# Interpretation of Mt Read 2001/2002
# Tasmanian Geological Survey
# Helicopter EM data
# EL 46/2003

For

**STELLAR RESOURCES  LTD**


By

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(JSA Pty Ltd)


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## SUMMARY

Analysis of 66 response in the Mt Read 2001/2002 helicopter electromagnetic data set over EL 46/2003 has identified 15 targets as potentially representing conductors that require further follow up. A number of these targets are at or close to the known mineralization at St Dizier, Big H, Big Rock and Granville East magnetite, sulphide skarns. As such in some cases they may represent significant extensions to these magnetic, sulphide skarns. The conductivity and geometry of the identified targets is variable and in some cases complex. As a result accurate targeting of these conductors may require collection of ground EM data, depending on which part of the EM conductor is identified for targeting.

In the northern western part of the survey area, presence of tertiary basalts has prevented identification of any potential target. Analysis of the HEM system noise levels has also demonstrated that even in very clean EM backgrounds the maximum penetration of the system for 3D EM targets was between 50 – 75 metres.

## INTRODUCTION

A total of 15600 line kilometres of regional helicopter electromagnetic (HEM) data were acquired in four separate areas during 2001 and 2002, as part of the Western Tasmanian Regional minerals Program (Reid 2003). The survey areas are prospective for a wide range of mineralization styles; including Palaeozoic VHMS replacement tin skarns, vein lead-zinc silver, gold, nickel and copper.

The purpose of this report however is to give the results of the analysis of the HEM data from one of the four flown areas, namely the Mt Read survey which encompasses the exploration licences EL 46/2003 Stellar Resources Ltd (Figure 1)

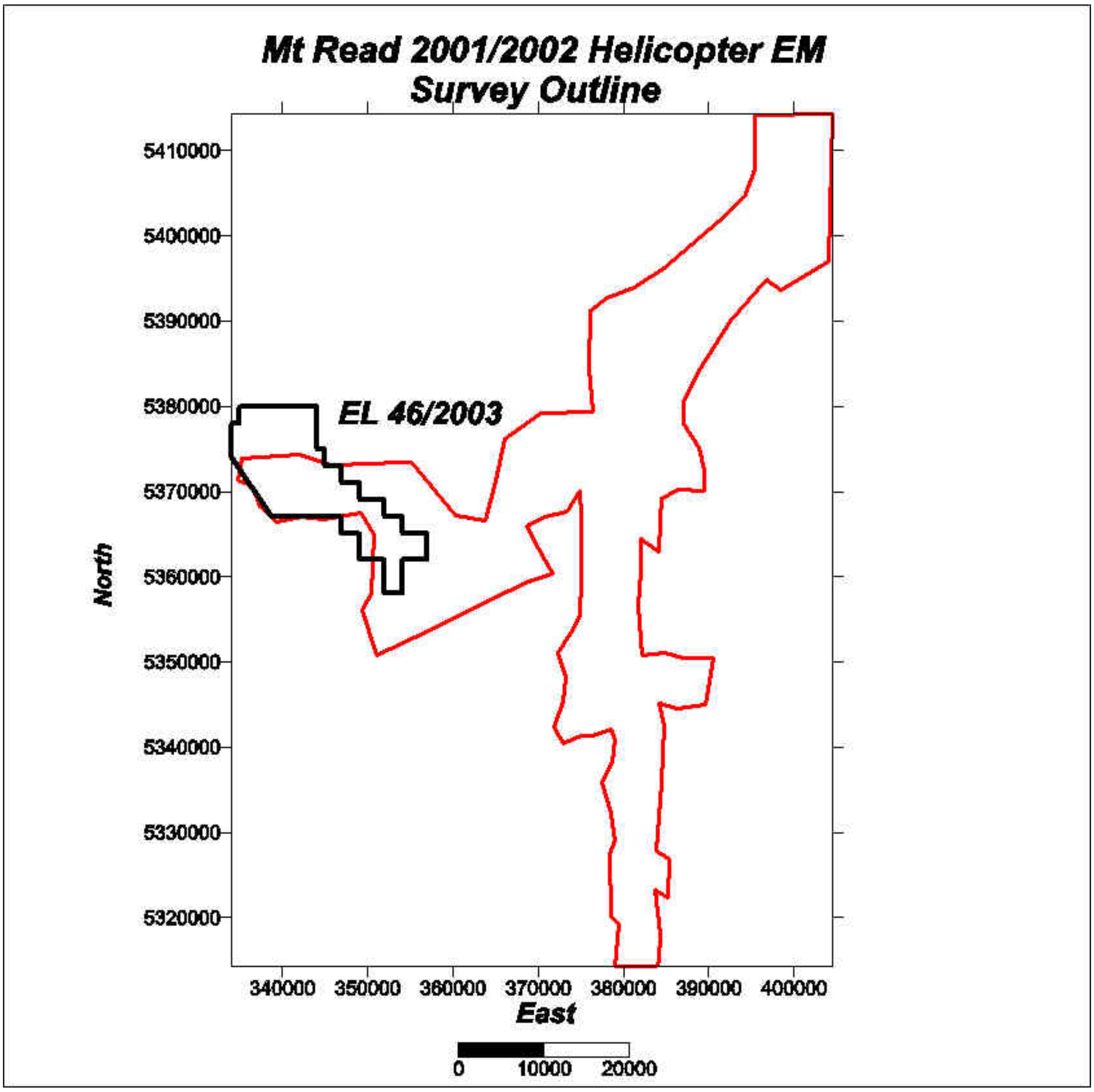



*Figure1: Mt Read 2001/2002 Helicopter EM Survey Outline and EL46/2003 boundary.*

## DATA ACQUISITION

Data were acquired using the Geotech Hummingbird HEM system. The survey contractors were Geo Instruments Ltd (January 2001) and Fugro Airborne Surveys (Late 2001 – 2002).

The Hummingbird HEM system employs both horizontal coplanar (HCP) and vertical coaxial (VCX) transmitter receiver geometries. Typical system parametres are listed in table 1.

**Table 1.**

| Hummingbird System Parameter | | |
|---|---|---|
| Frequency (Hz) | Coil Separation (In) | Orientation |
| 34111 | 5.10 | HCP |
| 7004 | 6.29 | VCX |
| 6600 | 6.29 | VCP |
| 985 | 6.03 | VCX |
| 880 | 6.03 | VCP |

Nominal bird height for the survey was 30 m, although actual heights were often greater than this due to the rugged and heavily forested terrain. Flight lines at 200 metre line spacing were directed east-west in the Mt Read survey area.

## HEM RESPONSE OVER CONDUCTIV E TARGETS

To illustrate the nature of HEM responses of the Hummingbird system a number of theoretical models were generated for a 200 x 200 metres plate (thin) like conductor with a conductivity thickness product of 50 siemens and variable depth to top and dip. This target was set within a relatively resistive basement of 500 ohm-metres. The target's conductivity-controls the ratio of in-phase to out-phase response; larger values better the conductor.

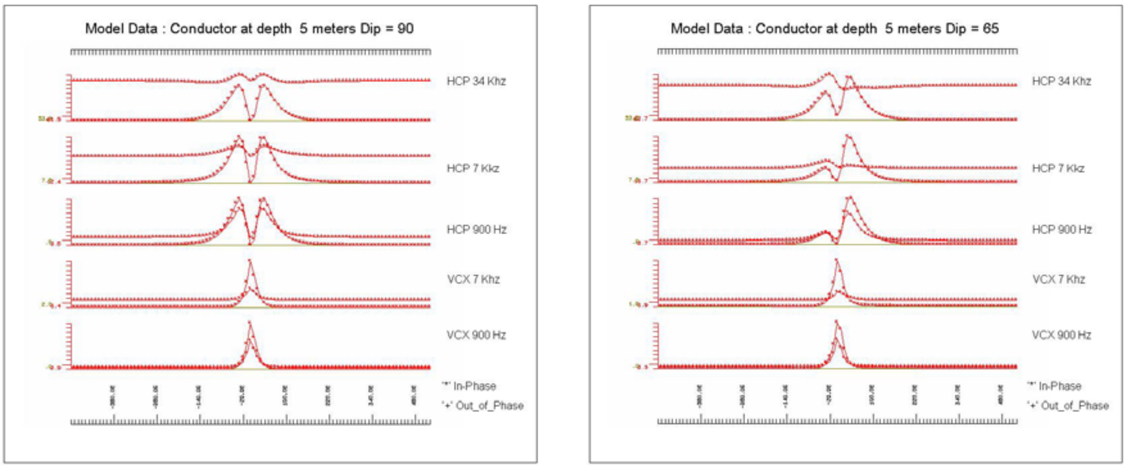
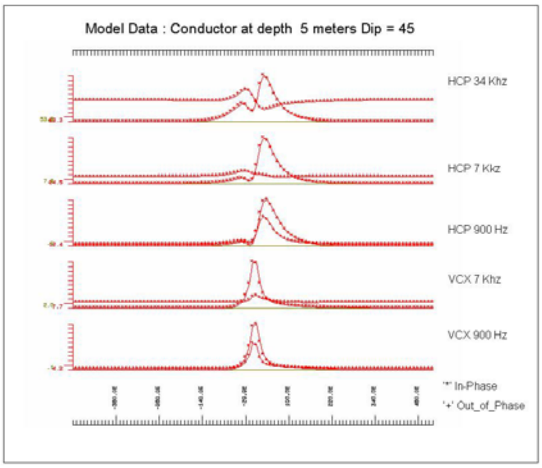



*Figure 2 & 2a: Model Data: Conductor at depth 5 metres Dip 90 and 65*



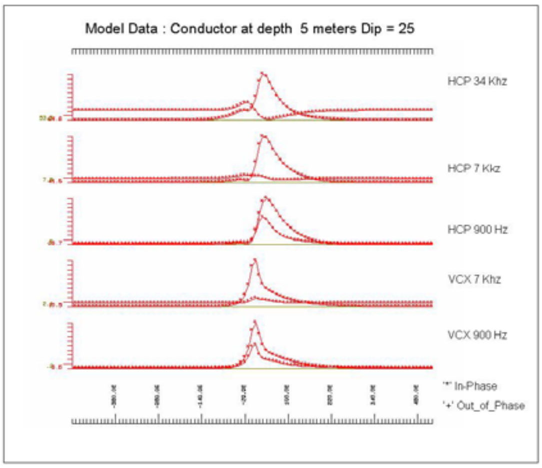




*Figure 2b & 2c:* *Model Data: Conductor at depth 5 metres Dip 45 and 25*

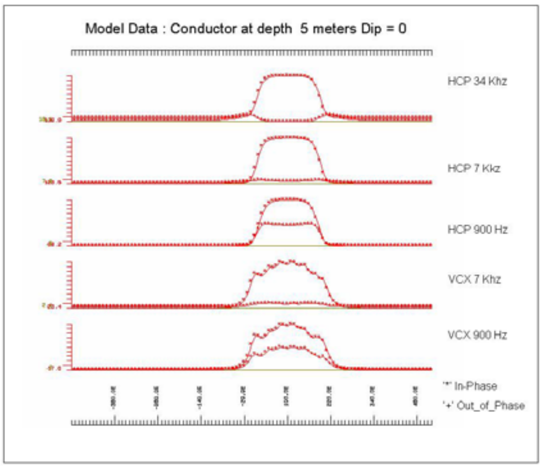
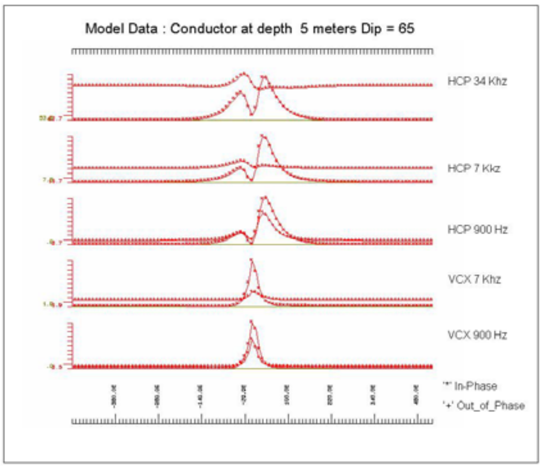



*Figure 2d:* *Model Data: Conductor at depth 5 metres Dip 0*

As is evident from profiles in the Figure 2 to 2d, the response over plate like targets are invariable characterised by a localised minimum in the coplanar (HCP) response over the top of the target and a peak in the coaxial (VCX) anomaly at the target location. The peak in the coplanar anomaly generally does not correspond or coincide to the maximum in the coaxial response. This offset between the coplanar and coaxial anomaly peak is related to the dip of the target (Figures 2 – 2c). These is true for all the conductors with dips significantly greater than zero (or flat) and as is evident in Figure 2d, over the relatively flat laying targets the profile shapes of the coaxial and coplanar anomalies are indeed similar. These modelling results than essentially illustrate that the analysis of the relationship between the coaxial and coplanar responses can be used to determine or at least estimate the geometry of the conductor causing the response.



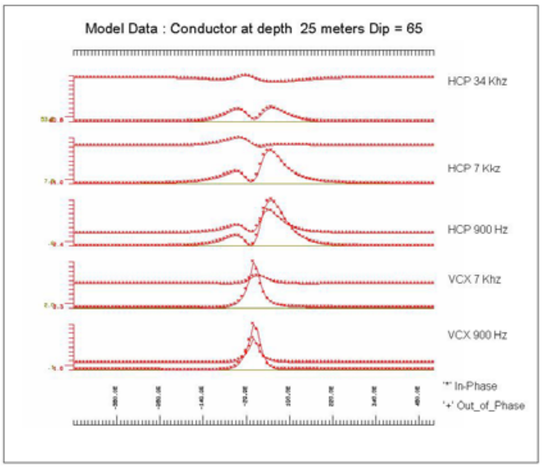
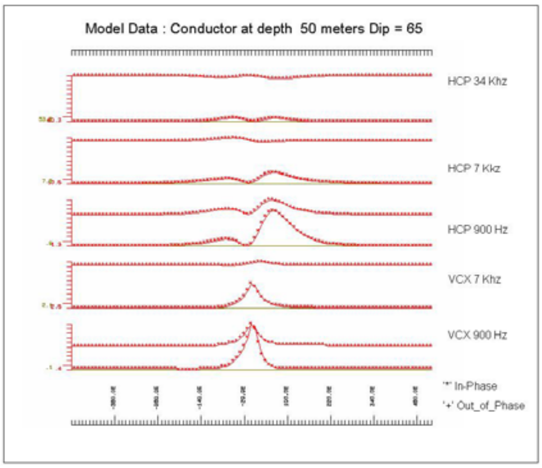




*Figure 3 & 3a:* *Model Data: Conductor at depth 5 and 25 metres Dip 65*



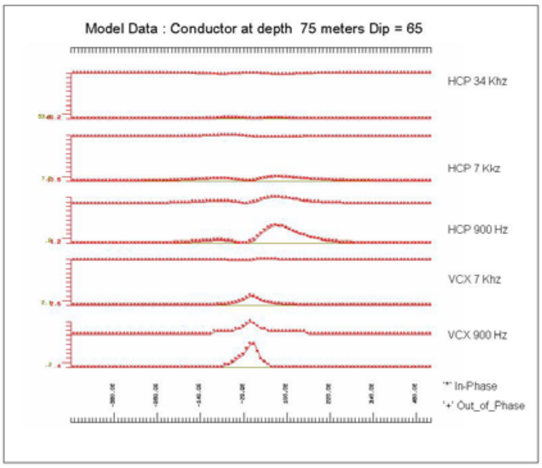




*Figure 3b & 3c:* *Model Data: Conductor at depth 50 and 75 metres Dip 65*

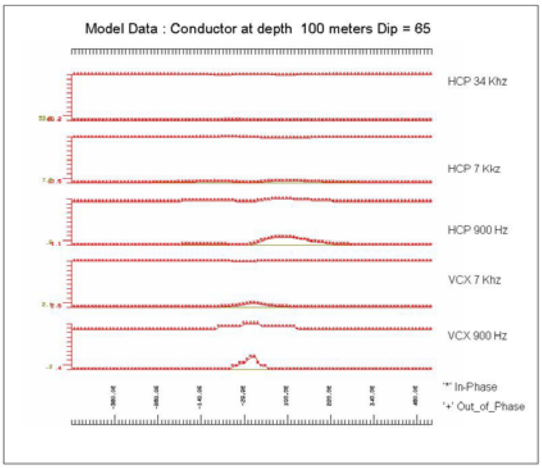



*Figure 3d:* *Model Data: Conductor at depth 100 metres Dip 65*

Profiles of modelled data as shown in Figures 3 to 3c, however illustrate the "dramatic" decrease in the target response with target depth. In fact considering the noise levels for the Mt Read survey and using these results it can be estimated that the penetration of the Hummingbird HEM system for isolated 3D conductive targets was not more than 75 metres, and in some cases not more than 50 metres.

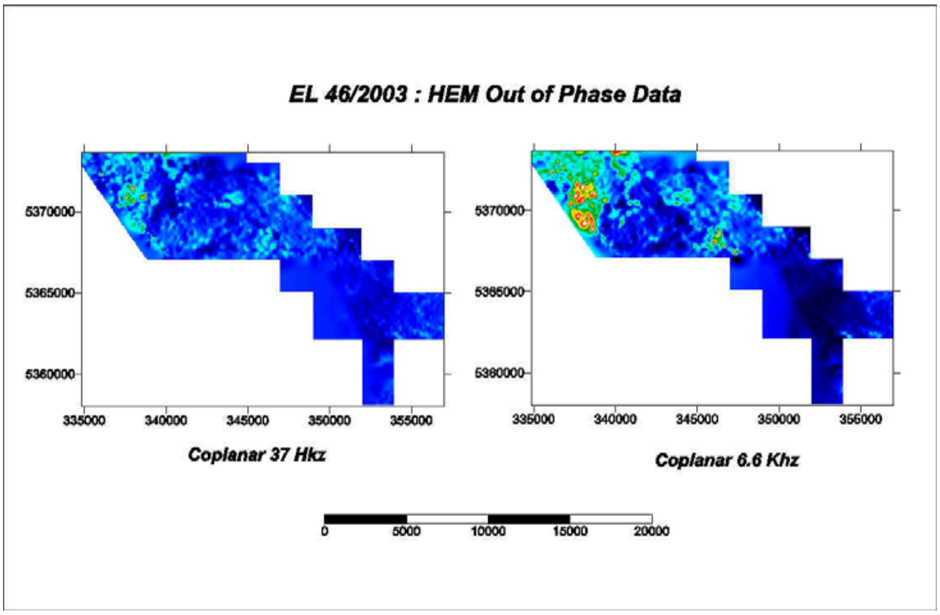



*Figure 4:* *EL 46/2003: HEM Out of Phase Data*

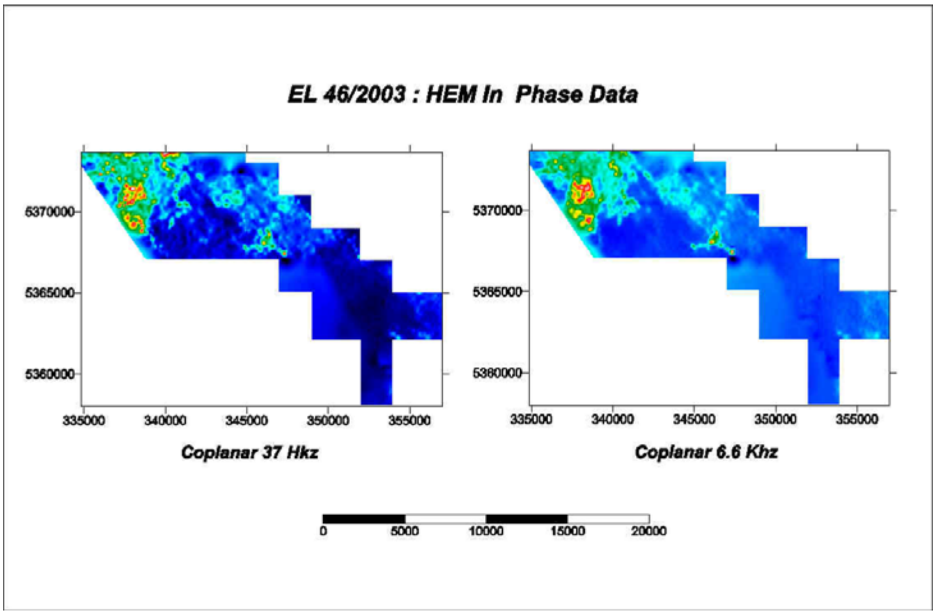



*Figure 4a:* *EL 46/2003: HEM in Phase Data*

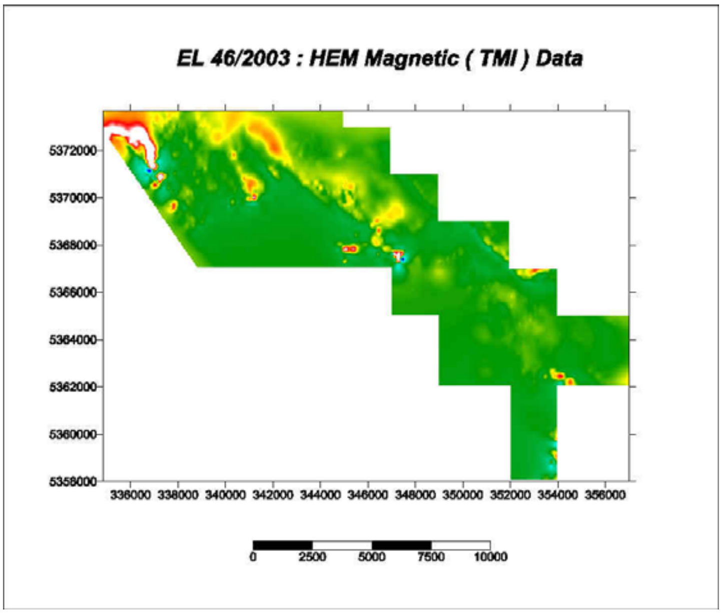



*Figure 4b: EL 46/2003: HEM Magnetic (TMI) Data*

## HEM RESPONSE OF KNOWN MINERALIZATION

Within EL 46/2003 exploration licence and its immediate vicinity two types of mineralised system have been identified. A number of magnetic, sulphide skarns near the margins of the Heemskirk granite and containing tin mineralization are within the boundaries of the EL 46/2003 exploration licence. Outside the exploration licence boundary and some 12 kms south west of town of Zeehan is the Avebury hydrothermal nickel sulphide deposit hosted by ultramafic rocks in the areole of the mineralising Heemskirk granite. Both of these different styles of targets have a magnetic anomaly association. The HEM response of the two targets is however somewhat different.

For example as the profiles of the HEM date over the Granville East and St Dizier tin bearing magnetite, sulphide skarn illustrate these deposits are un-ambiguous EM targets although with a variable geometry and conductivity thickness product (Figure 5 and 5a). In the example shown the Granville East mineralization with a more pronounced in-phase response (the thin line profile on Figure 5 and 5a) is more conductive of the two.

However because the magnetite within the skarns has the potential to reduce the in-phase signal at all frequencies (the greater the magnetite content the greater is the potential for this reduction) such conclusions however must be treated with caution.

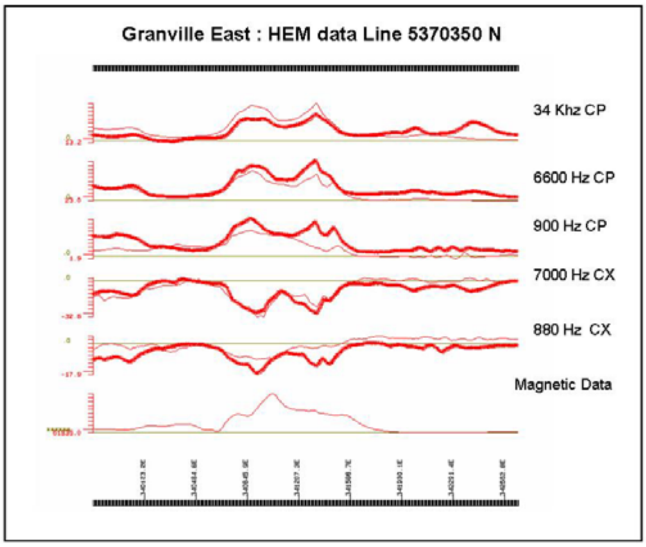



*Figure 5:* *Granville East: HEM data line 5370350 N*

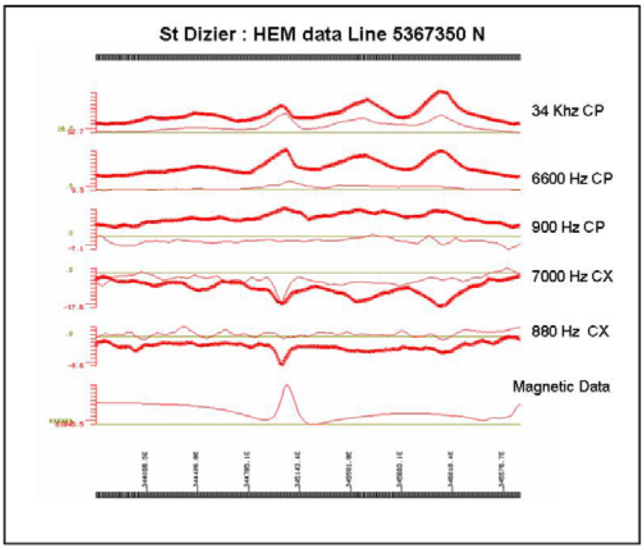



*Figure 5b:* *St Dizier: HEM data line 5367350 N*

Avebury skarn on the other hand, although located within highly magnetic rocks (Figure 6), has a much more subtle and reduced EM response with virtually no or little in-phase response at the lowest frequently of 900 Hz (Figure 7 and 7a). Nevertheless poor conductors are co-incident with the peaks in the response from the elongated magnetic unit. Without knowing the exact location of the Avebury deposit it is not known if indeed these poor conductors are actually the deposit. Nevertheless considering the low sulphide content of the Avebury skarn (pentlandite), Avebury style target if indeed is a conductor is not expected to be associated within a higher conductivity thickness product which characterises the magnetic, sulphide tin skarns within EL 46/2003.

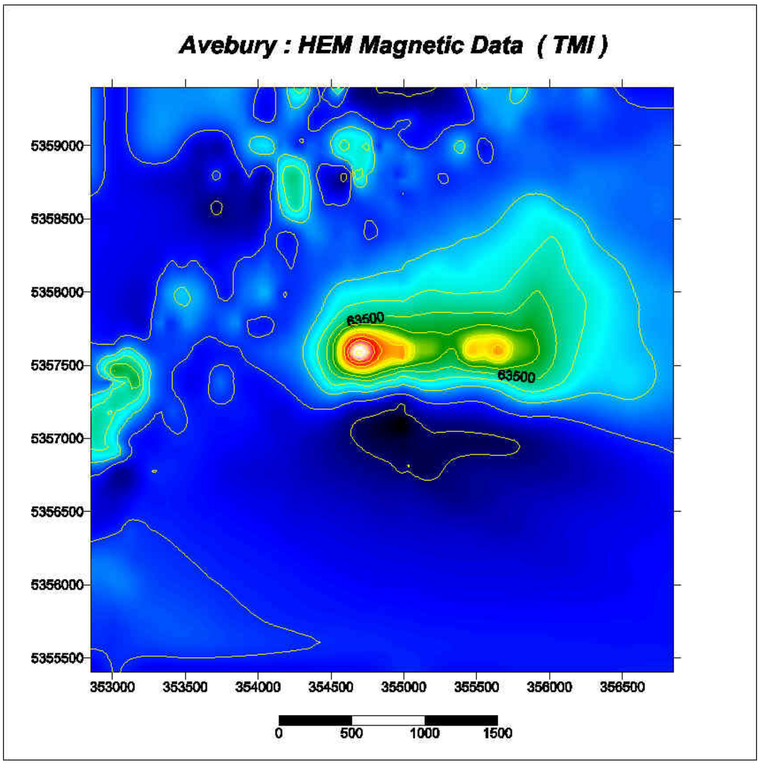



*Figure 6:* *Avebury: HEM Magnetic Data (TMI)*

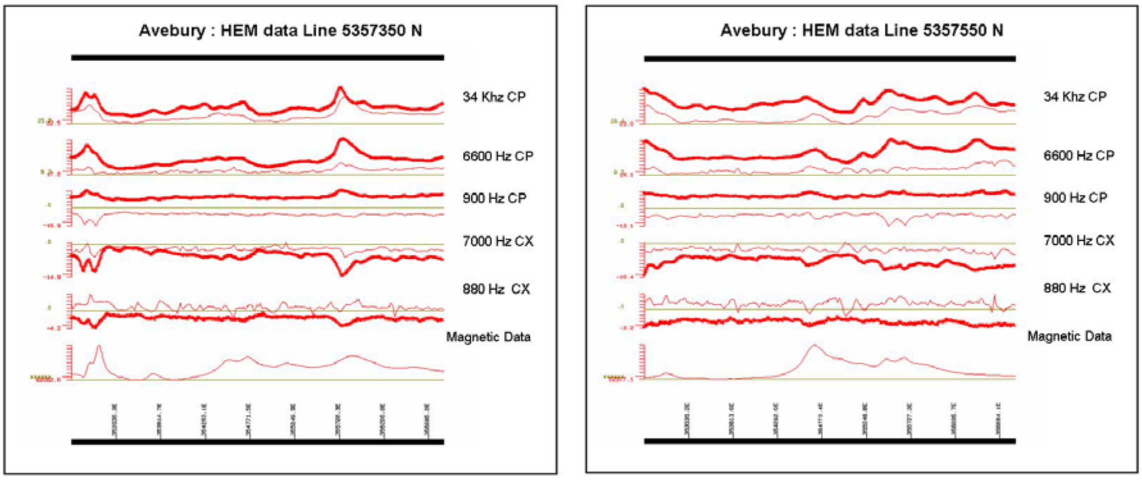



*Figure 7 & 7a:* *Avebury HEM data line 5357350 N and 5357550 N*

## INTERPRETATION OF MT READ HEM OVER EL 46/2003 .

Interpretation of Mt Read data essentially consisted of carefull analysis of some 66 responses and listed Appendix II and shown in Figure 8.

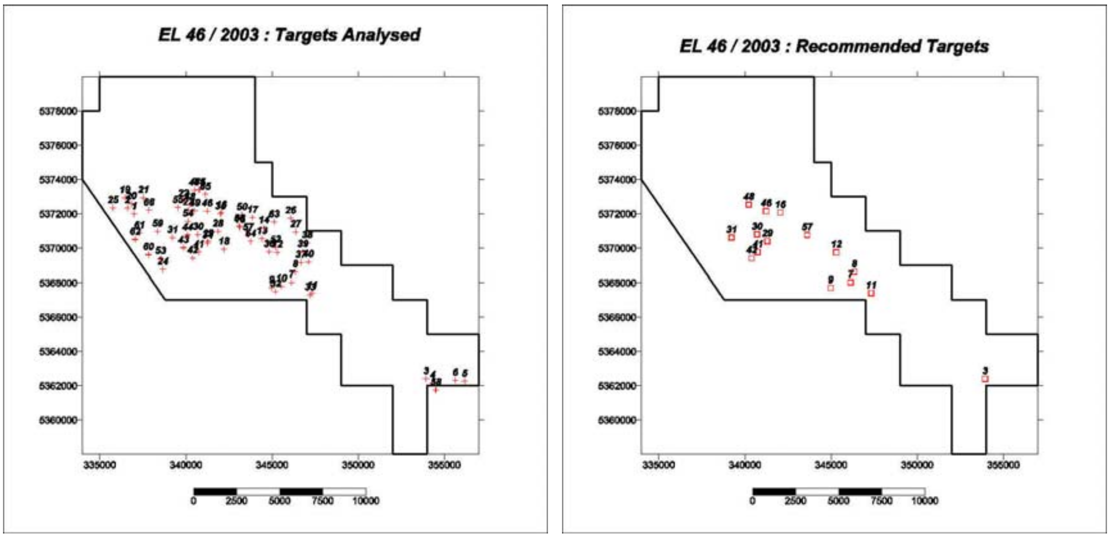



*Figure 8 & 8a: EL 46/2003 Analysed and Recommended Targets*

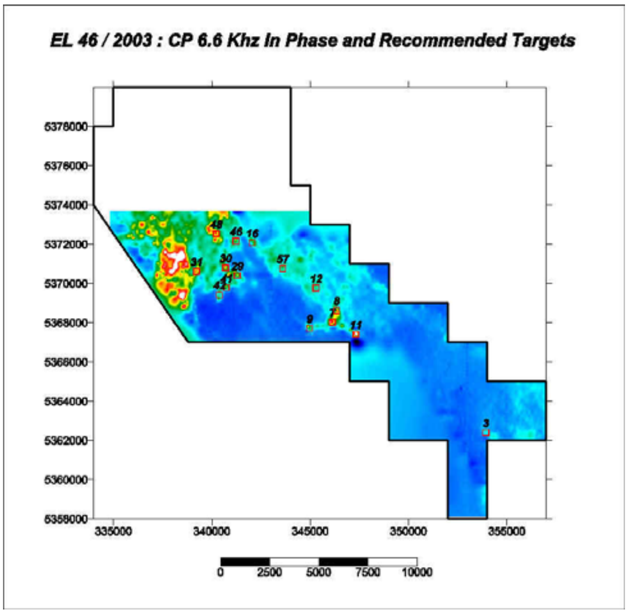



*Figure 8b: EL4/2003: CP 6.6 Khz in Phase and Recommended Targets*

These locations were essentially chosen on the basis of analysing the imaged data and decomposition of the HEM responses into its anomalous constituents as for example described in Silic 2004 (Appendix III). For the purpose to illustrate the numerous HEM responses that within the Mt Read data set, Figure 4 to 4c shows the imaged data over EL47 and 48/2003.

Of the 66 responses analysed most of these were rejected on the bases that they most likely represent overburden, transported cover or broad litho logical units. Analysis of the relationship between the coplanar and coaxial anomalies as briefly discussed in the previous section was an important factor in this decision or elimination process. The amplitude of the in-phase signal also played a crucial role in the selection process .The targets kept using these selection criteria are listed in Table 2 .

As Table 2 shows a number of recommended targets are over or in proximity to known mineralization. These targets are discussed in Appendix I where images and profiles of EM and magnetic data are over these targets are also shown. In-phase responses at all frequencies in the profiles shown correspond to the “thin lines “. However as pointed **previously because the magnetite content of the target has the potential to reduce the in-phase response at all frequencies the conclusions regarding the quality of some targets have to be treated with caution .**

**Table 2: EL 46/2003 HEM targets**

| Target No | East | North | Magnetic Anomaly | Nearby Mineralization |
|---|---|---|---|---|
| 3 | 353933 | 5362410 | Yes | |
| 7 | 346130 | 5368030 | Yes | Big H / St Dizier |
| 8 | 346340 | 5368630 | Yes | St Dizier |
| 9 | 344970 | 5367710 | Yes | St Dizier |
| 11 | 347320 | 5367410 | Yes | Big H |
| 12 | 345300 | 5369760 | Yes | |
| 16 | 342050 | 5372080 | Yes | Big Rock |
| 29 | 341290 | 5370410 | Yes | Granville East |
| 31 | 339220 | 5370615 | Unlikely | |
| 30 | 340700 | 5370800 | Yes | Granville East |
| 41 | 340740 | 5369780 | Yes | Granville East |
| 42 | 340390 | 5369420 | Yes | Granville East |
| 46 | 341230 | 5372165 | Yes | |
| 48 | 340220 | 5372540 | Possible | |
| 57 | 343610 | 5370770 | Possible | |

## CONCLUSION

Analysis of 66 response in the Mt Read 2001/2002 helicopter electromagnetic data set over EL 46/2003 has identified 15 targets as potentially representing conductors that require further follow up. A number of these targets are at or close to the known mineralization at St Dizier, Big H, Big Rock and Granville East magnetite, sulphide skarns. As such in some cases they may represent significant extensions to these magnetic, sulphide skarns. The conductivity and geometry of the identified targets is variable and in some cases complex. As a result accurate targeting of these conductors may require collection of ground EM data, depending on which part of the EM conductor is identified for targeting.

In the northern western part of the survey area, presence of tertiary basalts has prevented identification of any potential target. Analysis of the HEM system noise levels has also demonstrated that even in very clean EM backgrounds the maximum penetration of the system for 3D EM targets was between 50 – 75 metres.

# APPENDIX I

## EL 46/2003 Targets

## ST 03

Conductive target ST 03 is at the one of the eastern boundaries of the exploration licence. As illustrated by figures ST 03_1 – 3 the EM response is closely associated with the NW striking magnetic feature. The EM response over ST 03 lacks any significant in phase anomaly at the lowest frequency of 900 Hz , although magnetic effects super imposed on the in phase EM signals may be one of the reasons for this characteristic of the EM signal. The conductor geometry is most likely that of a flat top target. Its conductivity thickness product is between low to moderate.

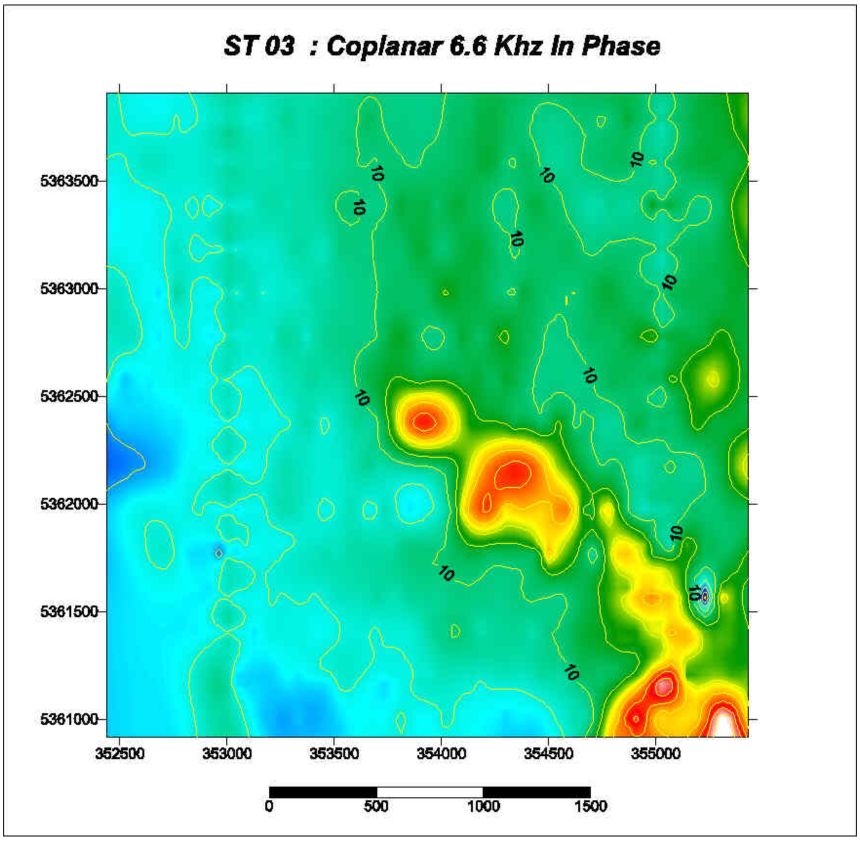



*Figure ST 03_1: Coplanar 6.6 Khz in Phase*

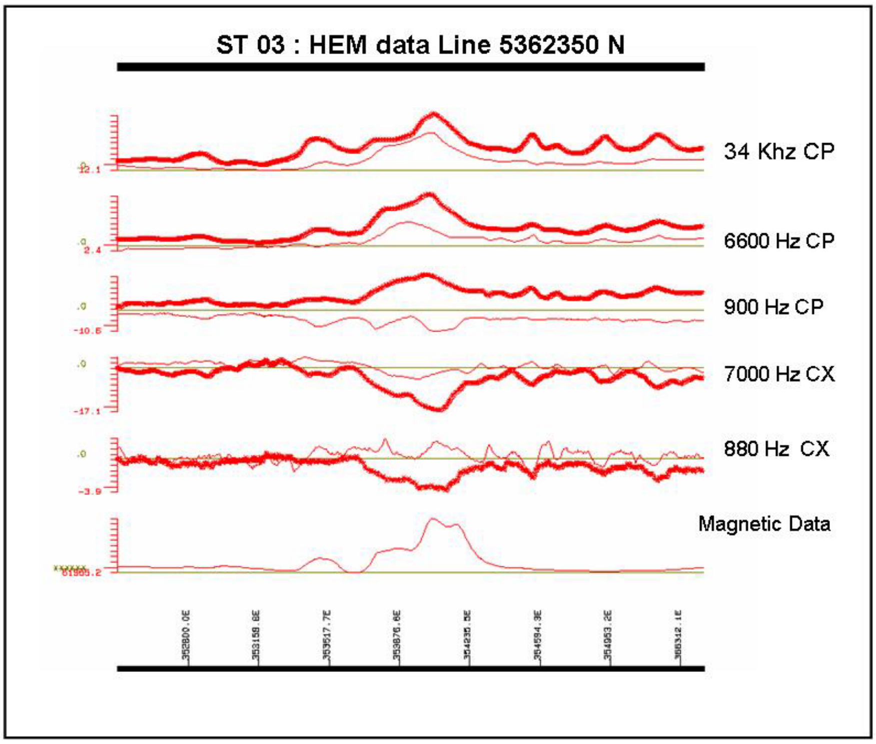



*Figure ST 03_2:* *HEM data line 5362350 N*

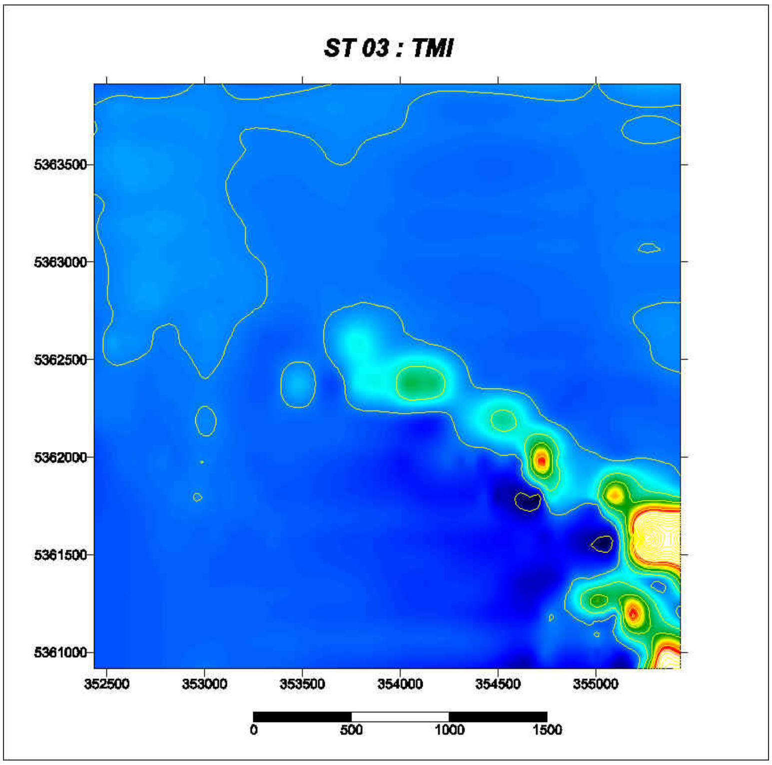



*Figure ST 03_3:* *TMI*

## ST 07

Target ST 07 is between the already known St Dizier and Big H mineralised systems. It is located on a line of moderate magnetic anomaloies which join with the more intense magnetic response over the St Dizier and Big H skarns (Figure ST 07_1 and 3).

As such ST 07 is one of a series of anomalies which trend away from and join up with the anomalies associated with the Big H skarn some 1 to 1.5 Kilometres to the SW. The EM response over this target identifies a moderate conductor, similar to the conductor which can be associated with the St Dizier and Big H skarns .

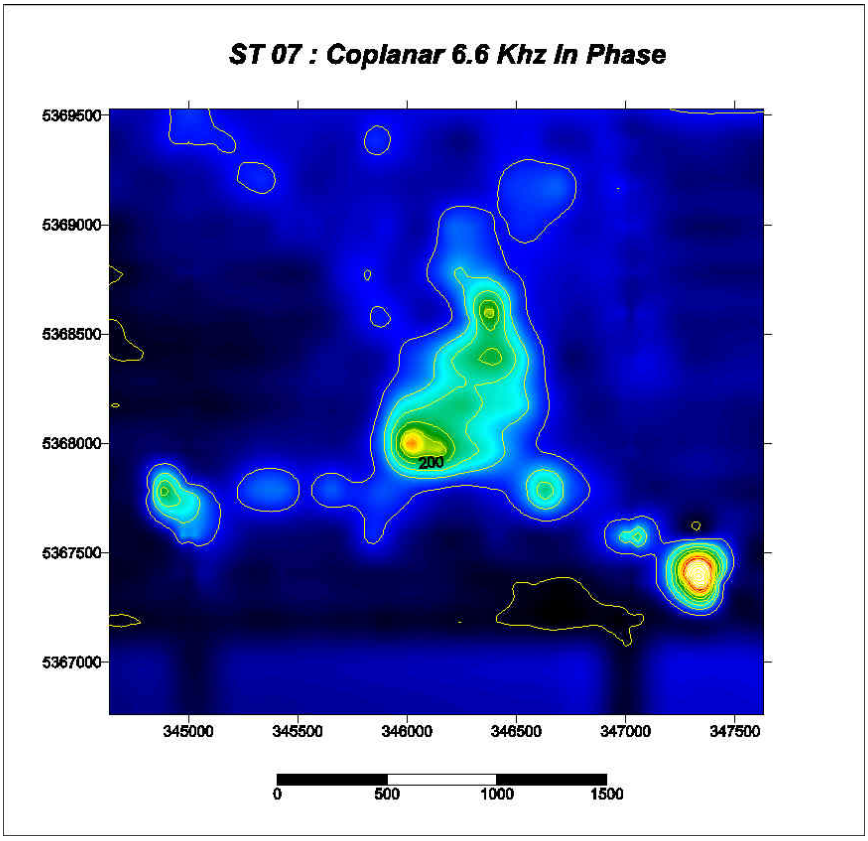



*Figure ST 07_1: Coplanar 6.6 Khz In Phase*

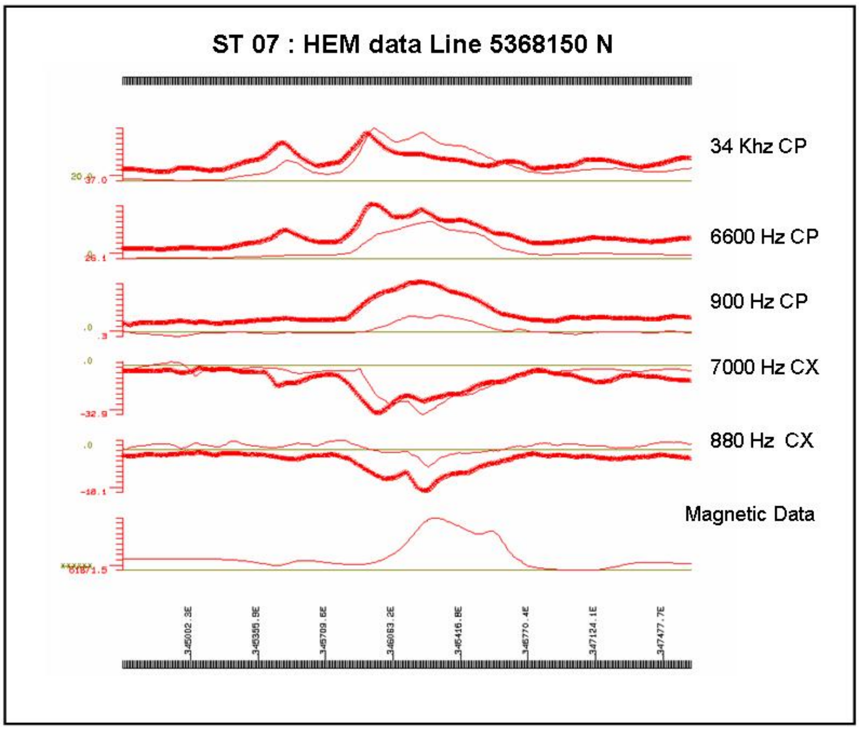



*Figure ST 07_2:* *HEM data line 5368150 N*

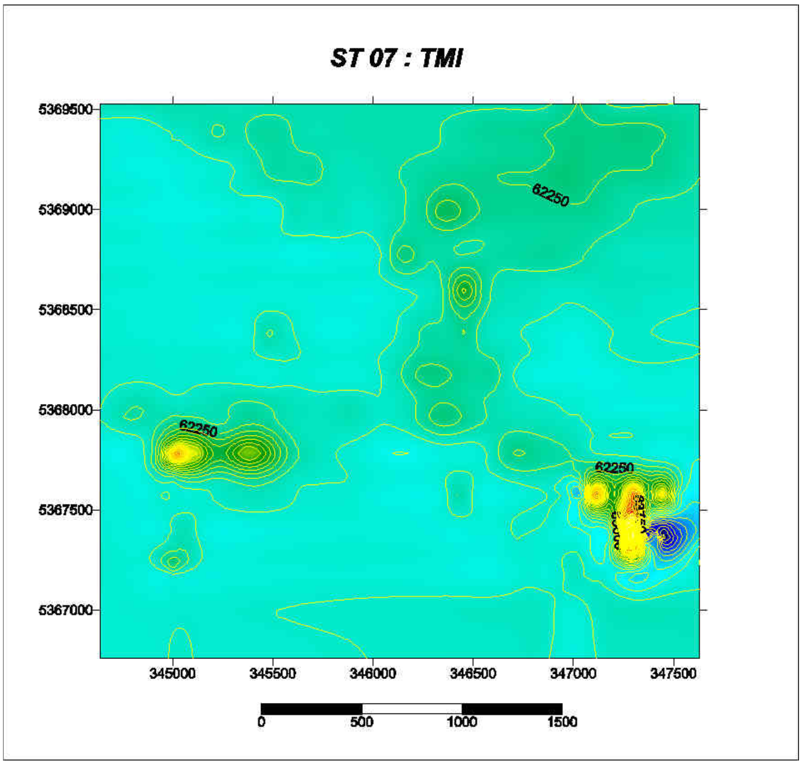



*Figure ST 07_3:* *TMI*

## ST 08

Target ST 08 is part of a continuous NNE striking conductive zone with a strike length of 700 – 1000 metres. It is located between the St Dizier and Big H mineralization and may be part of semi continuous trend which splits and joins up with the Big H and St Dizier skarns (Figure ST 08_1).

The targets conductivity thickness product is comparable to that of the St Dizier mineralization (Figure ST 08_2). The amplitudes of the magnetic anomalies associated with this target are smaller than those over the Big H and St Dizier skarns (Figure ST 08_3).

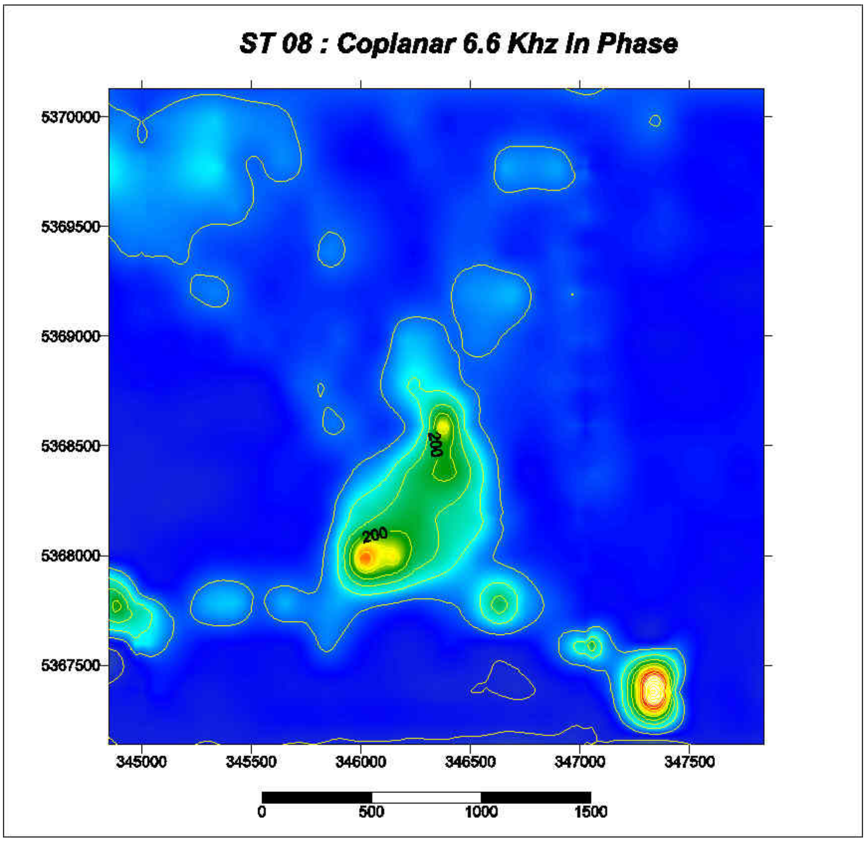



*Figure ST 08_1: Coplanar 6.6 Khz in Phase*

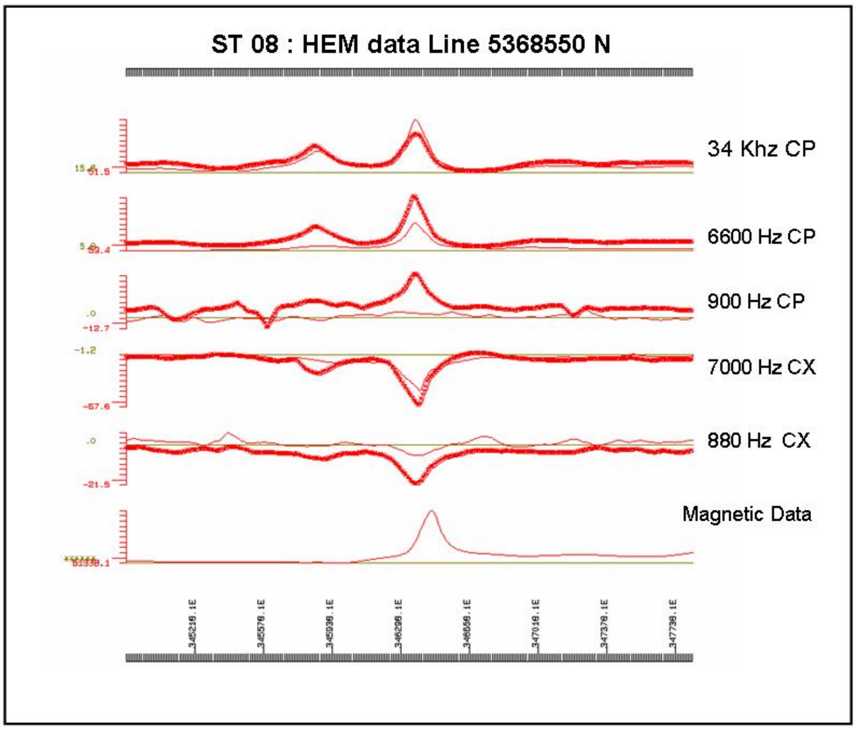



*Figure ST 08_2:* *HEM data line 5368550 N*

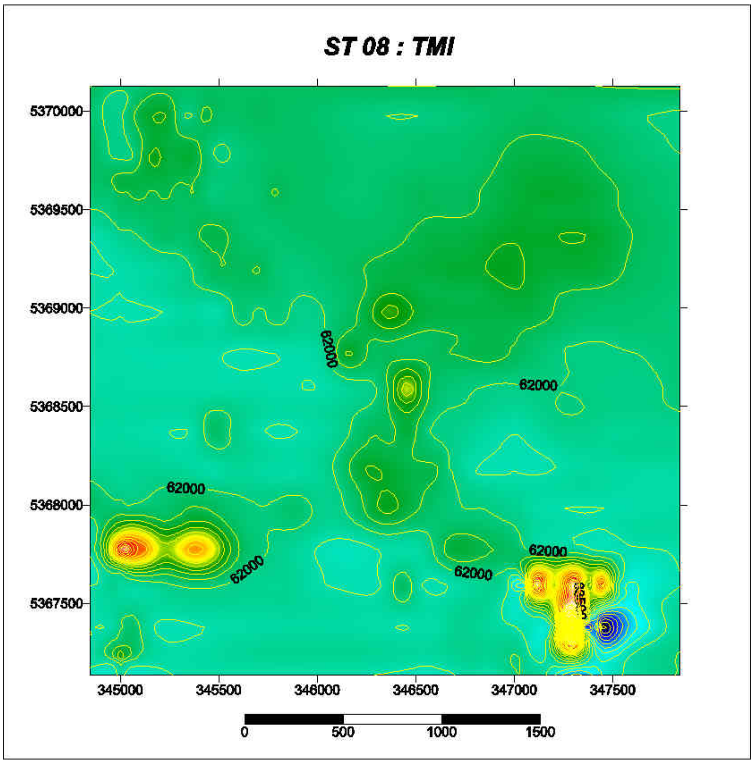



*Figure ST 08_3:* *TMI*

## ST 09

Target ST 09 is over the already known St Dizier mineralization and strikes in an approximate E – W direction (Figure ST 09_1). The lack of significant in phase response at the lowest frequency of 900 Hz defines this to be a moderate conductor. However possible overprinting of the EM response by magnetic effects may results in this being an underestimate (Figure ST 09_2).

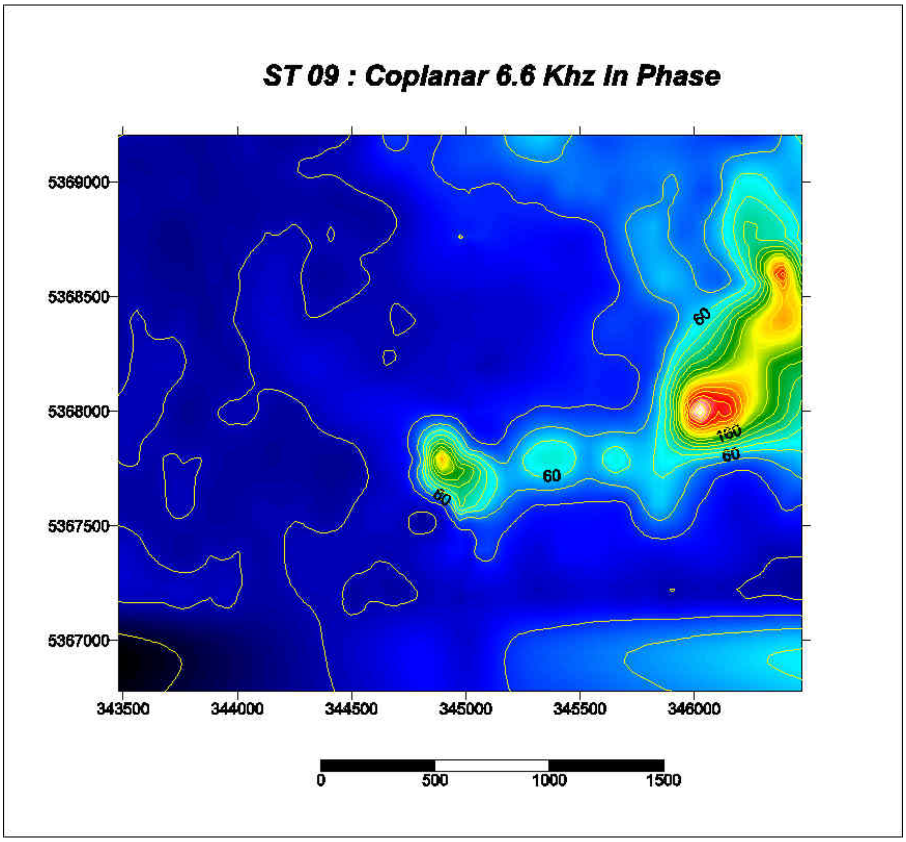



*Figure ST 09_1: Coplanar 6.6 Khz In Phase*

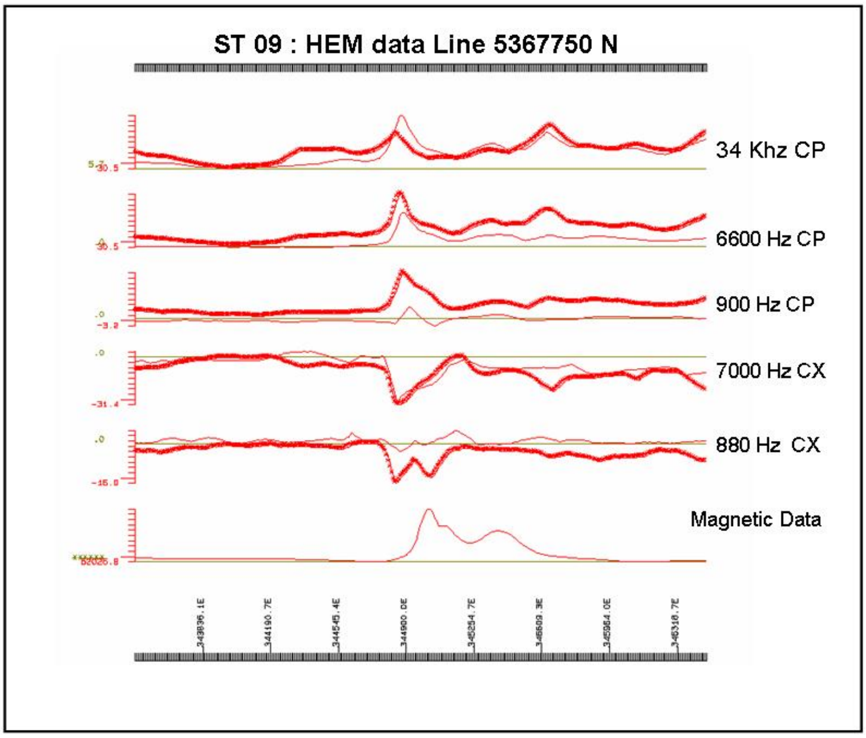



*Figure ST 09_2:* *HEM data line 5367750 N*

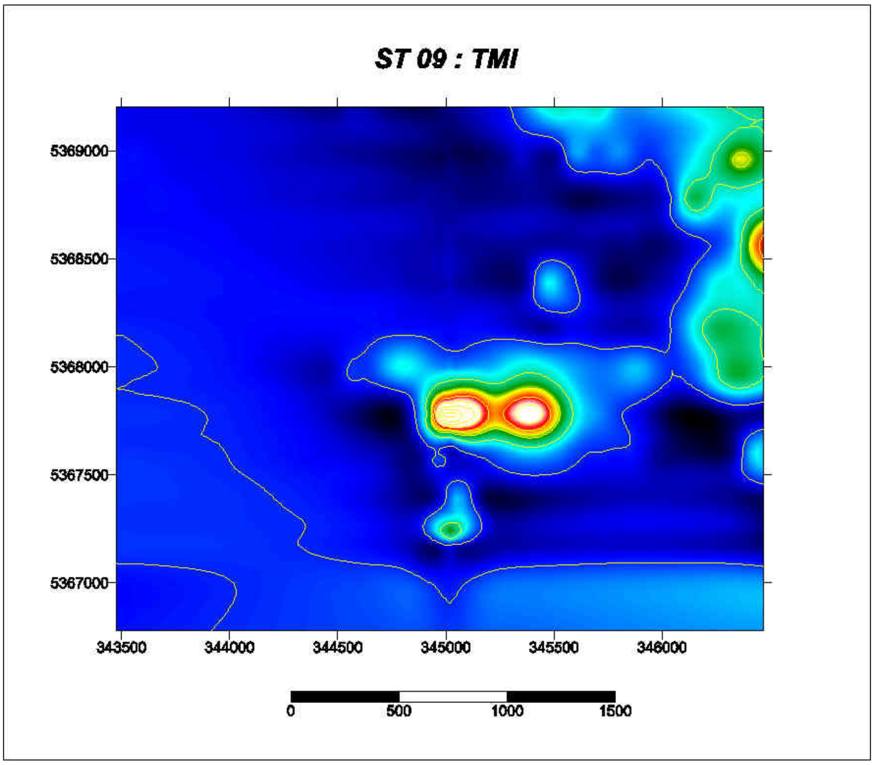



*Figure ST 09_3:* *TMI*

## ST 11

Target ST 11 is over the known Big H mineralization (Figure ST 11_1). This moderate and confined target nevertheless appears to extent in a NNW direction along a line of smaller amplitude magnetic anomalies (Figure ST 11_1 and 3).

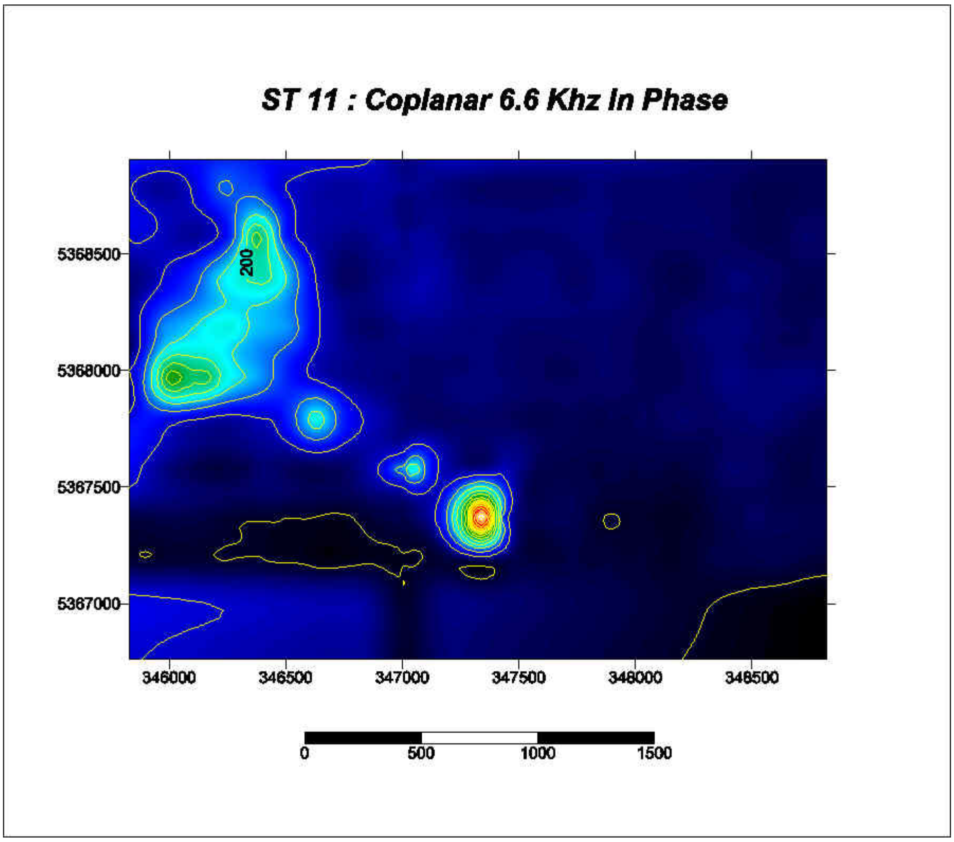



*Figure ST 11_1: Coplanar 6.6 Khz in Phase*

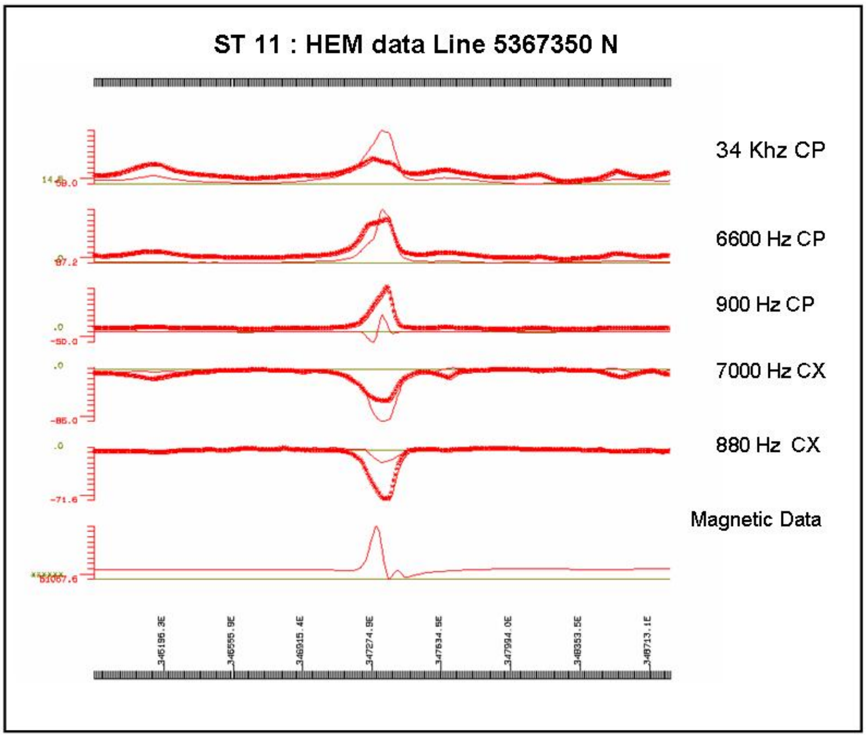



*Figure ST 11_2:* *HEM data line 5367350 N*

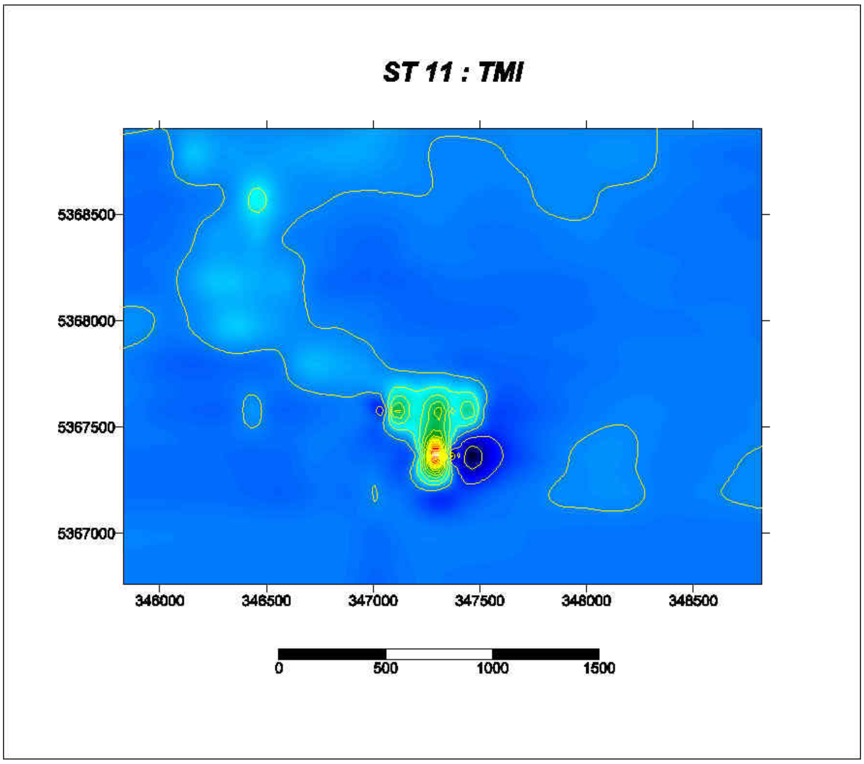



*Figure ST 11_3:* *TMI*

**ST 12**

Target ST 12 is within an EM active area which may contain area of conductive overburden or swampy ground. Its definition is clearest on the low frequency 900 Hz data as a significant in phase anomaly (Figure ST 12_1 and 2). This target is associated with a broad and complex magnetic anomaly (Figure ST 12_2 and 3) and is not expected to be close to outcrop.

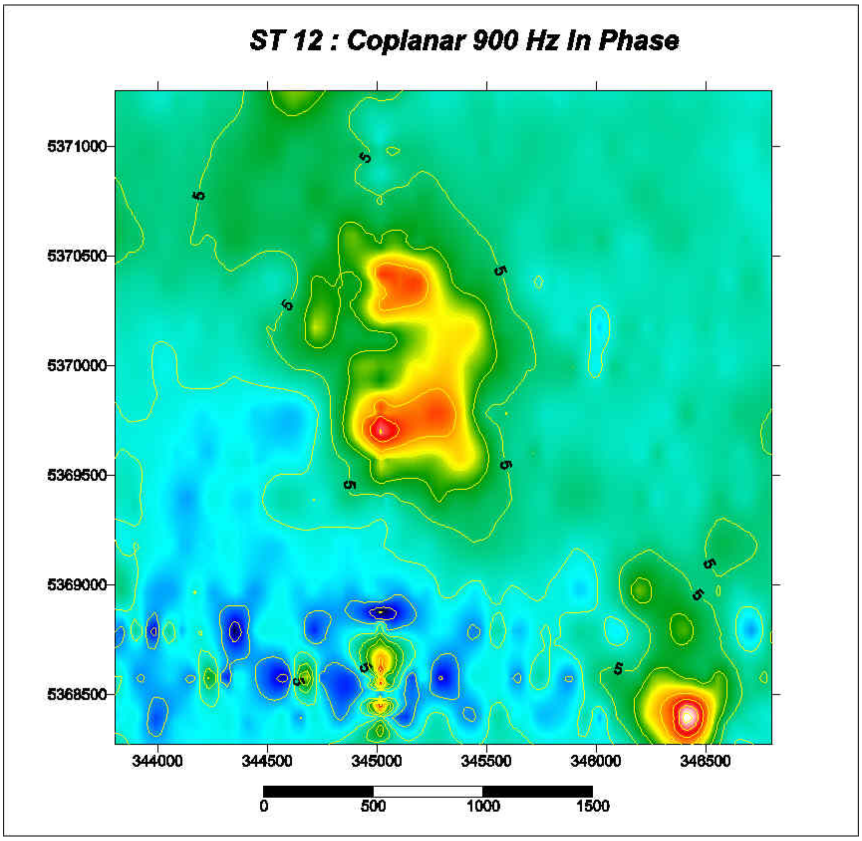



*Figure ST 12_1: Coplanar 900 Hz in Phase*

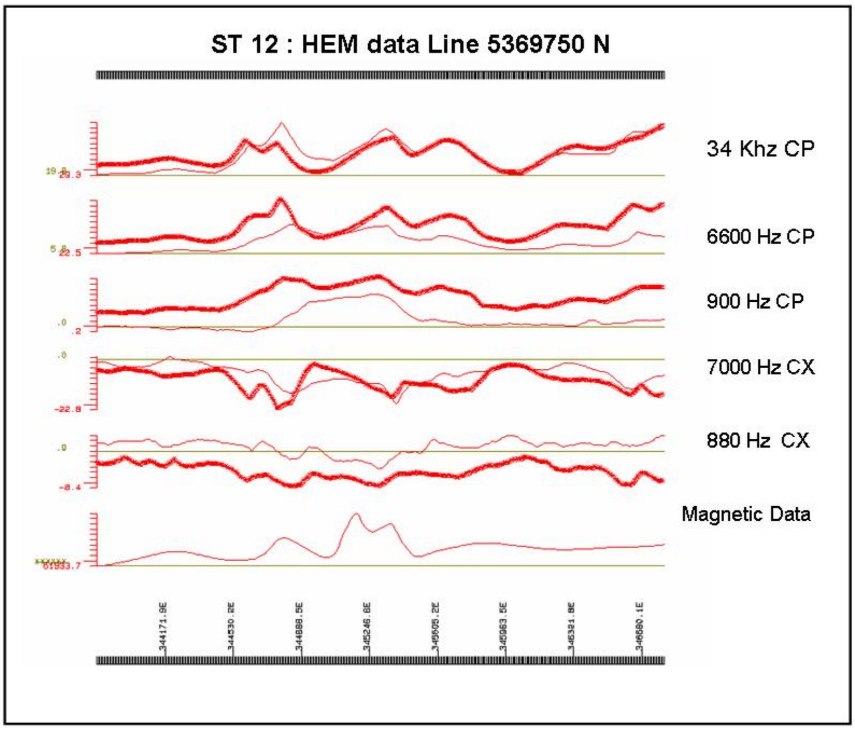



*Figure ST 12_2:* *HEM data line 5369750 N*

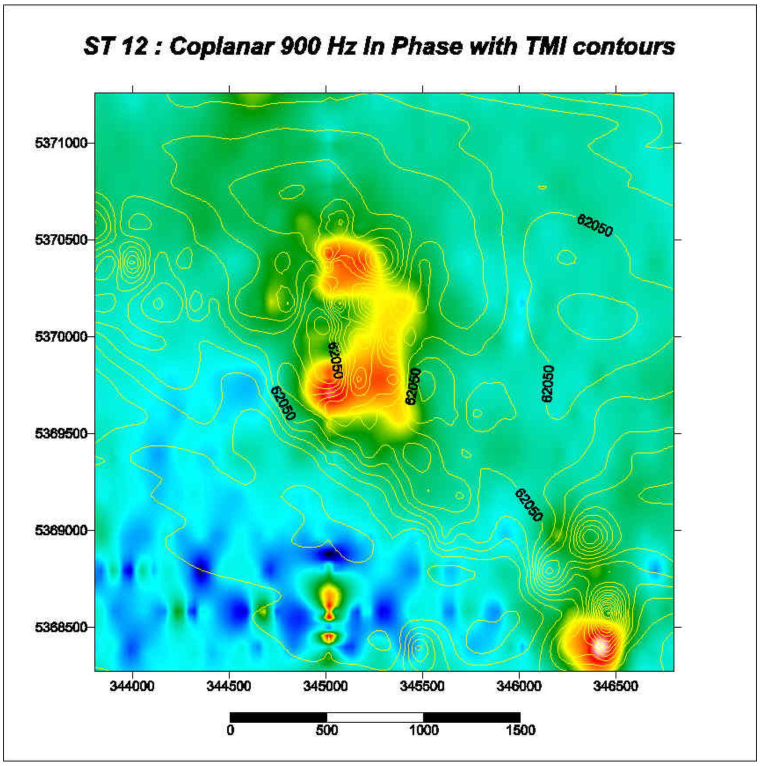



*Figure ST 12_3:* *Coplanar 900 Hz in phase with TMI contours*

**ST 16**

Target ST16 is over the Big Rock anomaly and mineralization. This moderate and discontinuous conductor extends over a strike length of 500 – 1000 metres (Figures ST 16_1 and 4), and is best developed at its southern extremity.

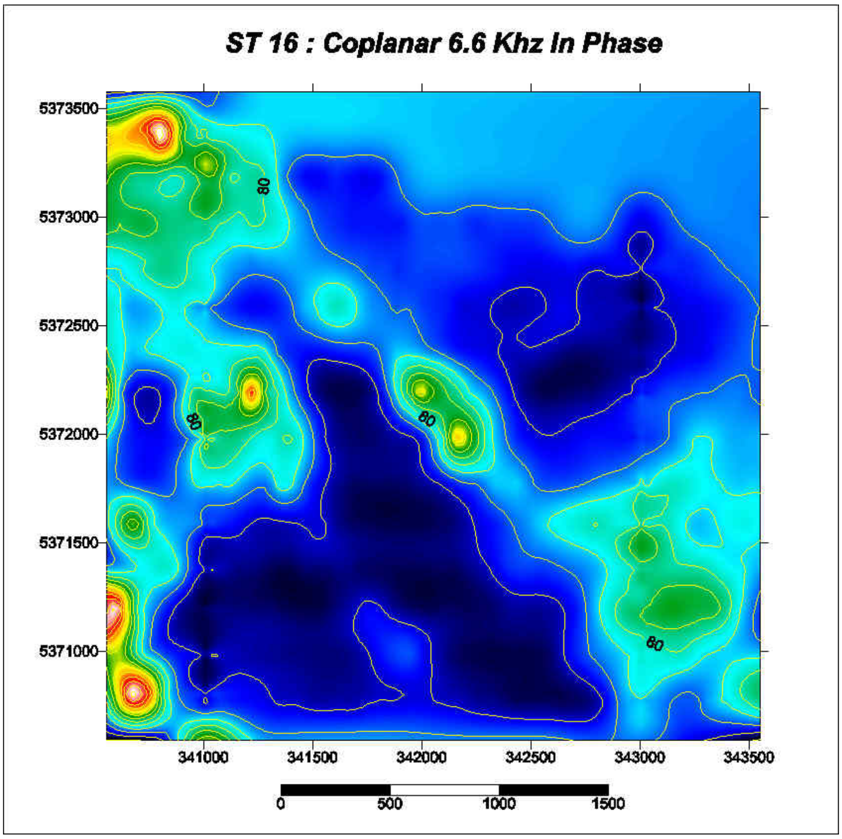



*Figure ST 16_1: Coplanar 6.6 Khz in phase*

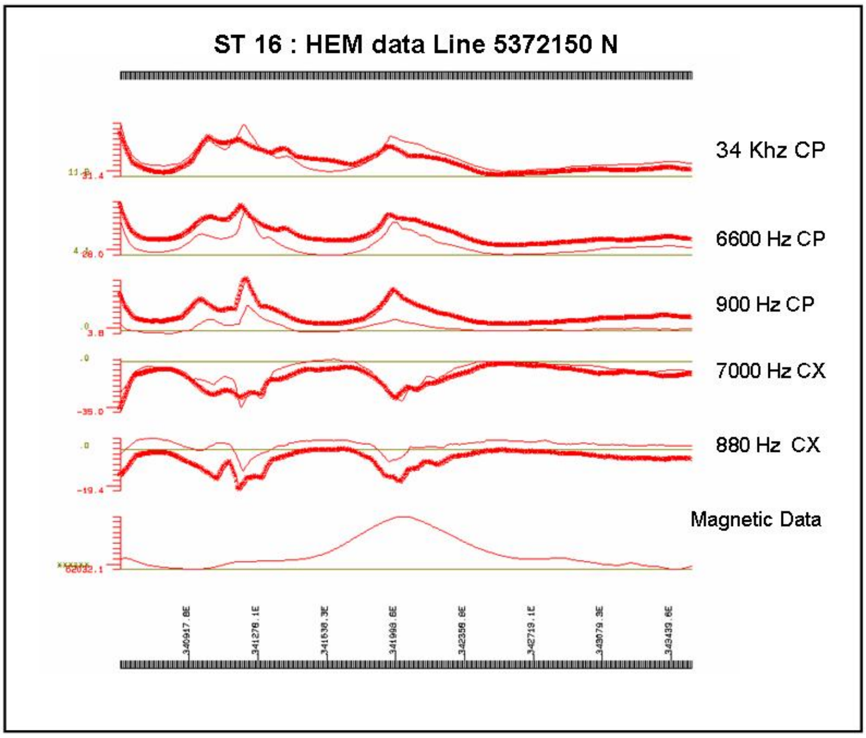



*Figure ST 16_2: HEM data line 5372150 N*

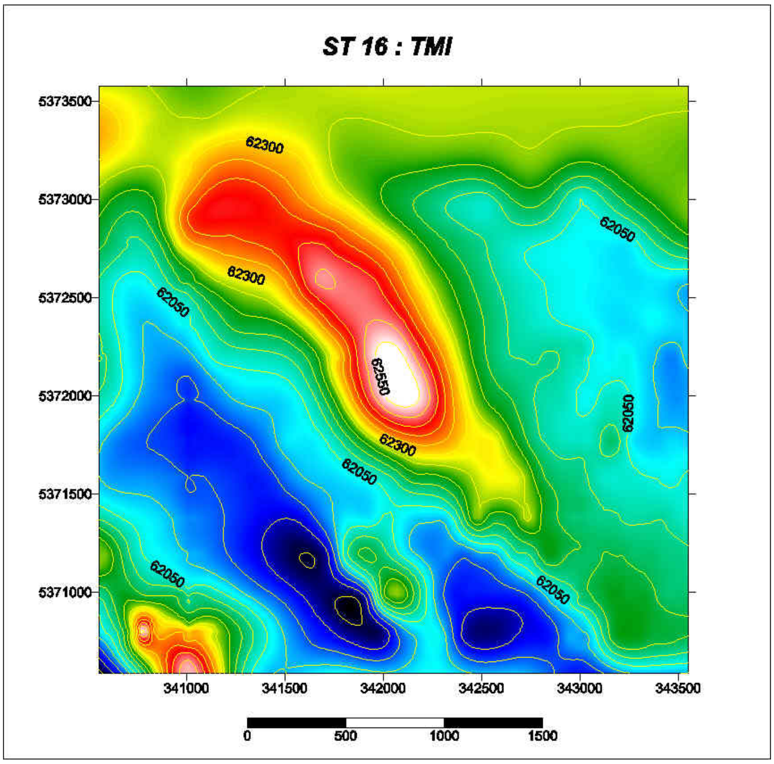



*Figure ST 16_3: TMI*

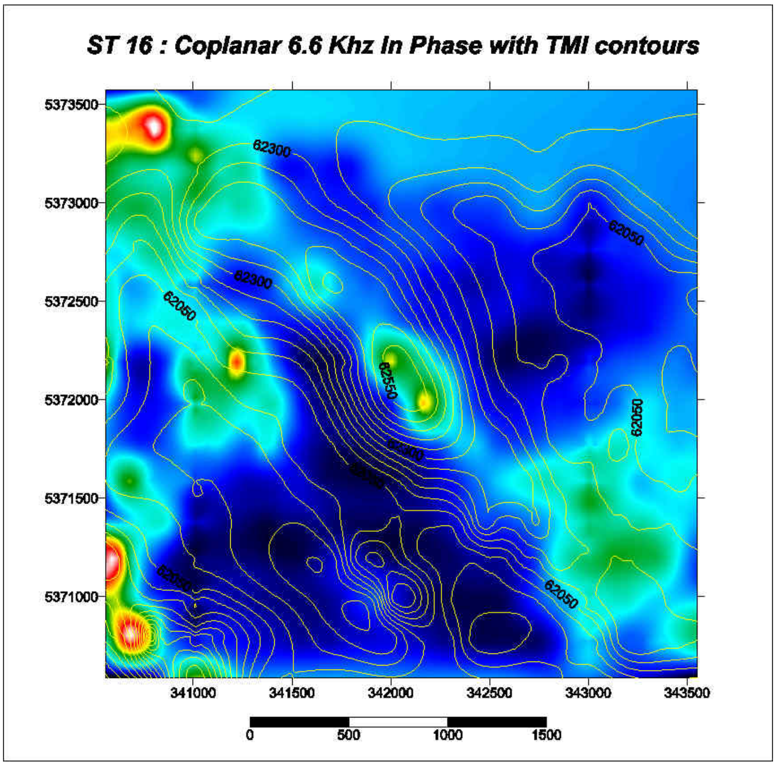



*Figure ST 16_4:* *Coplanar 6.6 Khz in phase with TMI contours*

**ST 29**

Target ST 29 is close to the known Granville East mineralization. It is a variable conductivity zone with over 1 kilometre in strike length (Figures ST 29_1 and 2). The association between this EM target and the magnetic anomaly data is unambiguous (Figure ST 29_4). High amplitude in-phase signals at the low frequencies define this to be one of the better conductors within the exploration licence .

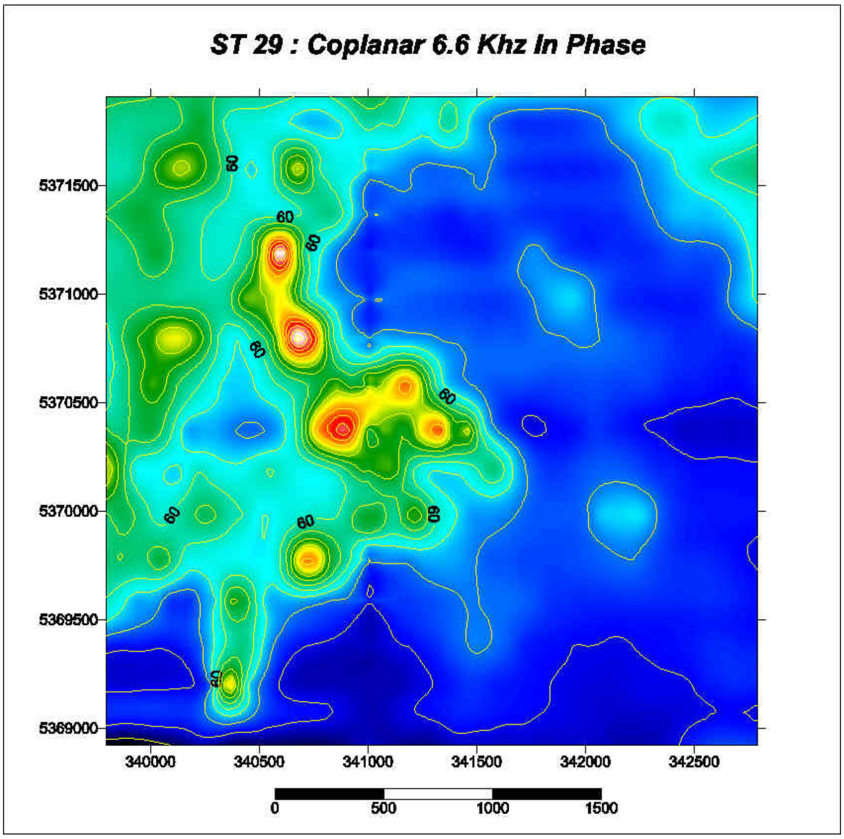



*Figure ST 29_1: Coplanar 6.6 Khz in phase*

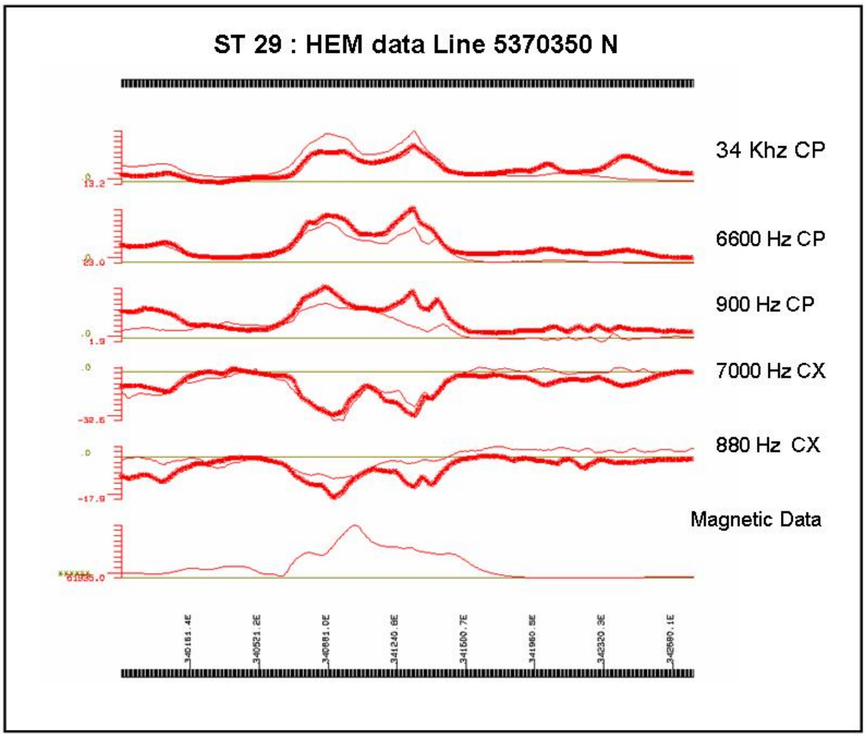



*Figure ST 29_2: HEM data line 5370350 N*

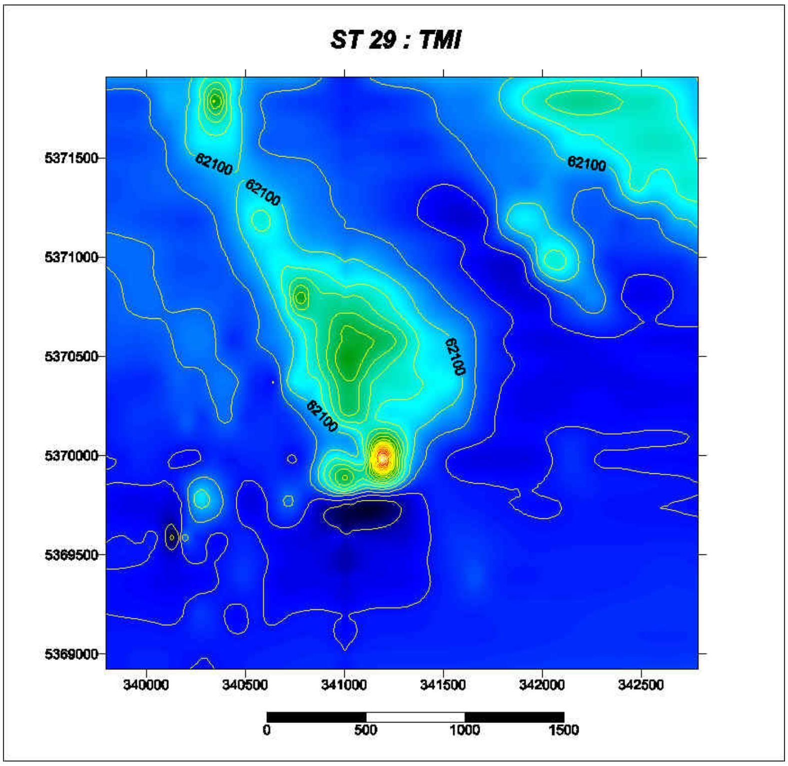



*Figure ST 29_3: TMI*

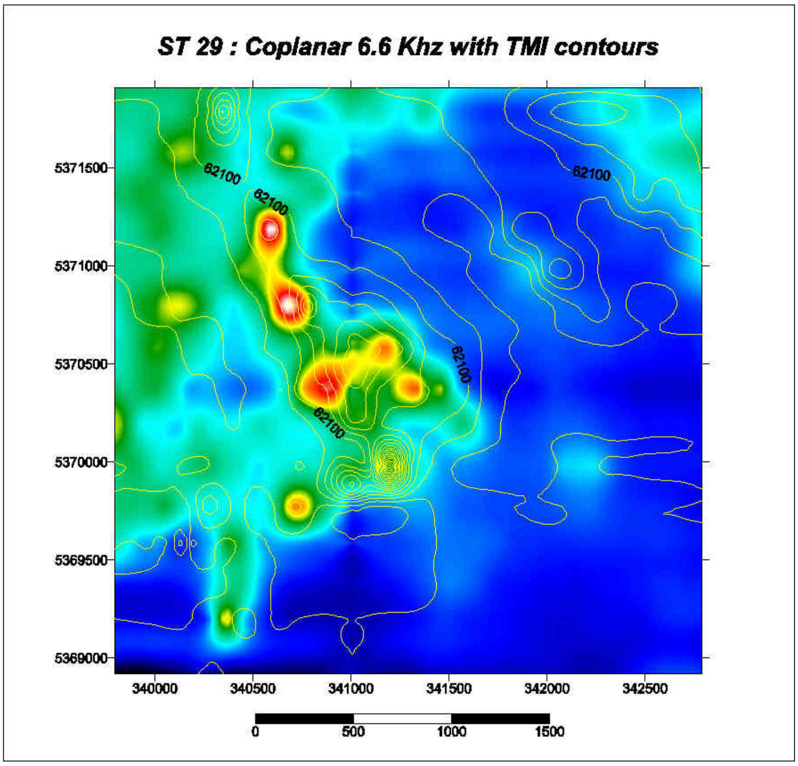



*Figure ST 29_4:* *Coplanar 6.6 Khz with TMI contours*

## ST 30

Target ST 30 is at the northern end of an EM and magnetic trend which is closely associated with the known Granville East mineralization. With a significant in phase response at the lowest frequency at 900 Hz this is one of the best conductors within the exploration licence (Figure ST 30_2).

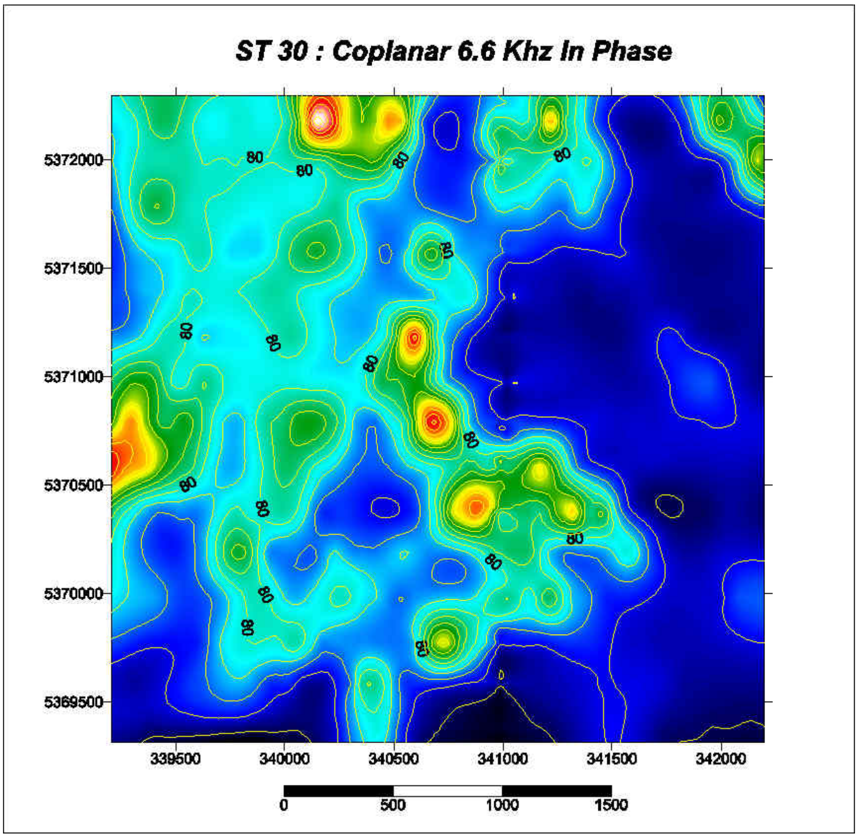



*Figure ST 30_1:* *Coplanar 6.6 Khz in phase*

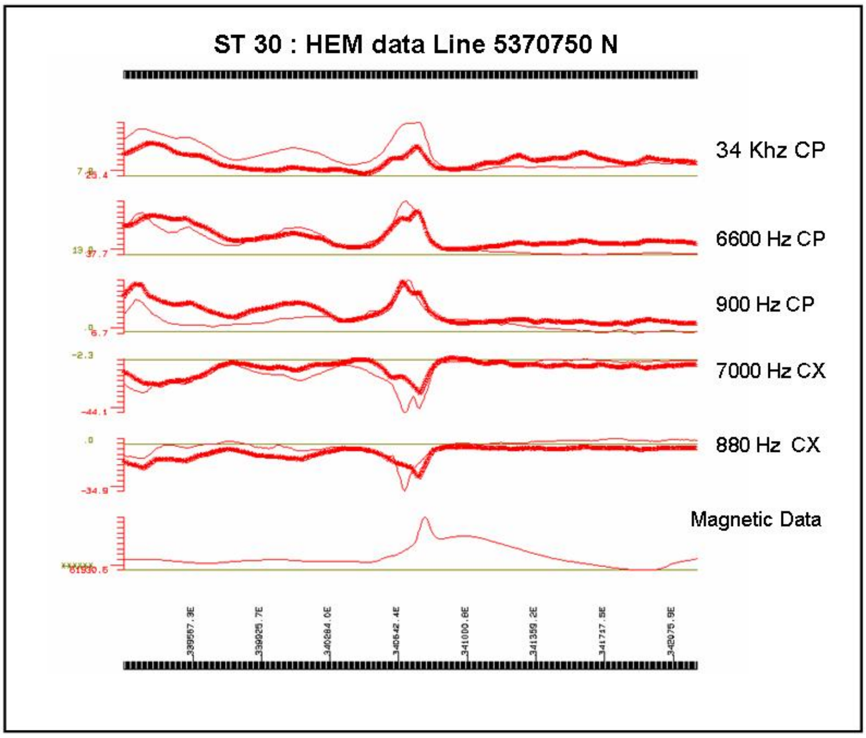



*Figure ST 30_2: HEM data line 5370750 N*

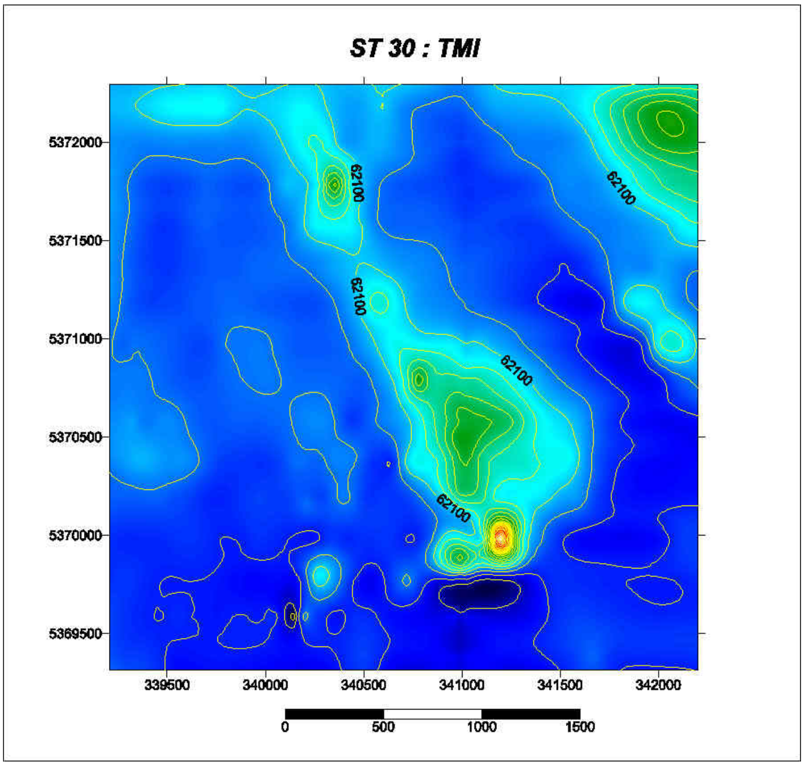



*Figure ST 30_3: TMI*

## ST 31

Target ST 31 is a limited strike length (200 – 300 metres) target close to or within the tertiary basalt cover. Its small amplitude response with a significant low frequency in phase amplitudes suggests that this target is quality target at depth (Figure ST 31_3).

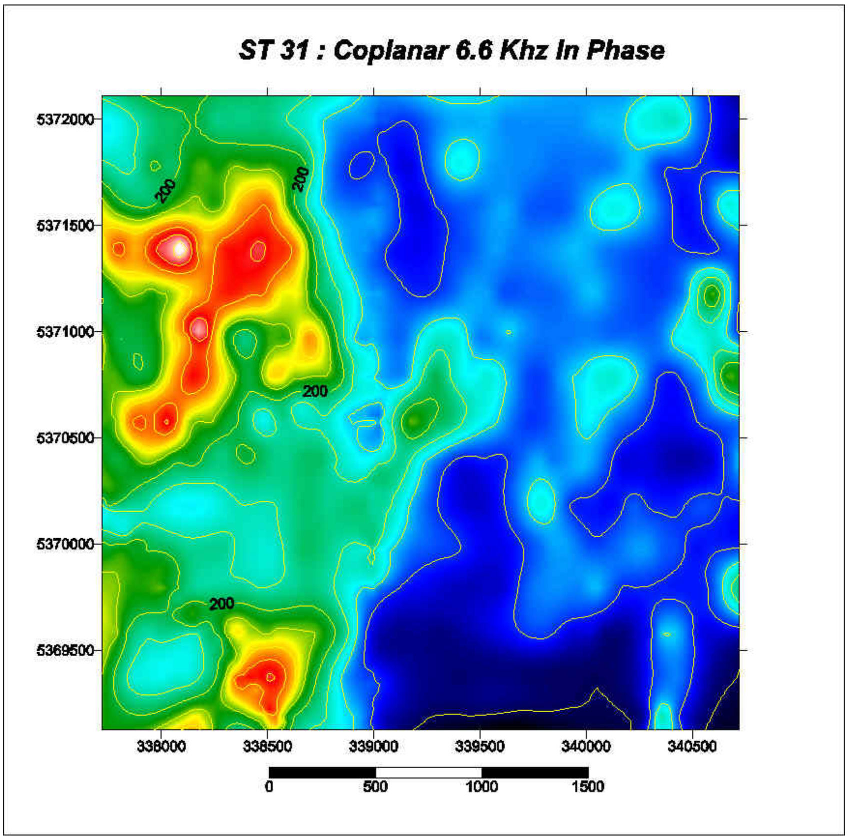



*Figure ST 31_1:* *Coplanar 6.6 Khz in phase*

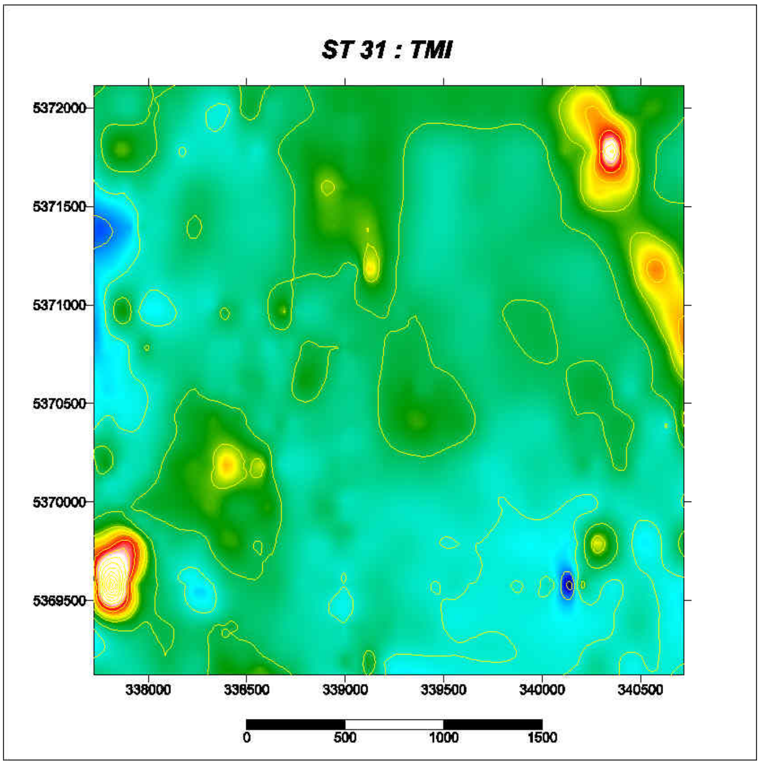



*Figure ST 31_2:* *TMI*

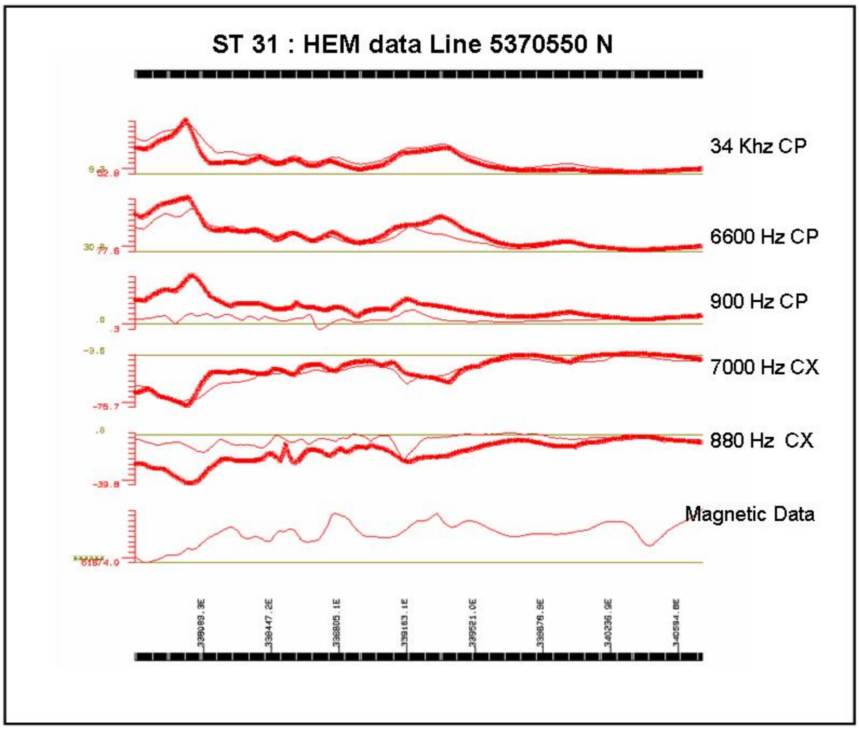



*Figure ST 31_3:* *HEM data line 5370550 N*

**ST 41**

Conductor ST 41 is a quality conductor to the SW of the main Granville East trend (Figure ST 41_1 and 2). In fact the EM data suggests that it is joined to the much broader Granville East conductor (Figure ST 41_1 ). It is associated with a magnetic anomaly although of a smaller amplitude than the main Granville East anomaly (Figure ST 41_3).

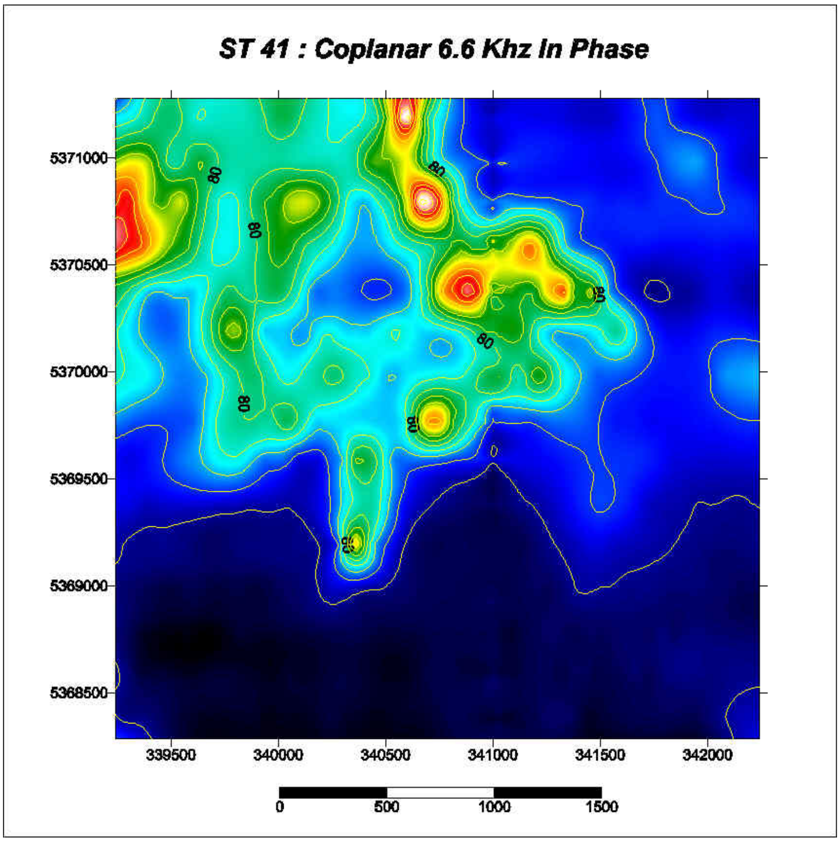



*Figure ST 41_1:* *Coplanar 6.6 Khz in phase*

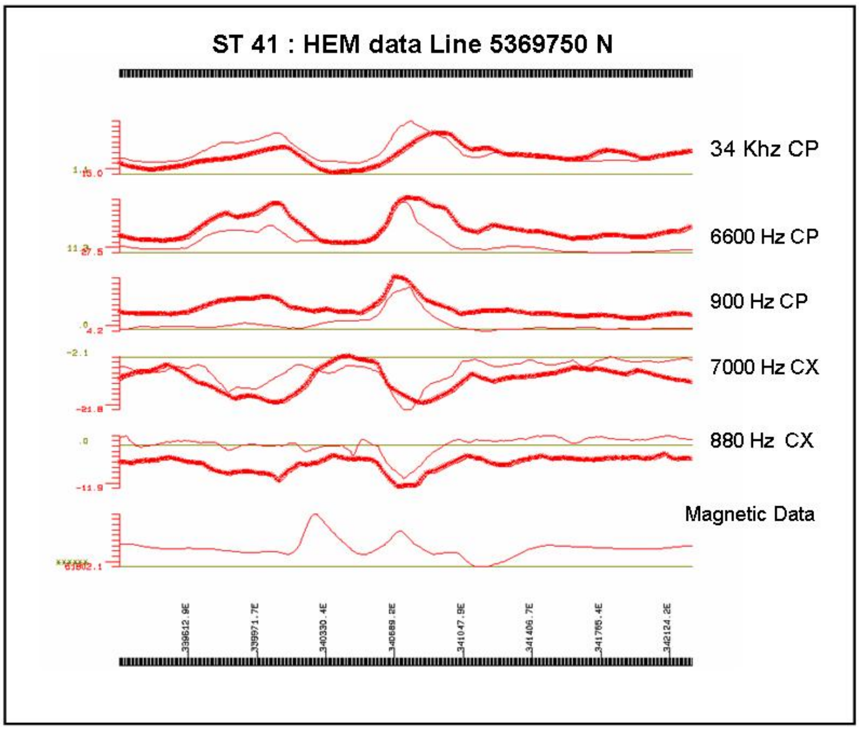



*Figure ST 41_2:* *HEM data line 5369750 N*

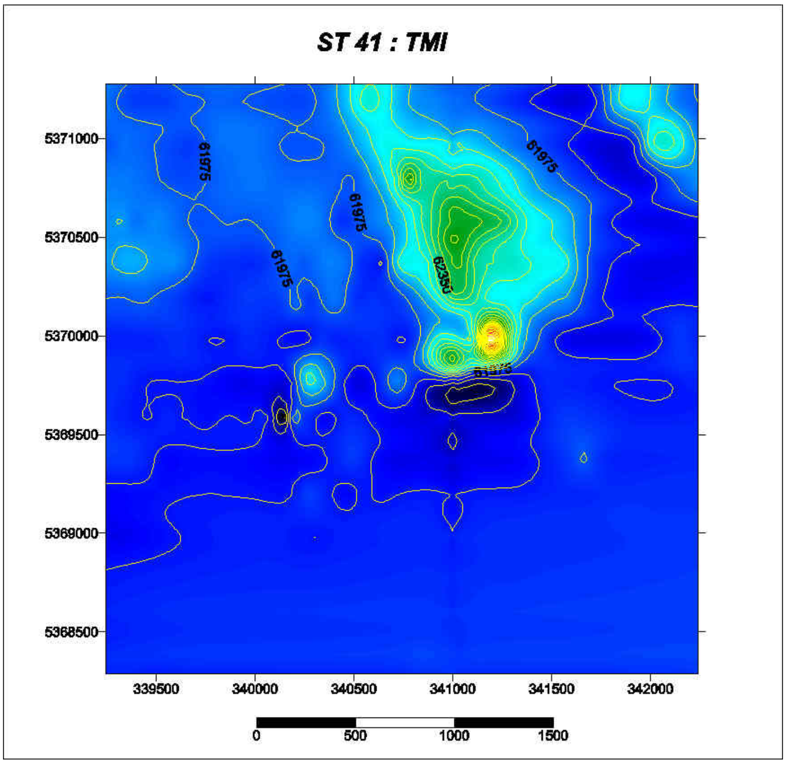



*Figure ST 41_3:* *TMI*

## ST 42

Target ST 42 is N – S striking EM feature with a moderate conductivity thickness product (Figures ST 42_1 and 2). It is to west and south of the main Granville East magnetic anomaly (Figure ST 42_1 and 3).

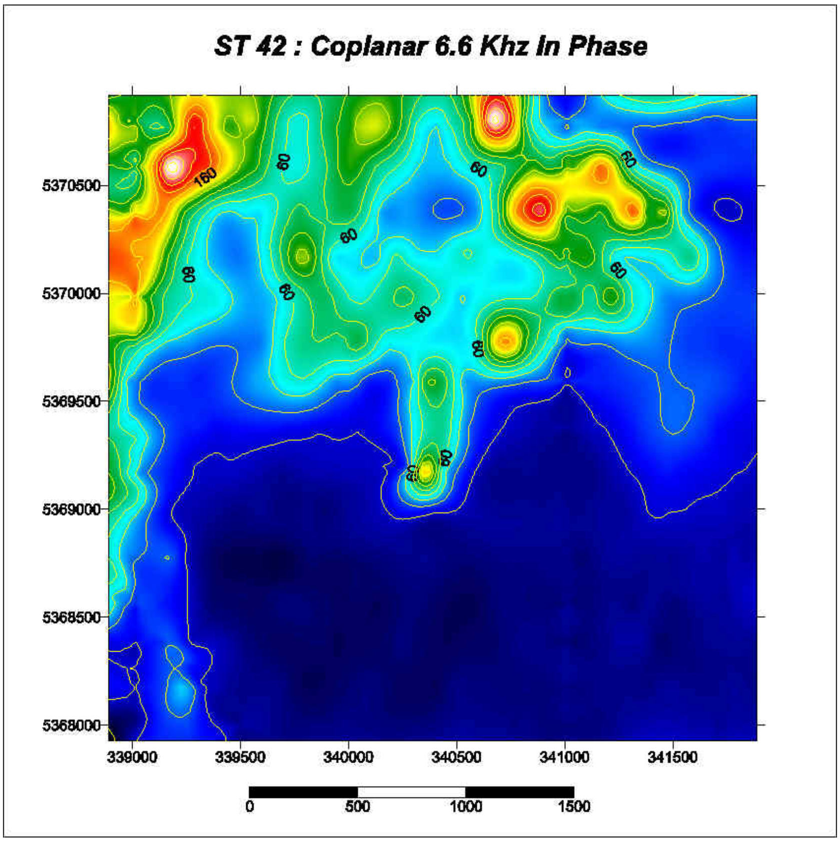



*Figure ST 42_1: Coplanar 6.6 Khz in phase*

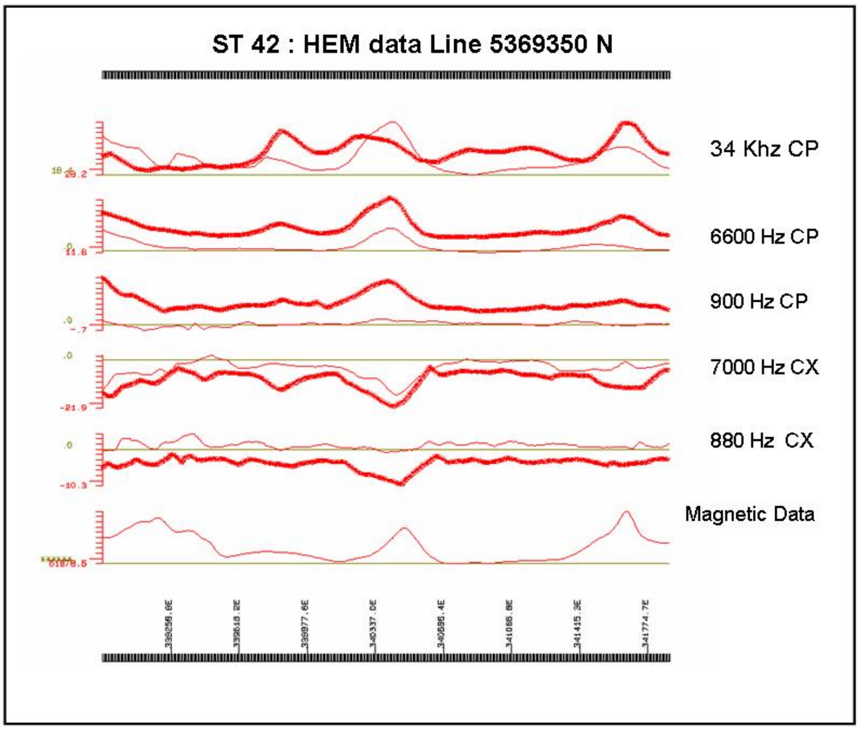



*Figure ST 42_2:* *HEM data line 5369350 N*

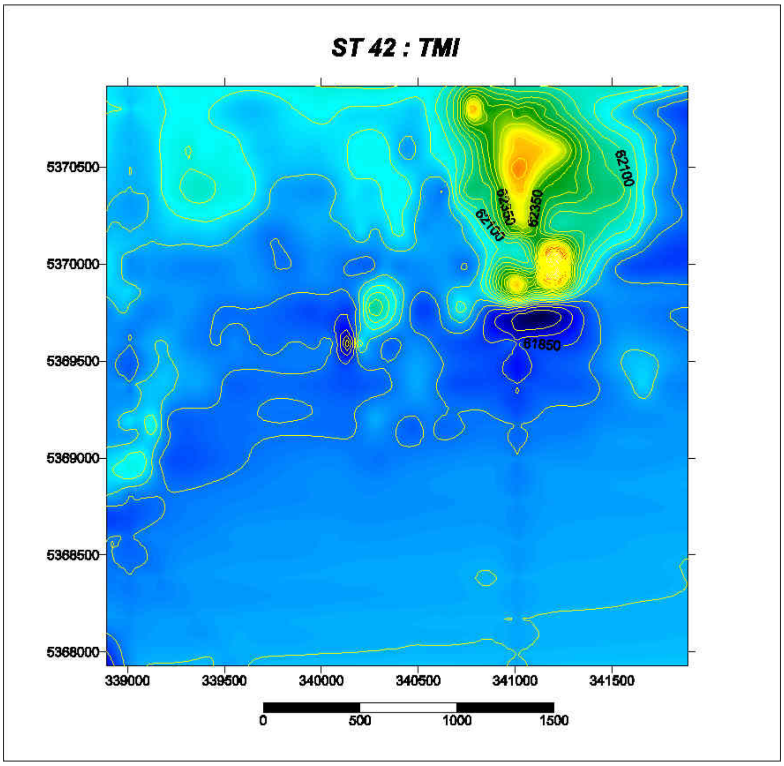



*Figure ST 42_3:* *TMI*

## ST 46

Target ST 46 is some 7000 – 1000 metres to the west of Big Rock magnetic / EM anomaly and mineralization (Figures ST 46_1 and 3). It has a strike length of approximately 500 metres and significant in phase response at the low frequencies identifies it as a moderate to good conductor (Figure ST 46_2). A “small” magnetic anomaly may be associated with this target (Figure ST 46_2 and 3).

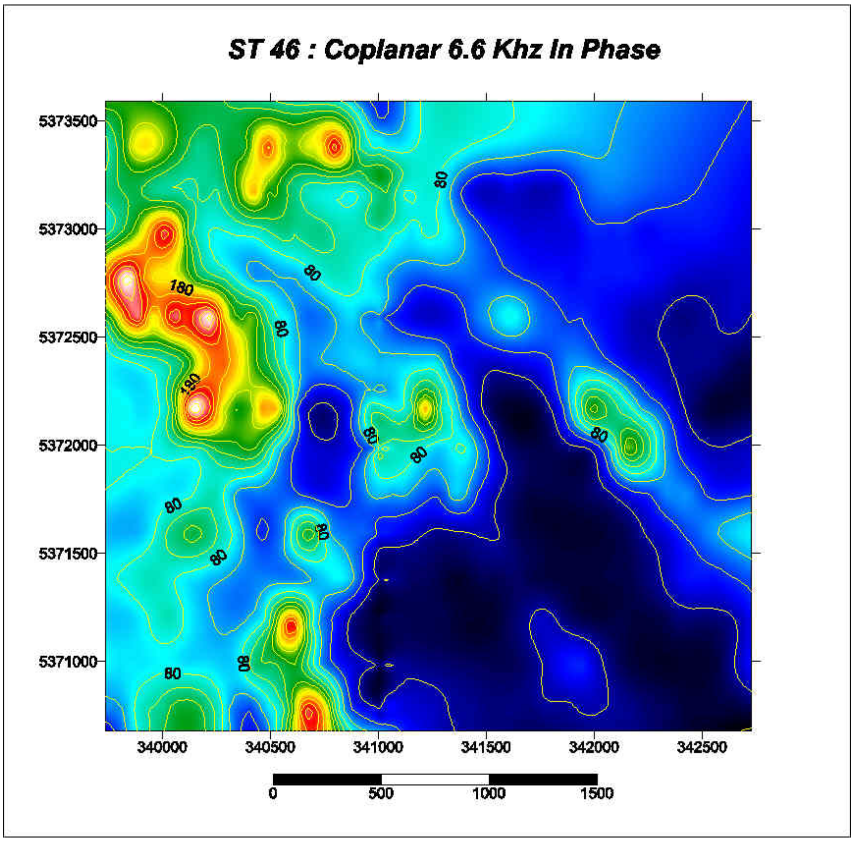



*Figure ST 46_1: Coplanar 6.6 Khz in phase*

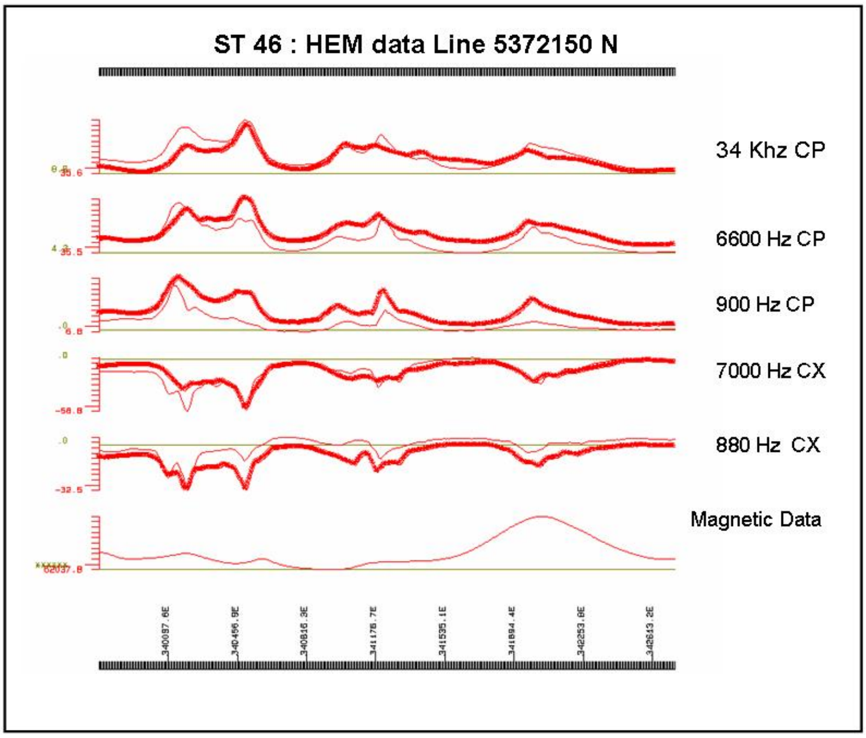



*Figure 46_1: HEM data line 5372150*

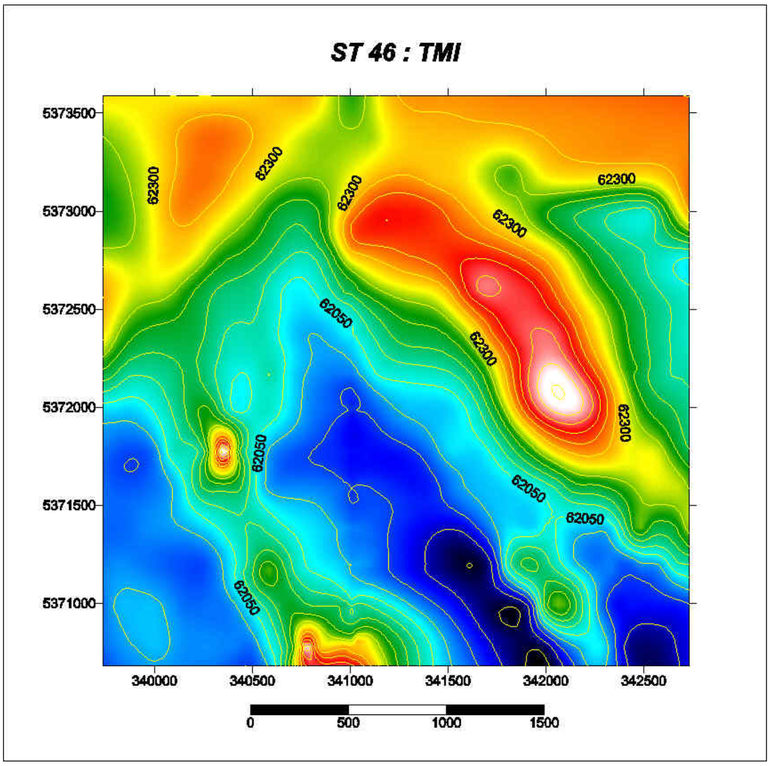



*Figure ST 46_1: TMI*

## ST 48

Target ST 48 is a complex approximately 1 kilometres long conductive zone (Figure ST 48_1). Its southern extremity is some 700 metres from the northern interpreted extremity of the Granville East mineralization (Target ST 31). Significant in phase response at the lowest frequency identify this to be one of the better conductors within the exploration licence. Its association with a magnetic anomaly is not clear although it appears to be part of the magnetic feature which joins up with the Granville East magnetic anomaly to the south (Figure ST 48_3).

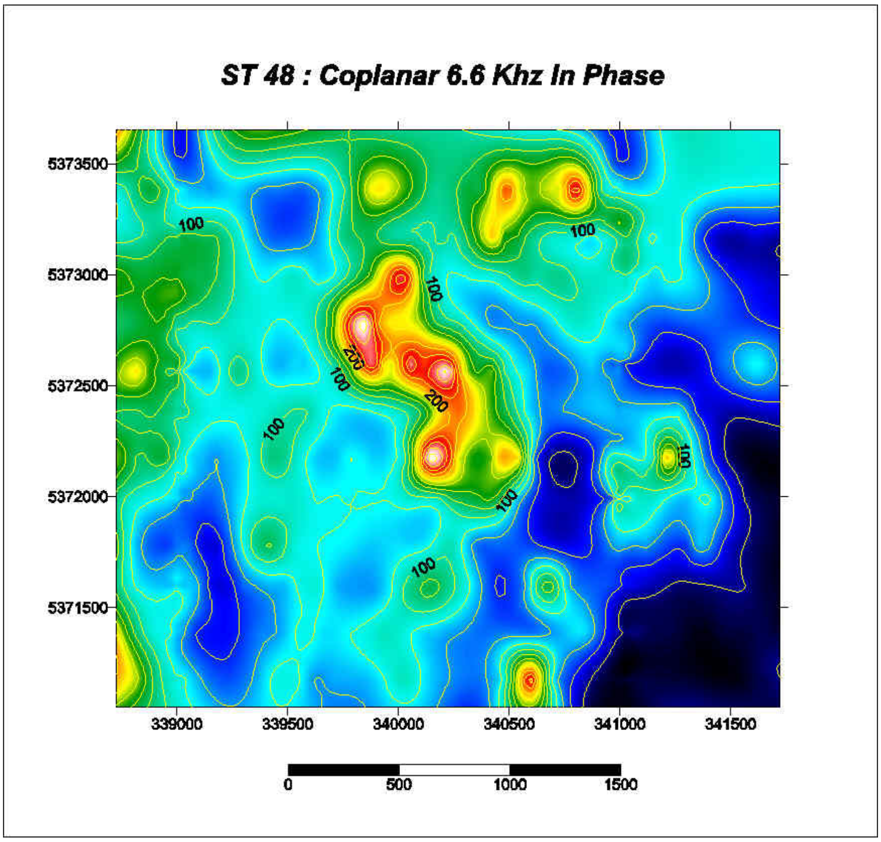



*Figure ST 48_1: Coplanar 6.6 Khz in phase*

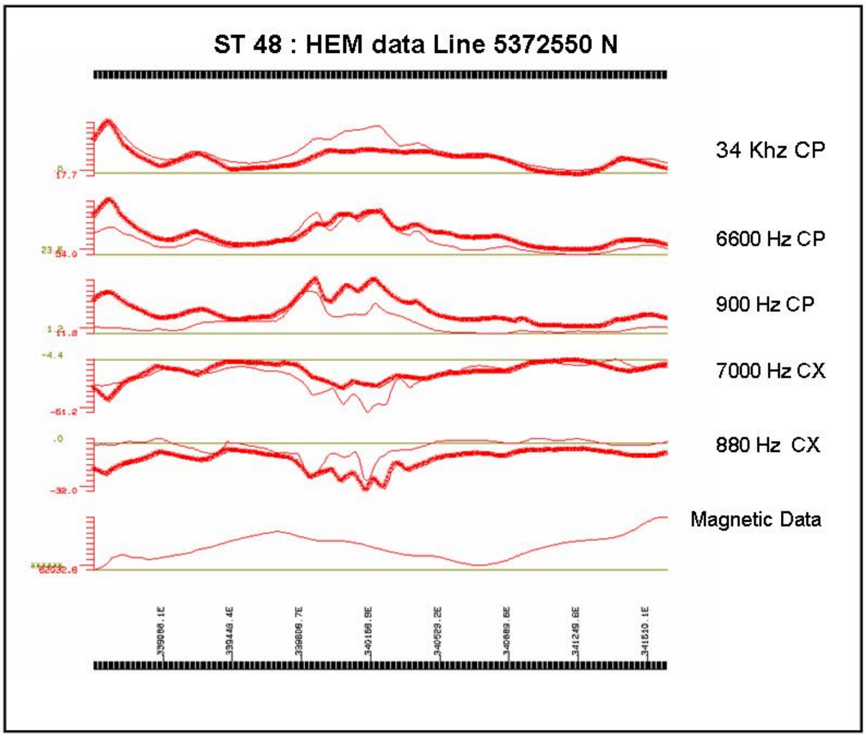



*Figure ST 48_2: HEM data line 5372550 N*

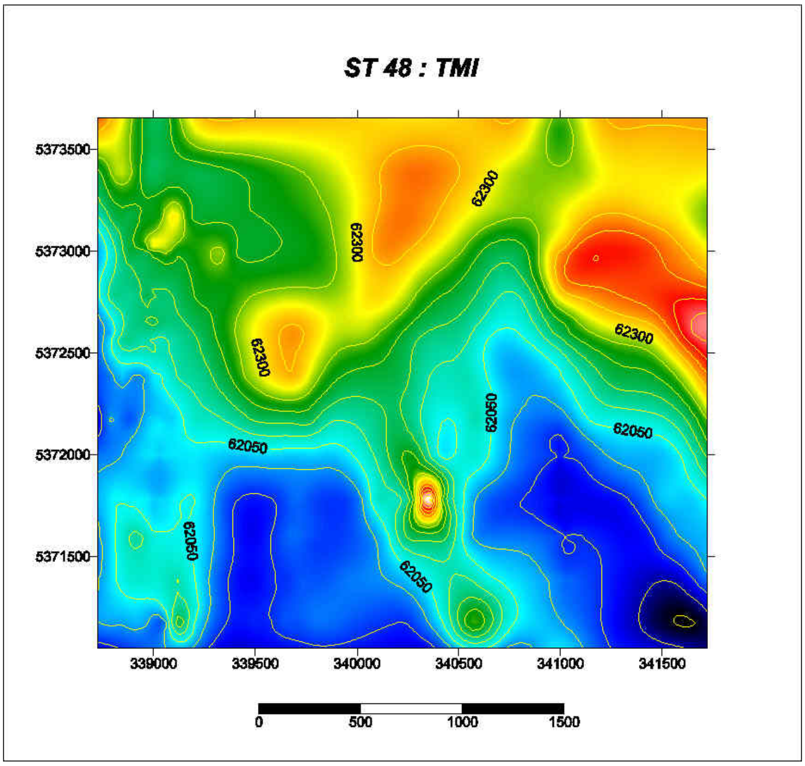



*Figure ST 48_3: TMI*

## ST 57

Target ST 57 is a limited strike length (200 – 300 metres) conductor on the magnetic NW trending feature which join up with the Big Rock magnetic anomaly to the NW (Figure ST 57_1 and 3). The small amplitude of the target response suggests that the conductor is at depth (Figure ST 57_3).

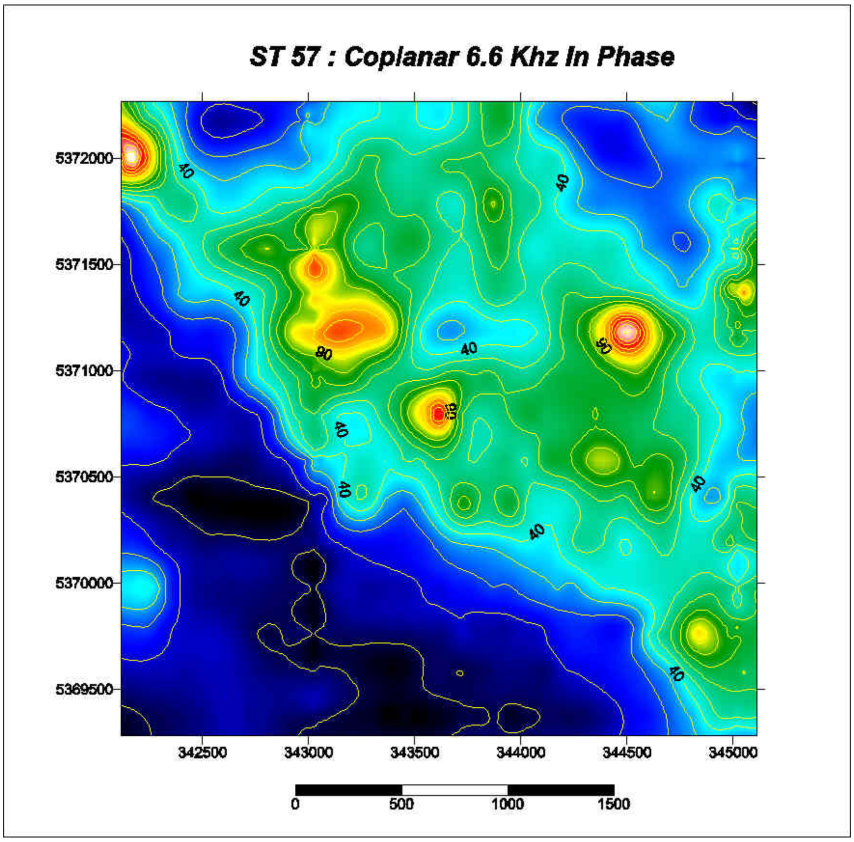



*Figure 57_1: Coplanar 6.6 Khz in phase*

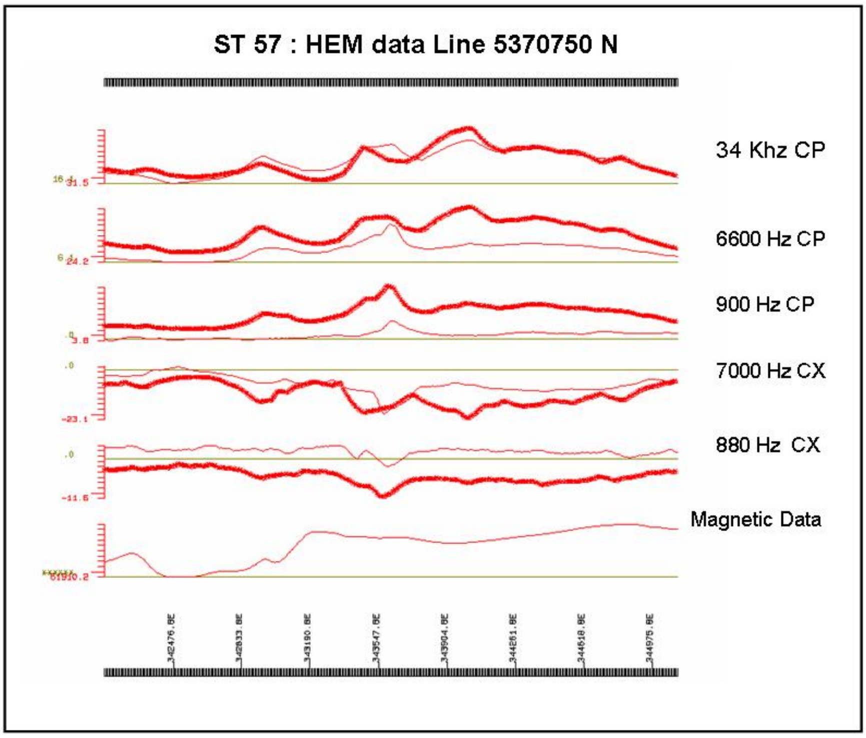



*Figure ST 57_2:* *HEM data line 5370750 N*

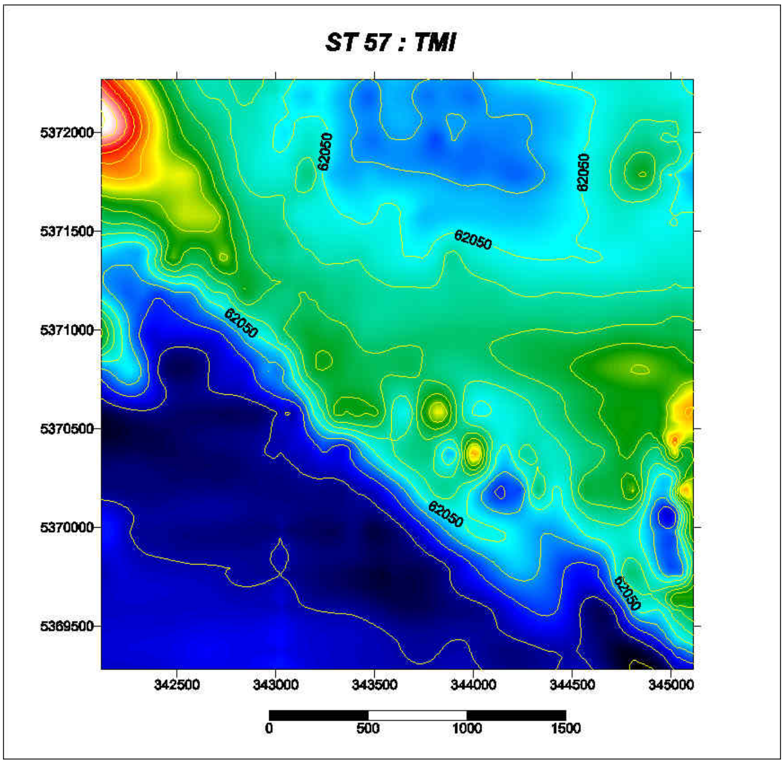



*Figure ST 57_3:* *TMI*

# APPENDIX II

## List of Targets Analysed Targets

| Target Number | East | North |
|---|---|---|
| 1 | 337000 | 5372000 |
| 2 | 336600 | 5372350 |
| 3 | 353933 | 5362410 |
| 4 | 354320 | 5362170 |
| 5 | 356170 | 5362260 |
| 6 | 355630 | 5362320 |
| 7 | 346130 | 5368030 |
| 8 | 346340 | 5368630 |
| 9 | 344970 | 5367710 |
| 10 | 345540 | 5367790 |
| 11 | 347320 | 5367410 |
| 12 | 345300 | 5369760 |
| 13 | 344410 | 5370560 |
| 14 | 344520 | 5371190 |
| 15 | 343130 | 5371220 |
| 16 | 342050 | 5372080 |
| 17 | 343870 | 5371790 |
| 18 | 342200 | 5369940 |
| 19 | 336450 | 5372950 |
| 20 | 336820 | 5372590 |
| 21 | 337530 | 5372950 |
| 22 | 339850 | 5372750 |
| 23 | 340120 | 5372230 |
| 24 | 338660 | 5368780 |
| 25 | 335770 | 5372350 |
| 26 | 346070 | 5371750 |
| 27 | 346370 | 5370950 |
| 28 | 341850 | 5370980 |
| 29 | 341290 | 5370410 |
| 30 | 340700 | 5370800 |
| 31 | 339220 | 5370615 |
| 32 | 345200 | 5367500 |
| 33 | 347200 | 5367300 |
| 34 | 341250 | 5370300 |
| 35 | 342000 | 5372000 |
| 36 | 344830 | 5369790 |
| 37 | 346670 | 5369170 |
| 38 | 347030 | 5370310 |
| 39 | 346780 | 5369790 |
| 40 | 347100 | 5369200 |
| 41 | 340740 | 5369780 |
| 42 | 340390 | 5369420 |
| 43 | 339850 | 5370030 |
| 44 | 340095 | 5370770 |
| 45 | 340810 | 5373410 |

| | | |
|---|---|---|
| 46 | 341230 | 5372165 |
| 47 | 340490 | 5373390 |
| 48 | 340220 | 5372540 |
| 49 | 340510 | 5372190 |
| 50 | 343250 | 5371950 |
| 51 | 340750 | 5373400 |
| 52 | 345190 | 5370050 |
| 53 | 338525 | 5369390 |
| 54 | 340115 | 5371575 |
| 55 | 339530 | 5372360 |
| 56 | 343095 | 5371290 |
| 57 | 343610 | 5370770 |
| 58 | 354500 | 5361750 |
| 59 | 338350 | 5370980 |
| 60 | 337825 | 5369620 |
| 61 | 337300 | 5370895 |
| 62 | 337050 | 5370510 |
| 63 | 345110 | 5371530 |
| 64 | 343750 | 5370410 |
| 65 | 341125 | 5373140 |
| 66 | 337850 | 5372215 |

# APPENDIX III

# Discoveries through innovations in airborne and Ground TDEM

**By**

**Jovan Silic**