

A Practical One-Day Workshop on Airborne Electromagnetics, November 2012

VTEM airborne EM system clearly detects Abra polymetallic base metal deposit; an ongoing comparison to other airborne and ground EM systems

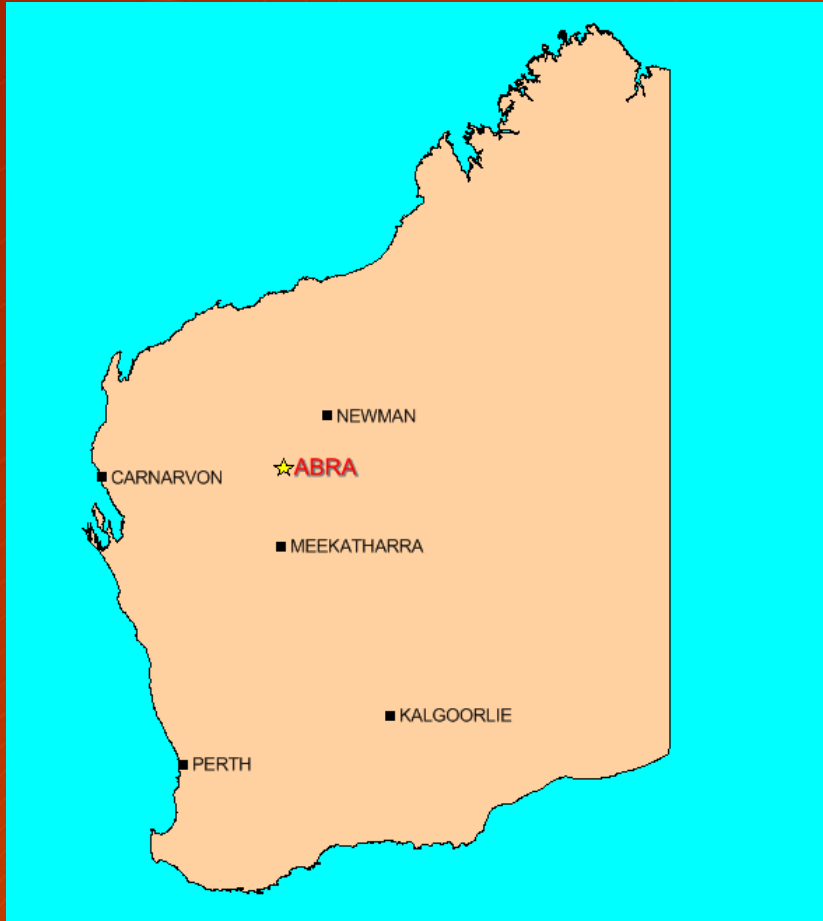
J. Meyers, J. Wood, D. Stannard and N. Cantwell: *Resource Potentials Pty Ltd*

Keith Fisk: *Geotech Airborne Pty Ltd*

M. Wang and L. Hardy: *Abra Mining Pty Ltd*

ABRA POLYMETALLIC BASE METAL DEPOSIT

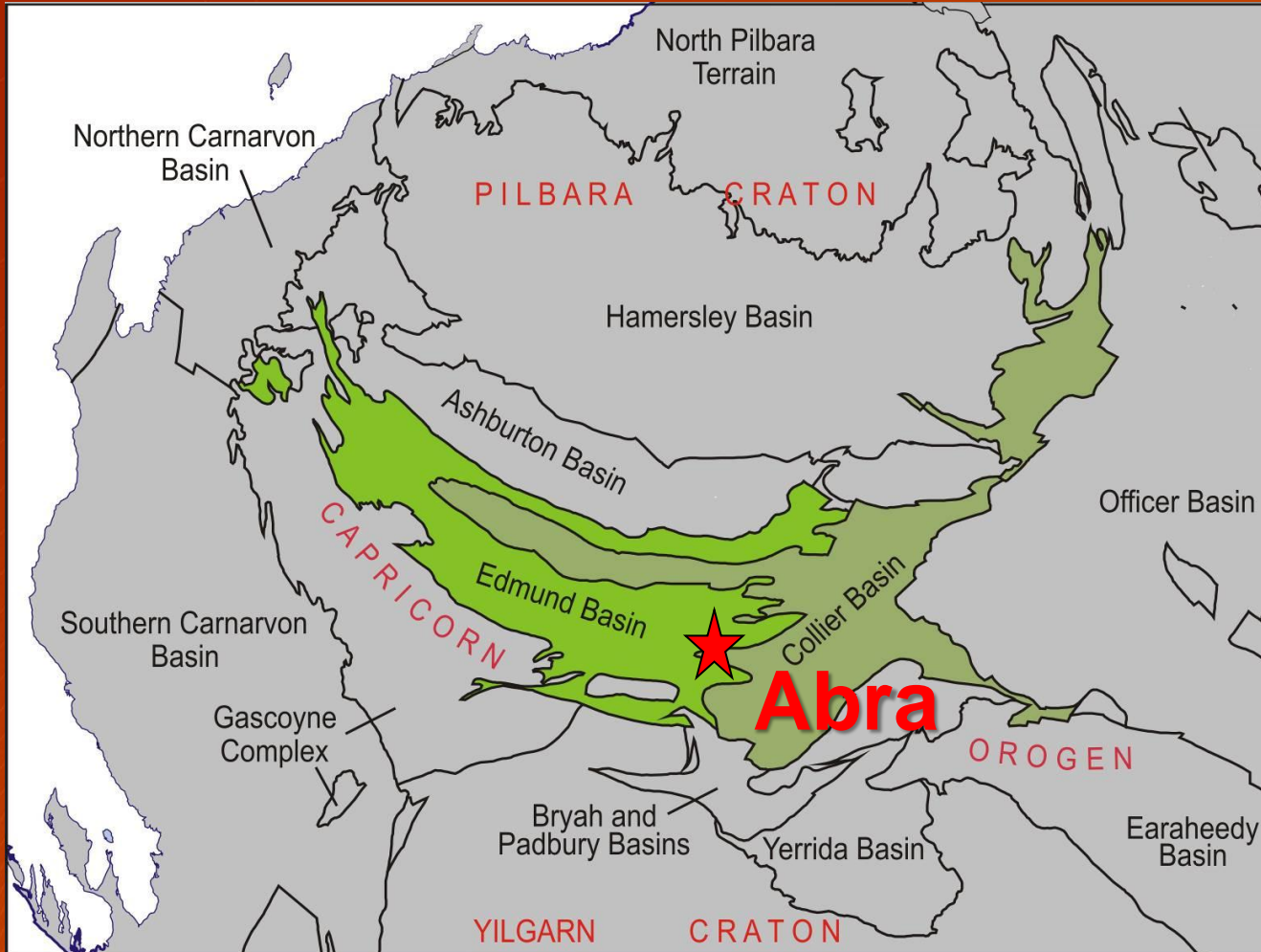
- Abra is a SEDEX (Sedimentary Exhalative) deposit
- Discovered in 1981 by drilling a blind coincident magnetic and gravity anomaly to over 250m depth



ABRA POLYMETALLIC BASE METAL DEPOSIT

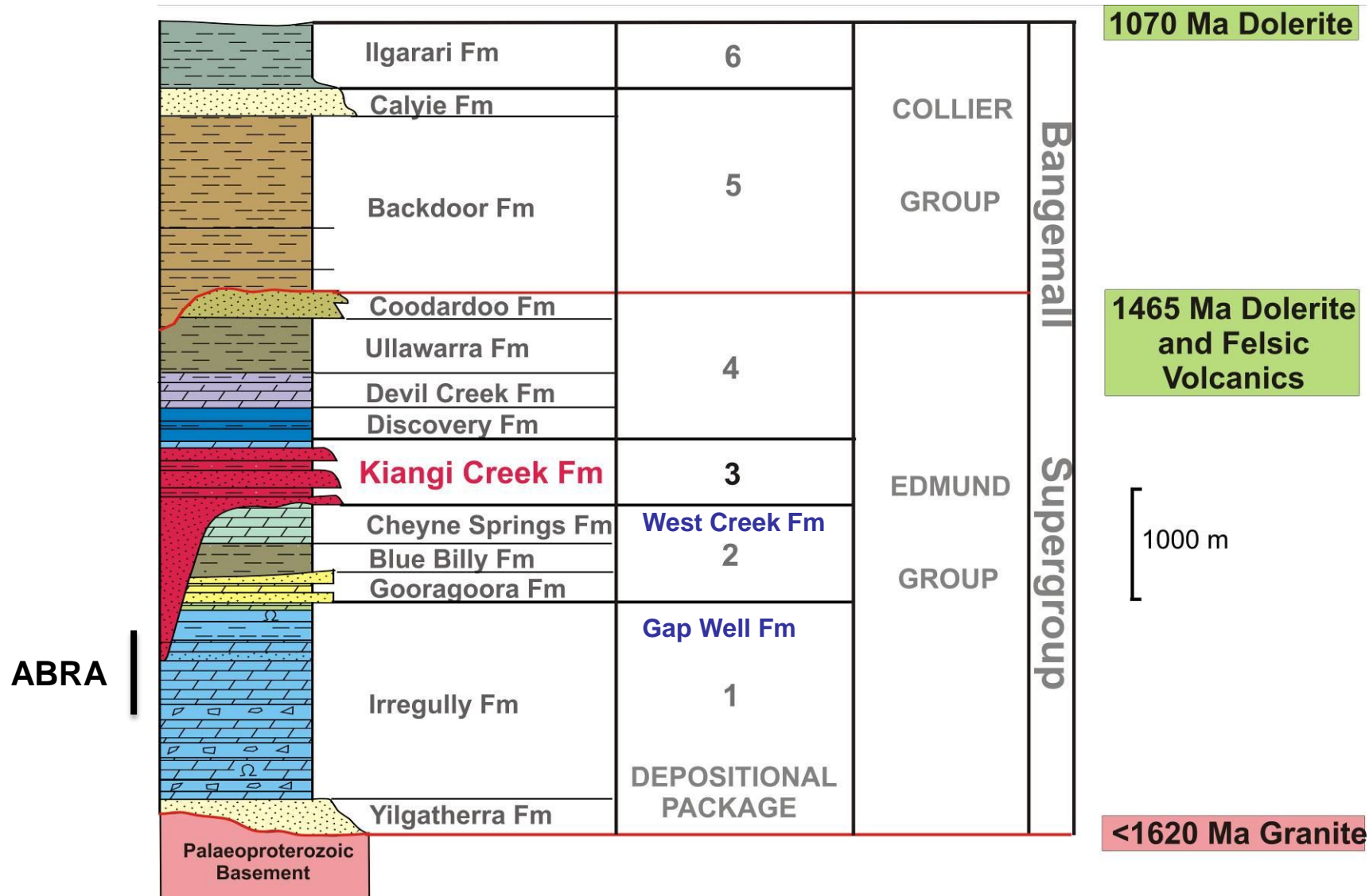
- Upper Stratabound zone main source of magnetic anomaly with MAGNETITE alteration and some PYRRHOTITE, underlain by HEMATITE alteration
- Entire mineralised zone contains some BARITE alteration, iron oxide minerals with minor Pb and Cu sulphides which contribute to gravity anomaly
- Deep base metal deposit still in the ground and is free of cultural interference – Excellent geophysical testing ground

LOCATION OF THE ABRA BASE METAL DEPOSIT

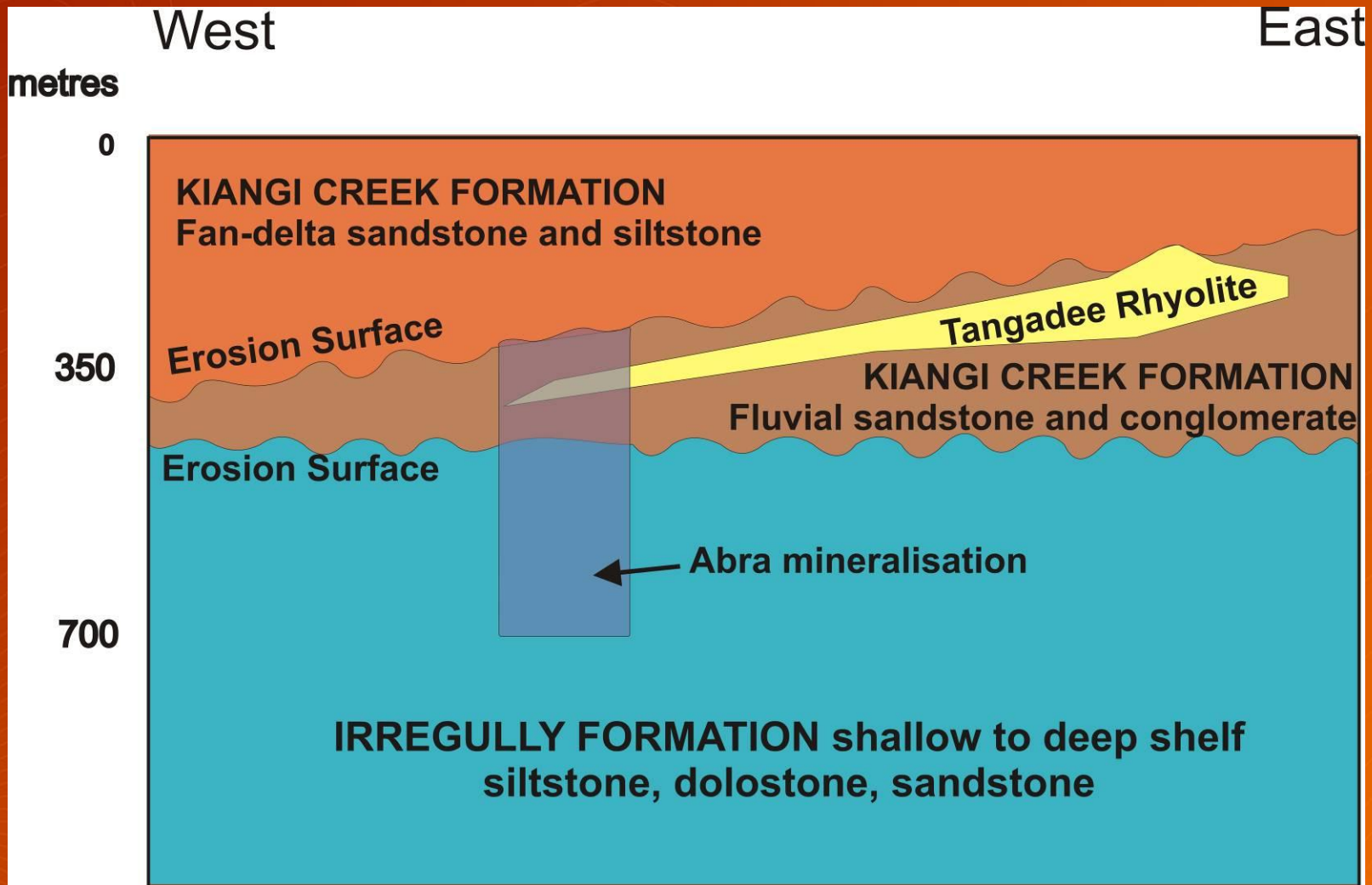


- Lies within the Former Bangemall Basin
- Now the Edmund and Collier Basins

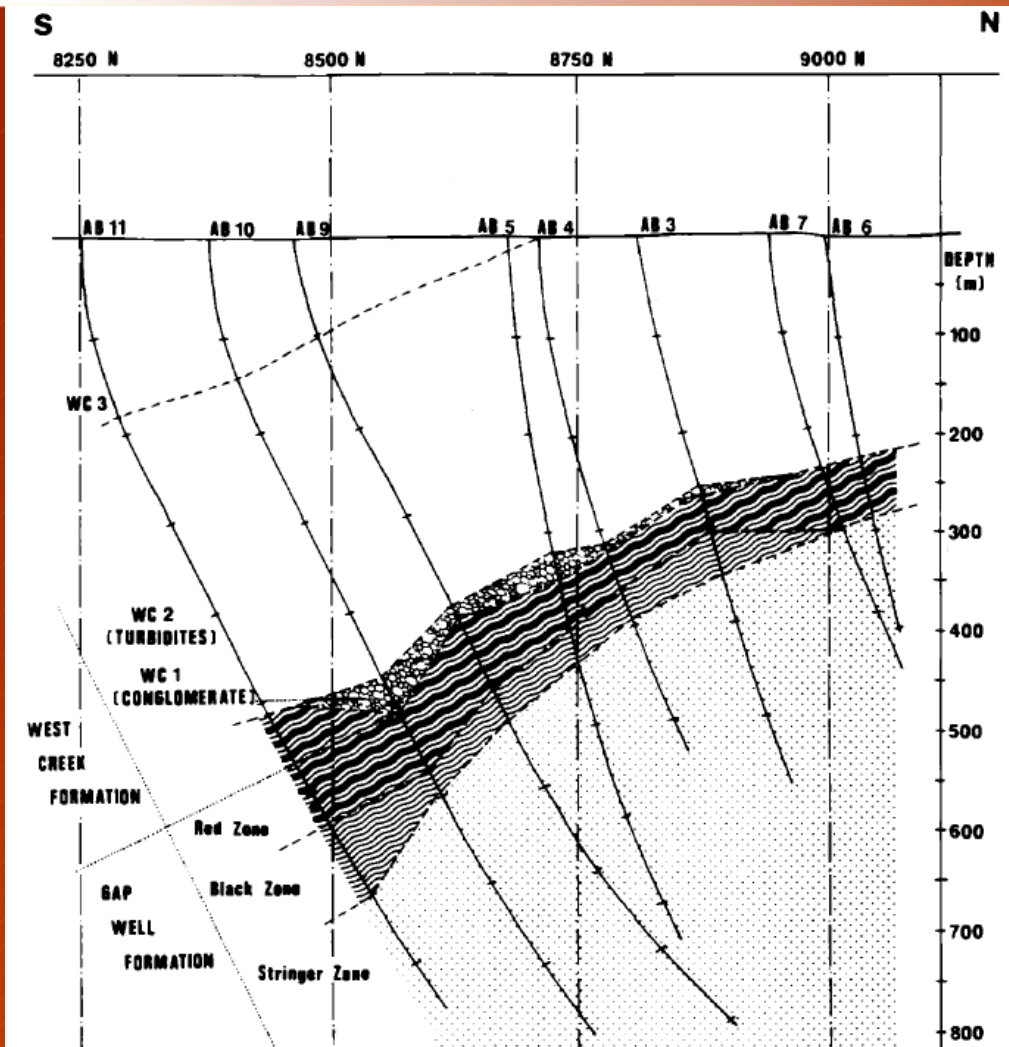
REVISED STRATIGRAPHY BY THE GSWA



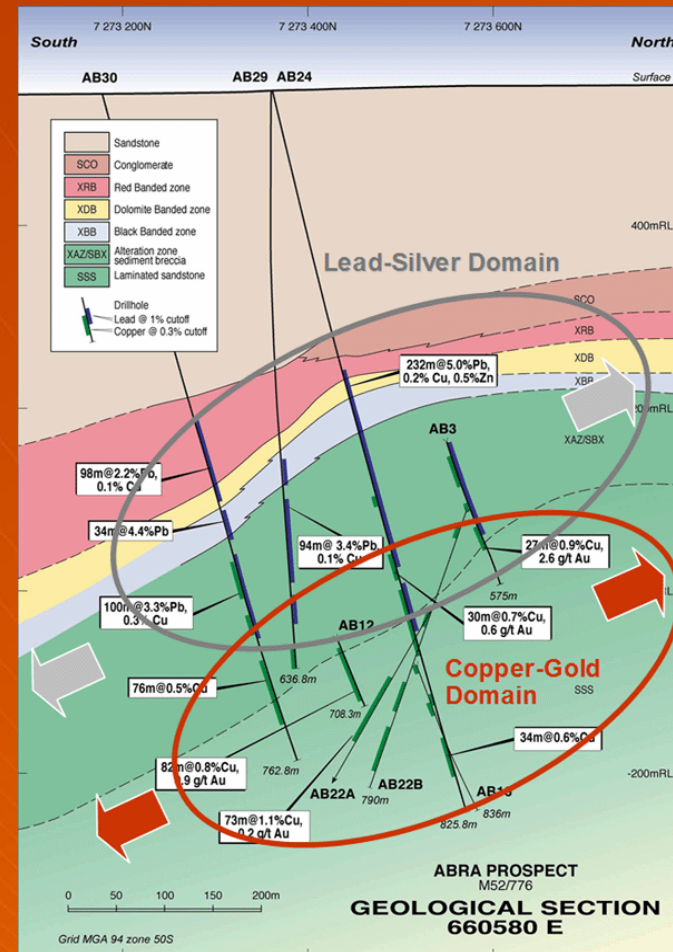
SIMPLIFIED MINERALISATION LOCATION



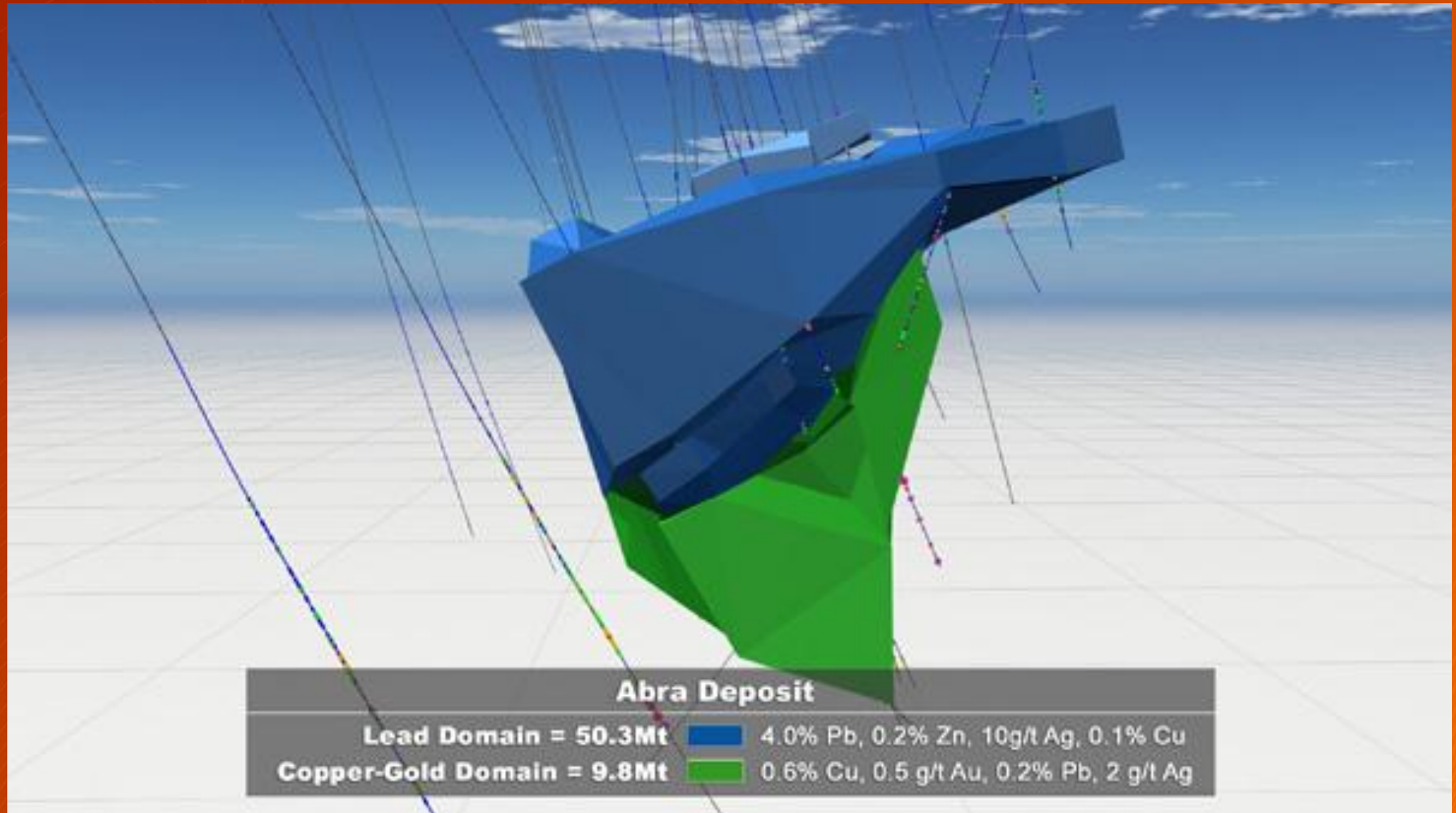
GEOLOGICAL CROSS SECTION



REPRODUCED FROM VOGHT AND STUMPF, 1987

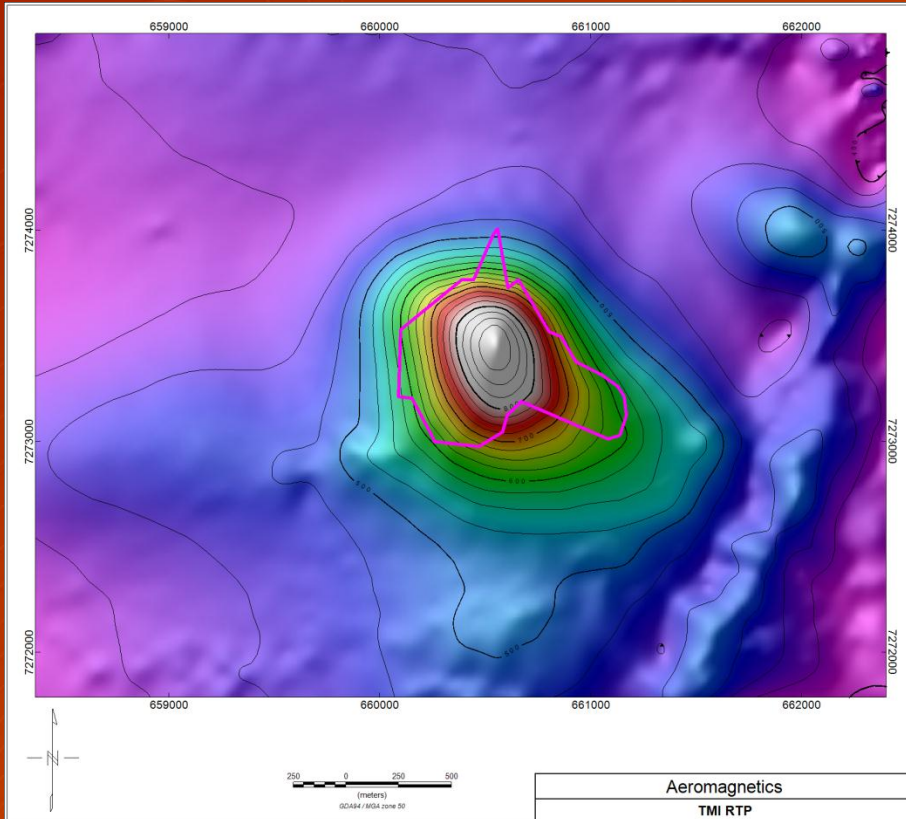


3D VIEW RESOURCE MODEL VIEW OF UPPER Pb-RICH UNIT AND LOWER Cu-RICH UNIT

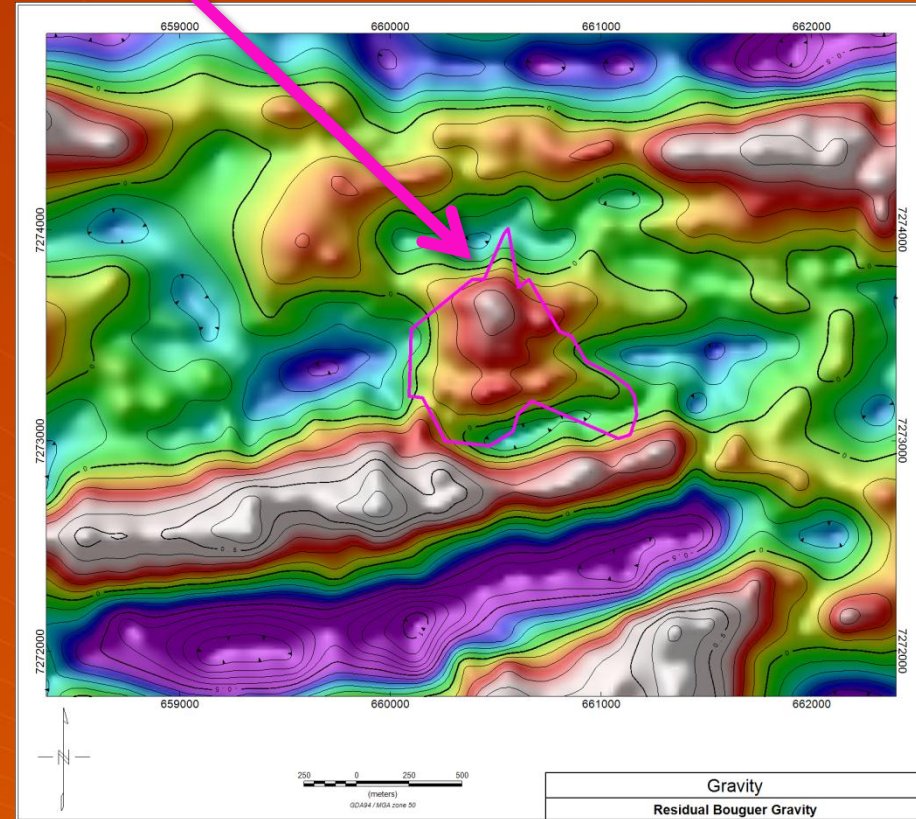


ABRA GEOPHYSICAL SIGNATURE

Abra Orebody Wireframe



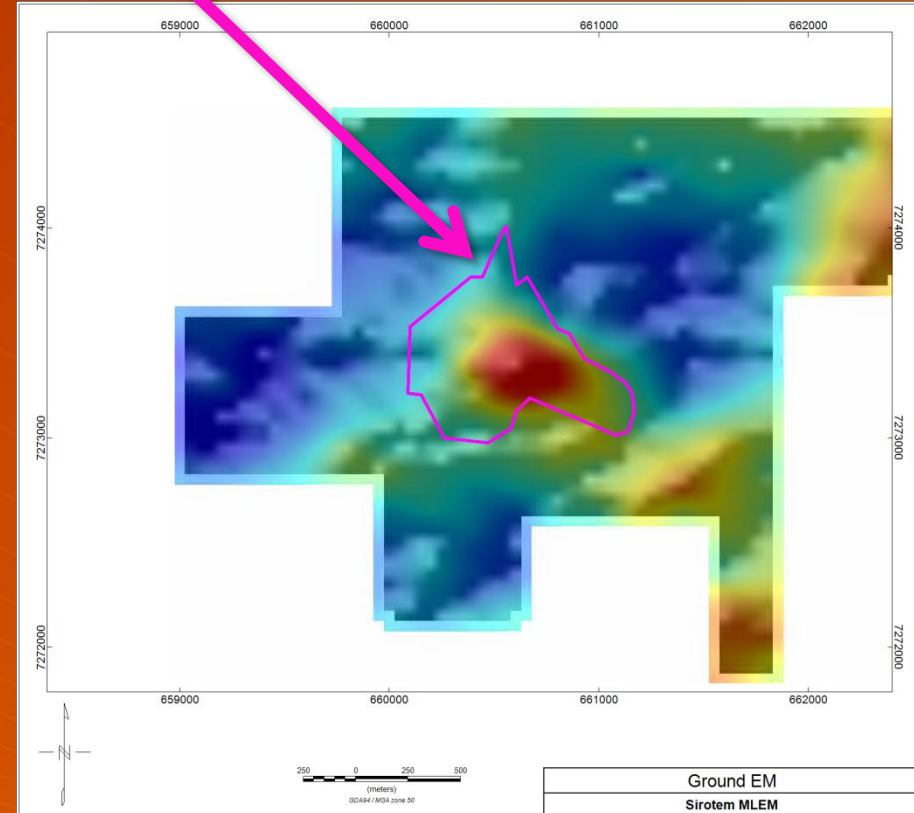
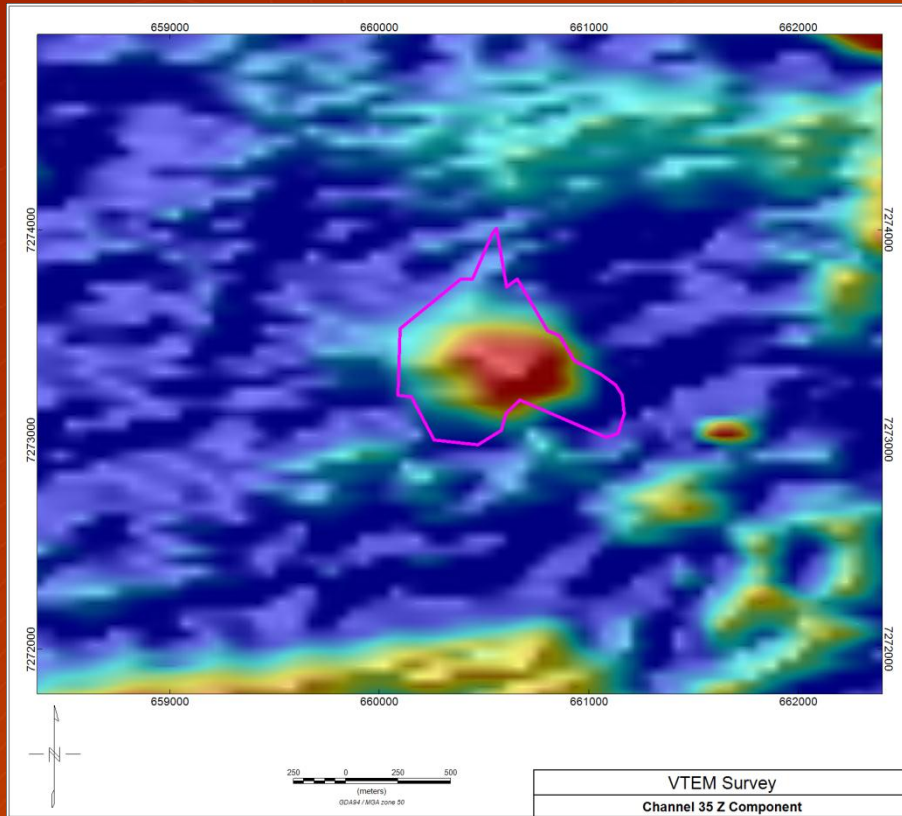
Aeromagnetics



Gravity

ABRA GEOPHYSICAL SIGNATURE

Abra Orebody Wireframe



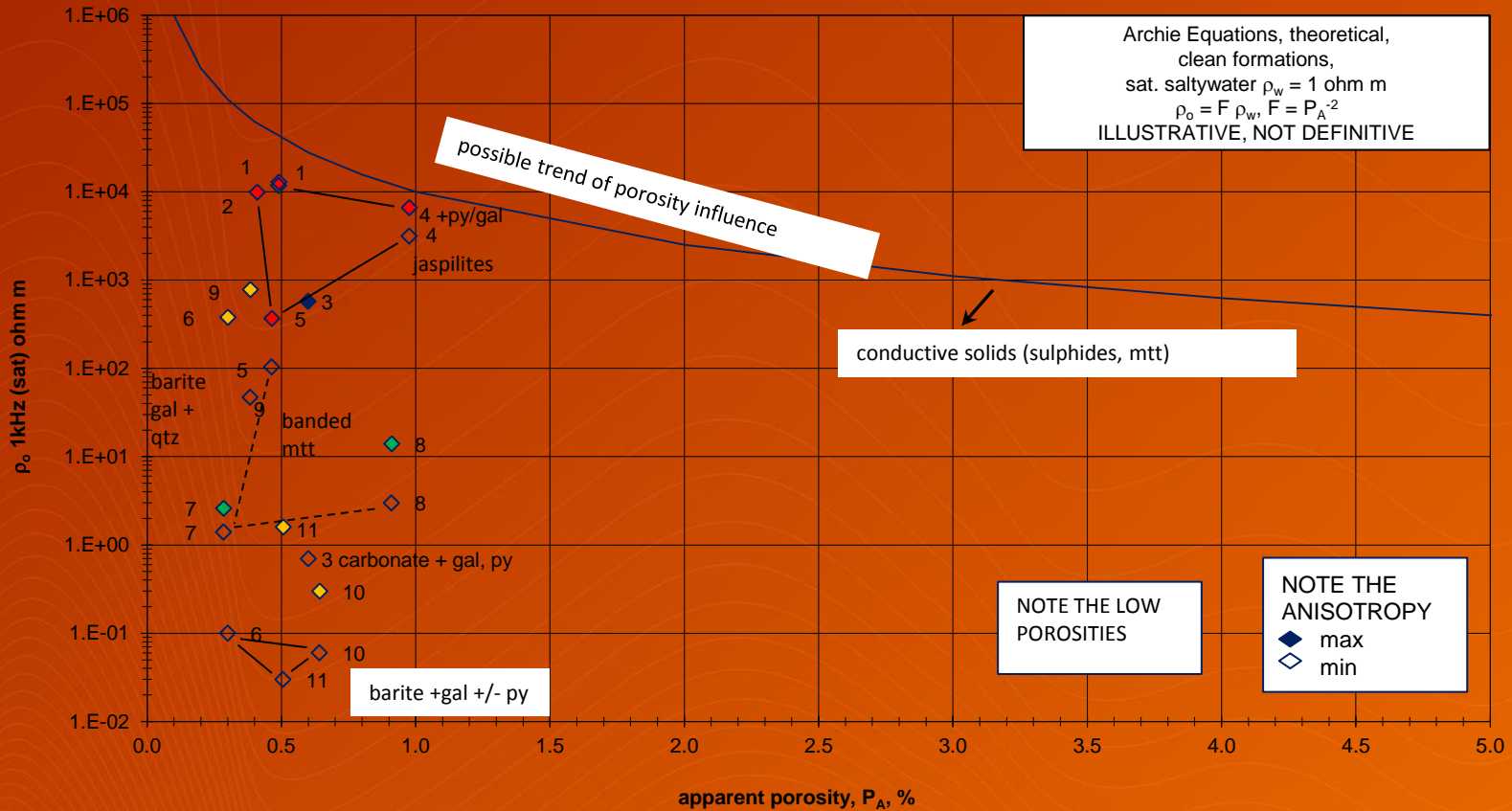
AEM - VTEM

Ground EM - SIROTEM

RESISTIVITY vs POROSITY

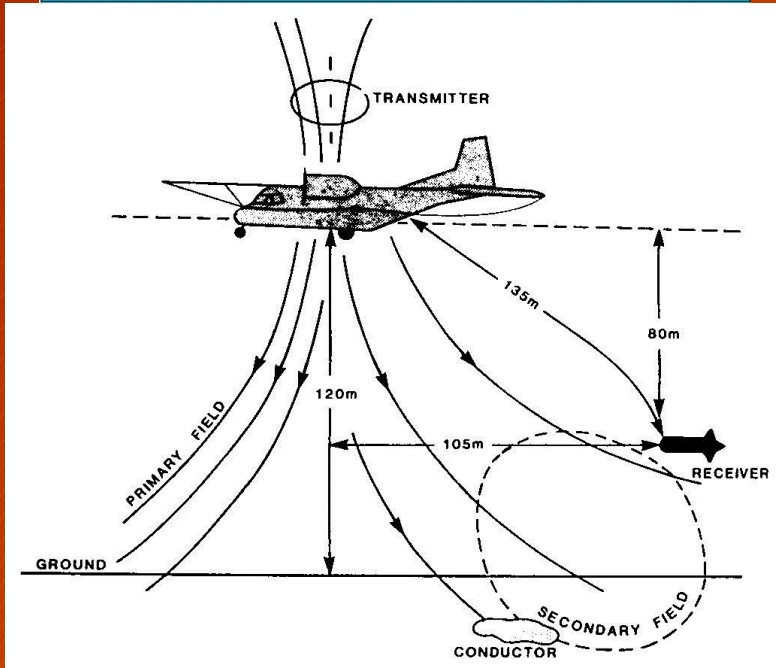
- Moderate conductor - Presence of Galena (PbS)

Fig R_{sat} vs P_A



TIME DOMAIN AEM SYSTEMS

GEOTEM – Geotrex / Fugro



XTEM - GPX



VTEM Plus - Geotech

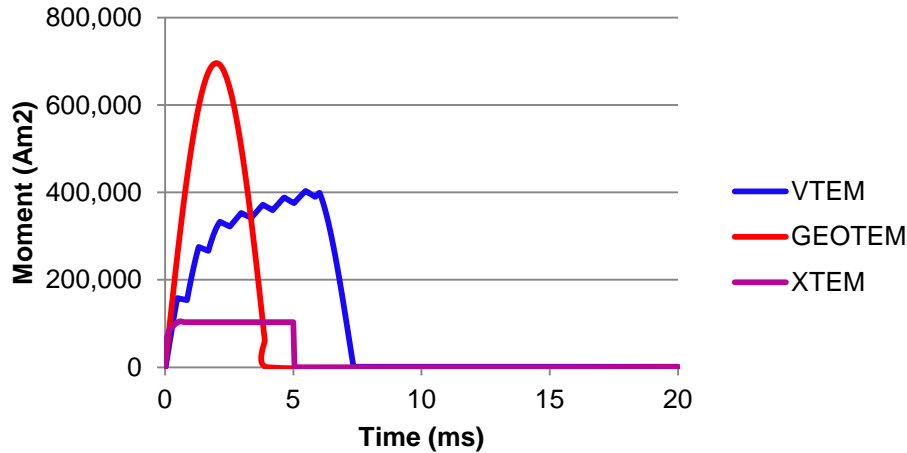


TIME DOMAIN AEM SYSTEMS - SPECIFICATIONS

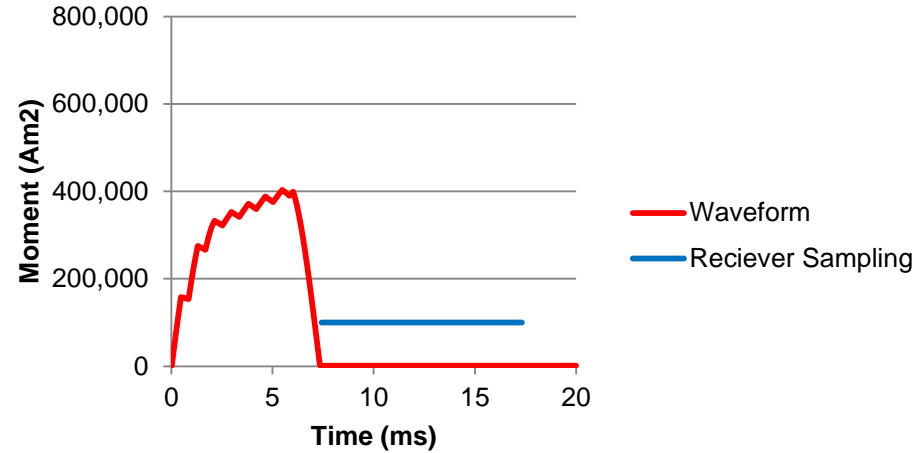
System	VTEM Plus	Geotem Deep	XTEM
Abra Survey Date	2012	1996	2011
Configuration	In Loop	Towed Bird	In Loop
Frequency (Hz)	25	25	25
Terrain Clearance (m)	25	60	35
Tx Dipole Moment (Am ²)	403506	696000	103200
Waveform	Trapezoidal	Half Sinusoid	Square Wave 25% Duty Cycle
Number Off Time Channels	35	16	30
Latest Channel Time Centers (ms)	9.286	14.486	11.733
Components	Z & X dB/dt & B Field	Z & X dB/dt (3 comp B Field now available)	Z dB/dt

TIME DOMAIN AEM SYSTEMS - WAVEFORMS

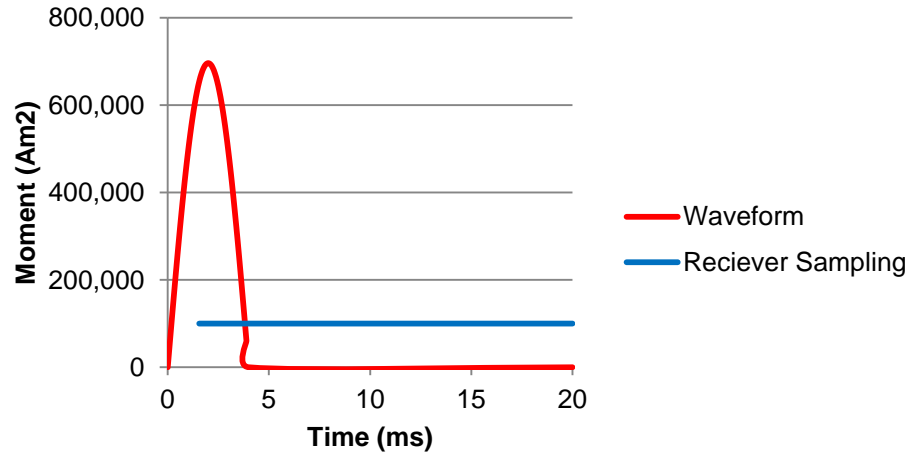
Airborne EM Waveforms



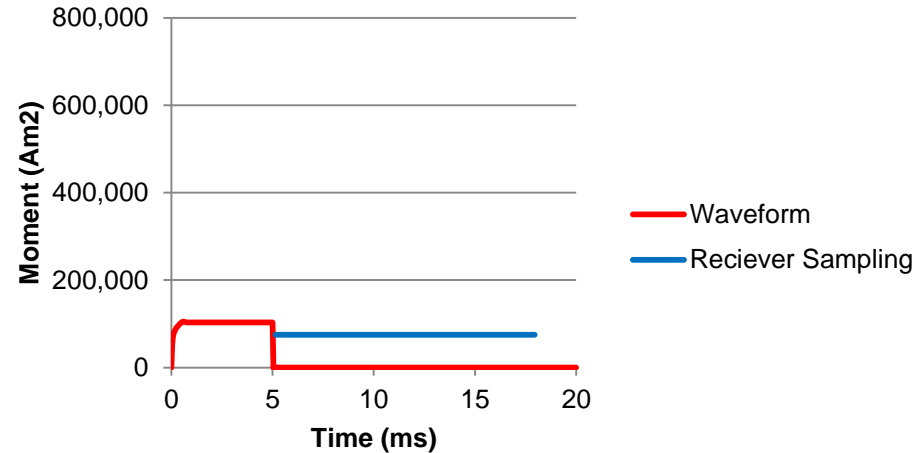
VTEM Plus



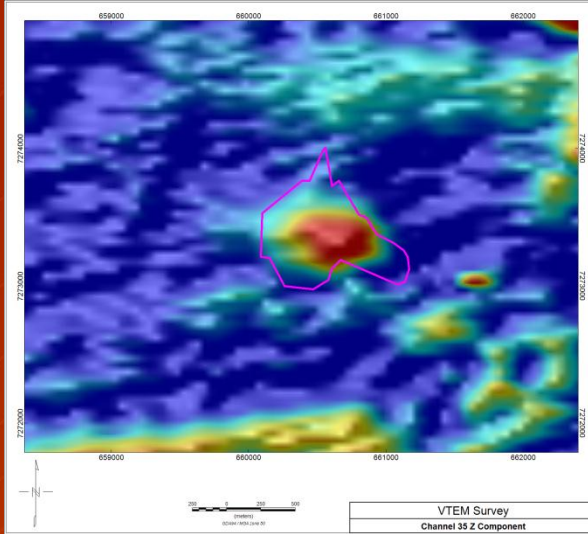
GEOTEM Deep



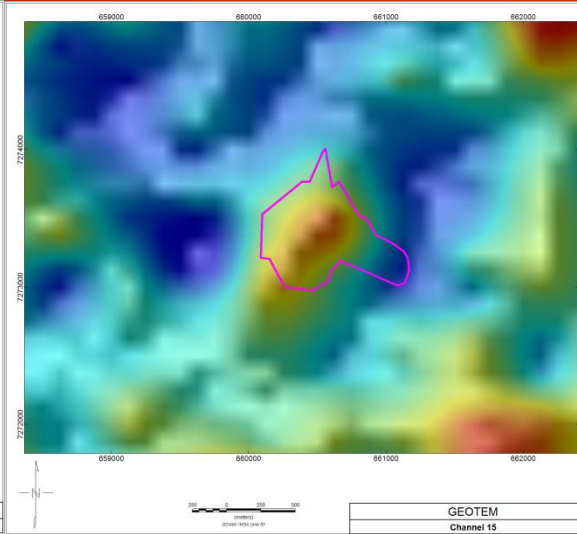
XTEM



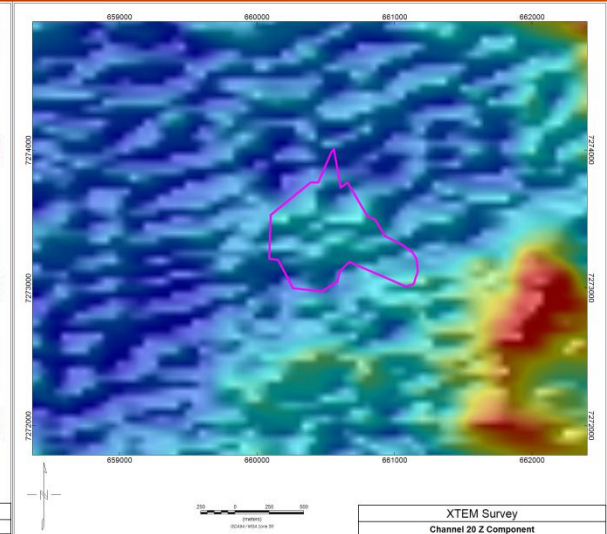
ABRA AEM RESPONSE – CHANNEL IMAGES



**VTEM Plus
Ch 35 B Field**

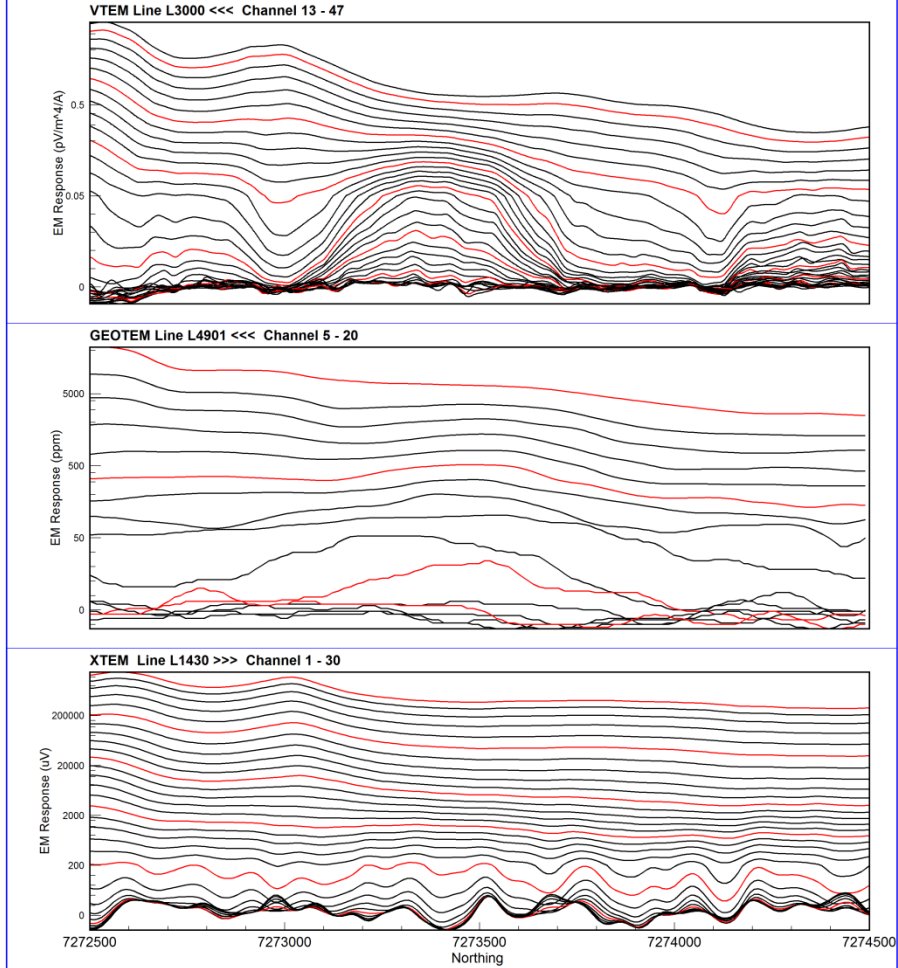


**GEOTEM Deep
Ch 15 dB/dt**



**XTEM
Ch 20 dB/dt**

ABRA AEM RESPONSE - PROFILES



S

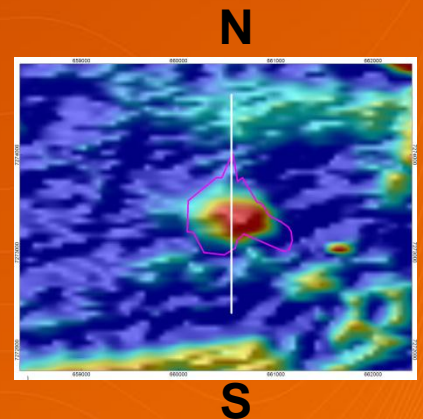
ABRA

N

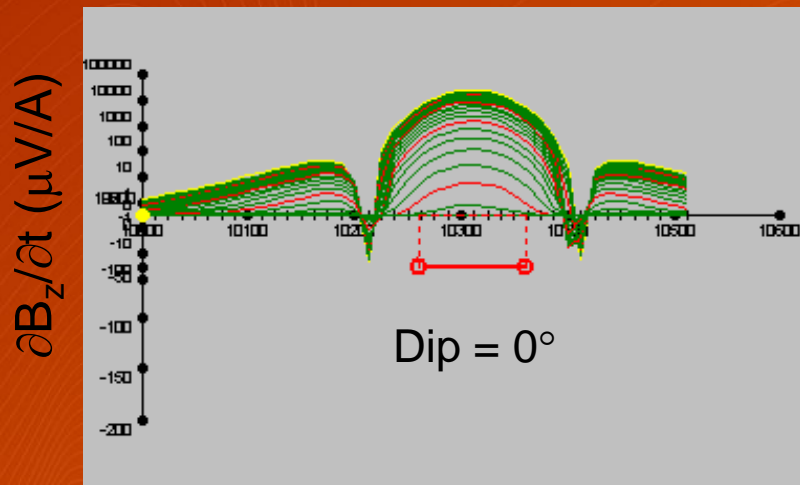
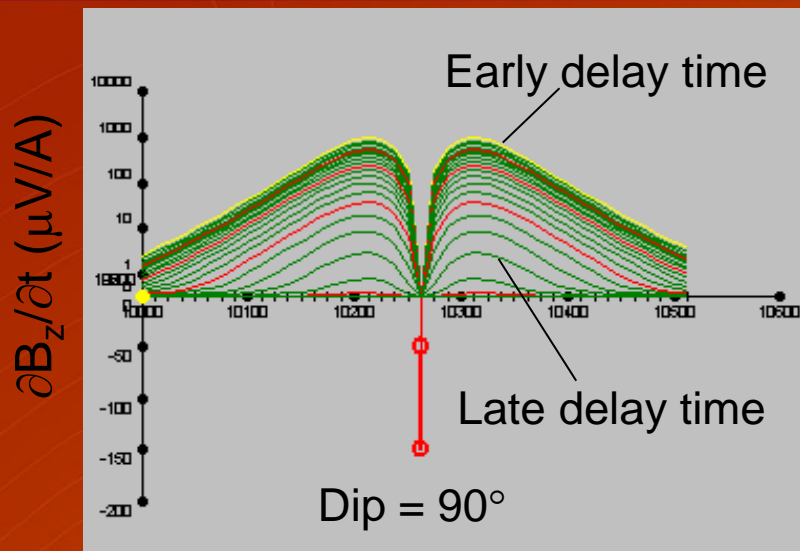
VTEM Plus – 2012
(Geotech)

GEOTEM Deep – 1996
(Geotrex / Fugro)

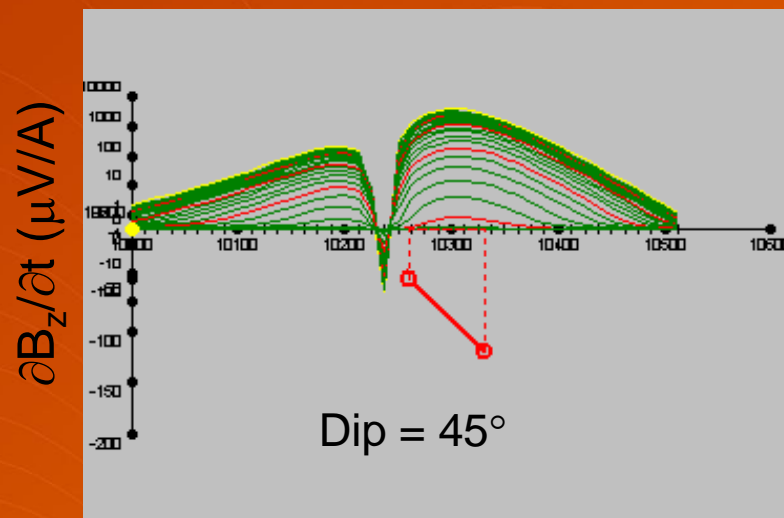
XTEM – 2011
(GPX)



MODELLED IN LOOP Z RECEIVER RESPONSES

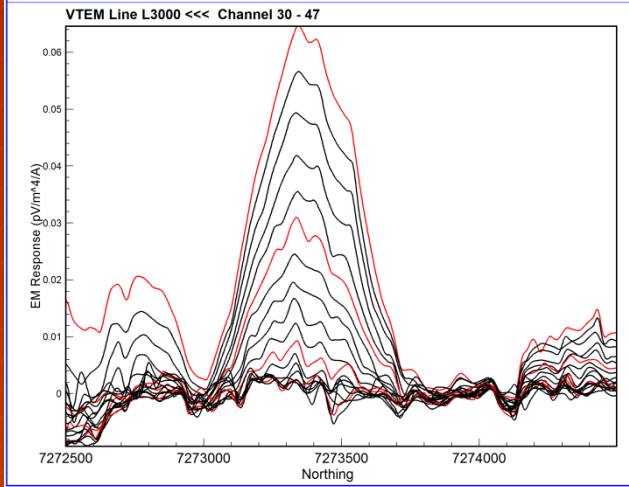
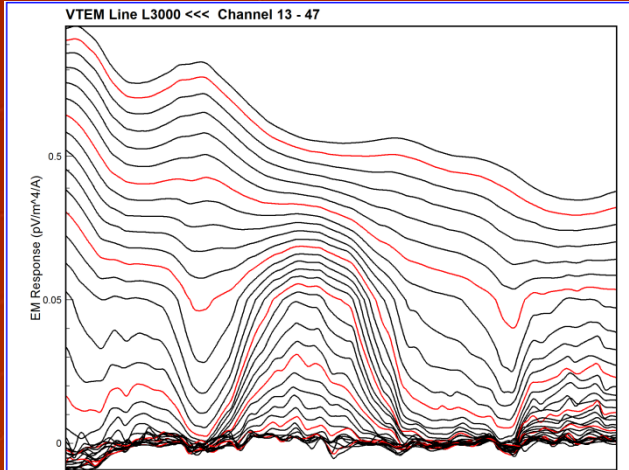


Asymmetric response



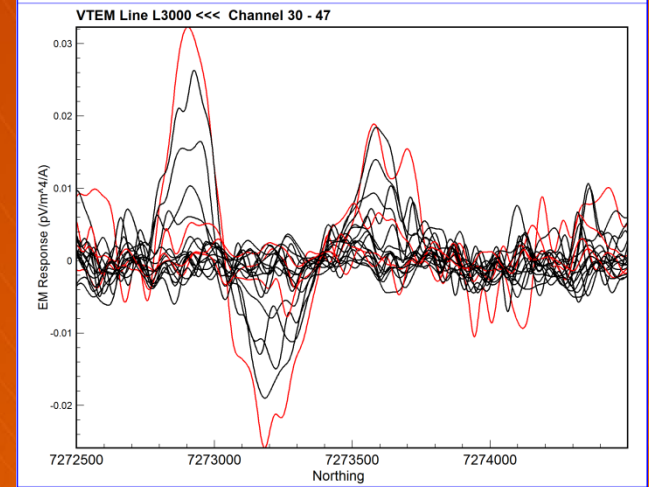
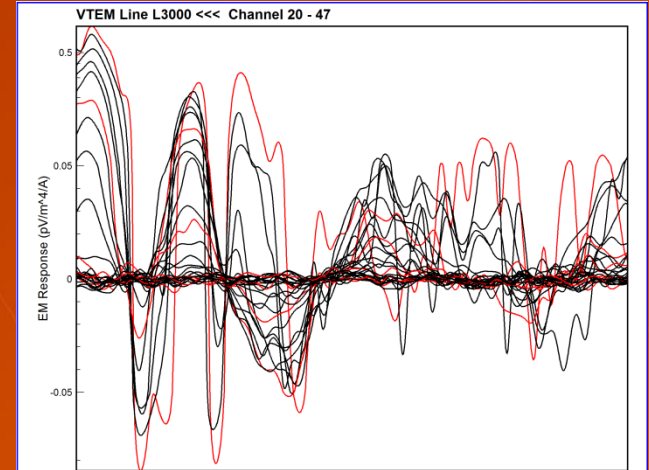
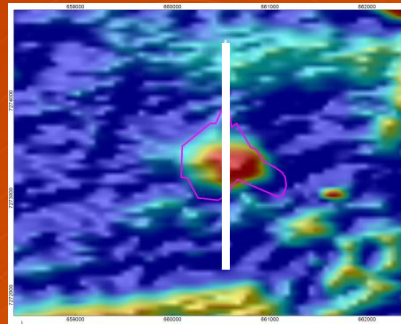
- Abra – Dipping approx 30° S

ABRA AEM RESPONSE – VTEM Plus



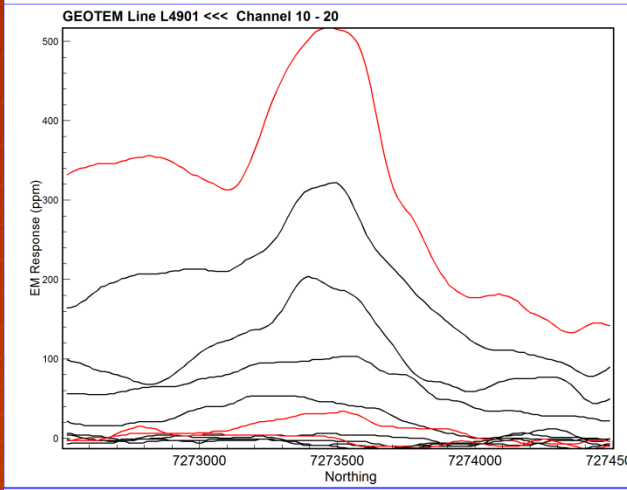
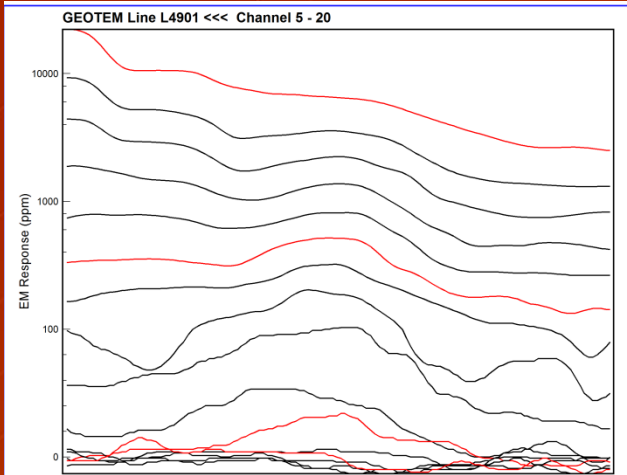
S **ABRA** N
Z Component – B Field

- Preliminary data
- Good mid – late time response

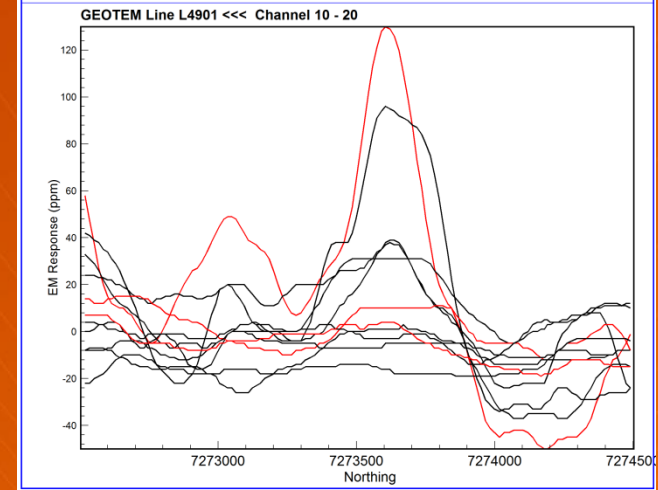
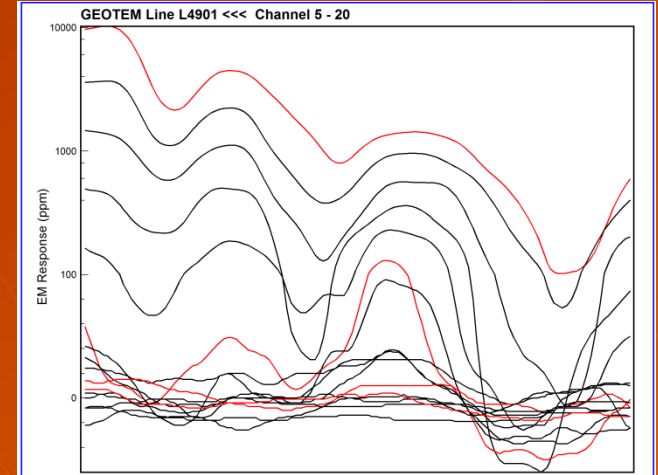
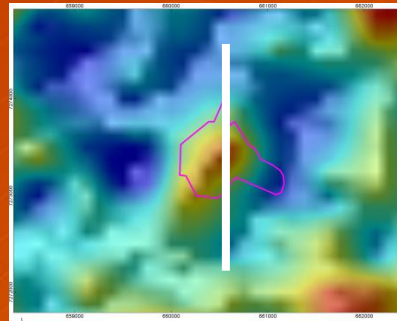


S **ABRA** N
X Component – dB/dt

ABRA AEM RESPONSE – GEOTEM Deep



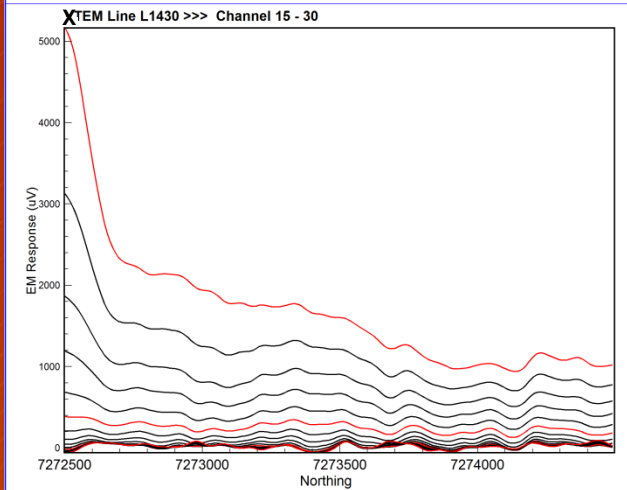
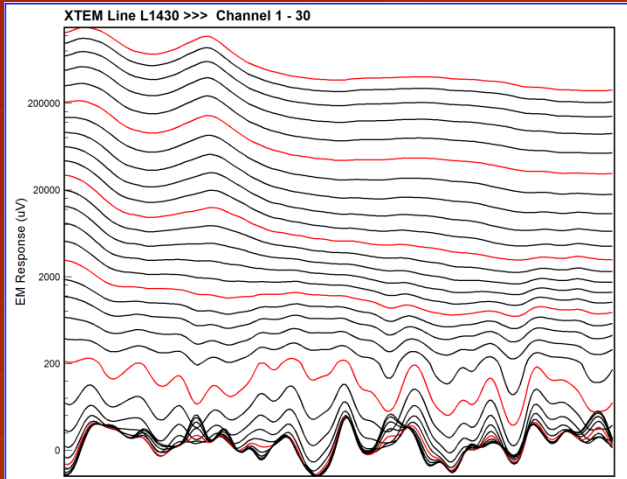
- Weak mid - late time response



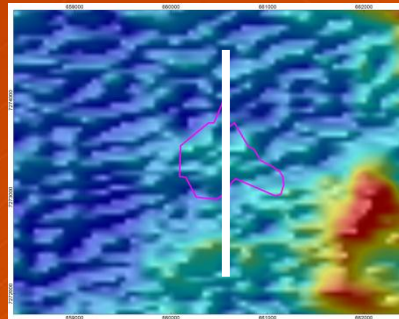
S **ABRA** N
Z Component – dB/dt

S **ABRA** N
X Component – dB/dt

ABRA AEM RESPONSE – XTEM

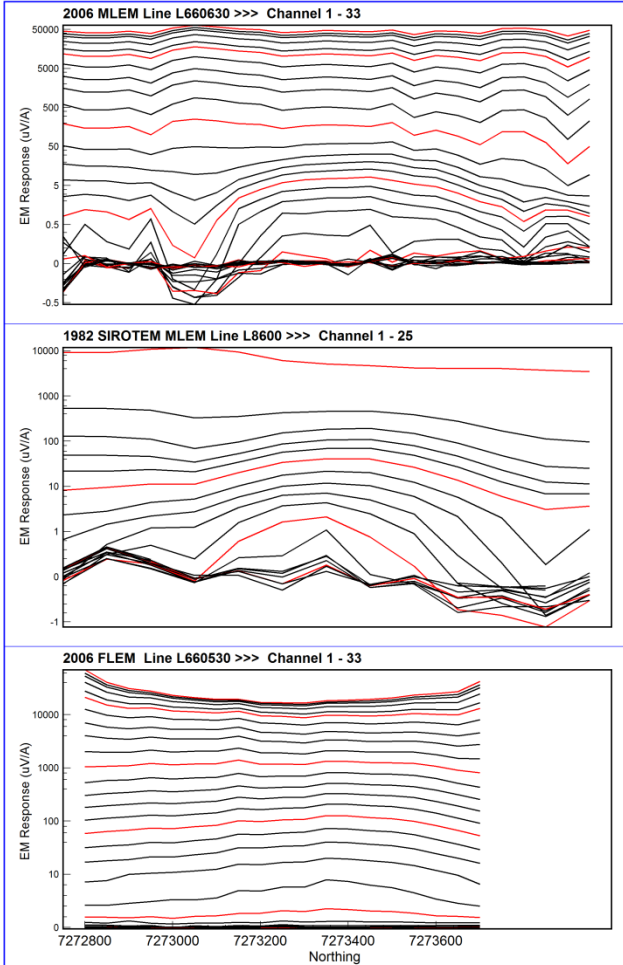


- No detectable response



S ABRA N
Z Component – dB/dt

ABRA EM RESPONSE – GROUND EM



S

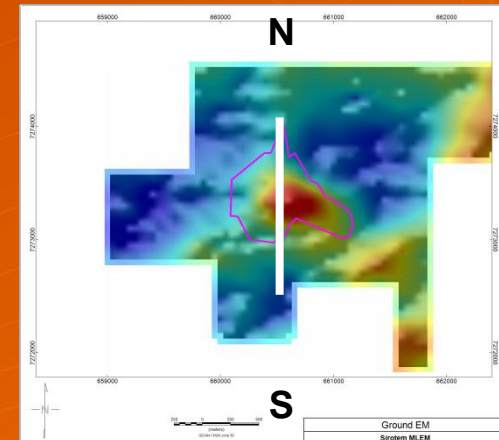
ABRA

N

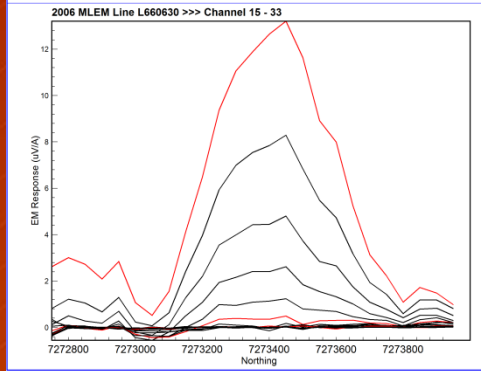
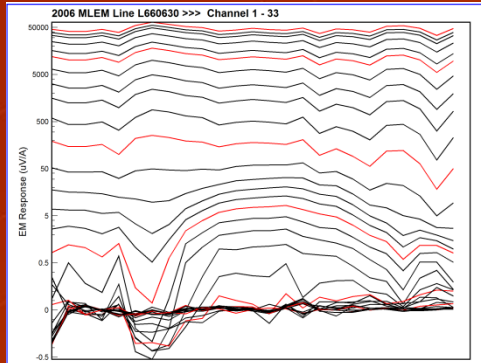
**SmarTEM - 2006
(200m In Loop)**

**SIROTEM - 1982
(200m Coincident Loop)**

**FLEM - 2006
(Single Large Loop)**

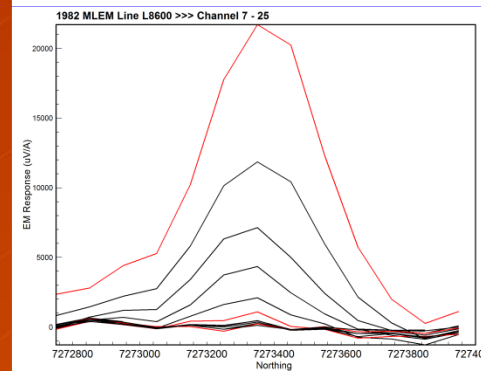
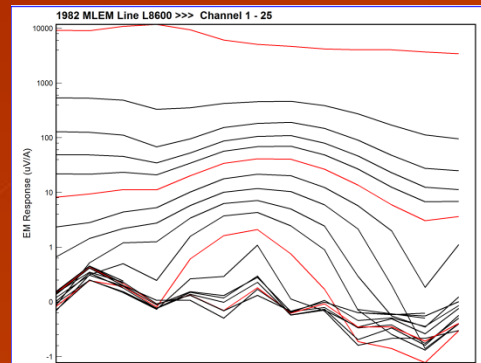


ABRA EM RESPONSE – GROUND EM



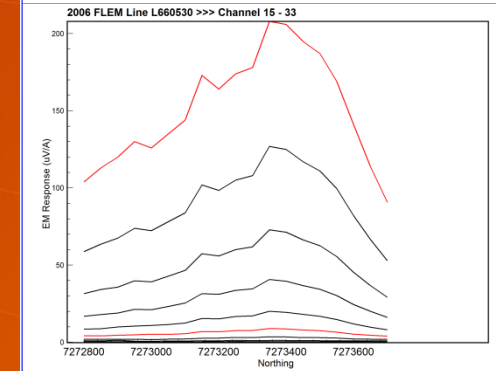
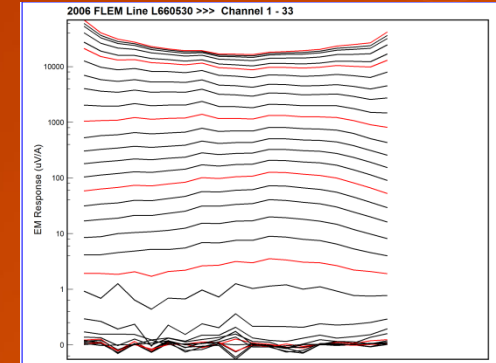
S ABRA N

2006 MLEM



S ABRA N

1982 MLEM

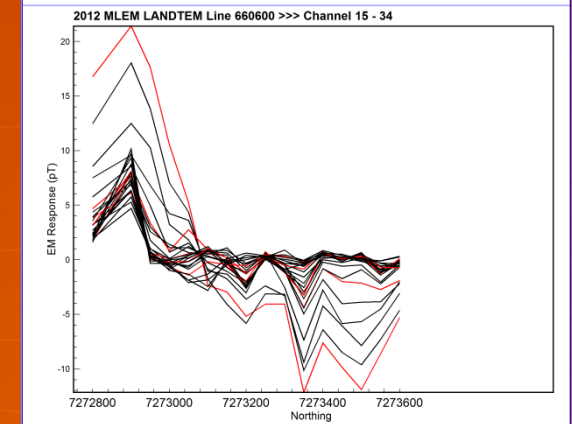
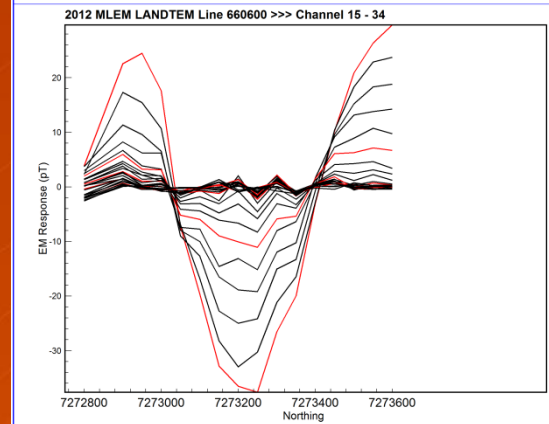
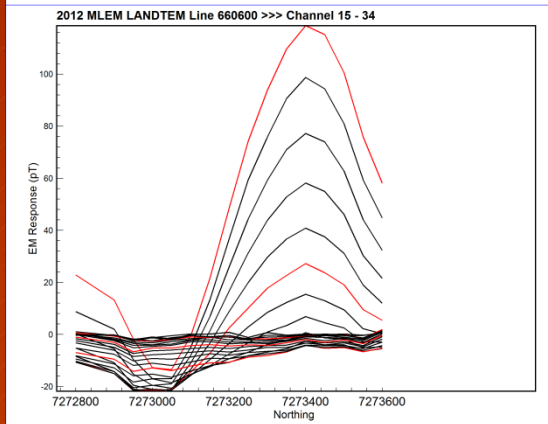
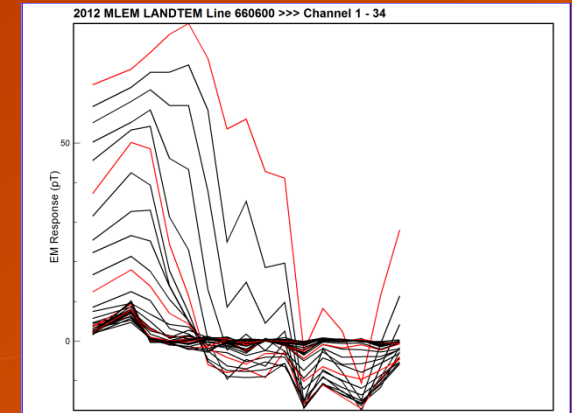
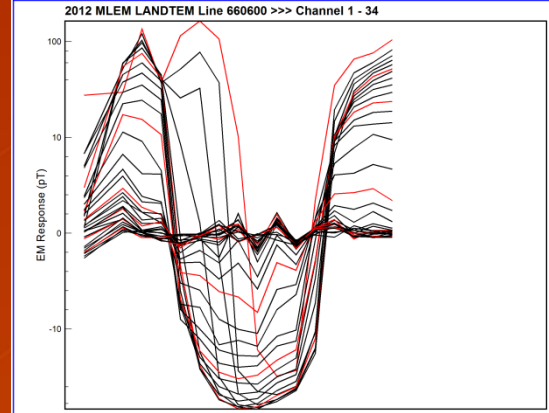
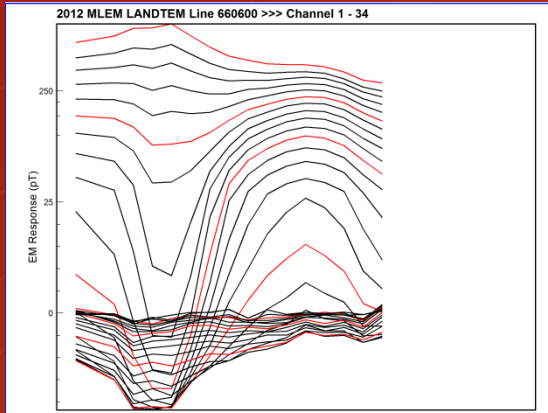


S ABRA N

2006 FLEM

- Good Mid to late time EM response, but still decays away at late times
- Only moderately conductive overall

ABRA EM RESPONSE – LANDTEM SQUID



S ABRA N

Z Component

S ABRA N

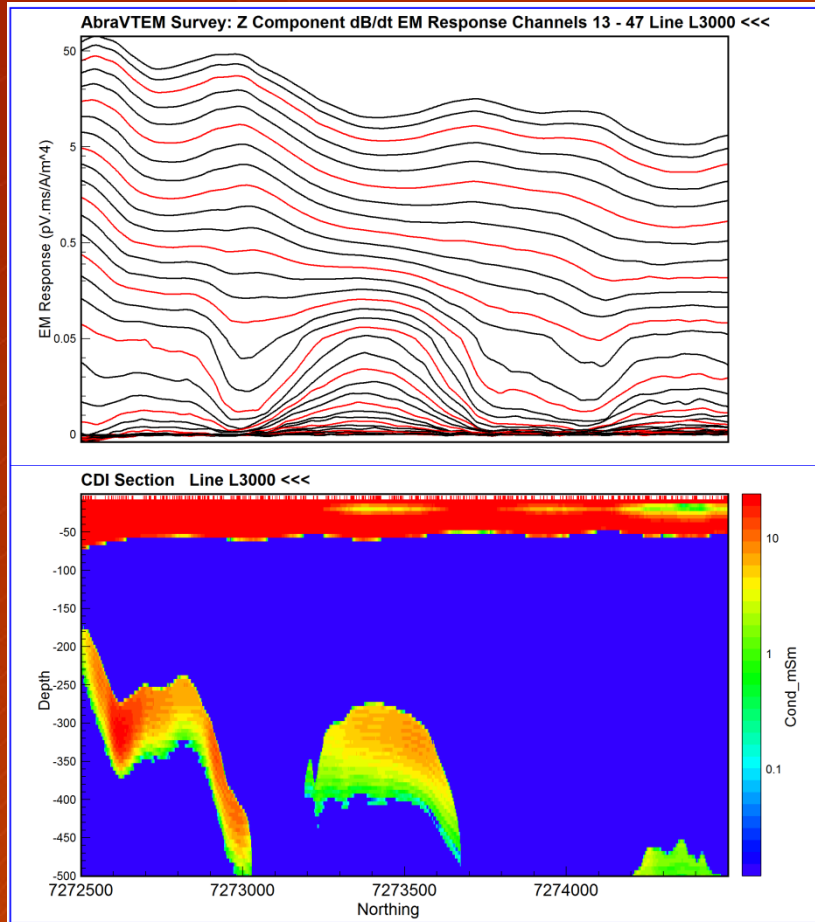
X Component

S ABRA N

Y Component

- Preliminary data to date, received last night

ABRA AEM RESPONSE – VTEM CDI



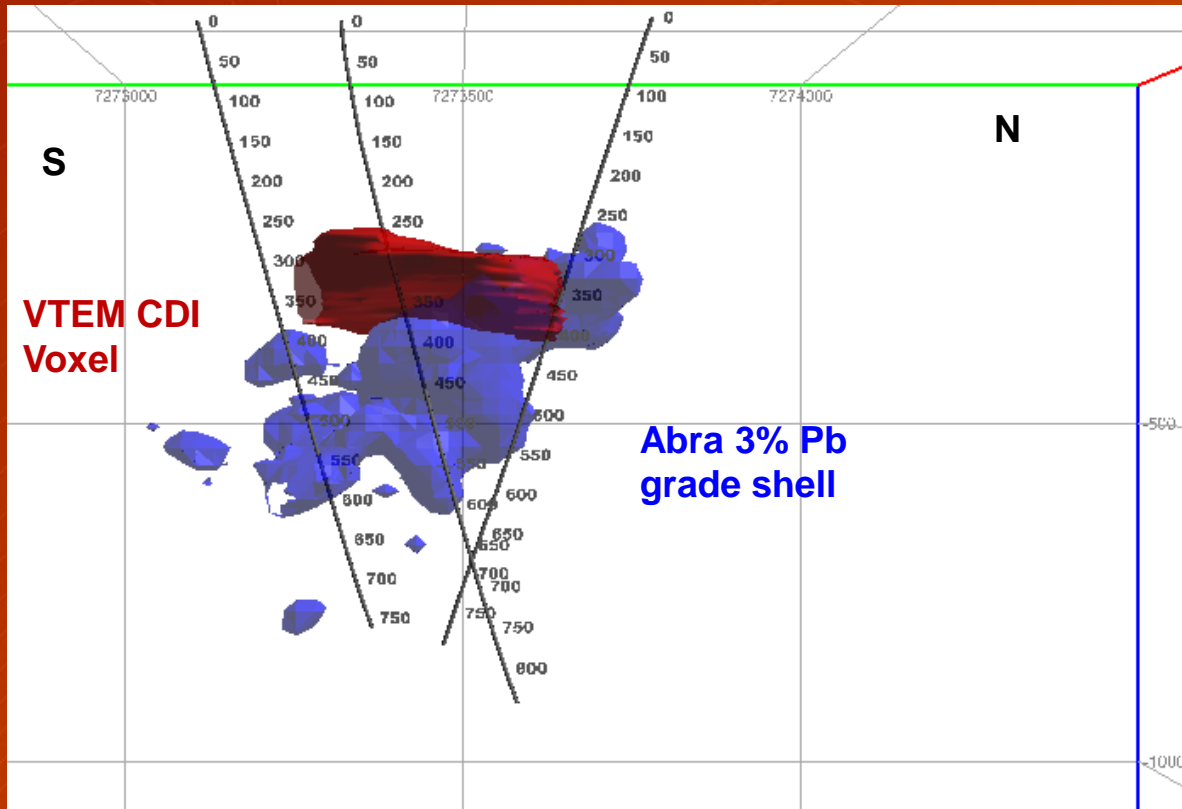
- Preliminary results to date
- Z Component dB/dt Conductivity Depth Image
- Good correlation to known mineralisation

S

ABRA

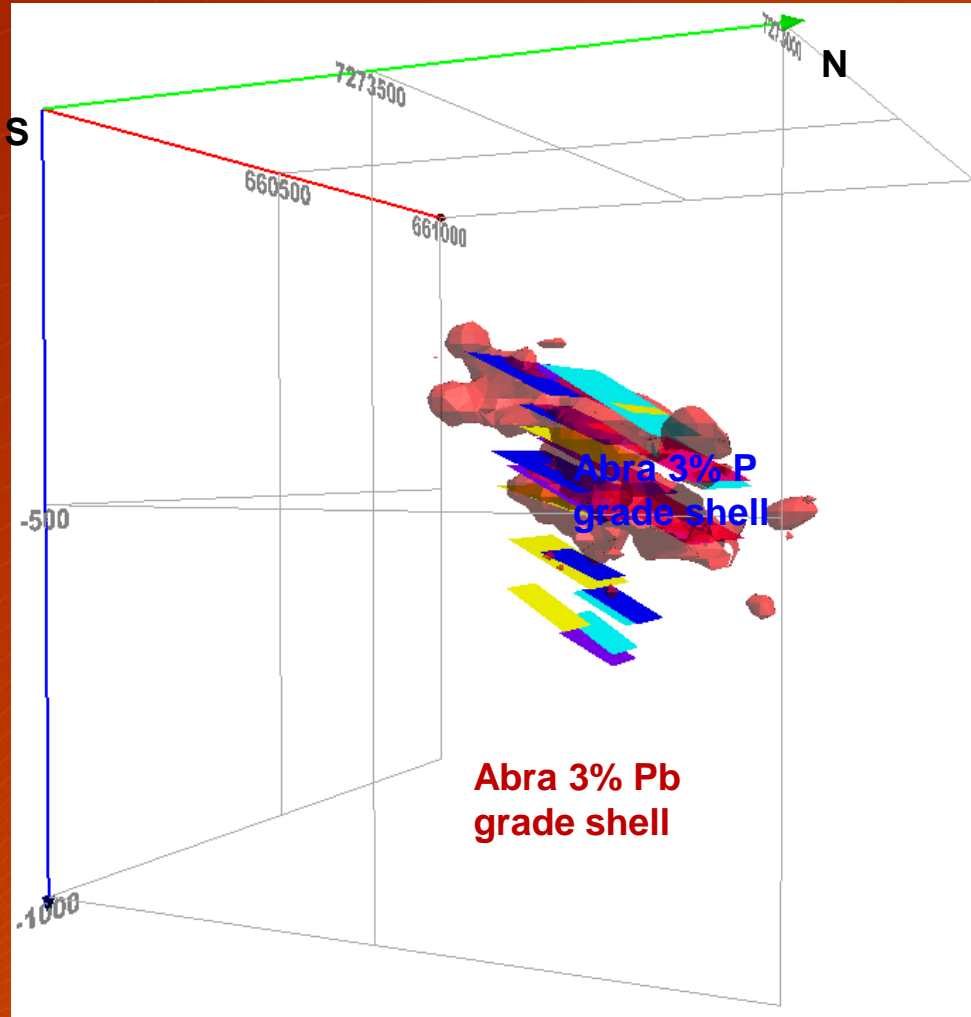
N

ABRA VTEM CDI and MINERALISED ZONE



- Westerly view of CDI and known mineralisation
- Good correlation to depth
- VTEM likely “seeing” the upper mineralised zone

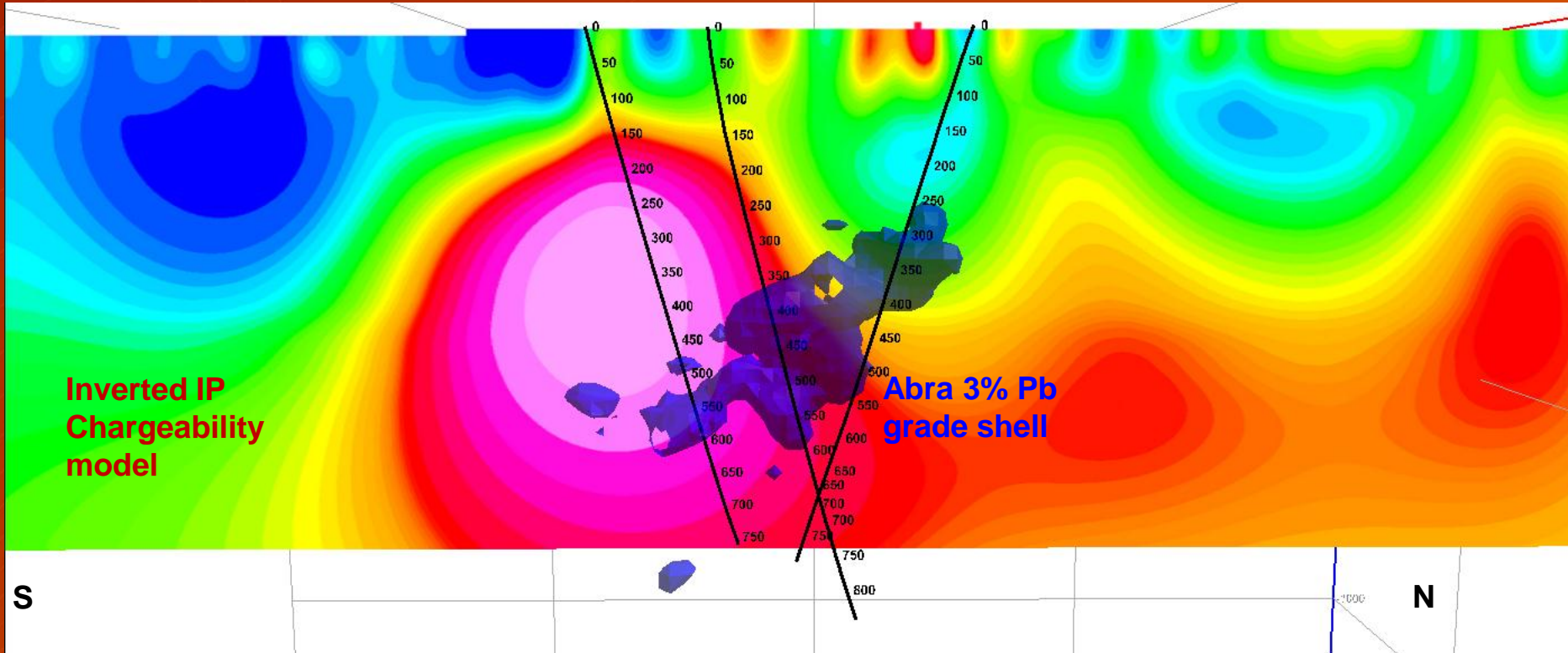
ABRA DHEM and MINERALISED ZONE



- NE view of DHEM and known mineralisation
- Locally some high conductivities
- Complex conductivity regime
- Possibly due to brecciated sulphide zones, giving a poor overall EM conductor

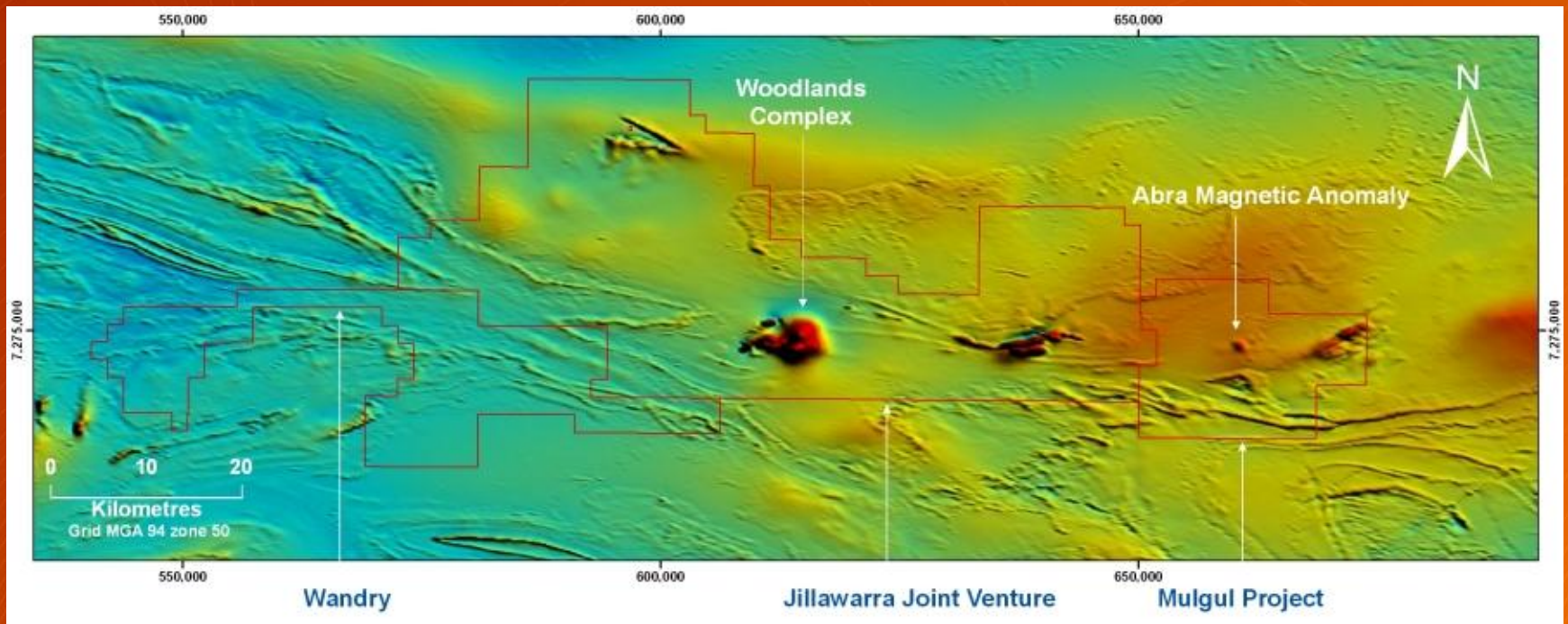
IP RESPONSE – POLE DIPOLE IP INVERSION

Westerly view of IP Section and known mineralisation



VERY DEEP COINCIDENT GRAVITY AND MAGNETIC TARGET

Scope for more AEM (VTEM) exploration in the area based on fantastic results at Abra



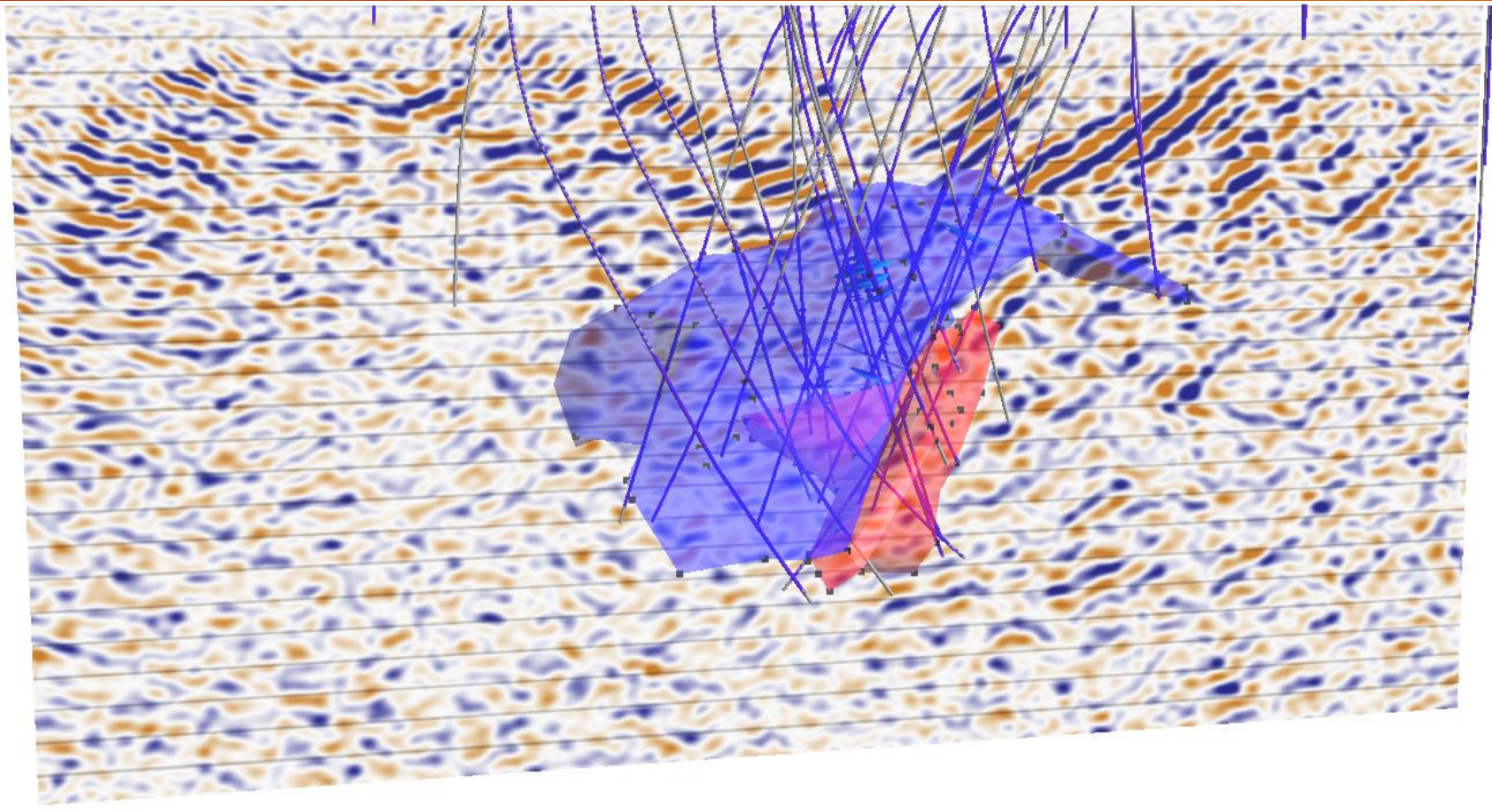
2D SEISMIC SURVEYING 2011

400 CHANNELS, 5m SHOTS+RECEIVERS, DEPTH MIGRATED

SOUTH

NORTH

0m



500m

1000m

CONCLUSIONS

- Abra is a good deep geophysical test range
 - Clean and still in situ
- Clearly detected by the VTEM plus system
- Locally has high conductive zones but overall is only moderately conductive

FUTURE WORK

TEST OTHER AEM SYSTEMS:

- HeliTEM – Fugro
- SpectrEM – Anglo
- VTEMmax and VTEM 35m – Geotech Airborne
- ZTEM – Geotech Airborne

More EM – MT, AMT

3D Seismic

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Thanks to:

Keith Fisk: *Geotech Airborne Pty Ltd*

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