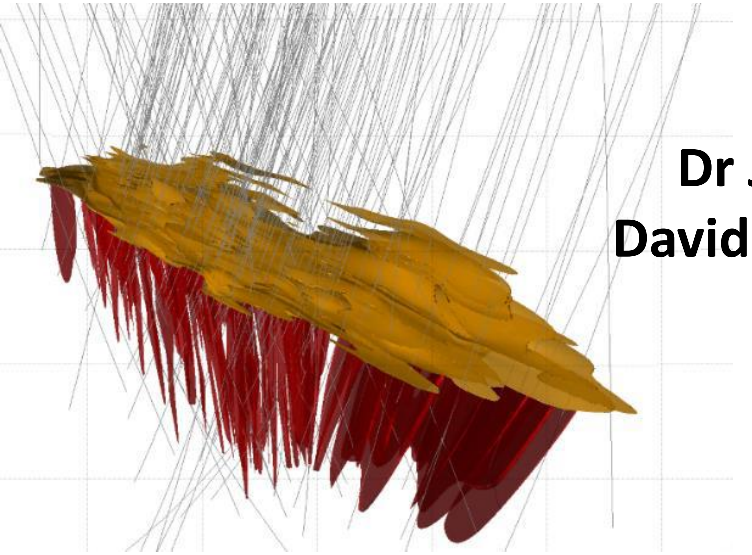
The geophysical expression of the Abra sedimentary replacement Pb-Ag-Cu-Au deposit, WA



Dr Jayson Meyers – Resource Potentials
David Stannard – Fortescue Future Industries
Angelo Scopel – Galena Mining
(and a squillion others…)

Resource Potentials

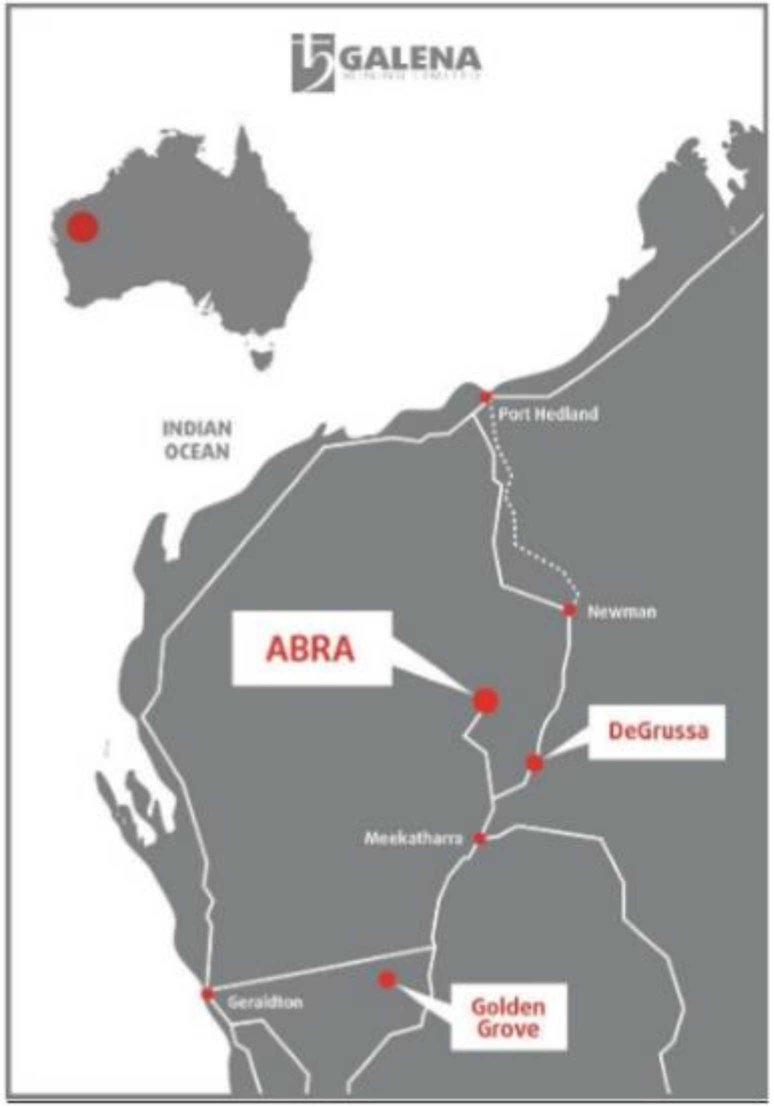
GALENA MINING LIMITED

Introduction

Resource Potentials

- The Abra polymetallic base metal deposit (Pb-Ag-Cu-Au) is located in the Gascoyne region of Western Australia, approximately 900km NNE of Perth.
- Maybe not as new and exciting as other deposits presented in the session, but it has relevance in that mining has commenced this year, exactly 40 years since discovery!
- Abra is often cited as a “blind” geophysical discovery, along with Olympic Dam and a few others, due to lack of outcropping geological vectors or a surface geochemical expression, and the style of mineralisation was not fully predicted ahead of drilling into a geophysical target.
- I have the luxury of presenting results from a lot of hard work by my team, students and many others over Abra’s long history, and will quickly show examples of results from most of the geophysical methods trailed at Abra.
- **Takeaways**: 1) some galena is electrically conductive, 2) most of Abra is NOT magnetic, 3) excess modelled magnetic zones and mass successfully indicated untested ore zones, and 4) good to trial multiple geophysical methods for deep targeting.

2011 Curtin 3rd year field trip to Abra



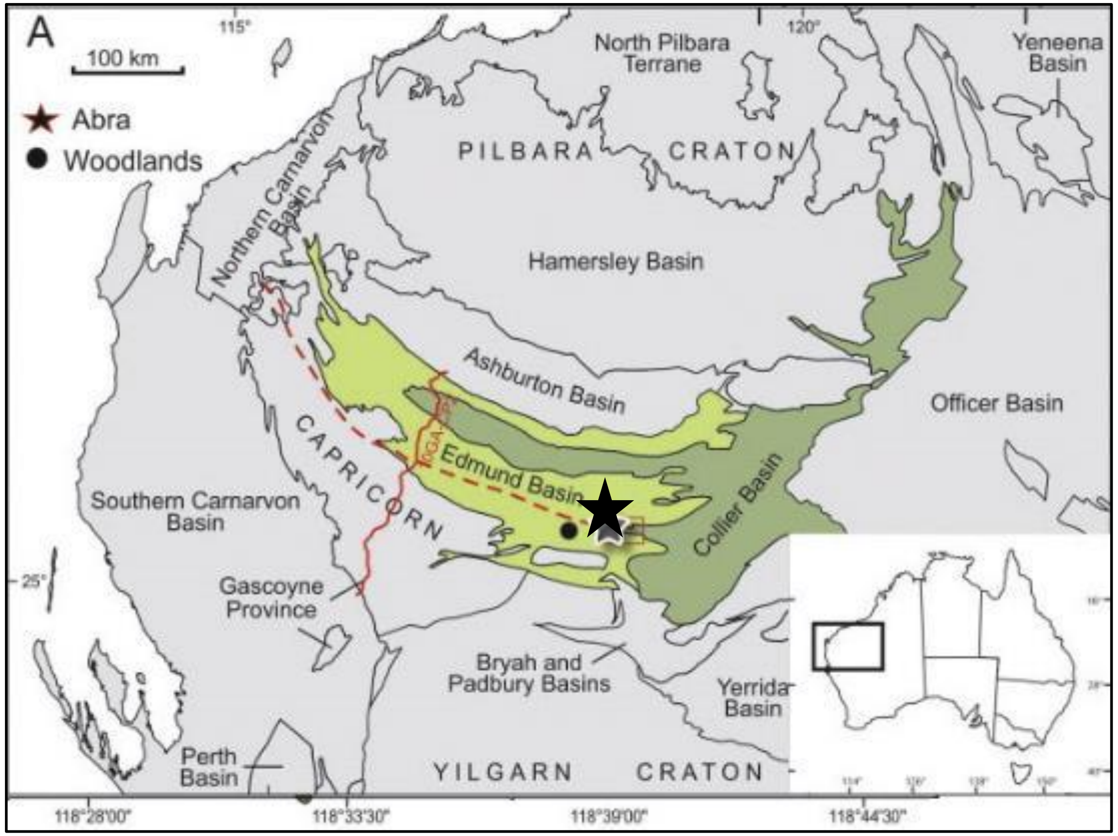
Abra location and infrastructure (sourced from galenamining.com.au)

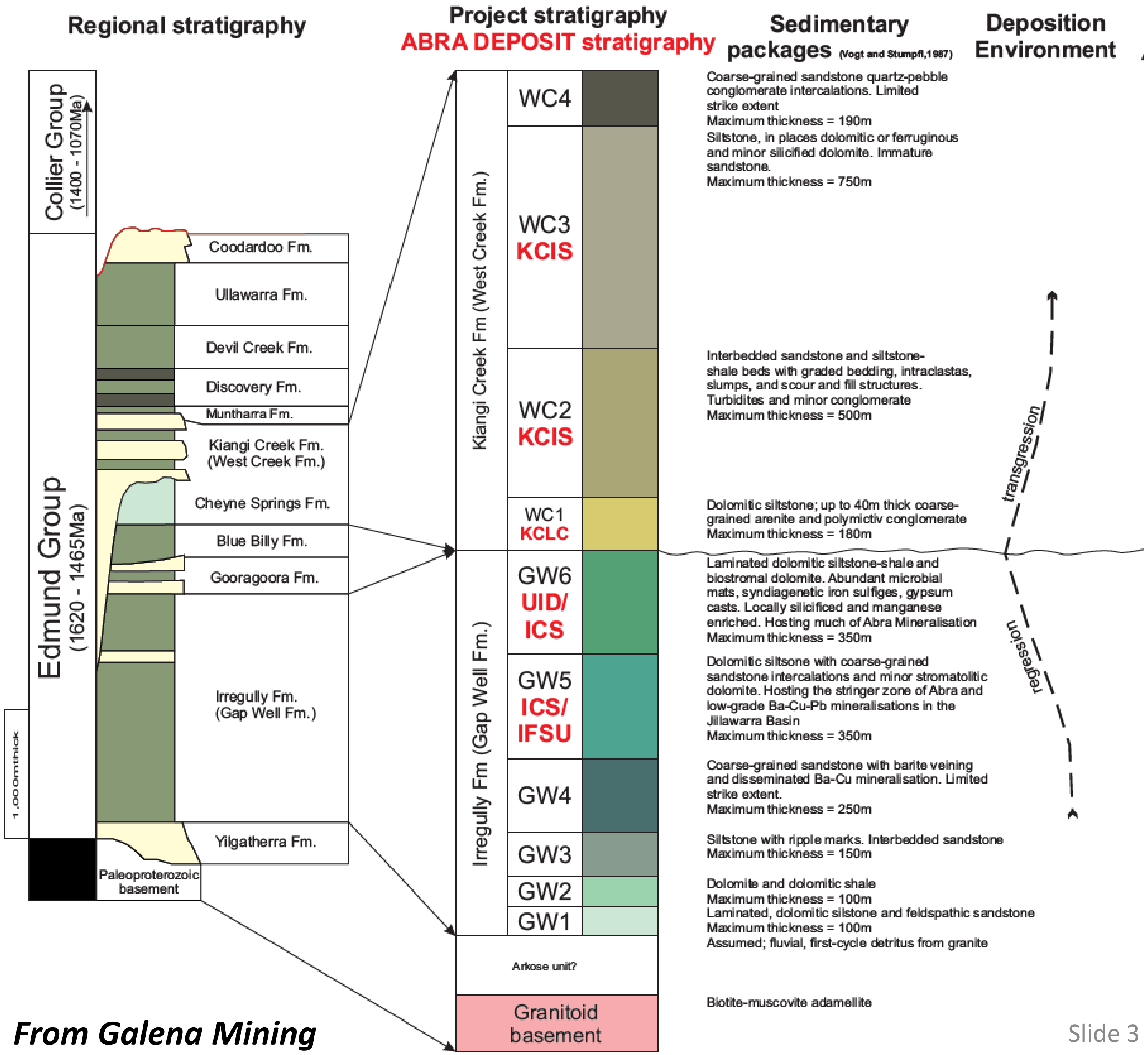
Abra Project Setting and Stratigraphy

Resource Potentials

Abra sits within the Jillawarra sub-basin of the Edmund Basin, which formed as part of Capricorn Orogen and is hosted within siliciclastic and carbonate deposits of the Edmund Group, formerly lower part of the Bangemall Basin, specifically in the Irregully Fm and along the overlying contact with the Kiangi Creek Fm.

Regional geological setting of the Edmund Basin, with Abra shown as a black star (reproduced from Pirajno et al., 2016).

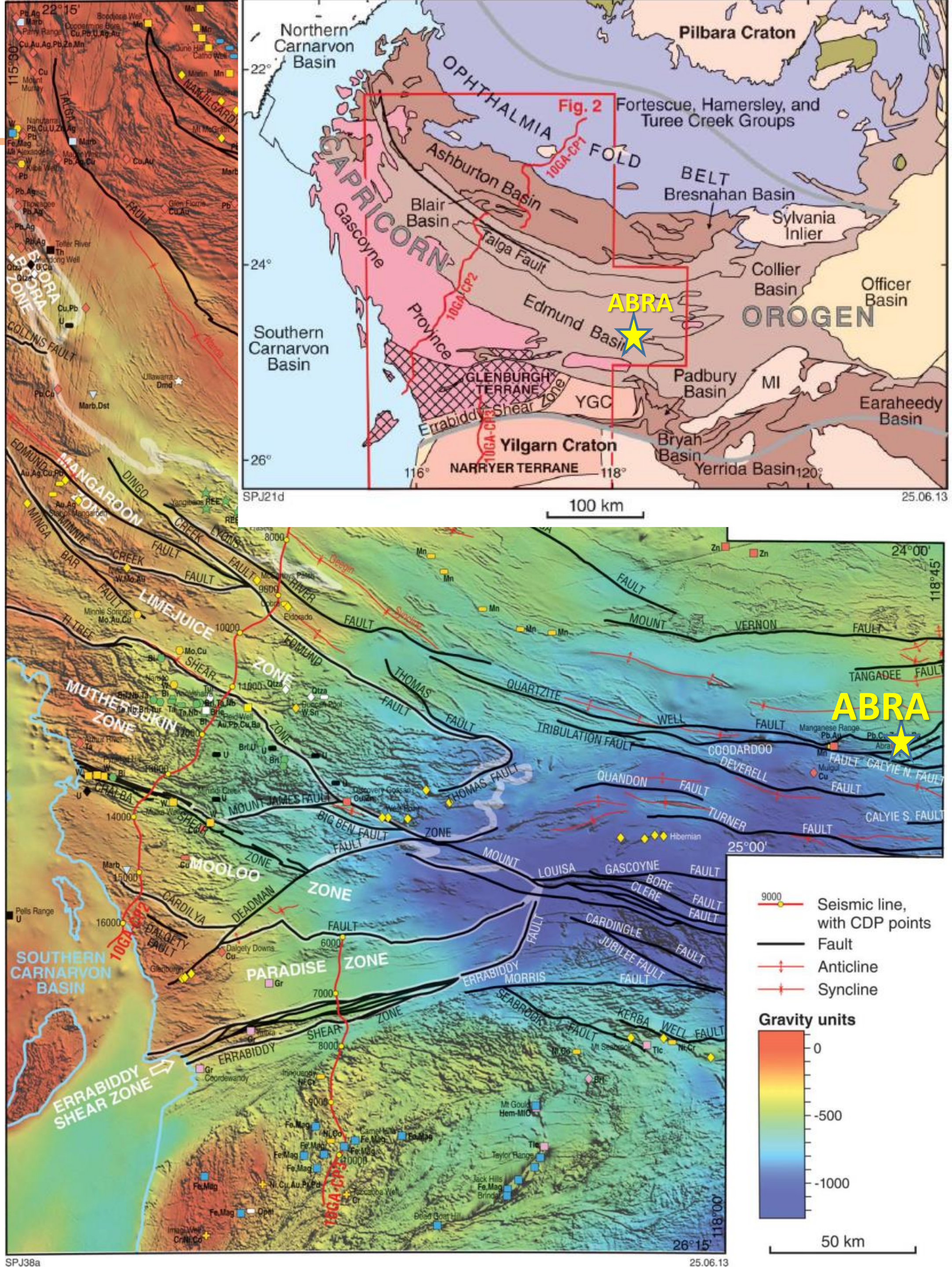




From Galena Mining

Abra Project Tectonic History and Genesis

- The **Edmond Basin** sequence was deposited following the Mangaroon Orogeny (ca 1,620Ma) within a chain of grabens that became linked and flooded to form deepening upward sequences of terrestrial to marine sedimentary deposits.
- Uncomfortably overlying the Edmond Basin sequence is the **Collier Basin / Group** of deposits forming a widespread blanket of sediments in the Central Capricorn Orogen; it used to form the upper part of the Bangemall Basin.
- The **Mutherbuken Tectonic Event** (ca 1,385-1,200Ma) occurred just after Edmund Basin formation and during the formation of the Collier Group, it is marked by compression causing basin inversion and shearing, and low-grade metamorphism, and it was associated with dolerite sill and dyke emplacement (Narimbunna Dolerite).
- The Abra mineralisation event has been age dated to be coeval to the Mutherbuken Tectonic Event , but the heat and metal source for Abra is unknown and could be related to seismic pumping of brines, convection driven by latent heat from underlying Durlacher Supersite granitoid batholiths intruded during the Mangaroon Orogeny, or more localised heat from doletiric sill emplacement; shallow asthenosphere is an unlikely heat source.
- Local anticlines in proximity to regional shears may have played a role in the formation of Abra.



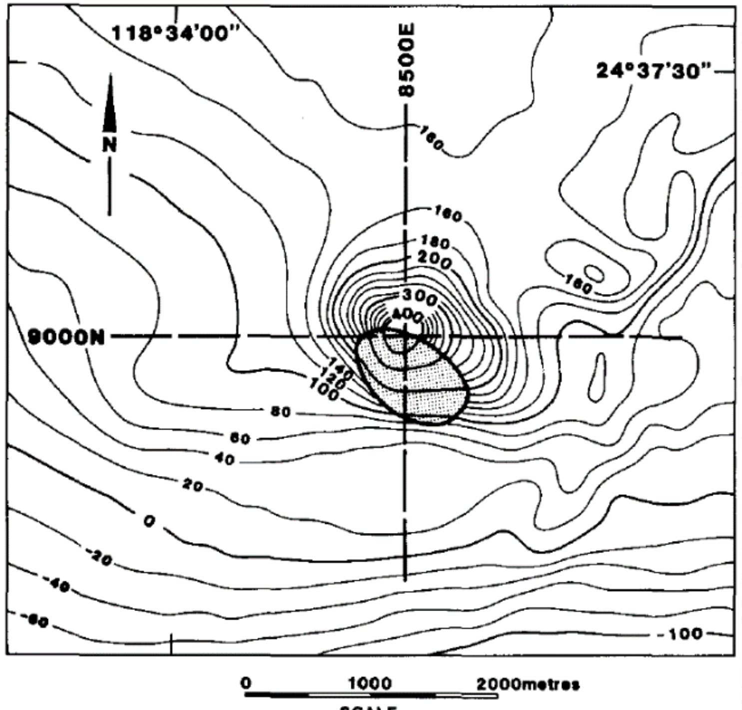
(From Johnson et al., 2013)

Abra Geophysical Discovery

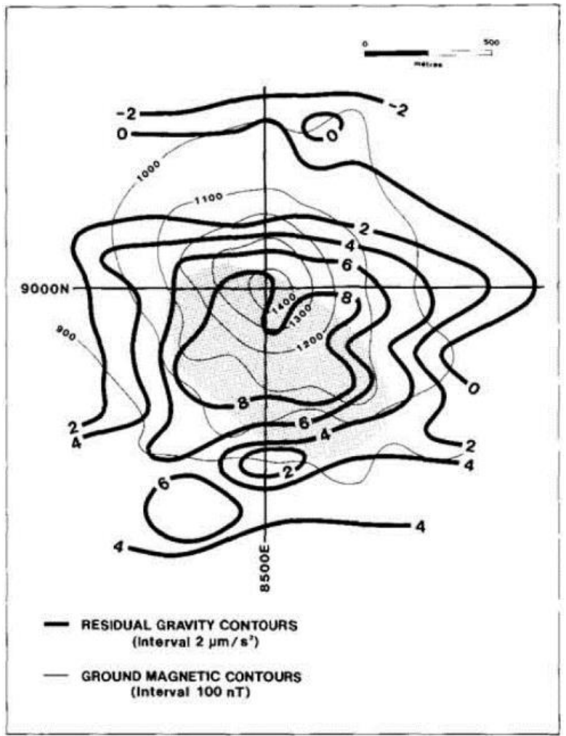
Resource Potentials

- Abra was discovered in 1981 by Geopeko Ltd and Amoco Minerals Australia following successful drill targeting of coincident magnetic and gravity high anomaly responses. The deposit starts at 250m depth, and has no direct surface geochemical expression, and no indication of a significant high-grade lead deposit can be inferred from outcrop geology. "Blind geophysical discovery"
- Figures below reproduced from Mutton and McInerney (1987) and McInerney et al. (1994) show bullseye magnetic and gravity anomaly responses, and 3D ellipsoidal polygonal body modelling results.
- Drill testing of the modelled body in 1981 intersected 255m of Fe-Ba-Pb-Ag-Cu-Au mineralisation from below 260m.
- As at October 2021, total resource stands at 34.5Mt @ 7.2% Pb and 16g/t Ag (+/- Cu and Au mineralisation in varying amounts).

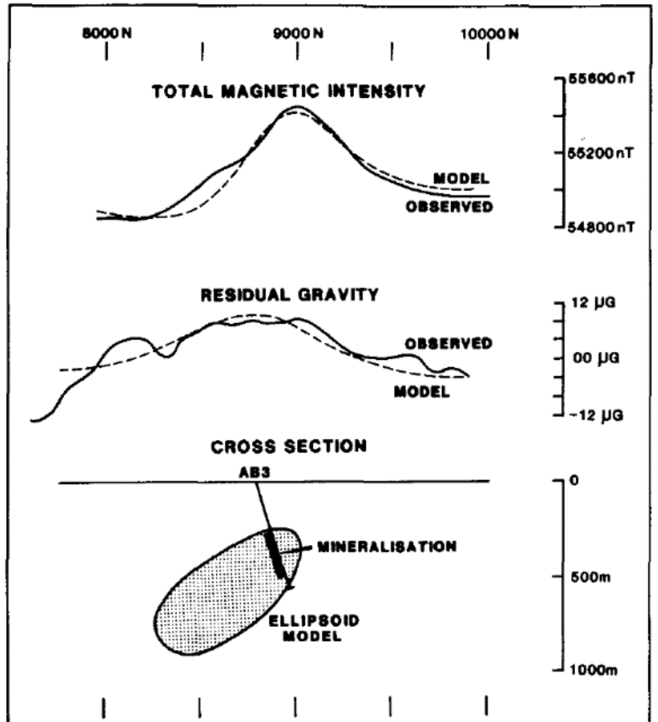
Magnetic contour map



Gravity and ground magnetic contour map



Polygonal modelling of magnetic and gravity anomaly responses



>60% Pb

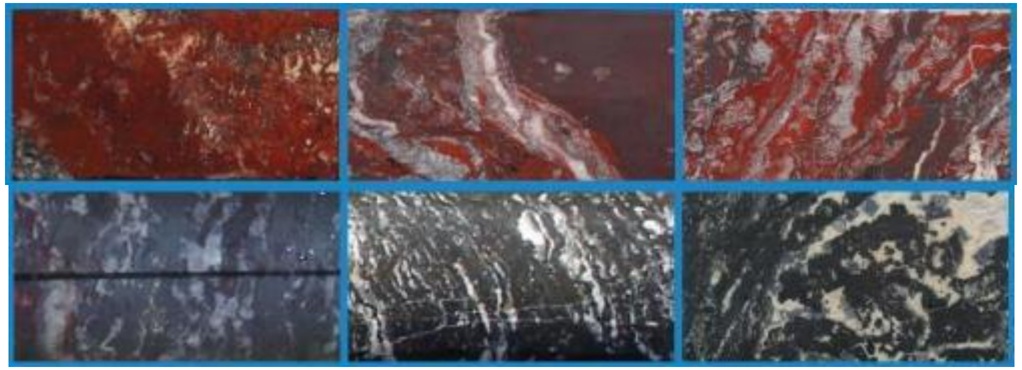
Abra Mineralisation Model

Resource Potentials

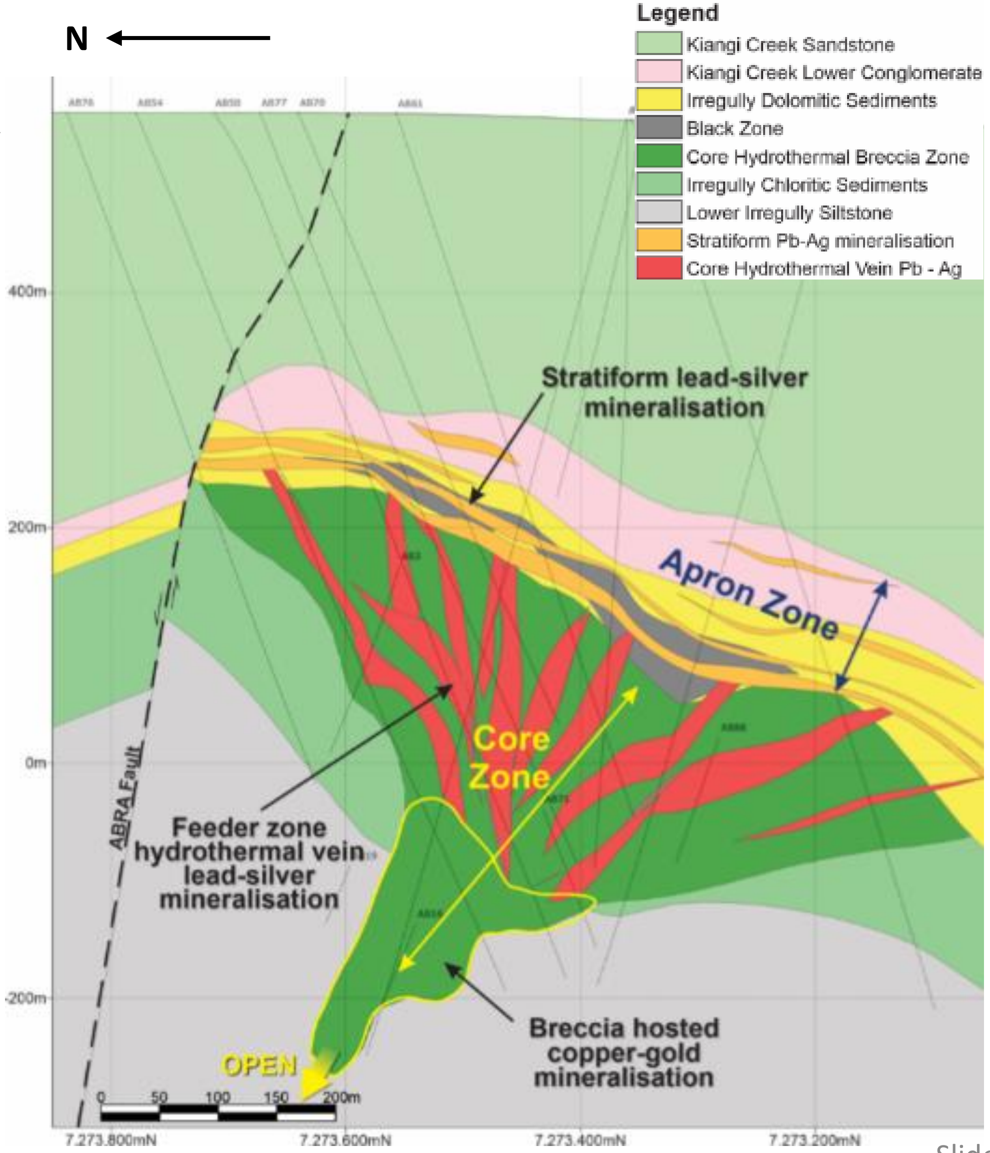
- Abra sits in a faulted E-W trending anticline and has two main parts:
  - <u>Stratabound or ‘apron’ zone:</u> Pb-Ag-Ba mineralisation associated with a laminated iron oxide and barite altered siltstone, which is divided into two domains, an upper oxidised ‘**red zone**’ identified by conglomerate and laminated to banded hematite-barite-jaspillite, and overlies the ‘**black zone**’ dominated by magnetite (>20%), barite, quartz and dolomite, with pervasive carbonate replacement.
  - <u>‘Stockwork’ or ‘feeder’ zone:</u> chlorite altered, brecciated and extensively veined carbonaceous siltstone, containing high-grade Pb-Ag veining in the core, and transitioning to more Pb-Cu and Cu-Au veined feeder zone mineralisation at greater depth.
- The red zone is an impermeable silica cap which trapped mineralising fluids from migrating up through veins and faults to react and replace dolomite and precipitate sulphide and oxide minerals. *We consider Abra to be a form of hydrothermal sedimentary replacement deposit.*

Red zone

Black zone



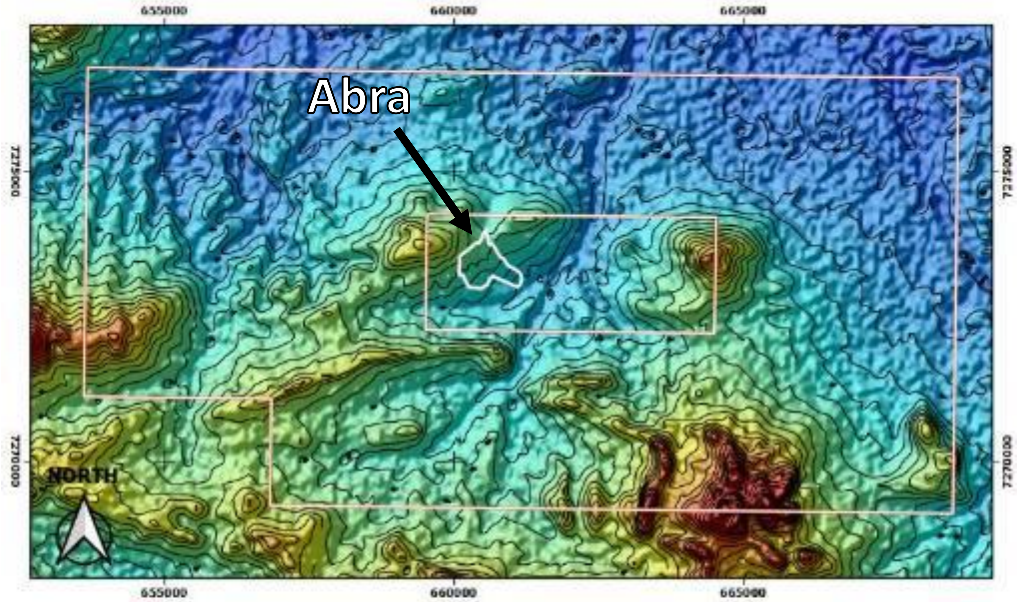
Stylised geological cross-section of the Abra deposit looking east (reproduced from galenamining.com.au).



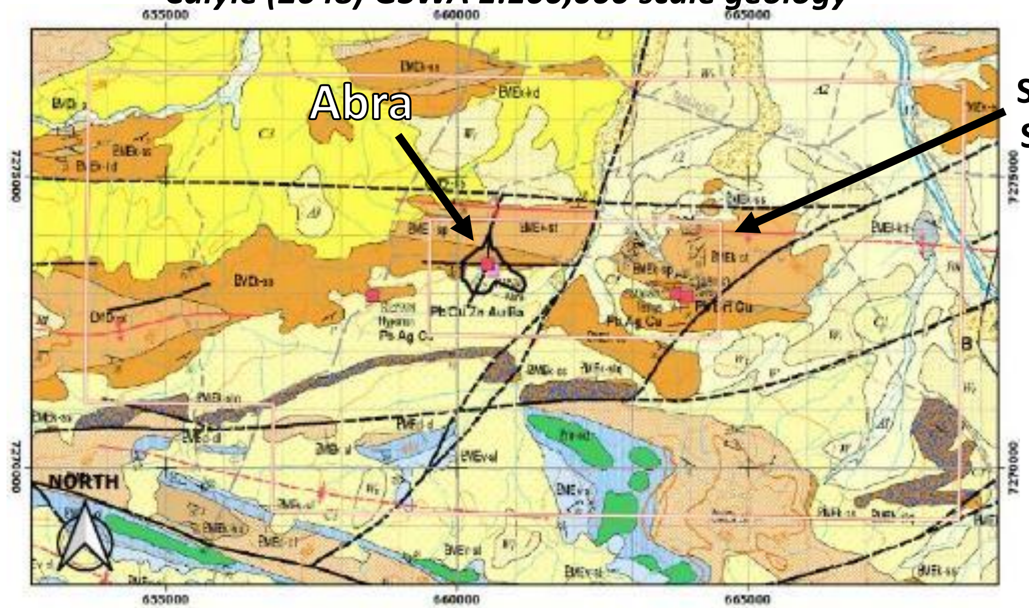
Surface Expression of Abra – older resource footprint

Resource Potentials

SRTM 5m contours

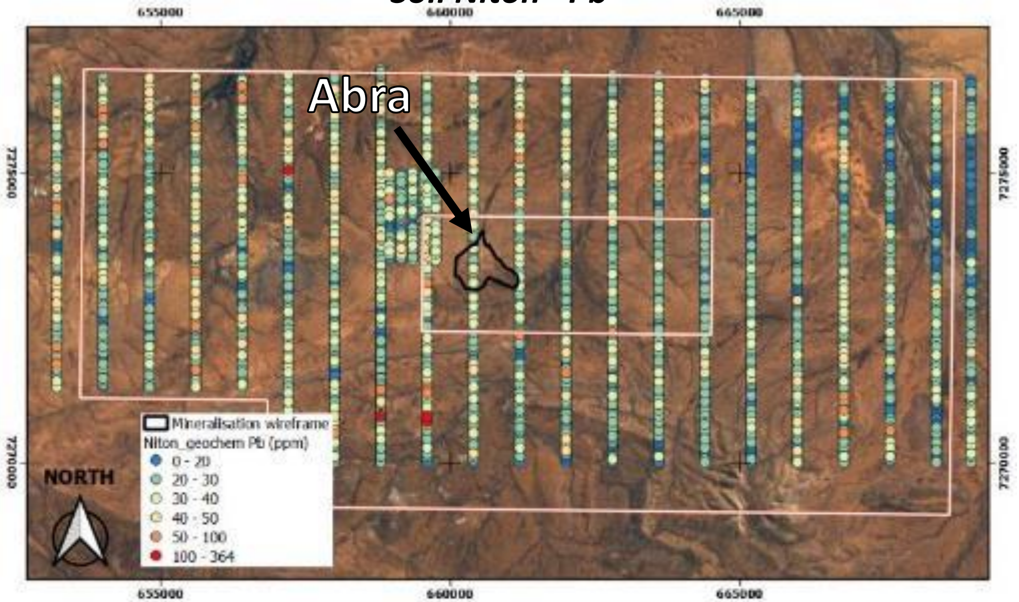


Calyie (2648) GSWA 1:100,000 scale geology

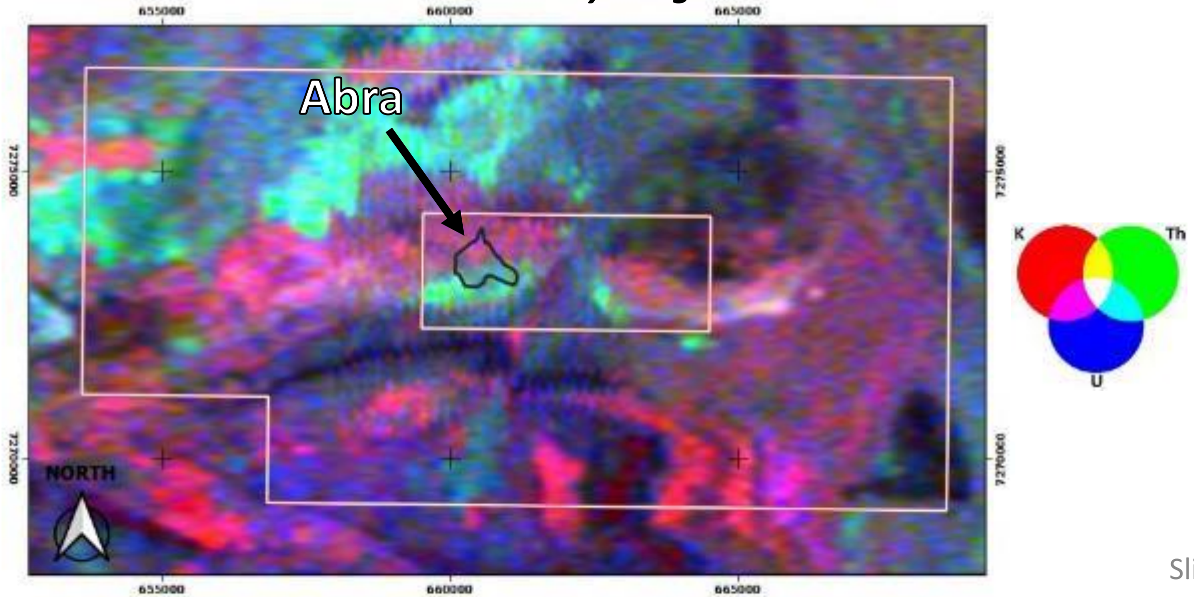


Kiangi Creek Sandstone and Siltstone units

Soil Niton - Pb

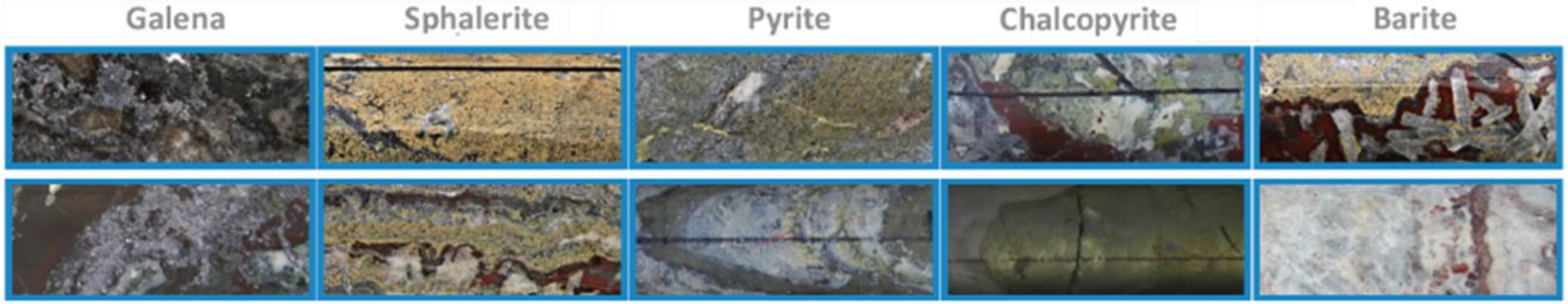


Radiometric ternary image



Abra Petrophysical Studies

Electrical conductivity due to presence of galena and lots of non-magnetic Pb-Ag ore.



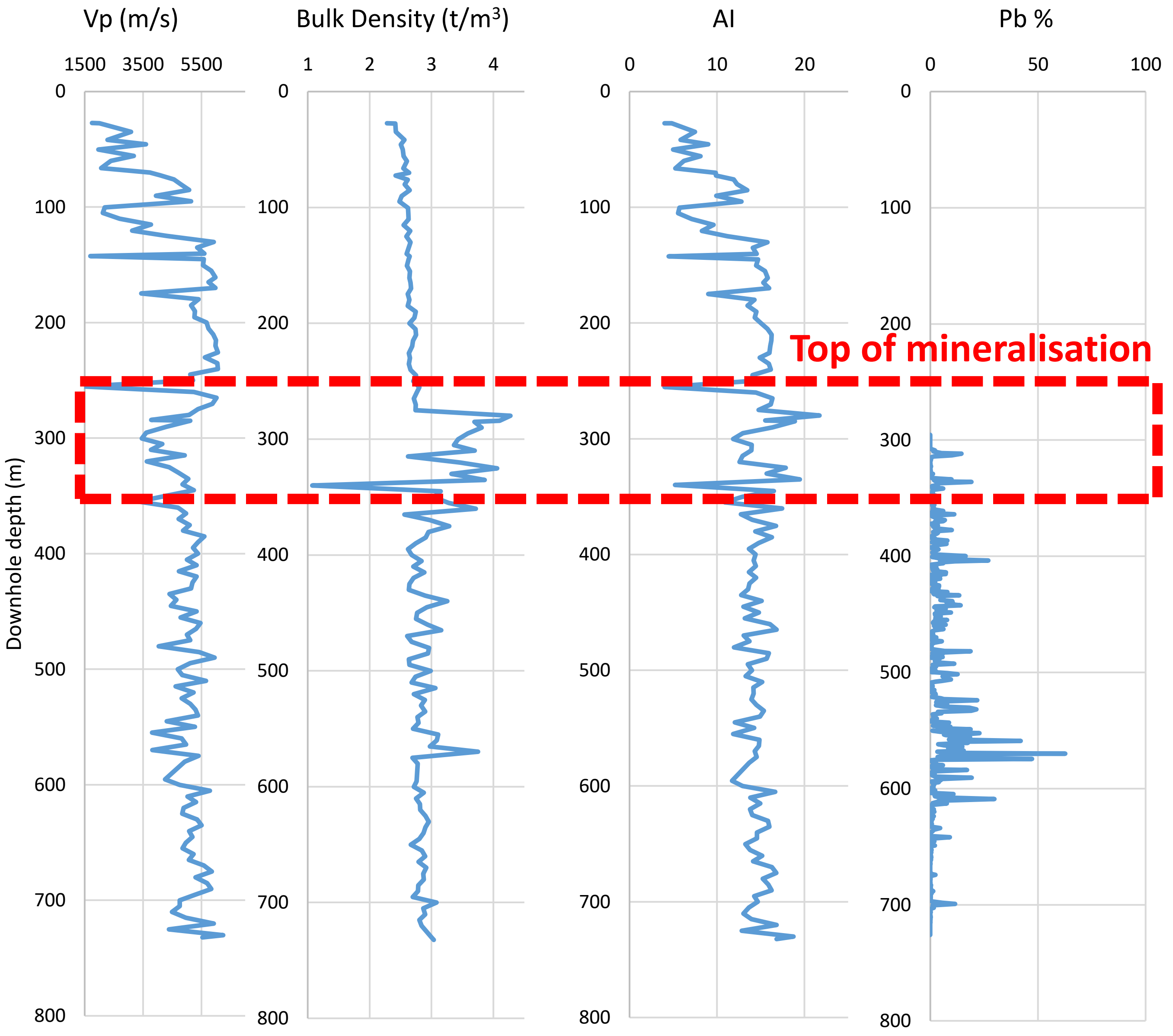
Averaged petrophysical results from Abra core samples analysed in 2009 by System Exploration.

Sample	Depth	Lithology	Zone	Domain	Mag Sus	Density	EM Conductivity	Galvanic Resistivity	IP Chargeability
	m				SIx10^{-3}	t/m^3	S/m	Ohm.m	ms
1	375.49	jasp, hem, mtt, bar	Stratabound	Red Zone	**225**	3.59	≥0	50250	12
2	382.71	conglom + jsp, bar		Red Zone	**60.3**	3.86	->0	57804	24
3	397.3	jsp-py-mtt-bar-gal		Red Zone	**22.4**	3.68	->0	33654	50
4	262.27	jsp-hem-mtt-bar		Red Zone	**745**	3.83	NA	16490	83
5	392.16	dolomite-py-gal		Dolomite banded	1.96	3.78	**16**	8014	**128**
6	284.11	bar-gal-py		Barite Zone	0.1	**4.42**	**15**	**0.06**	**212**
7	272.92	bar-gal-py		Barite Zone	0.45	**4.44**	**4-40**	16356	70
8	316.25	mtt-hem-qtz-bar-dol		Black Zone	**1120**	3.58	NA	**1.4**	80
9	318.9	hem-mtt-qtz-chl		Black Zone	**141**	3.62	NA	**14**	72
10	401.46	bar-gal-qtz vein	Feeder	Vein	3.64	**4.3**	**10**	**0.03**	**103**
11	382.06	qtz-bar-gal vein		Vein	0.08	**4.37**	->0	51183	78

Abra Petrophysical Studies

Resource Potentials

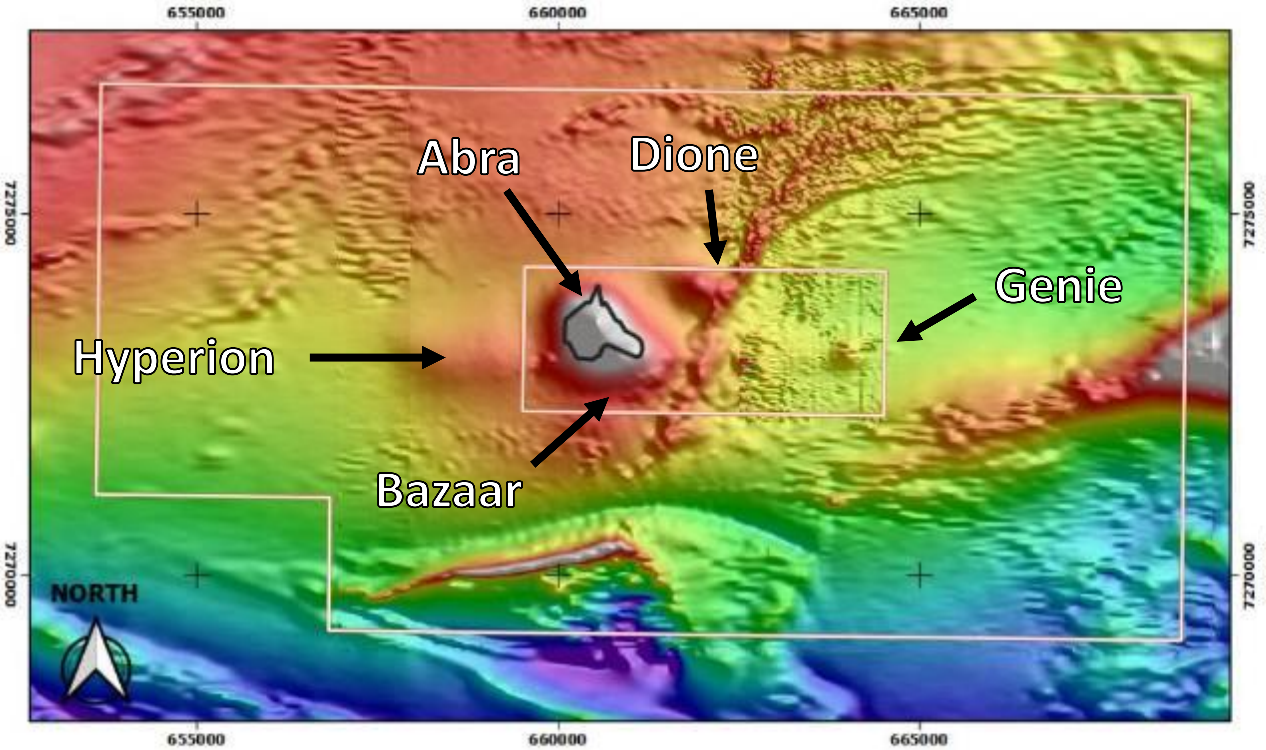
- Handheld P-wave velocity measurements and bulk density measurements acquired on representative diamond drilling core samples extending through the deposit as part of a 3D seismic de-risking study by Resource Potentials and HiSeis.
- The Vp values do not show a large degree of variation through stratigraphy and mineralisation (*Vp of massive sulphide mineralised zones does not generally increase with increased density like most rocks*), but bulk density measurements clearly show a sharp increases within mineralised intervals and therefore an acoustic impedance (AI) contrast should occur between mineralisation and host rocks.
- An AI contrast is estimated to occur at around 300m, corresponding to the top of mineralisation.
- A 3D seismic survey was planned and budgeted for, but was not approved.



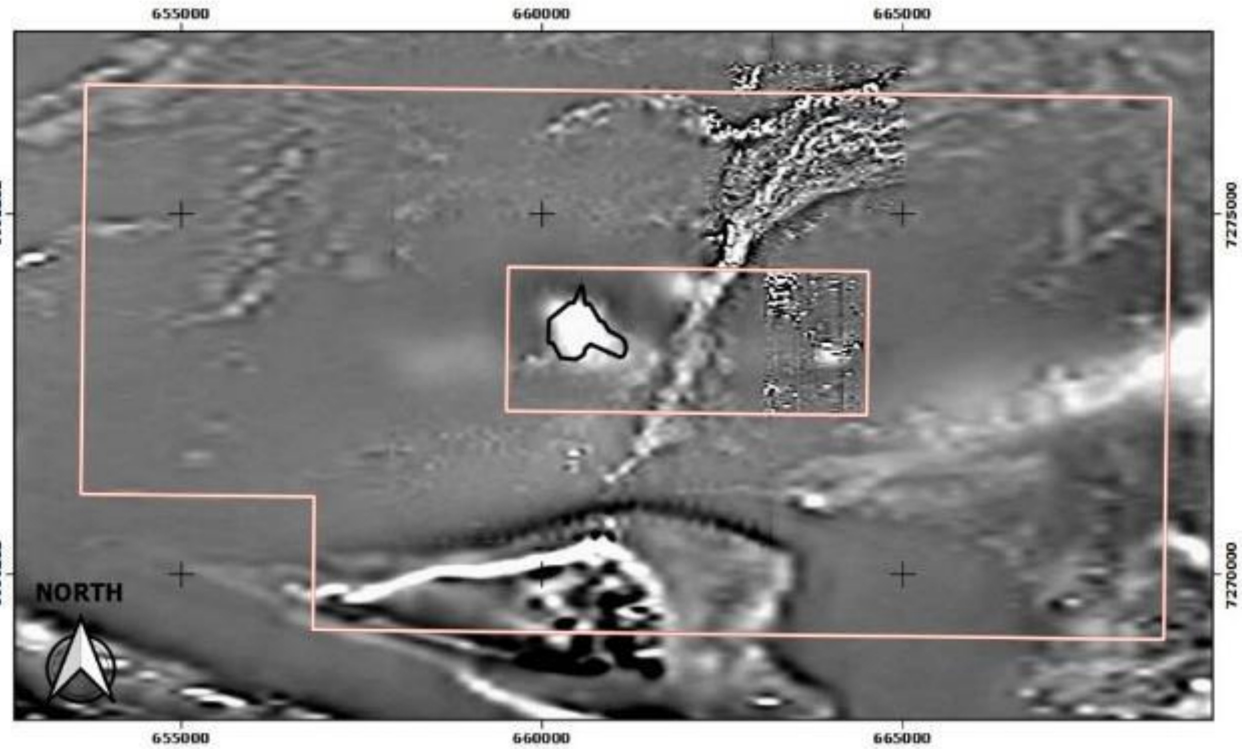
Abra Geophysical Responses: Magnetics – older footprint

- Airborne magnetic survey data resolves Abra as a **+450nT** magnetic anomaly surrounded by magnetically quiet sedimentary deposits of the Kiangi Creek Formation, with some magnetic chatter caused by maghemite in the shallow regolith.
- Smaller discrete magnetic anomalies in the Mining Lease and surrounding Exploration Licence have had sporadic drill testing, and similar stratabound and vein mineralisation toAbra has been intersected at Hyperion to the west.
- Some weakly magnetic trends are associated with altered sedimentary stratigraphy, and strong anomalies to the south are caused by dolerite sills.

TMI-RTP



TMI-1VDAGCRTP



Abra Geophysical Responses: Magnetics

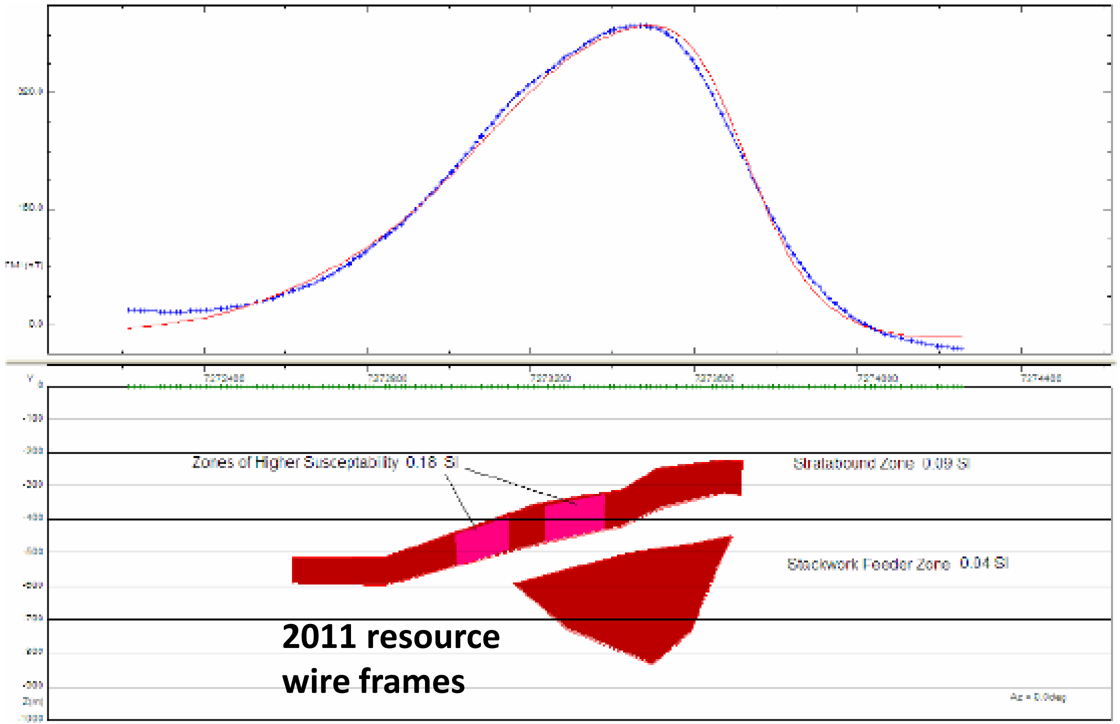
Resource Potentials

- The magnetic expression of Abra and surrounding project area has been subjected to various 2D and 3D model and inversion studies, and magnetic data continues to assist exploration for extensions of known mineralisation.
- A constrained potential field inversion study by Dan Eden (2011, Curtin Honours thesis) showed that the known magnetic mineralisation from resource modelling at the time explained most of the observed magnetic anomaly pattern, except in the NW part of the main anomaly zone, which has since been drill tested and intersected stratabound mineralisation.

S

2.5D polygonal modelling

N



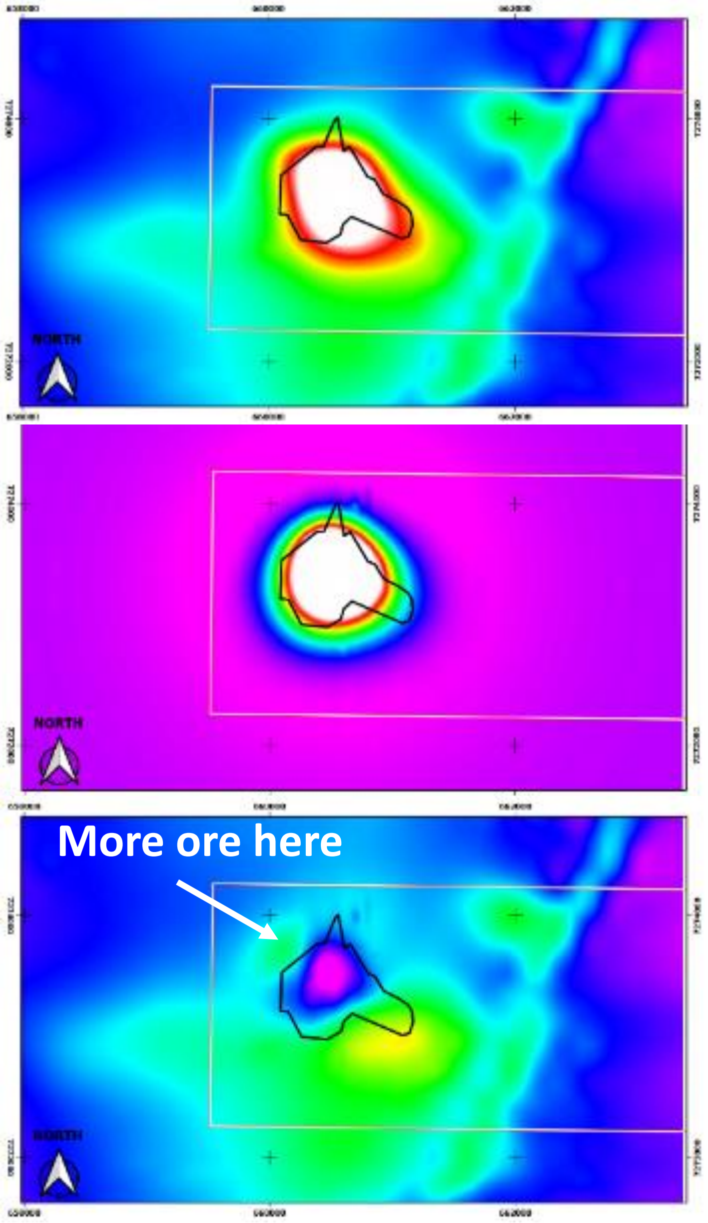
TMI-RTP

-

FORWARD MODELLED

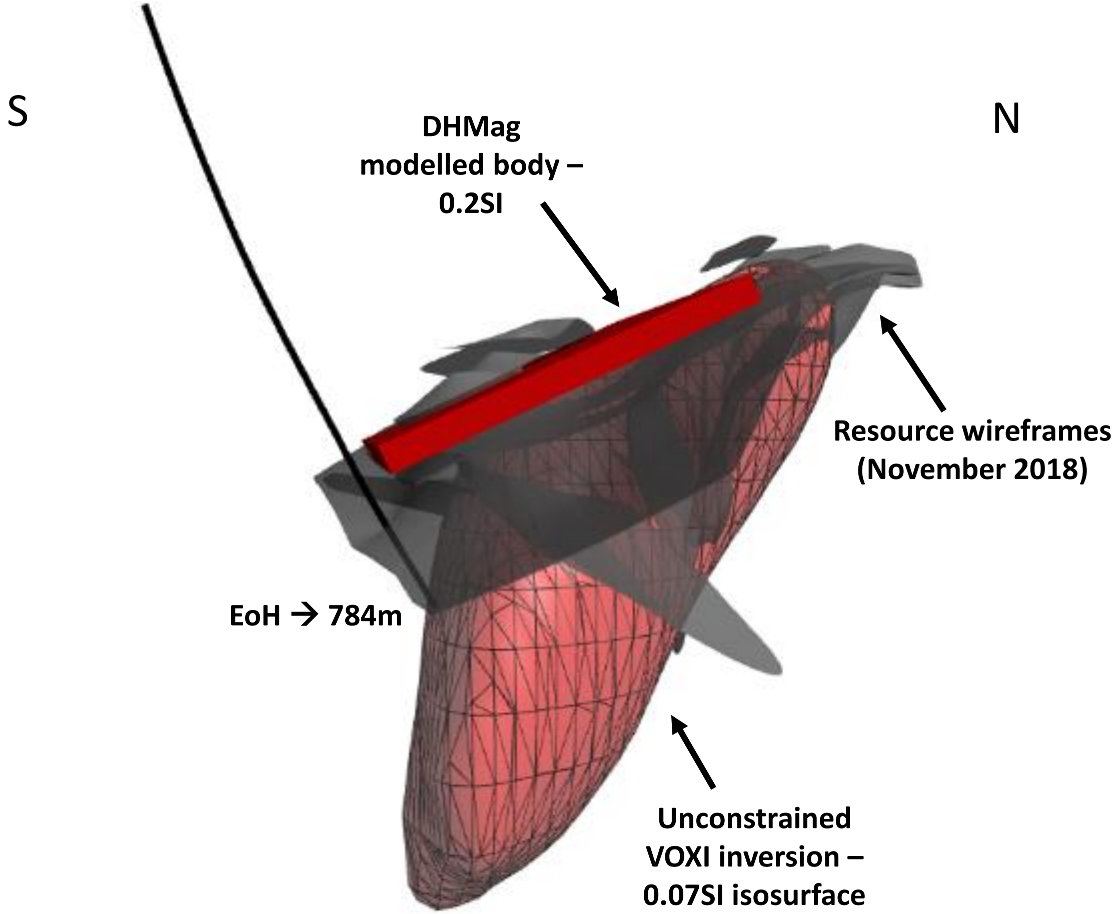
=

RESIDUAL

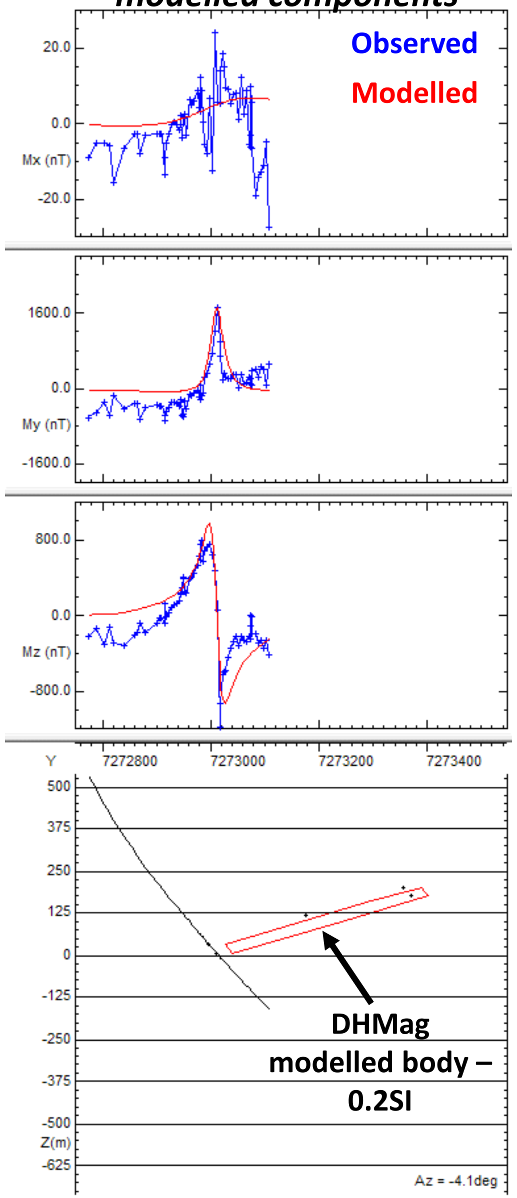


Abra Geophysical Responses: Downhole Magnetics

- Downhole magnetic data can be extracted from the digi-Atlantis B-field EM sensor probes when carrying out DHEM surveying, and this is routinely done in the project area.
- 3D polygonal modelling of broad off-hole magnetic responses matched the magnetic stratabound mineralisation.



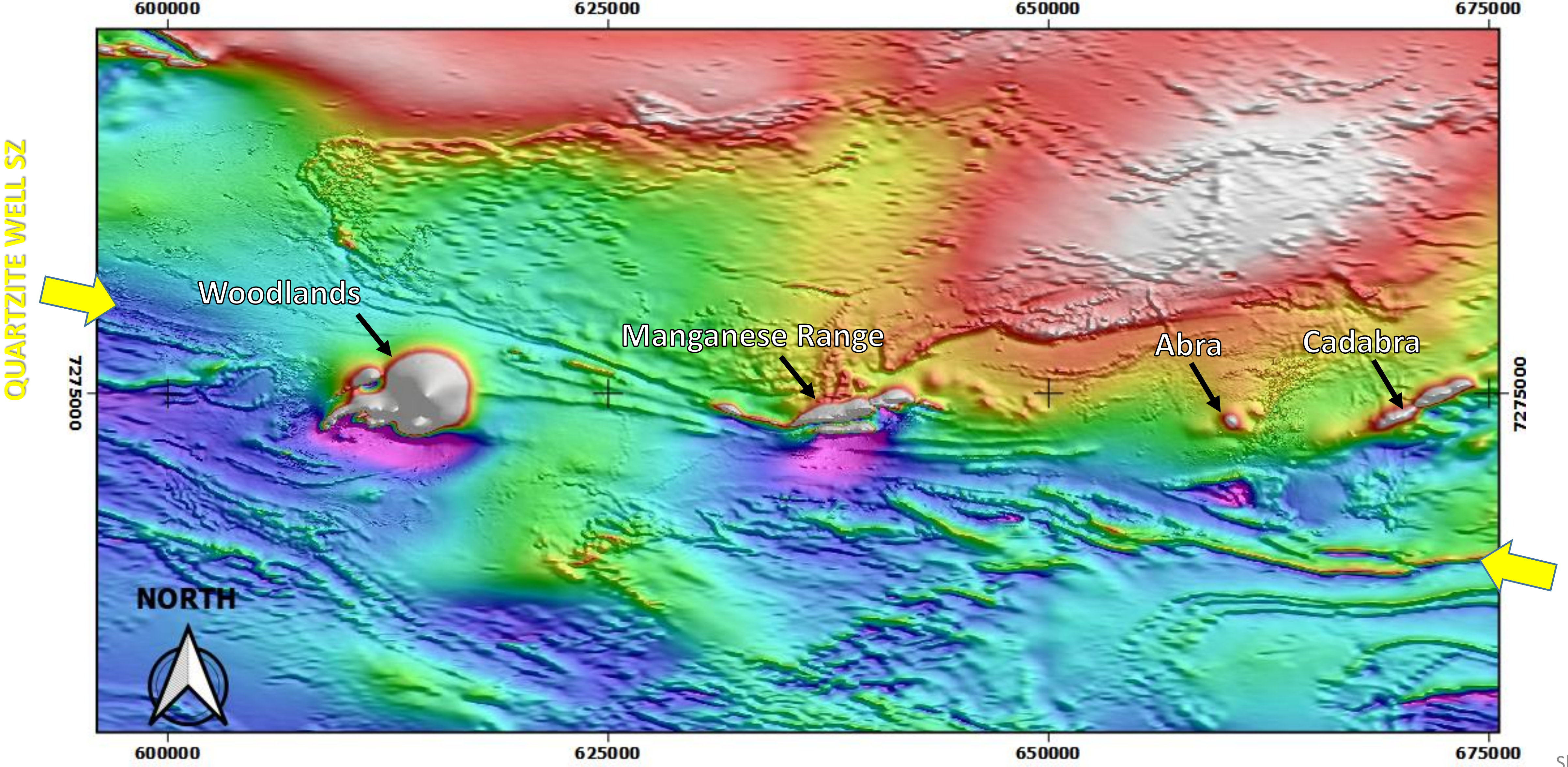
Downhole magnetic surveying – modelled components



Abra Regional Magnetic Anomalies and Targets

Resource Potentials

Regional TMI-RTP image

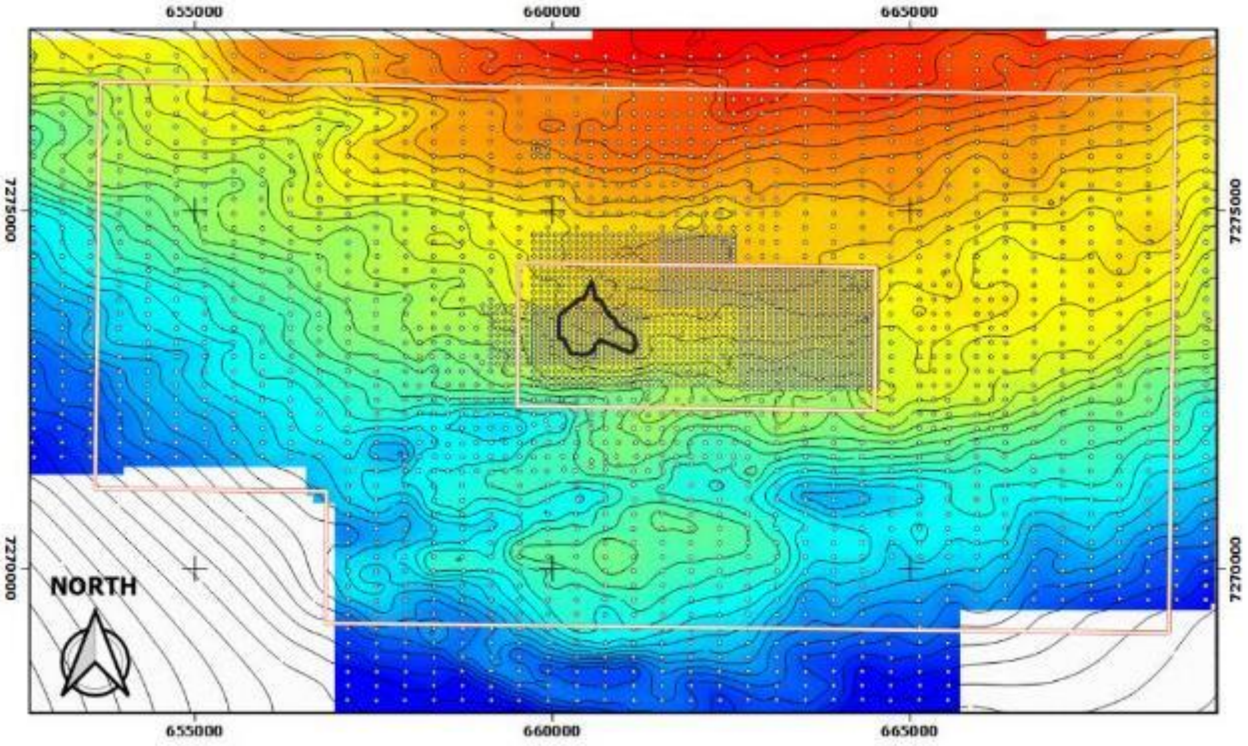


Abra Geophysical Responses: Gravity

Resource Potentials

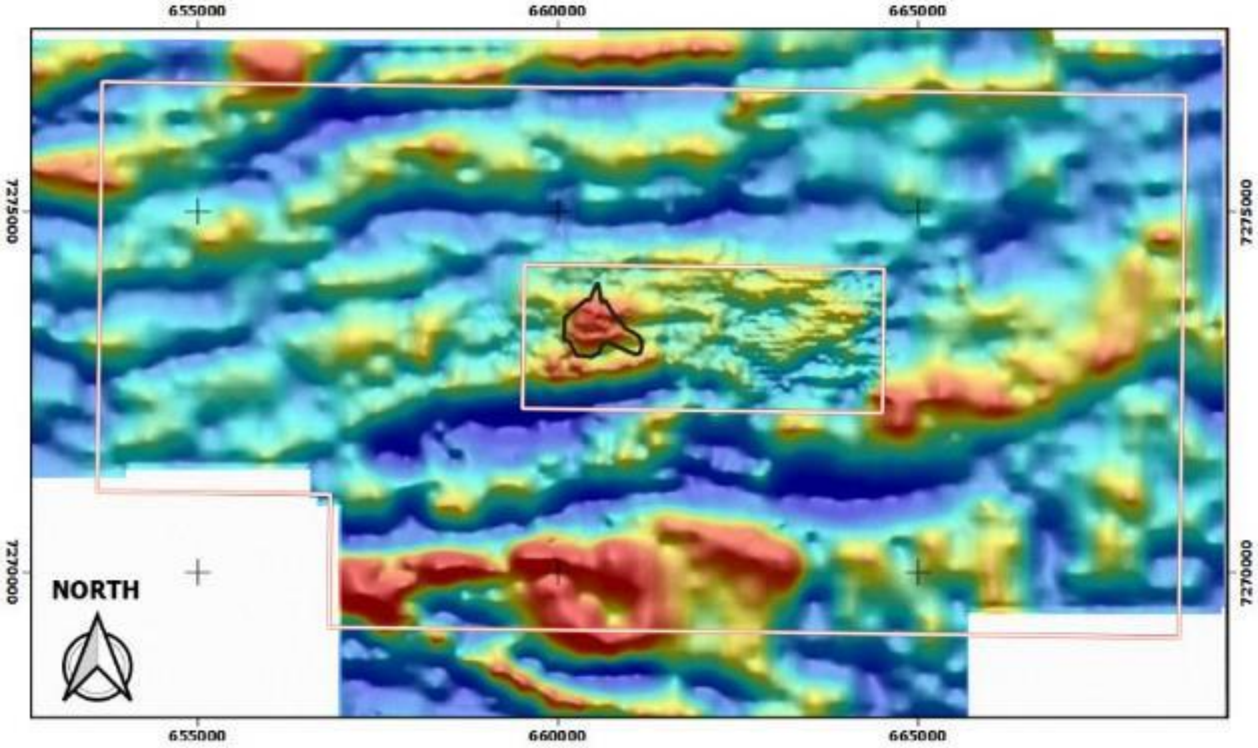
- High resolution gravity surveying carried out in 2005 by Haines.
- Abra is associated with a gravity anomaly high of up to **+1mGal**.
- The source of the gravity anomaly high is mainly dense iron oxide, galena and barite mineralisation in the stratabound zone (red and black), galena-chalcopyrite mineralisation in the feeder zone, and some carbonate, surrounded by low-density sedimentary host rocks.

Bouguer anomaly gravity response (0.5mGal contours)



50m station spacing, 100m line spacing throughout the mining lease
100m station spacing, 400m line spacing throughout greater project area

5km high pass filtered gravity image (terrain corrected)



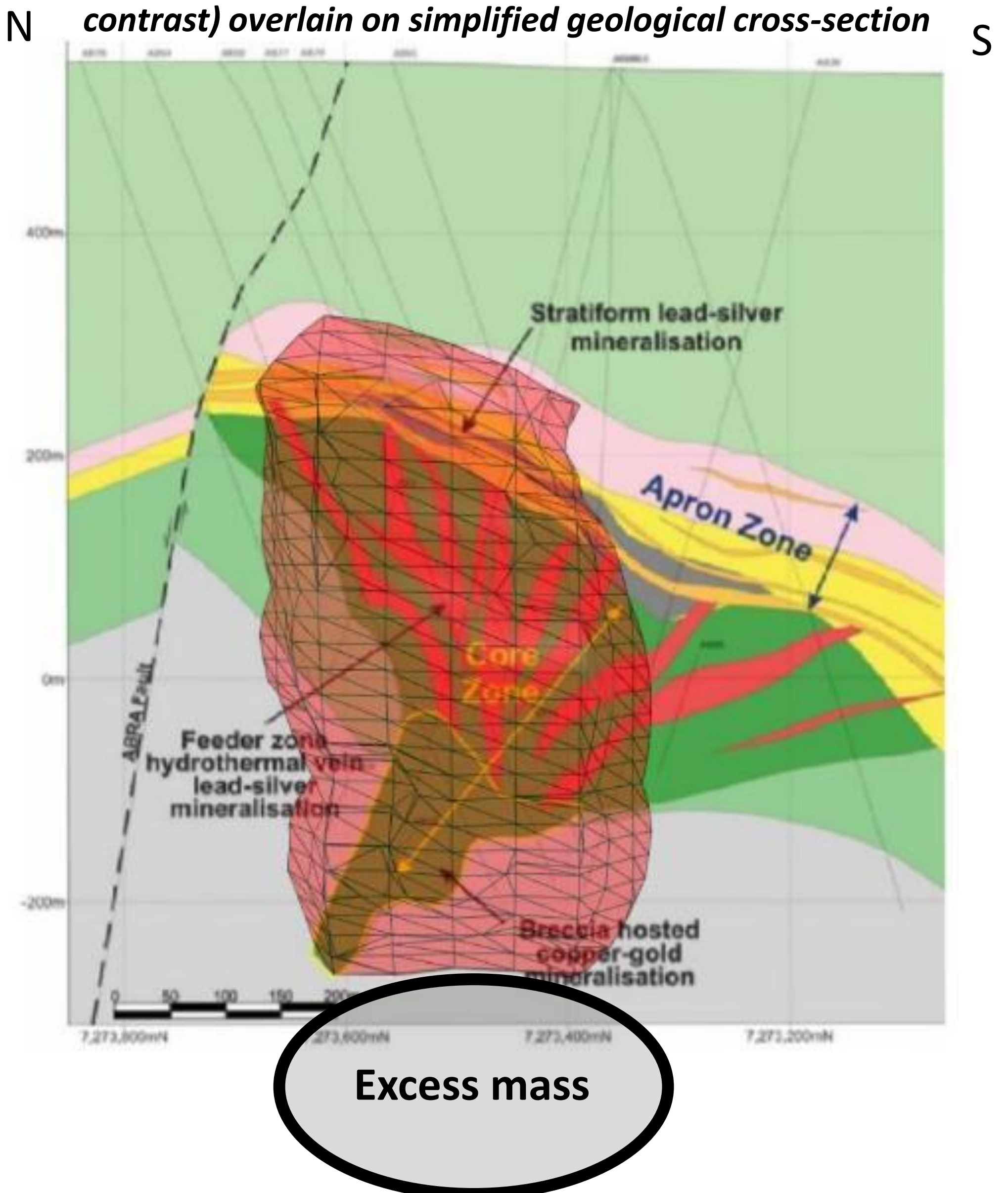
Additional stratigraphic and structural information compared to magnetics

Abra Geophysical Responses: Gravity

Resource Potentials

- Unconstrained 2D and 3D modelling and inversion results in dense source bodies centred on the recently expanded 'feeder' zone, which agrees with petrophysical measurements and is associated with very high grade Pb mineralised zones.
- Constrained gravity inversion study by Eden (2011, Curtin Hons), showed that the known resource zones at the time could only account for 50% of the observed gravity anomaly response, with more higher density zones likely occurring below existing drilling, and this was later confirmed to be more Pb mineralisation in the feeder zone.
- The excess gravity expression can now be explained by a combination of recent drilling results extending dense mineralisation at depth having high Pb grades in the feeder zone, and still some excess mass remains, indicating a deeper dense zone yet to be tested, which could be caused by dolomite, additional mineralisation or a dolerite sill.

Unconstrained gravity inversion isosurface (+0.8 t/m³ contrast) overlain on simplified geological cross-section

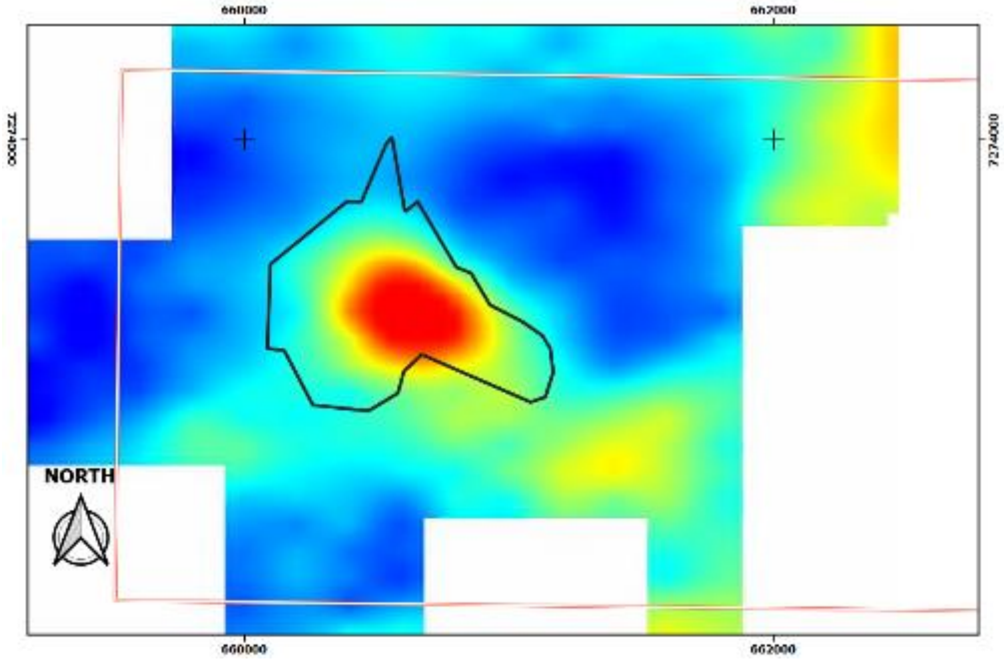


Abra Geophysical Responses: Electromagnetics (Ground)

Resource Potentials

- Ground EM surveys resolve Abra as a broad, asymmetric single peak EM anomaly associated with a weakly conductive bedrock source sitting below weakly conductive weathered siltstone overburden; *and minor IP effects*.
- The most extensive surface EM surveying carried out across Abra was a 1982 SIROTEM MLEM survey, with further MLEM surveying carried out in 2006 using a Curtin/Kepic RVR coil, and in 2012 using LANDTEM high-temperature B-field sensor, <u>all with increasing Tx power over time</u>.
- The results of petrophysical testing on core indicate that the source of the EM conductor responses is mainly massive galena (±pyrite) mineralisation.

Gridded image of 1982 SIROTEM MLEM survey Z component channel 8

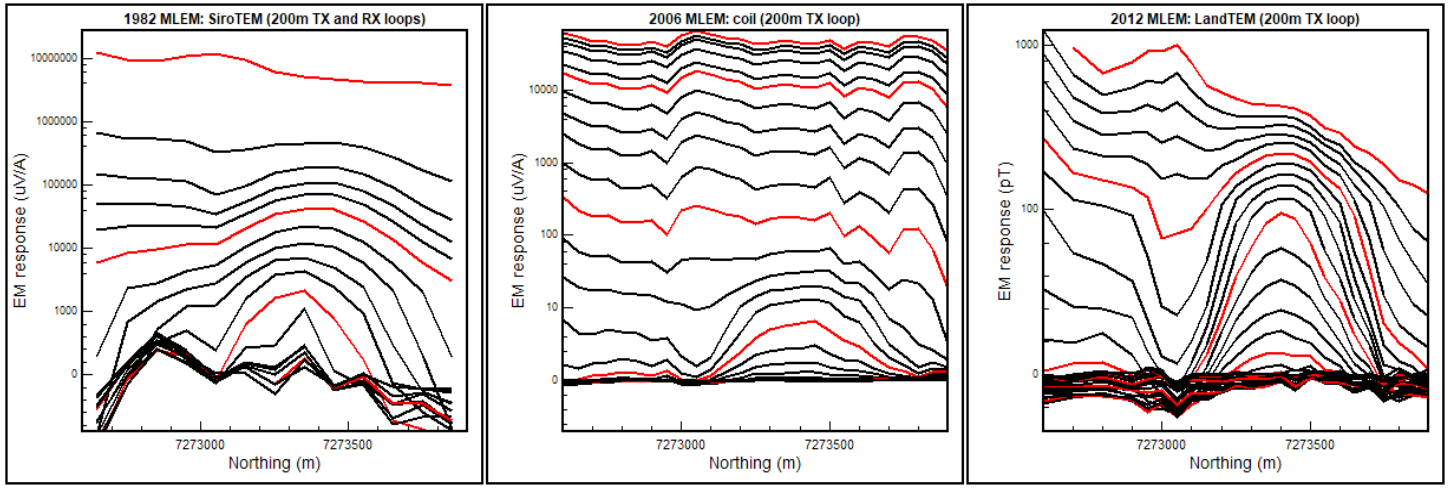


Coincident Z component EM response profiles from MLEM surveys carried out in A) 1982, B) 2006 and C) 2012.
All surveys carried out using 200m x 200m Tx loops.

S

N

A **B** **C**



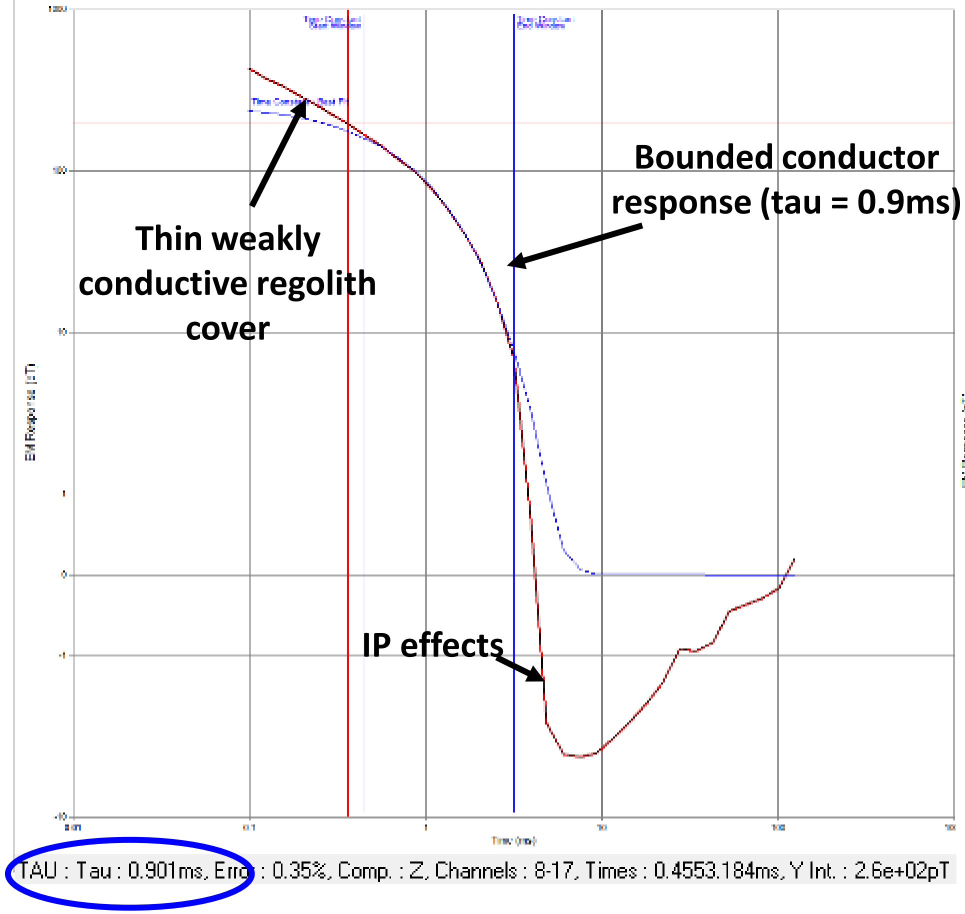
5 Amps 5Hz | **25 Amps 2 Hz** | **40 Amps 1.5Hz**

Abra Geophysical Responses: Electromagnetics (Ground)

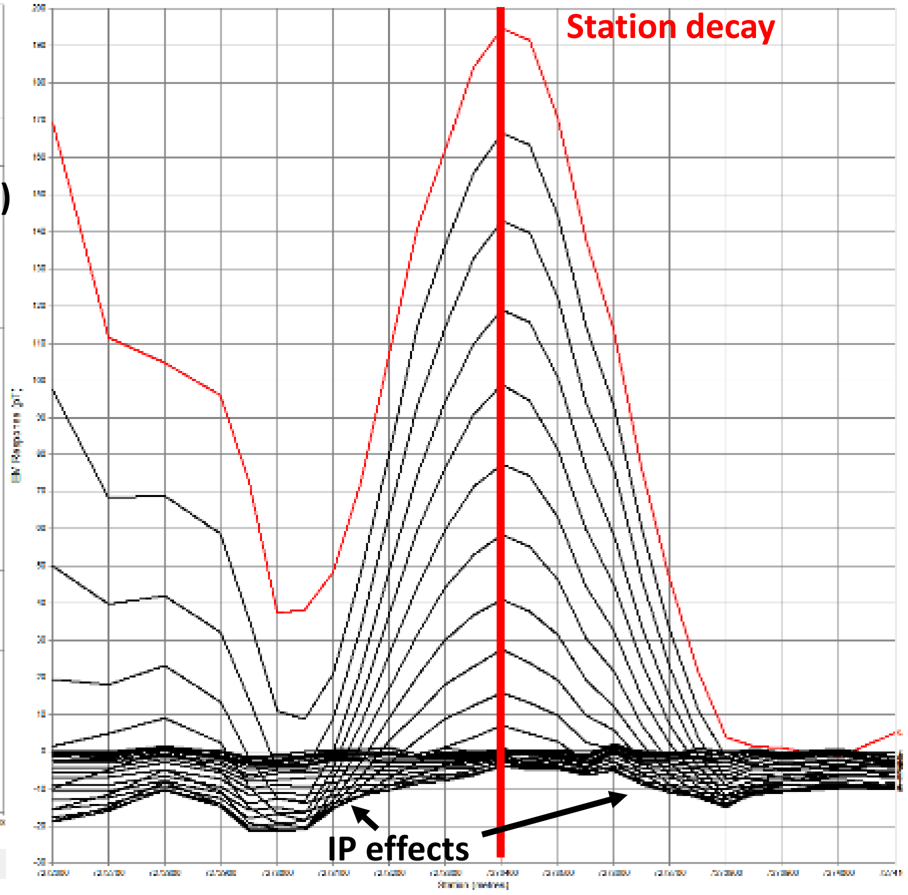
Resource Potentials

- 2012 LANDTEM MLEM survey resolved a mid-time single peak EM decay channel conductor anomaly in the Z component data centred over known base metal mineralisation, within a background of weakly conductive bedrock and beneath thin regolith cover. Conductor plate modelling using all 3 MLEM datasets confirm a conductor source sitting within the stratabound mineralised zone, masking the underlying mineralisation.

Z component time decay



Z component EM response profiles from 2012 LANDTEM survey (>Ch 9).



Looking west at resource wireframes (grey) and modelled MLEM conductor plate (red)

S

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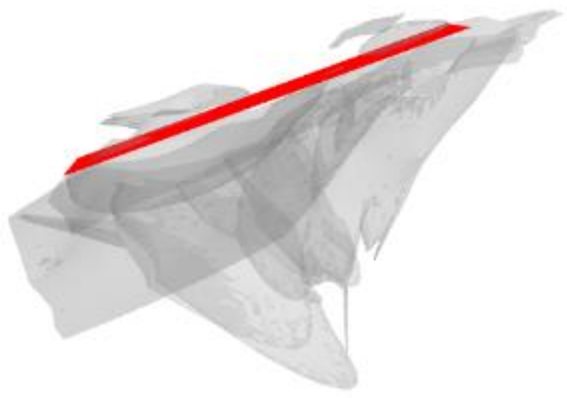
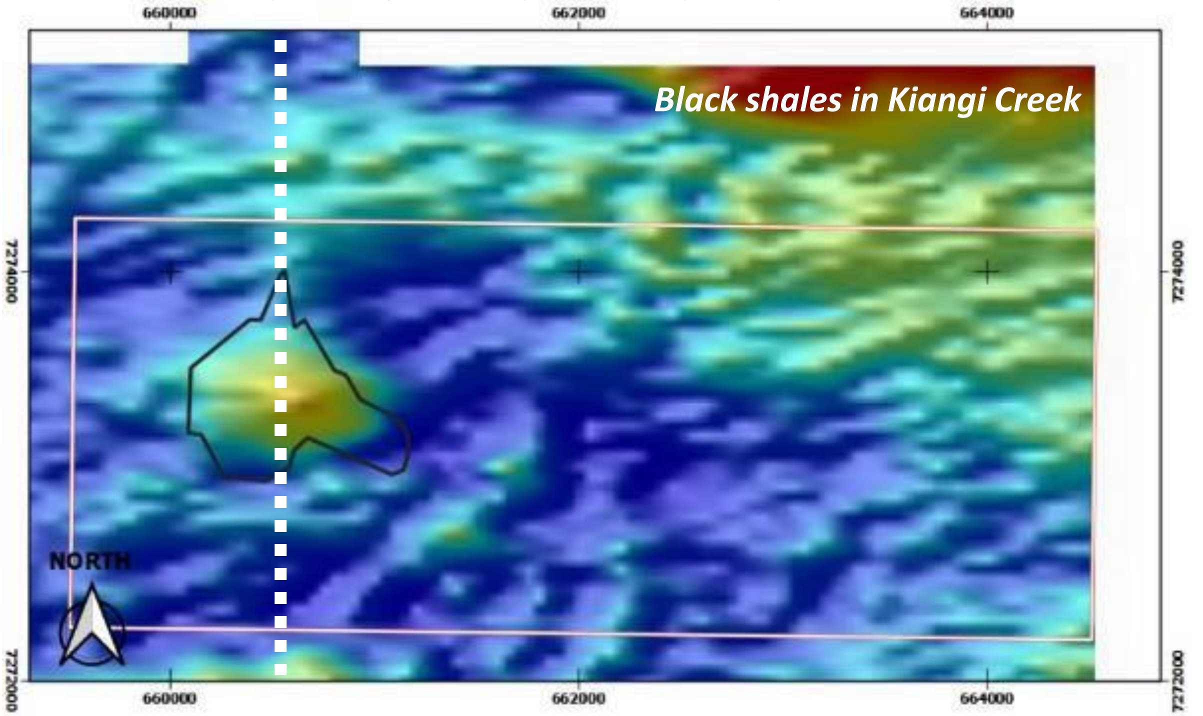
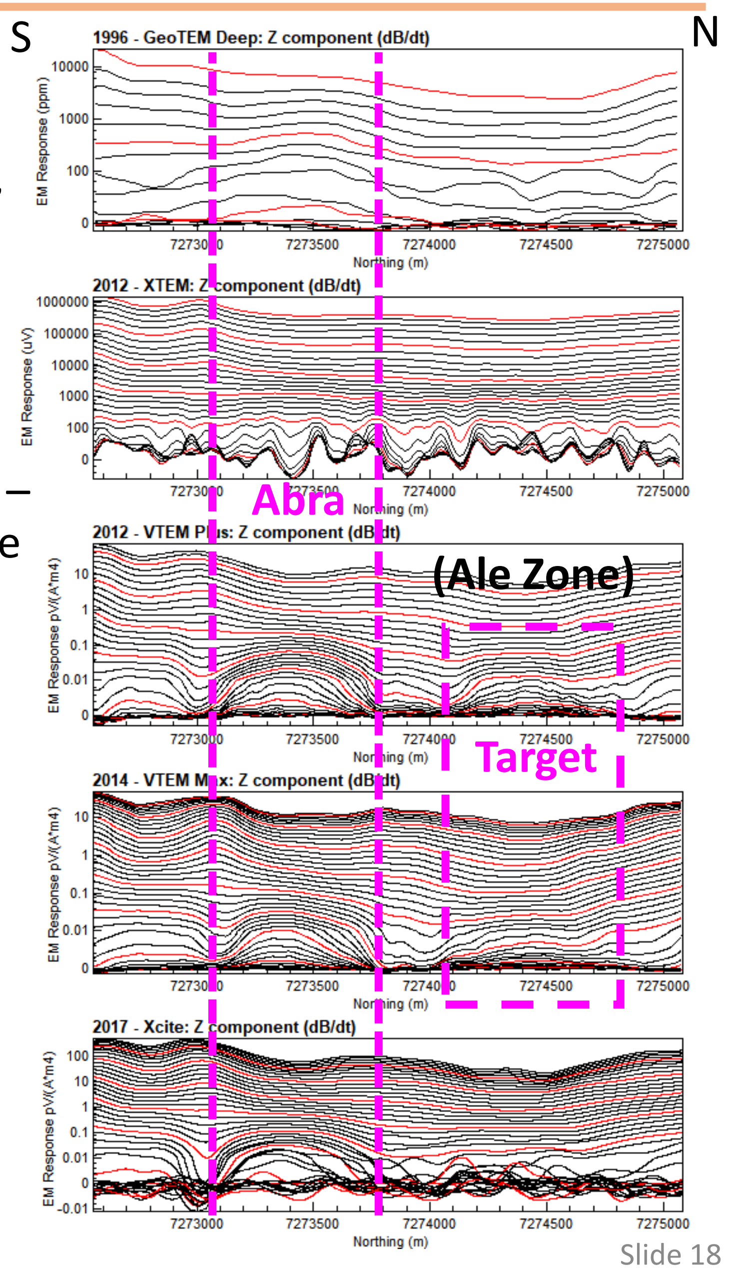


Abra Geophysical Responses: Electromagnetics (Airborne)

- First airborne EM surveying carried out in 1996 using GeoTEM-Deep, which barely resolved Abra above the noise envelope in both the Z and X receiver component data.
- This was followed by several different airborne EM systems, including: VTEM-Plus (2012), XTEM (2012), VTEM-Max (2014), and Xcite (2017). The ZTEM airborne AMT system was flown over Abra for CSIRO in 2014, results were initially ambiguous, but 3D modelling by Jean Legault and his team at Geotech generated interesting results.
- VTEM results are similar to SIROTEM in terms of depth penetration and IP effects.
- VTEM has detected a deep conductor anomaly to the north of Abra forming a drill target – which has recently been tested by deepening a deep hole by only 2 drill rods, now the Ale zone.

2012 VTEM Plus – Channel 40 Z component dB/dt

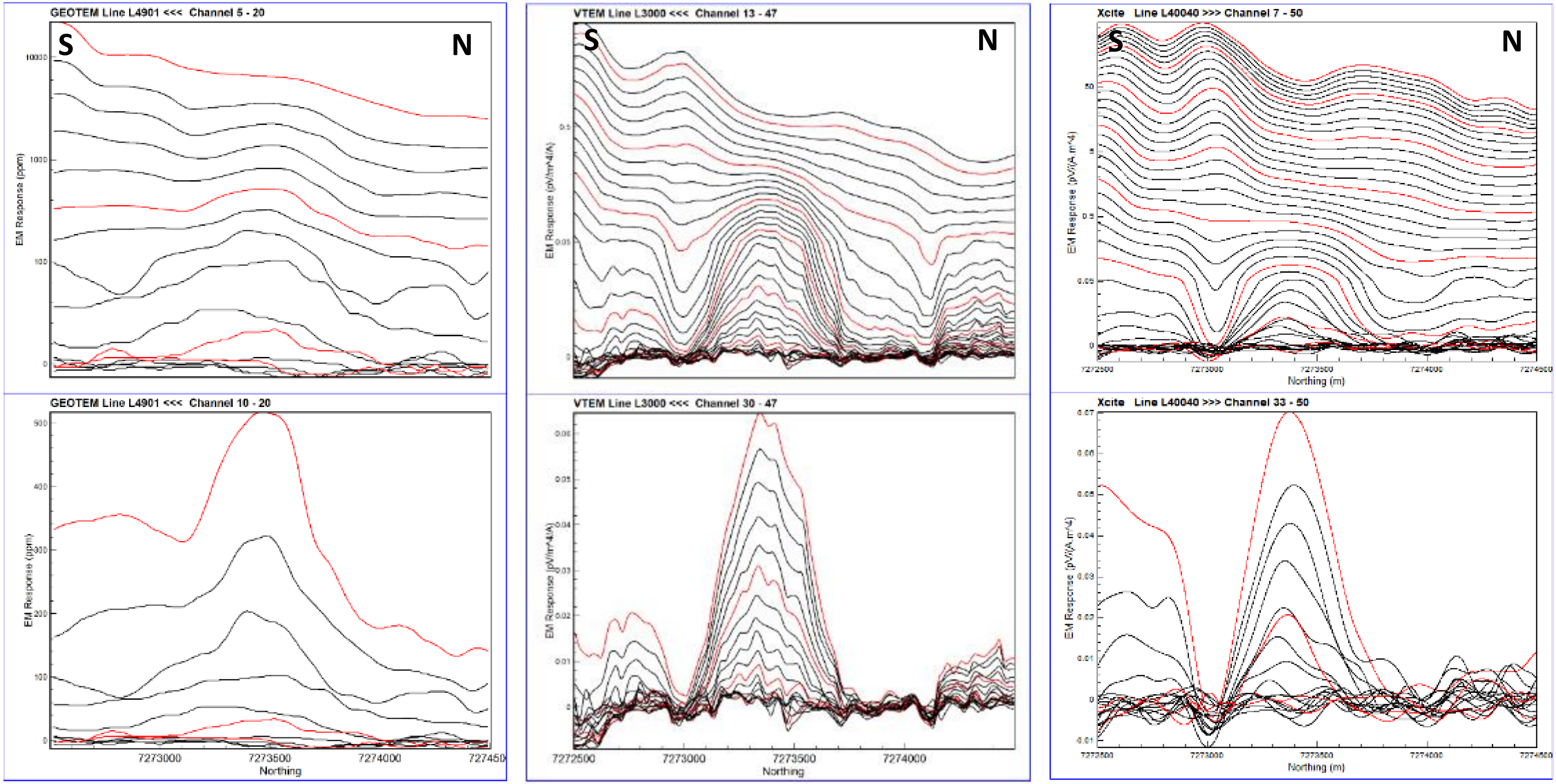




Abra Geophysical Responses: Electromagnetics (Airborne)

Resource Potentials

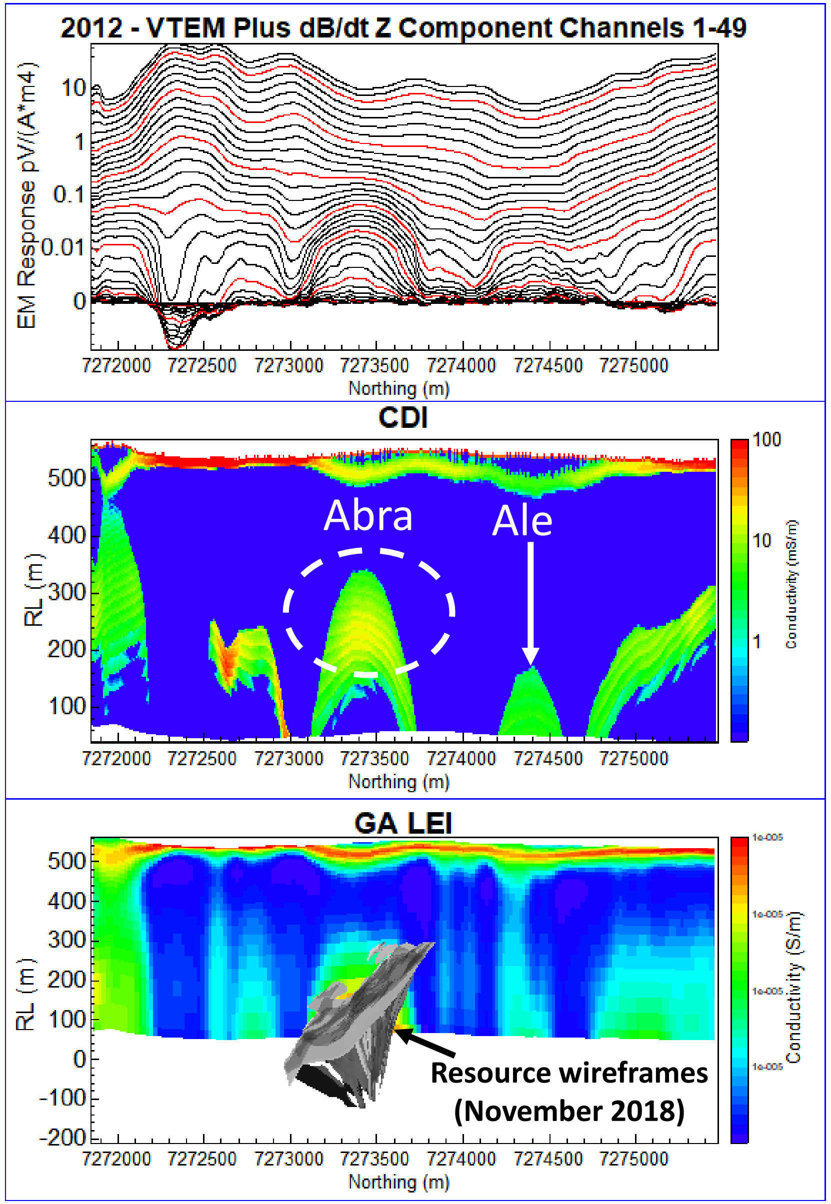
GEOTEM - 1996 ***VTEM-Plus - 2012*** ***Xcite - 2017***

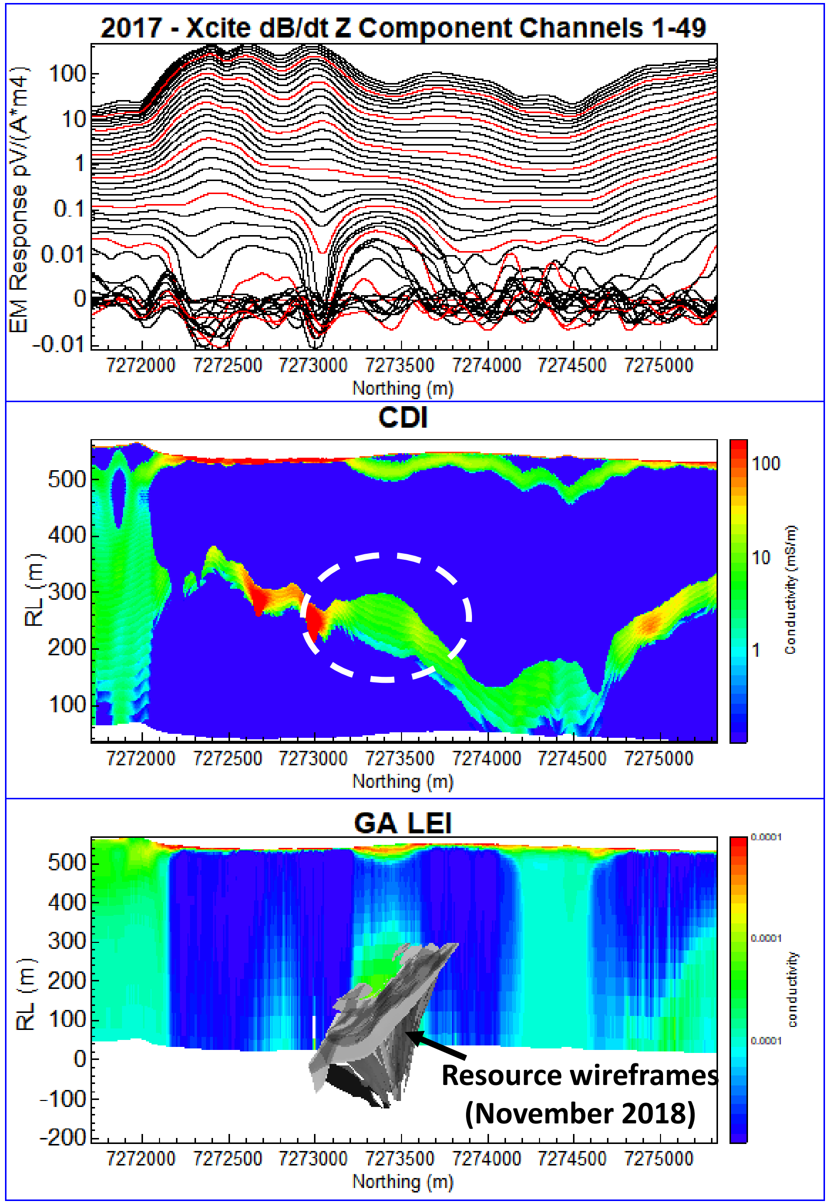


Abra Geophysical Responses: Electromagnetics (Airborne)

Resource Potentials

- Conductor plate modelling and 1D conductivity inversions (AMIRA CDI and GA LEI) show that model results from AEM data correspond to stratabound mineralisation.
- Late-time EM decay channel conductor anomaly to the north of Abra was drill tested by Galena Mining in 2020 and shown to be related to Pb mineralisation - Ale.





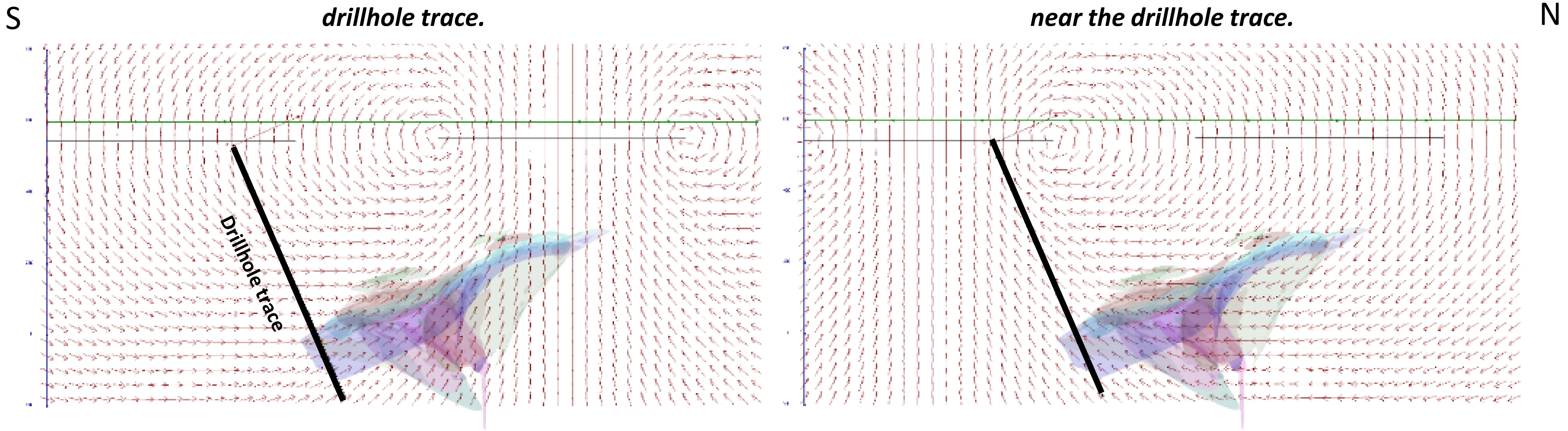
Abra Geophysical Responses: Electromagnetics (Downhole)

Resource Potentials

- Various phases of DHEM surveying carried out at Abra since 1982. Recent DHEM surveying on an 784m deep drillhole located to the southern end of the Abra deposit shown here. The drillhole failed to intersect the Red and Black mineralised zones, with only minor disseminated sulphide mineralisation intersected within dolomitic sediments – IP anomaly zone.
- DHEM surveying carried out by Vortex Geophysics using a Zonge transmitter (Tx) and (EMIT) DigiAtlantis B-field probe at a base frequency of 1Hz. Tx current of 96A achieved.
- The drillhole was surveyed twice using two large single turn Tx wire loop layouts with dimensions of 700m x 700m, which were designed to provide good EM coupling with both shallow south dipping and steep vertical to north dipping conductor bodies close to the drillhole trace. Results shown on next slide.

EM field vectors generated by northern Tx loop, providing good EM coupling with steep dipping conductors near the drillhole trace.

EM field vectors generated by southern Tx loop, providing good EM coupling with shallow south dipping conductors near the drillhole trace.

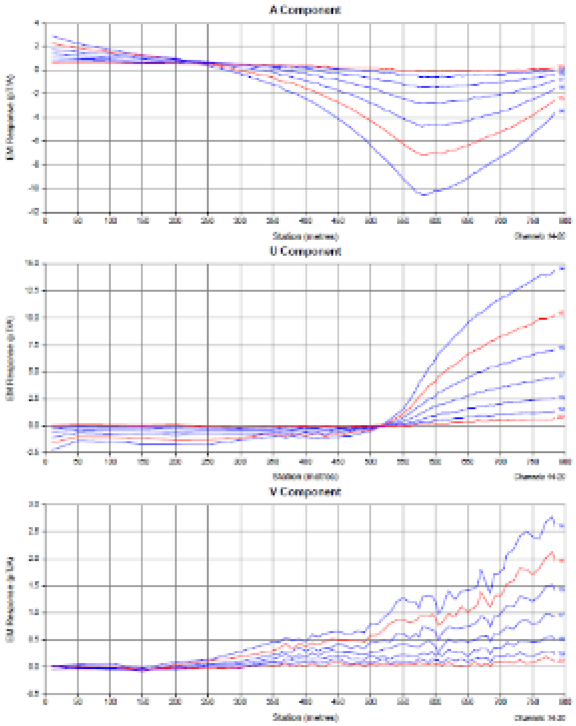


Abra Geophysical Responses: Electromagnetics (Downhole)

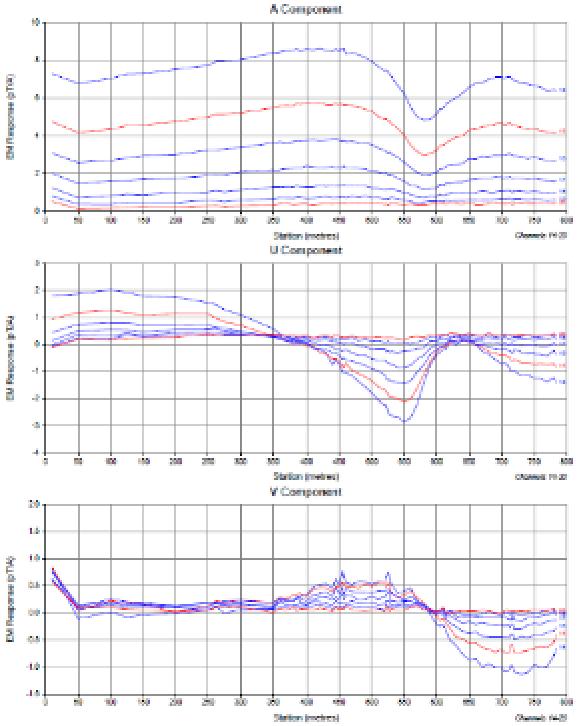
Resource Potentials

- DHEM data acquired using both Tx loop configurations were considered to be of good quality, with noise levels generally <0.1pT/A.
- Observed DHEM responses typically reflect weakly conductive regolith cover and host rock units in early to middle time decay channels.
- At mid-time decay channels (channels 14 - 20), moderate amplitude anomalous DHEM conductor responses are observed around 600m downhole as a negative or 'pull down' response in the A component receiver DHEM data, and as inflections / cross overs in the U and V component receiver DHEM data.
- Anomalous DHEM responses observed are typical of weakly to moderately conductive sources to the north and above the drillhole, correlating to known mineralised zones, with a potentially untested conductor sitting directly below the feeder zone.

Northern Tx loop (Ch 14 – 20)



Southern Tx loop (Ch 14 – 20)



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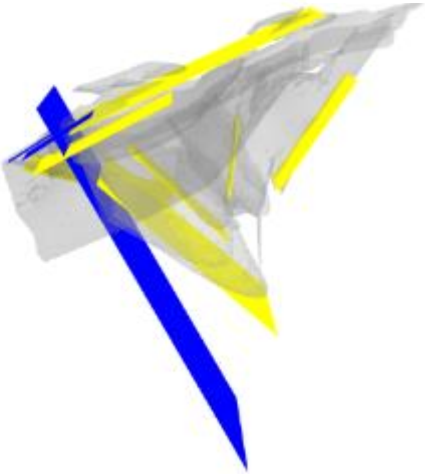


Various DHEM conductor plates used to model the observed DHEM responses, with an untested conductor zone (blue) below the known mineralisation (grey).

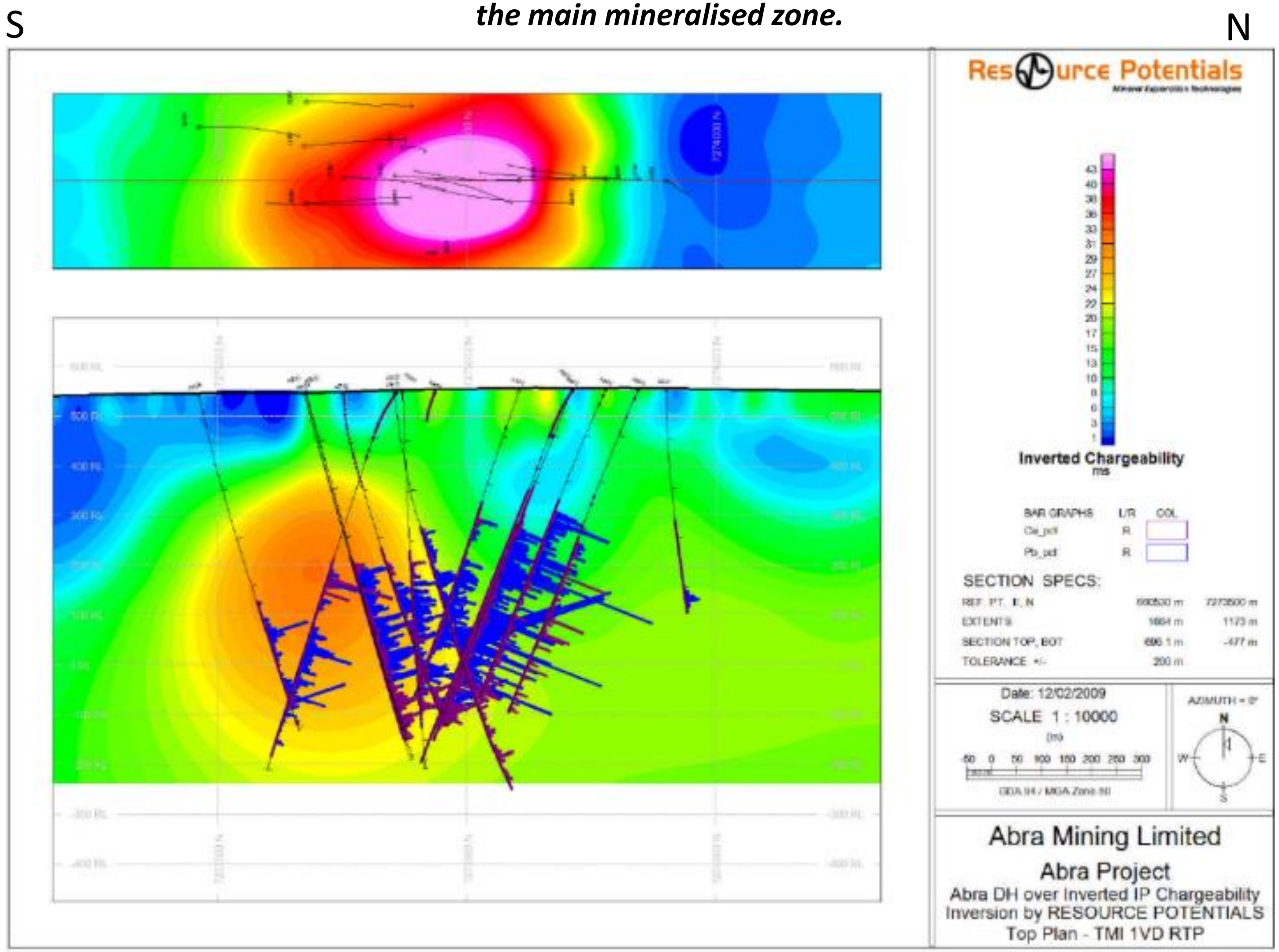
Yellow DHEM conductor plates provide an equally good fit with the observed DHEM responses

Abra Geophysical Responses: Induced Polarisation

Resource Potentials

- Petrophysical studies indicate that high-grade parts of Abra should result in a moderate to strong IP chargeability anomaly.
- Dipole-dipole IP (DDIP) and Pole-dipole IP (PDIP) surveying using 100m A-spacing to N=10 was carried out between 2006-2008 by GPX Surveys.
- Inverted DDIP data resolved a high amplitude chargeability anomaly which was offset above and just to the south of high-grade mineralisation, despite disseminated sulphide mineralisation occurring within the main zone of the deposit.
- The observed offset chargeability anomaly likely represents a zone of intense alteration or disseminated sulphide minerals on the periphery of the deposit as sparse chalcopyrite and pyrite mineralisation intersected in this zone.

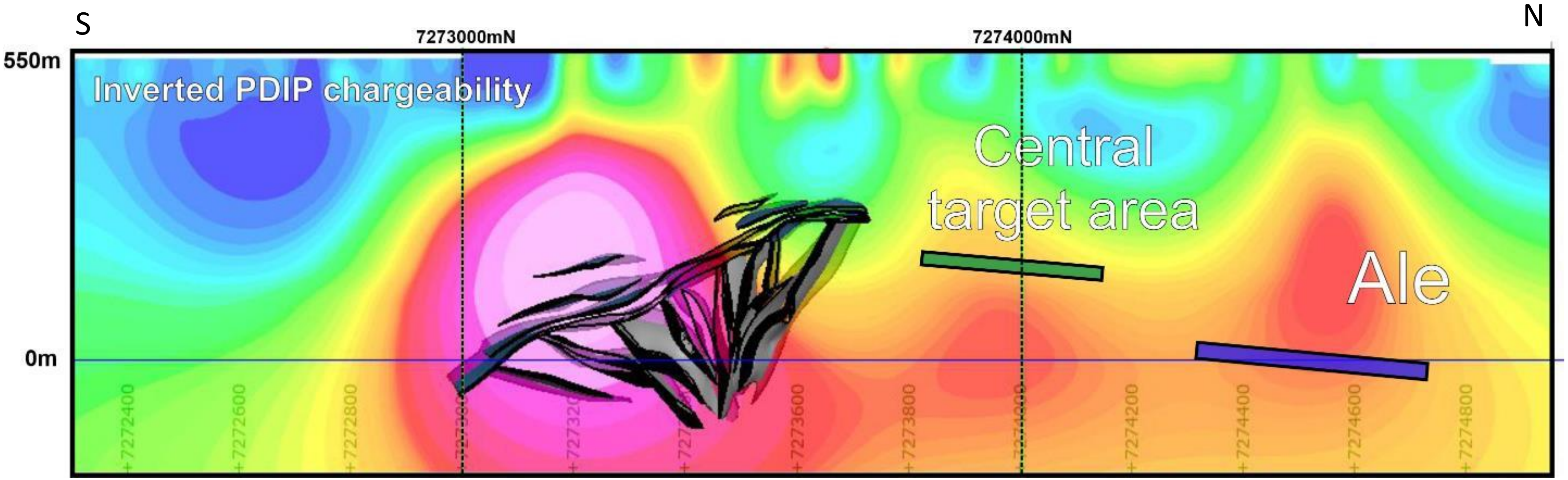
Inverted chargeability IP section overlain by drillholes with Pb assay results shown as bar graphs to the right, showing a significant chargeable anomaly offset to the south of the main mineralised zone.



Abra Geophysical Responses: Induced Polarisation

Resource Potentials

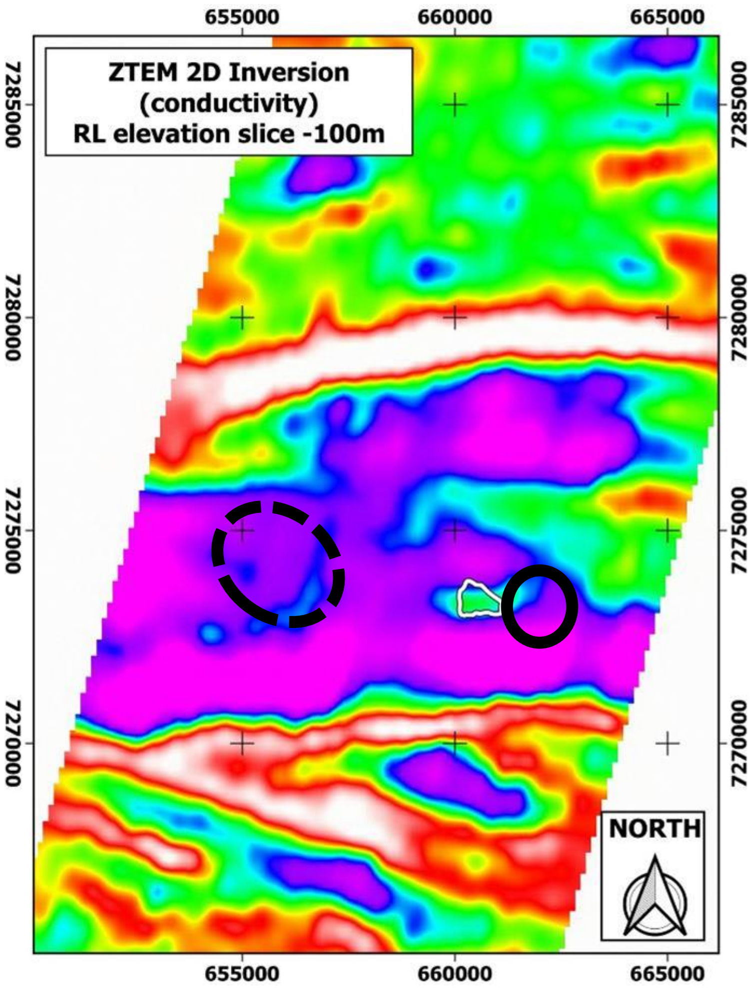
Inverted chargeability PDIP section extending further north overlain by Abra resource wireframes showing a significant chargeable anomaly above the southern part of the deposit. The blue and green polygons show the Ale and Central target areas, where modelled EM conductor plates are roughly associated with vertically offset inversion modelled chargeable zones.

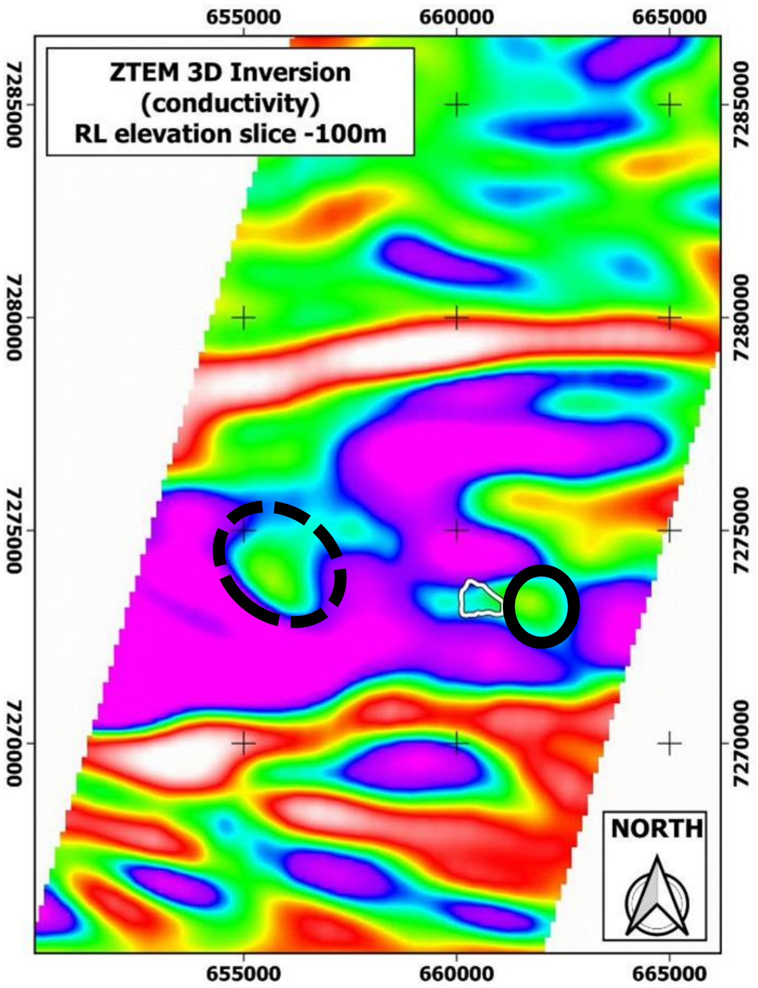


Abra Geophysical Responses: ZTEM AMT (CSIRO)

Resource Potentials

- ZTEM flown by Geotech/UTS in 2017 using NE-SW survey lines at 500m spacing, database copy supplied by Tim Munday.
- -100m RL elevation slice (650m depth) through 2D (left) and 3D (right) ZTEM inversion conductivity block models. White outline shows the more recent footprint of Abra mineralisation projected to the surface. Black circles highlight anomalous conductor response observed only in the 3D inversion result.



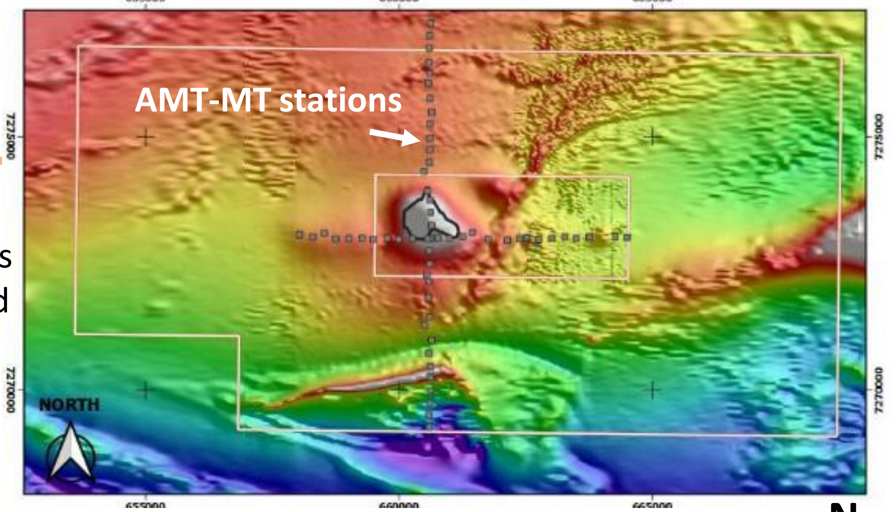


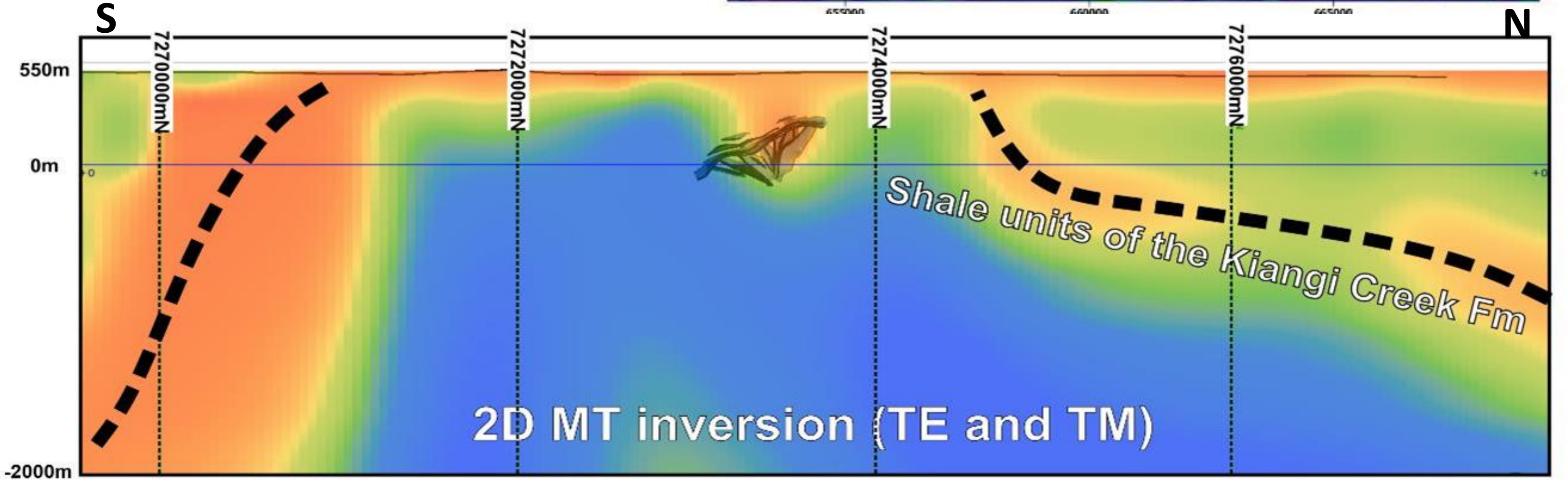
Abra Geophysical Responses: Magnetotellurics

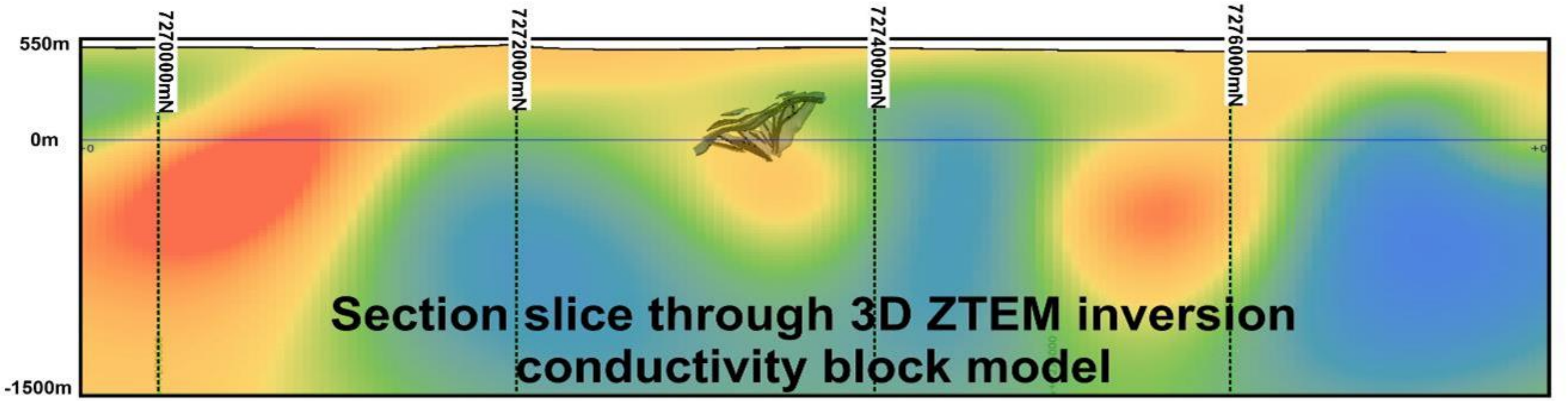
- Combined AMT-MT surveying in 2014 to map large-scale conductive structures and stratigraphy to a depth of approximately 5km.
- Data acquisition by Moombarriga Geoscience at 100-200m along 10km N-S orientated survey line and a 6km E-W orientated survey line.
- Contractor provided 1D and 2D inverted resistivity cross sections, and Resource Potentials also used two different inversion programs to generate similar results. The existing 2D AMT-MT modelled cross section resolved Abra as a broad weakly conductive zone within a resistive host in the centre of an anticline.
- Graphitic shale units of the upper Kiangi Creek Formation are resolved as anticlinal limbs dipping to the north and south of Abra, forming a broad fold and thrust structure from rift basin inversion.
- 3D ZTEM model result broadly similar, but the 2D ZTEM model results did not detect Abra.

AMT/MT survey specs

ADU-07e recorders and MFS06e induction coils
Hx, Hy, Hz and Ex and Ey components recorded
Dipole length 50m
AMT data recorded for 1-2 hours
MT data recorded for 10-16 hours





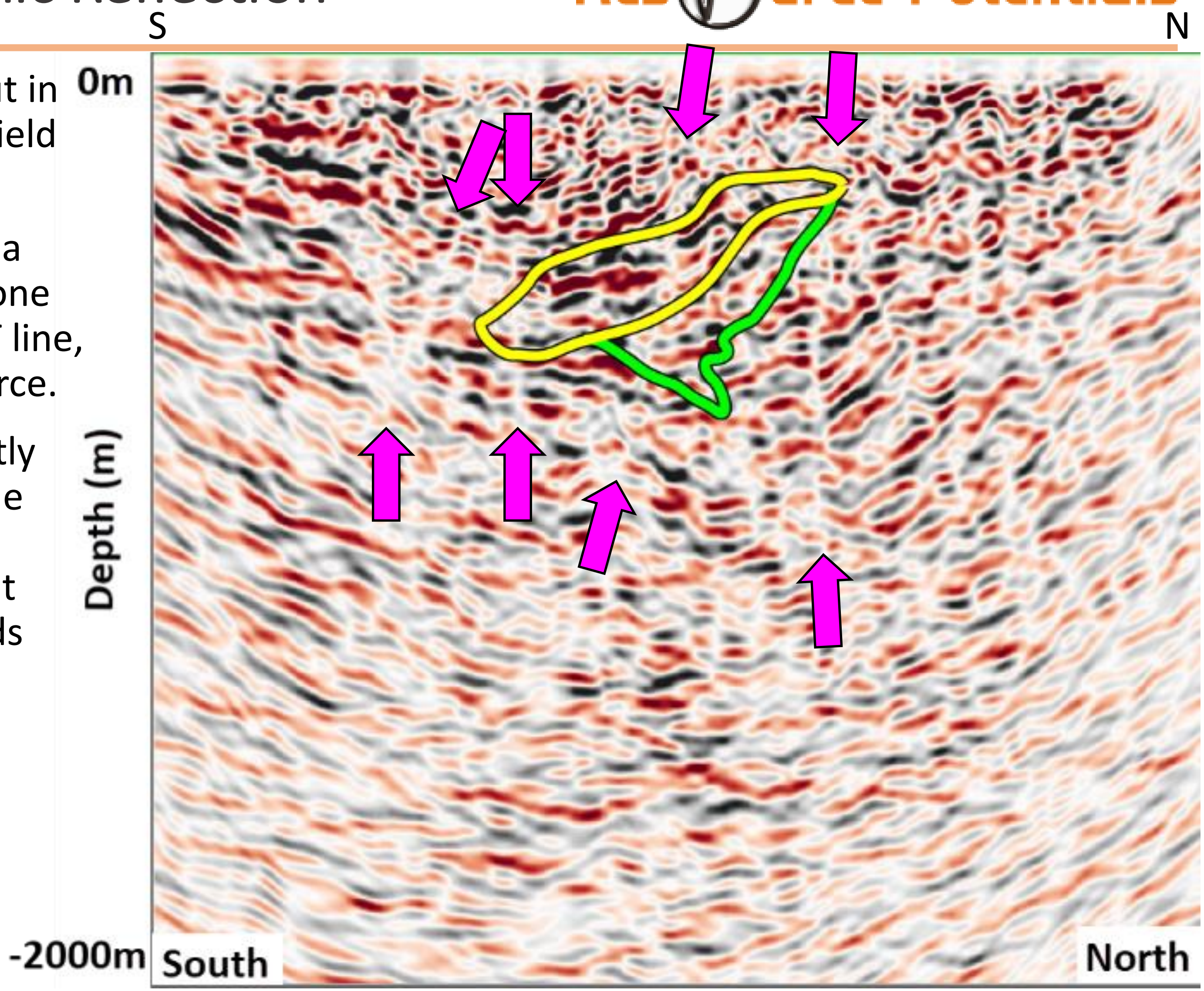


Abra Geophysical Responses: 2D Seismic Reflection

Resource Potentials

- 2D multichannel seismic reflection surveying carried out in 2011 as part of a Curtin University 3rd year geophysics field program.
- Data acquisition using HiSeis receiver equipment along a 2.5km N-S orientated traverse (5m shot and 5m geophone spacing) centred directly over Abra, coincident with MT line, and using Curtin designed accelerated weight drop source.
- Data were initially processed by Curtin, and then recently reprocessed by HiSeis in 2019, which better resolved the stratabound mineralisation as semi-coherent seismic reflectors, as well as better imaging late cross faults that may have initially formed conduits for mineralising fluids and have since been reactivated.

Curtin accelerated weight drop source mounted on a bobcat



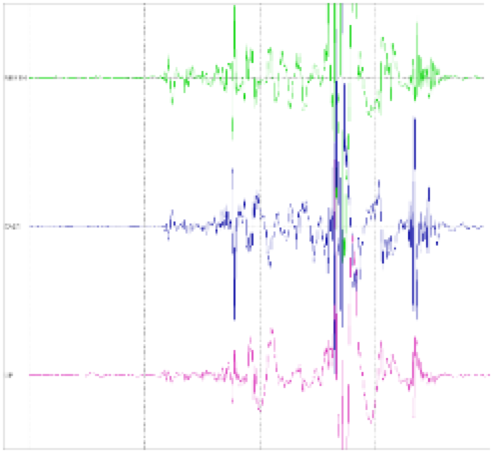
View looking west of reprocessed depth migrated seismic reflection cross section image overlain with outlines of Abra stratabound mineralisation in yellow and feeder zone in green.

Abra Geophysical Responses: Passive Seismic HVSR

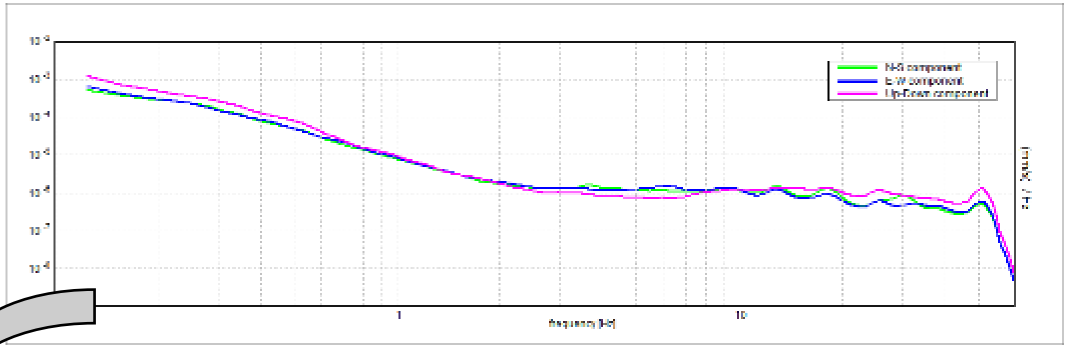
Resource Potentials

- Trial passive seismic horizontal to vertical spectral ratio (HVSR) surveying was carried out by Resource Potentials over Abra in 2019 to acquire detailed information about regolith cover thickness, possibly provide static correction information to improve reprocessing of 2D seismic reflection data and future 3D seismic reflection surveying, and identify structural offsets.
- Data acquisition was carried out along the same N-S traverse as the 2D seismic reflection survey, along with an E-W traverse.
- The HVSR data at each recording station were amplitude normalised and converted to depth using a constant average shear wave velocity (Vs) of 3,000m/s, based on measured Vp data from core converted to Vs. Pixel plot HVSR normalised amplitude-depth cross sections were then generated.

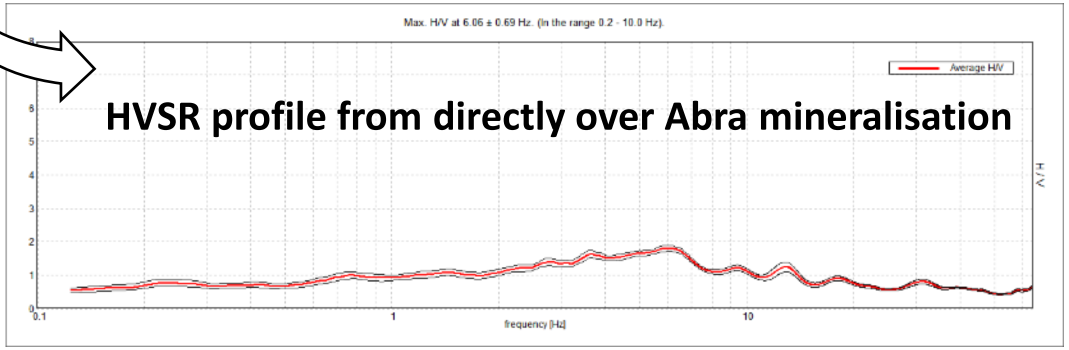
Representative passive seismic data acquired at Abra



FFT



Horizontal spectra component / vertical component spectra profile response

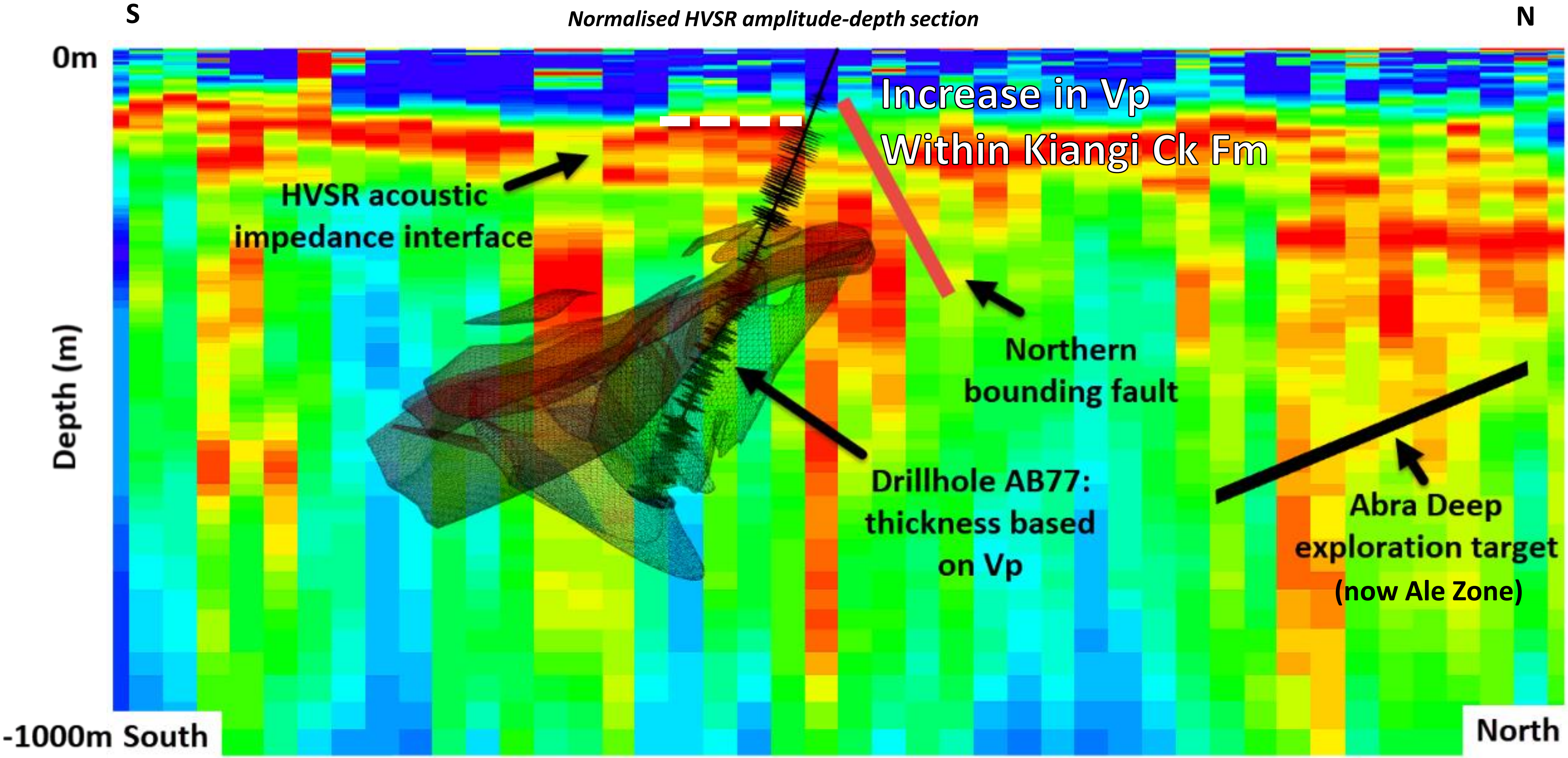


HVSR profile from directly over Abra mineralisation

Passive seismic HVSR survey specs
8x Tromino seismometers
50m station spacing
30min recording time
<u>Total field time → 1 day</u>

Abra Geophysical Responses: Passive Seismic HVSR

Resource Potentials

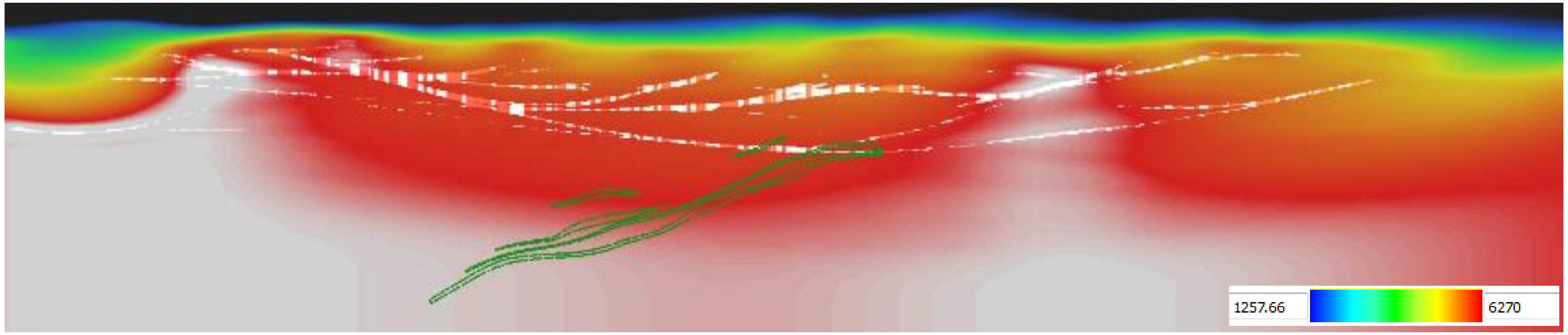


Abra Geophysical Responses: Passive Seismic HVSR

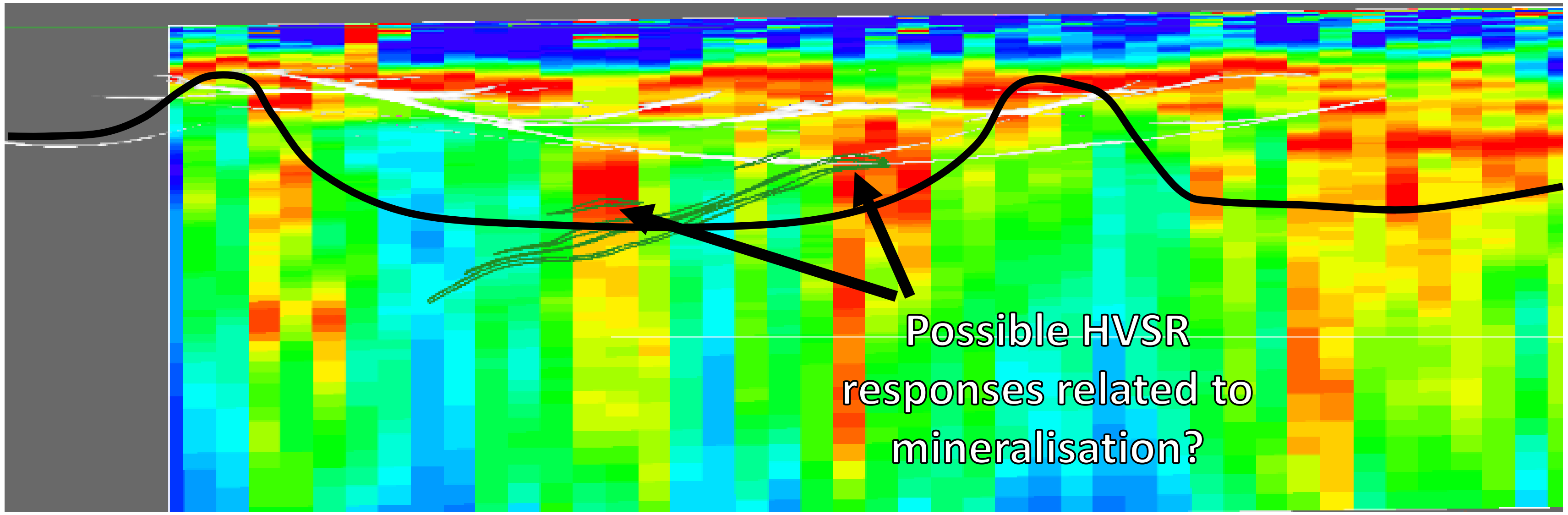
Resource Potentials

- Refraction tomography extracted from the 2D seismic reflection data set by HiSeis, specifically from first break picking, provided detailed velocity of the near surface to the top of fresh high velocity rock.
- The refraction tomography algorithm iteratively calculated velocity along ray paths from source to receiver using travel times derived from first break picks.
- Refraction tomography ray paths agree with HVSR acoustic interface layering, and this likely reflects a diagenetic cementation boundary within the Kiangi Creek Fm sandstones and siltstones between oxidised sediments sitting above less weathered to re-cemented clastic sediments below.

S *Seismic refraction tomography and ray paths (from HiSeis, 2019)* N



Normalised HVSR amplitude-depth section overlain by seismic refraction ray paths

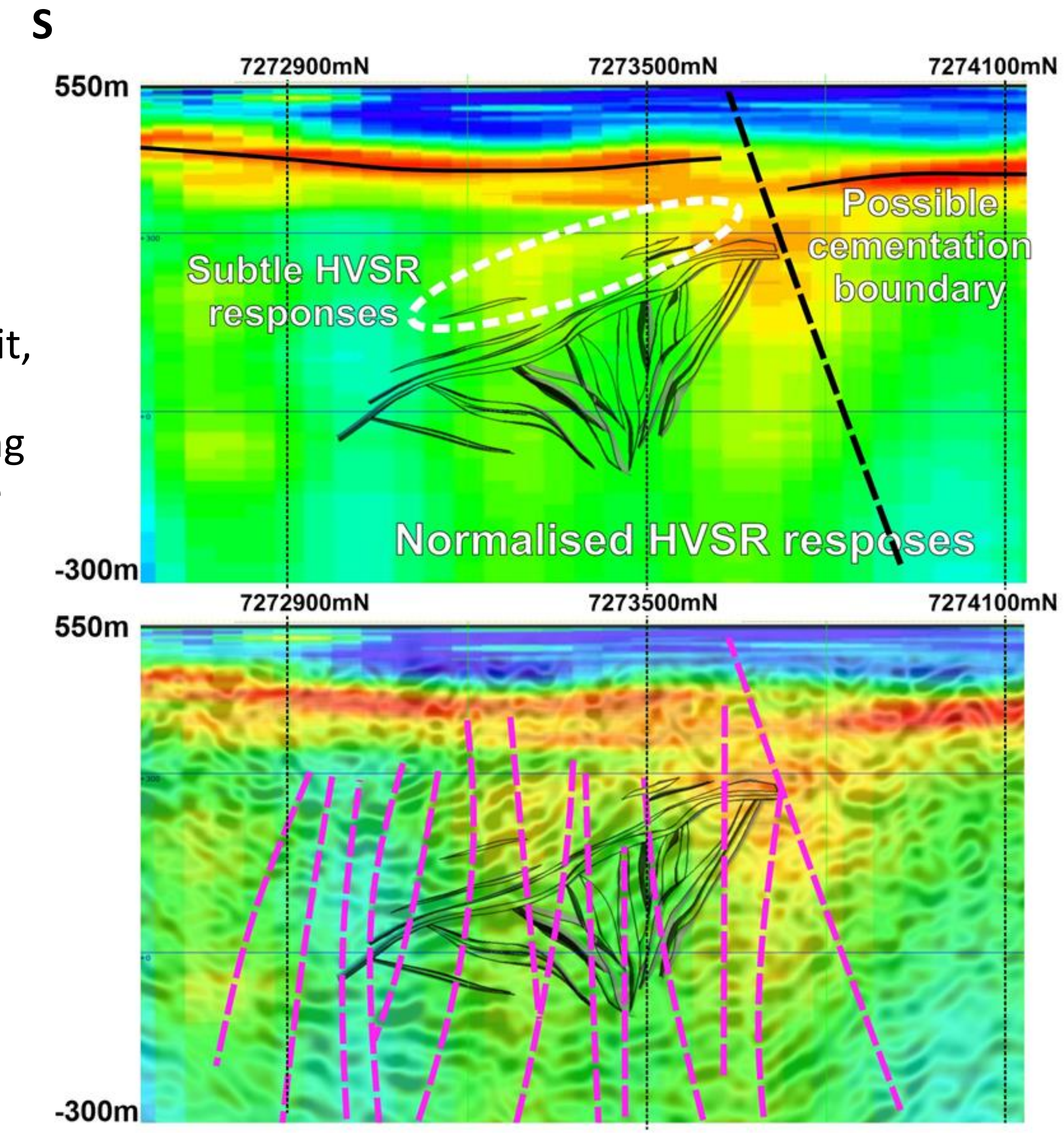


Abra Geophysical Responses: Passive Seismic HVSR

Resource Potentials

Amplitude normalised HVSR cross section overlain by mineralised resource wireframes, with red colours indicating high HVSR responses associated with acoustic impedance contrast. A flat lying acoustic impedance contrast (solid black line) is resolved overlying the deposit, and this likely reflects a change in weathering within the sediment host unit, which appears to be offset by a young normal fault. Subtle HVSR responses below this interface are related to galena and barite mineralisation (white ellipse).

Amplitude normalised HVSR cross section draped on the 2D seismic reflection cross section, with interpreted late faults in pink.



Summary of the Geophysical Characteristics of Abra

Resource Potentials

- The geophysical expression of the Abra polymetallic base metal deposit is characterised by discrete magnetic, gravity and electromagnetic anomaly high responses from sources greater than 250m depth – a “blind” deposit.
- The magnetic anomaly response is related to magnetite mineralisation primarily within the black zone of the shallower stratabound mineralisation.
- Galena, iron oxide and barite mineralisation in the stratabound mineralisation zone, and galena-chalcopyrite mineralisation within the more recently expanded feeder zone, are the main sources of the gravity anomaly high, and some residual dolomite may also contribute.
- Downhole, ground and airborne EM surveying has resolved a main discrete EM conductor anomaly associated with known massive sulphide mineralisation, and this conductive response is mainly related to zones of conductive galena. The deposit halo was also resolved as a broad and moderate conductor response in inverted AMT-MT data, and in 3D inverted ZTEM data, ***but NOT in the ZTEM 2D inversion results***!
- Although petrophysical testing on selected core samples indicated that Abra should be associated with a chargeable IP anomaly, IP surveying has so far failed to identify a coincident chargeable anomaly with the main mineralised zone, likely due to the dominance of massive sulphide mineralisation; ***requires another go?***
- The stratabound mineralisation zone is resolved in 2D seismic data as semi-coherent reflectors, offset by sub-vertical faults, and surrounded by a seismically bland zones. Higher amplitude seismic reflectivity is likely related to high density galena, iron oxide and barite mineralisation within the stratabound zone in contrast to the surrounding much lower density sedimentary host rocks. The stratabound mineralisation and new Ale mineralised zone are possibly resolved as subtle anomaly responses in normalised passive seismic HVSR data.