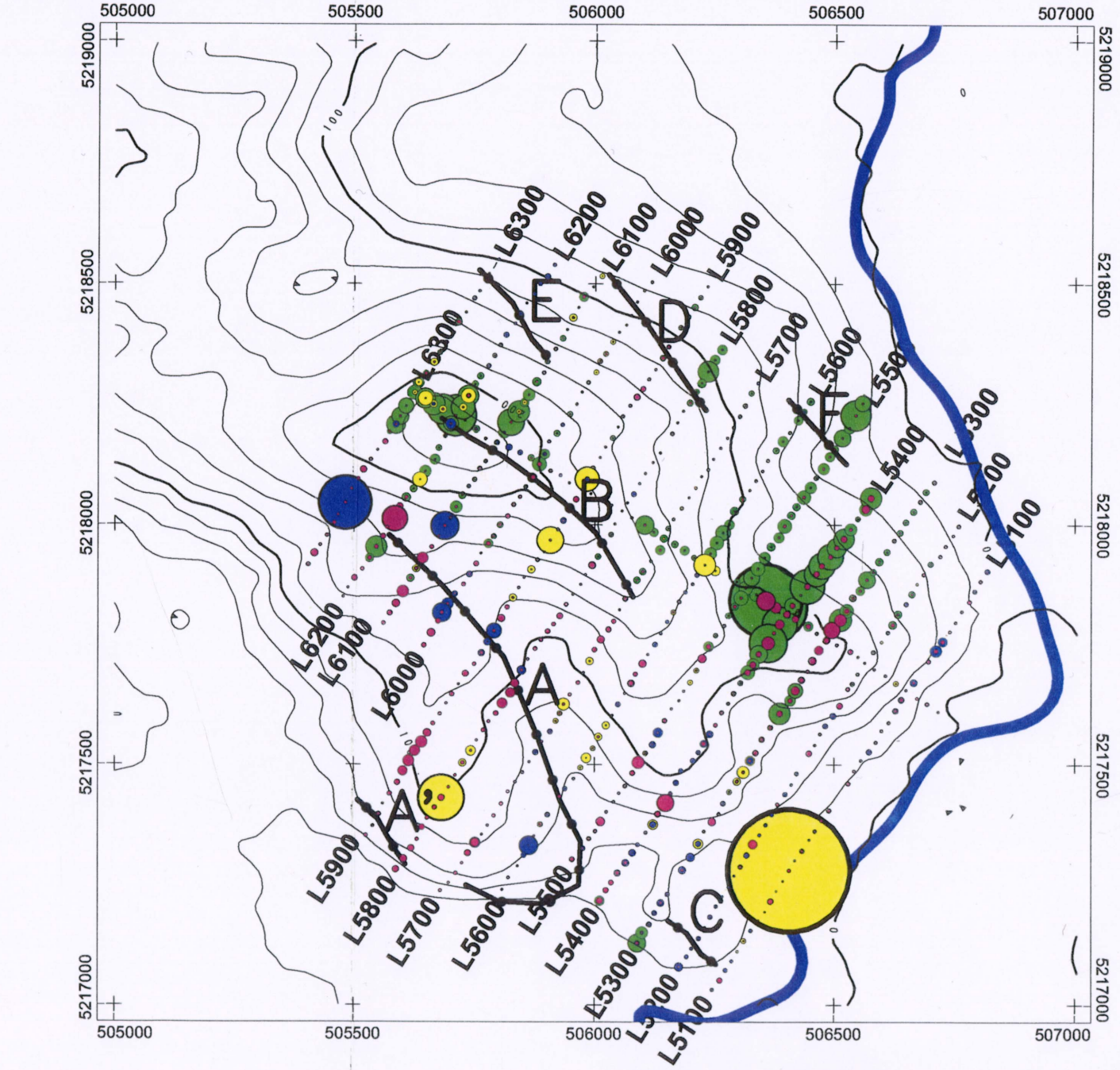
L6000
L5900
L5800
L5700
L5600
L5500
L5400
L5300
L5200
L5100
A
B
C
D
E
F
251.3
192.2
177.9
166.8
162.5
155.7
147.8
139.9
131.2
125.9
119.2
111.2
99.2
89.3
77.8
64.0
App Res
ohm-m
Scale 1:10000
100 0 100 200 300
metres
AGD66 / AMG zone 55
IP CHARGEABILITY TRENDS
MMP DRILLING PTY LTD
LANGDONS HILL, CYGNET, SE TASMANIA
APPARENT RESISTIVITY (ohm-m) from Gradient IP Survey
TIME DOMAIN; 1.25hZ.
Elevation contours (black); interval=10m
HUNGERFORD GEOPHYSICAL CONSULTANTS; 03/2004 FIG 5


505000
505500
506000
506500
507000
5219000
5218500
5218000
5217500
5217000
L6300
L6200
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L6000
L5900
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L5200
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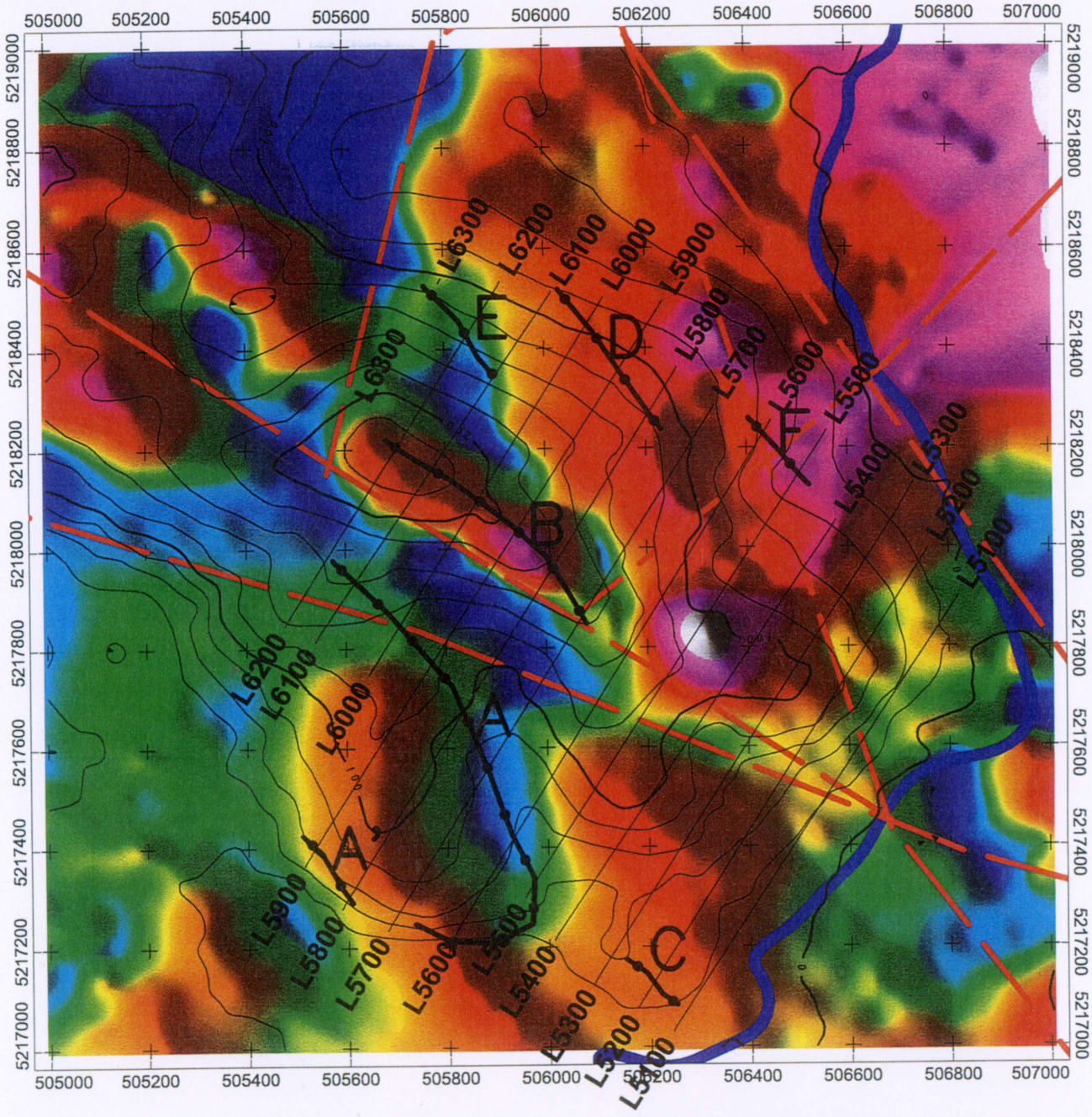
L6300
L6200
L6100
L6000
L5900
L5800
L5700
L5600
L5500
L5400
A
B
C
D
E
F
Scale 1:10000
100 0 100 200 300
metres
AGD66 / AMG zone 55
N
IP CHARGEABILITY TRENDS
MMP DRILLING PTY LTD
LANGDONS HILL, CYGNET, SE TASMANIA
SOIL GEOCHEMISTRY
Au (yellow): 0.02ppm/mm; Cu (green) 20ppm/mm
Zn (magenta): 50ppm/mm; As (blue): 10ppm/mm
HUNGERFORD GEOPHYSICAL CONSULTANTS; 03/2004 FIG 6



Scale 1:10000

100 0 100 200 300

metres

AGD66 / AMG zone 55

IP CHARGEABILITY TRENDS

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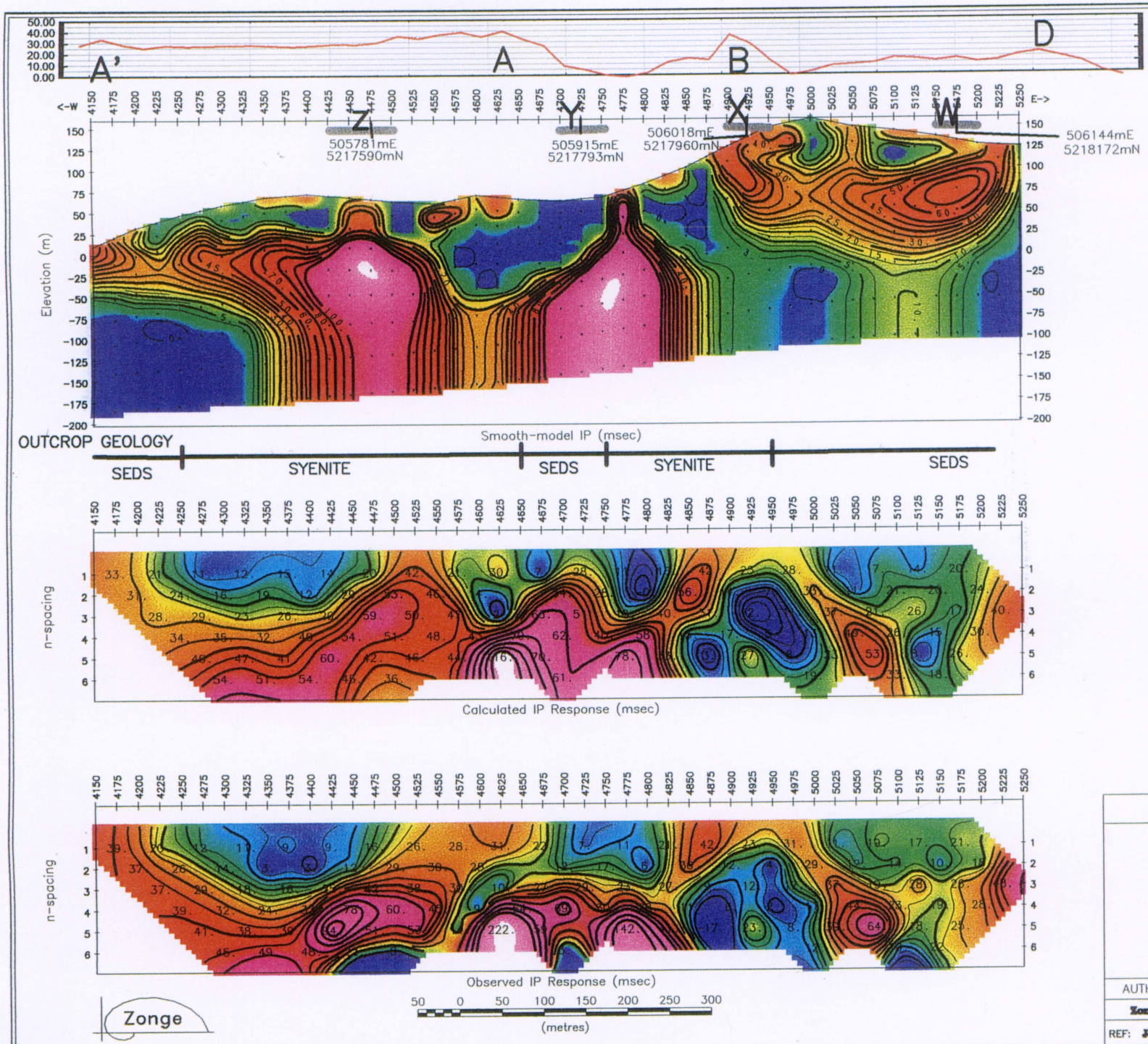
LANGDONS HILL, CYGNET, SE TASMANIA
MAGNETICS: 1st VERTICAL DERIVATIVE, RTP

CONTOURS OF DIGITAL TERRAIN (BLACK)
from UTS helimag survey

HUNGERFORD GEOPHYSICAL CONSULTANTS; 03/2004 FIG 7

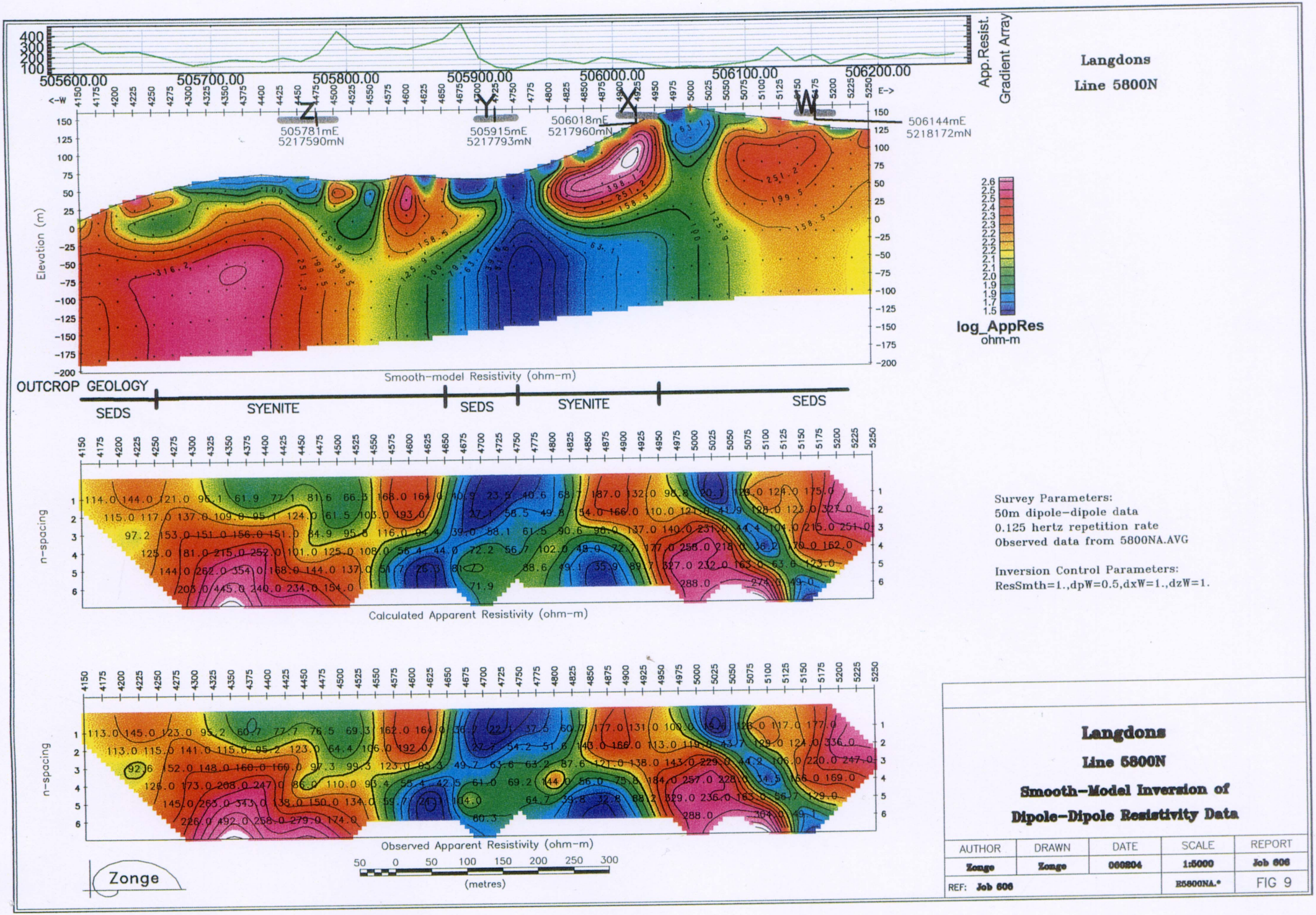


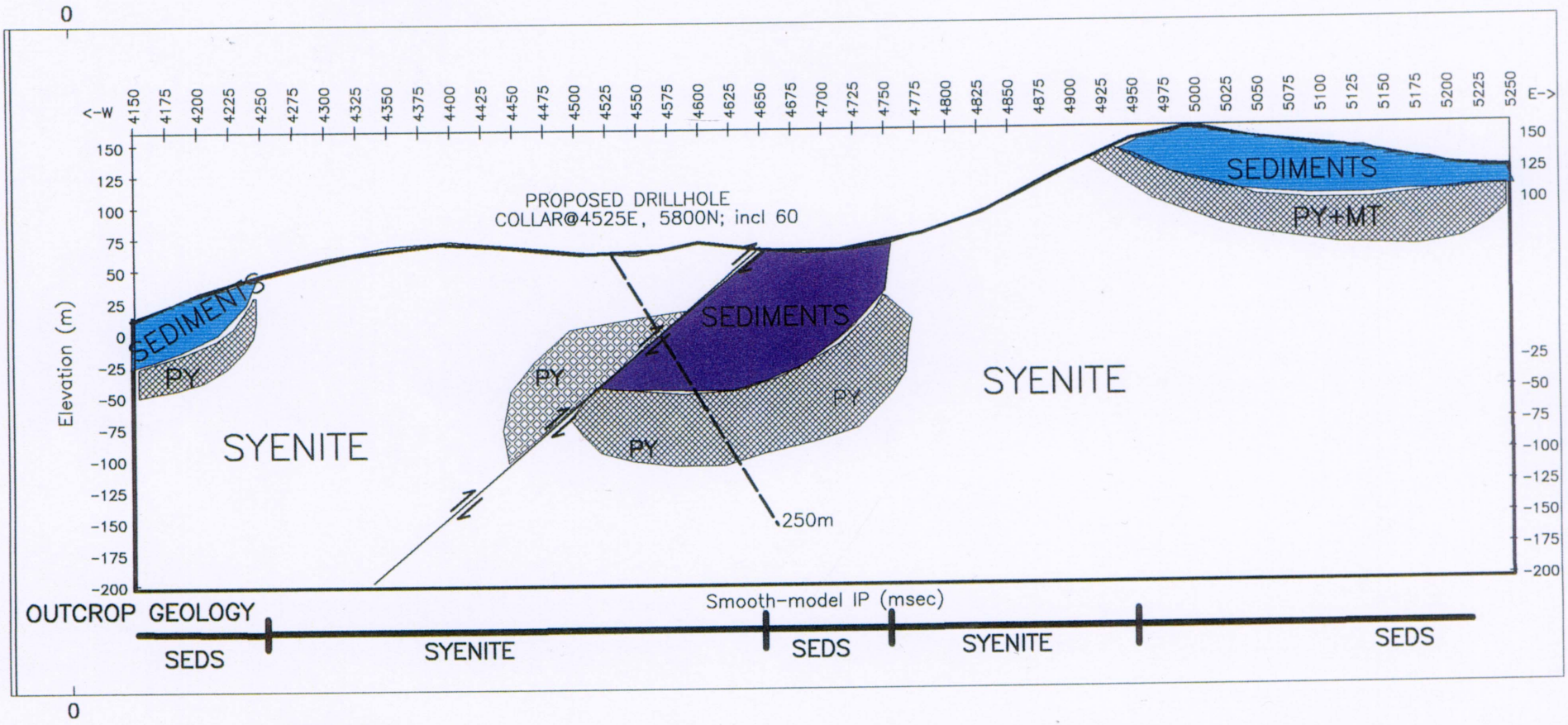
Langdons

Line 5800N

Smooth-Model Inversion of Dipole-Dipole IP Data

AUTHOR	DRAWN	DATE	SCALE	REPORT
Zonge	Zonge	060204	1:5000	Job 606
REF: Job 606			R5800NA.*	FIG 8


App.Resist.
Gradient Array
Langdons
Line 5800N
505600.00
505700.00
505800.00
505900.00
506000.00
506100.00
506200.00
<-W
E->
Z
Y
X
W
505781mE
5217590mN
505915mE
5217793mN
506018mE
5217960mN
506144mE
5218172mN
Elevation (m)
log_AppRes
ohm-m
Smooth-model Resistivity (ohm-m)
OUTCROP GEOLOGY
SEDS
SYENITE
SEDS
SYENITE
SEDS
n-spacing
Calculated Apparent Resistivity (ohm-m)
Observed Apparent Resistivity (ohm-m)
Zonge
50 0 50 100 150 200 250 300
(metres)
Survey Parameters:
50m dipole-dipole data
0.125 hertz repetition rate
Observed data from 5800NA.AVG
Inversion Control Parameters:
ResSmth=1.,dpW=0.5,dxW=1.,dzW=1.
Langdons
Line 5800N
Smooth-Model Inversion of
Dipole-Dipole Resistivity Data
AUTHOR
DRAWN
DATE
SCALE
REPORT
Zonge
Zonge
060804
1:5000
Job 606
REF: Job 606
R5800NA.*
FIG 9



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LANGDONS HILL, CYGNET, SE TASMANIA **LINE 5800n; INTERPRETED GEOPHYSICAL SECTION**
N. HUNGERFORD; 3/2004; FIG 10