Mines and Wines 2015

The Anatomy of the Mallee Bull

Recent exploration and research, and a great new discovery

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Introduction

Mines & Wines 2013: Mallee Bull discovery, mineralisation and exploration

Since then: maiden resource estimate and resource model, new geophysics, additional drilling and a new discovery, on-going research into deposit and its regional relationships

Today:

1. brief outline of Mallee Bull
2. NEW: resource estimate and recent exploration
3. NEW: on-going research

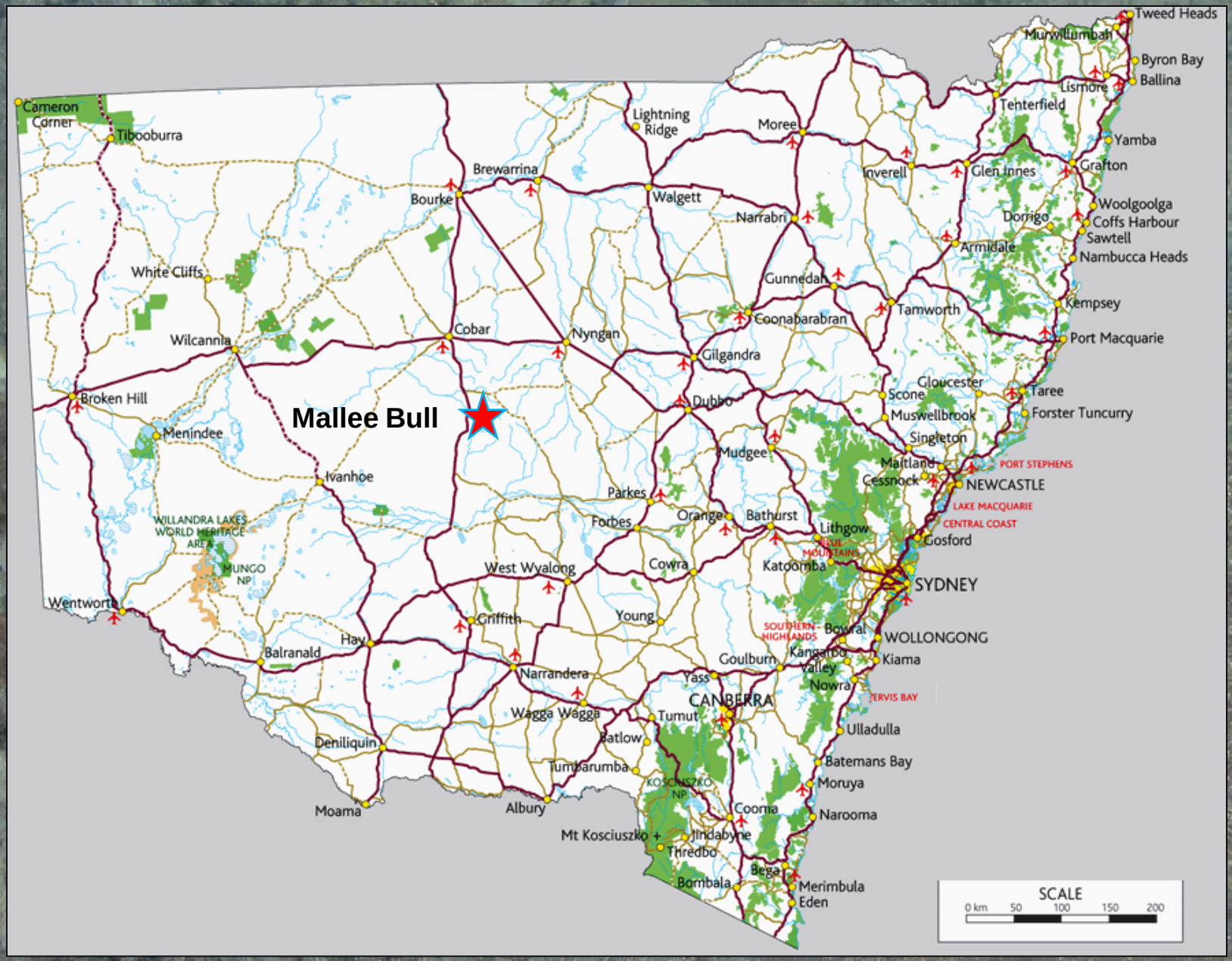
Mallee Bull

Stratabound, “Cobar-style” polymetallic deposit

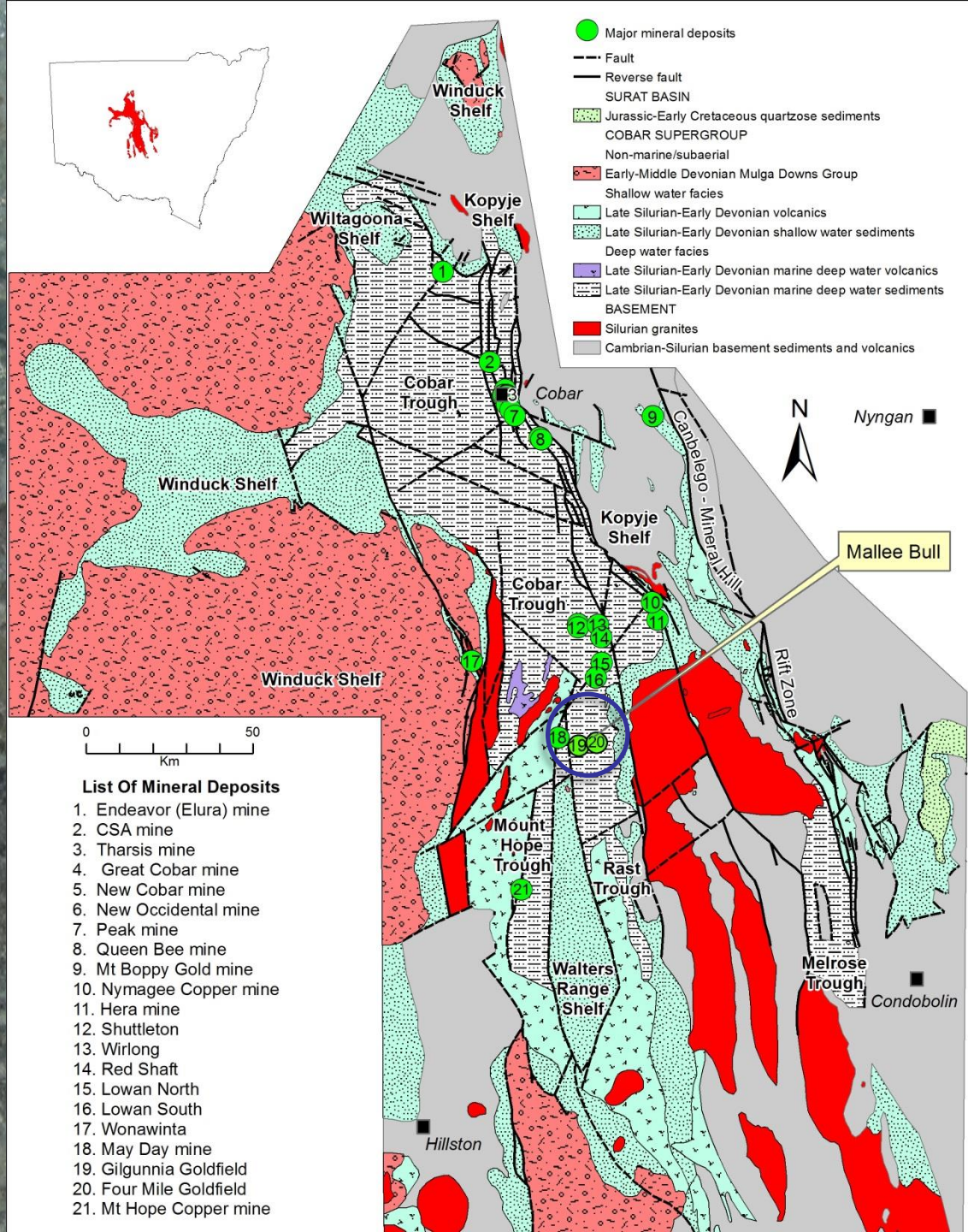
Cu-Zn-Pb-Ag-Au with significant Co, Sb, Bi and Sn

Lithological control dominant, but situated in a significant structural setting of regional-scale faults and folding

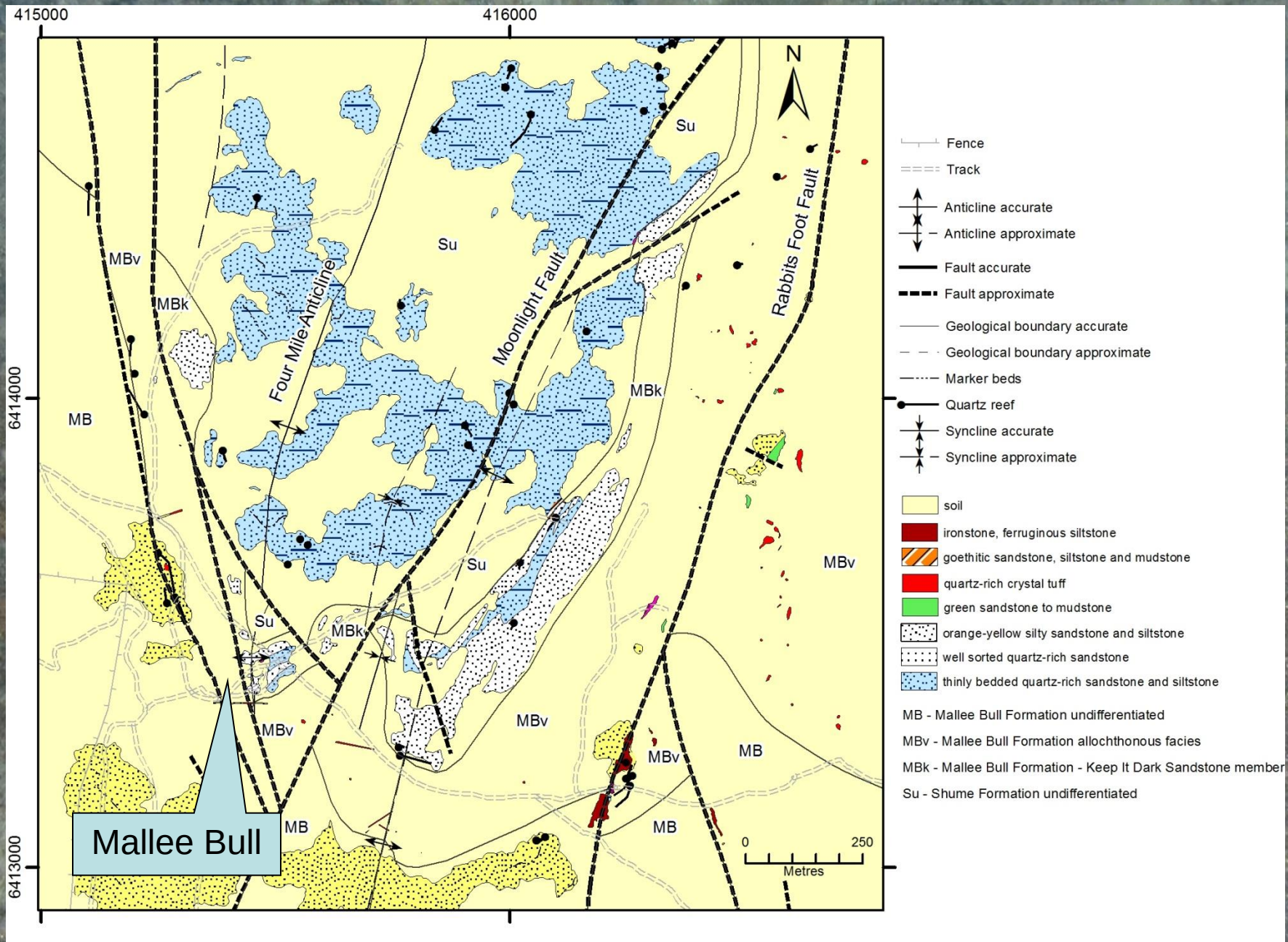
Mallee Bull Location



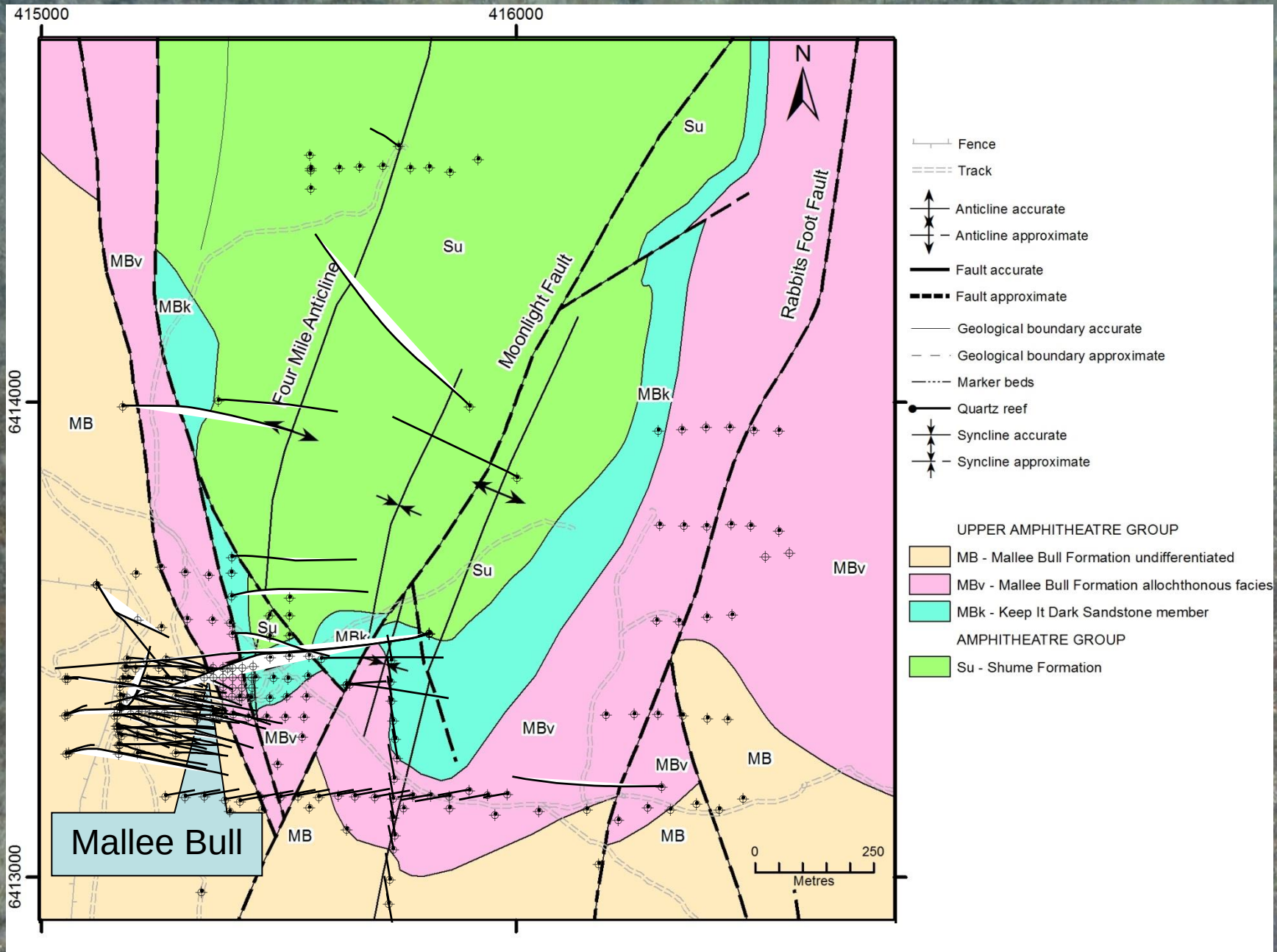
Cobar Basin


Major mineral deposits
Fault
Reverse fault
SURAT BASIN
Jurassic-Early Cretaceous quartzose sediments
COBAR SUPERGROUP
Non-marine/subaerial
Early-Middle Devonian Mulga Downs Group
Shallow water facies
Late Silurian-Early Devonian volcanics
Late Silurian-Early Devonian shallow water sediments
Deep water facies
Late Silurian-Early Devonian marine deep water volcanics
Late Silurian-Early Devonian marine deep water sediments
BASEMENT
Silurian granites
Cambrian-Silurian basement sediments and volcanics
Winduck Shelf
Kopyje Shelf
Wiltagoona Shelf
Cobar Trough
Cobar
Nyngan
N
Canbelego - Mineral Hill
Rift Zone
Mallee Bull
Mount Hope Trough
Rast Trough
Walters Range Shelf
Melrose Trough
Condobolin
Hillston
0
50
Km
List Of Mineral Deposits
1. Endeavor (Elura) mine
2. CSA mine
3. Tharsis mine
4. Great Cobar mine
5. New Cobar mine
6. New Occidental mine
7. Peak mine
8. Queen Bee mine
9. Mt Boppy Gold mine
10. Nymagee Copper mine
11. Hera mine
12. Shuttleton
13. Wirlong
14. Red Shaft
15. Lowan North
16. Lowan South
17. Wonawinta
18. May Day mine
19. Gilgunnia Goldfield
20. Four Mile Goldfield
21. Mt Hope Copper mine

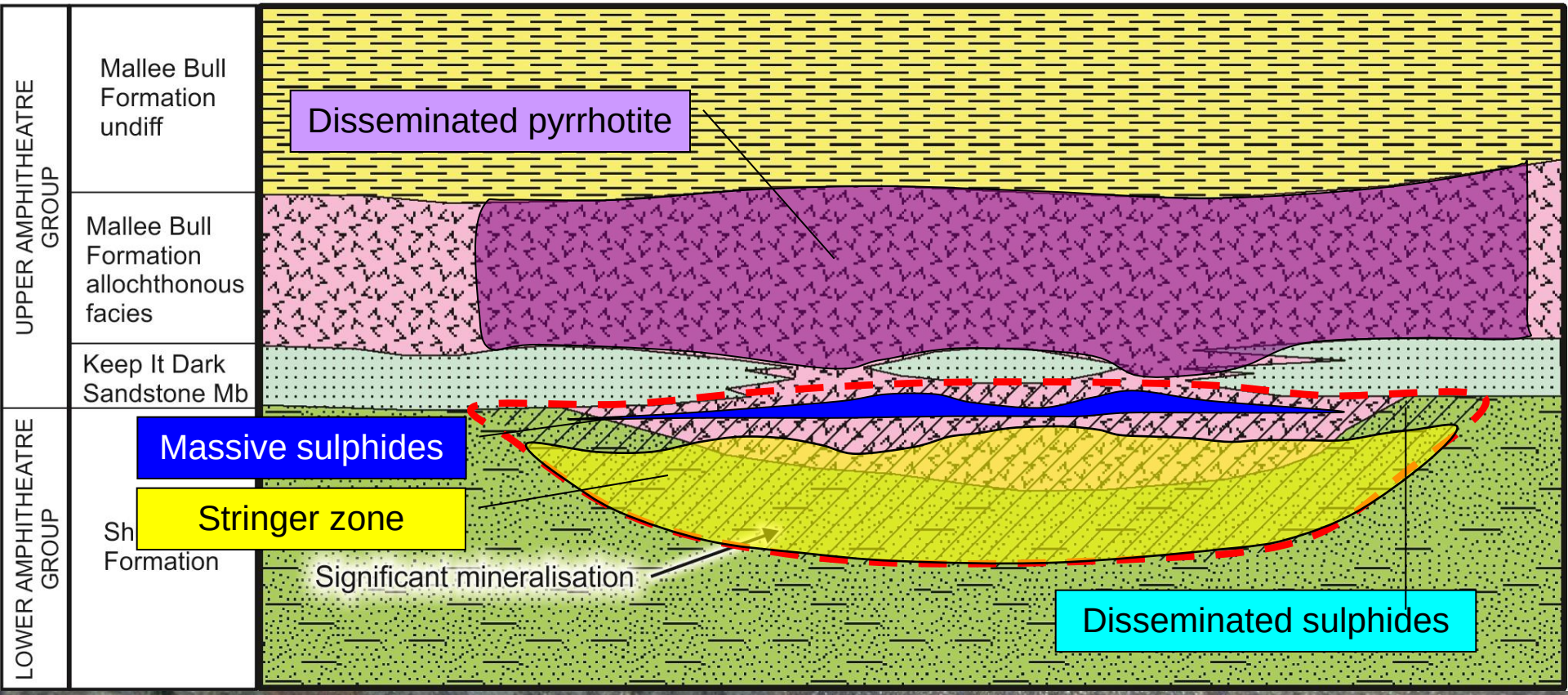
Mallee Bull Deposit



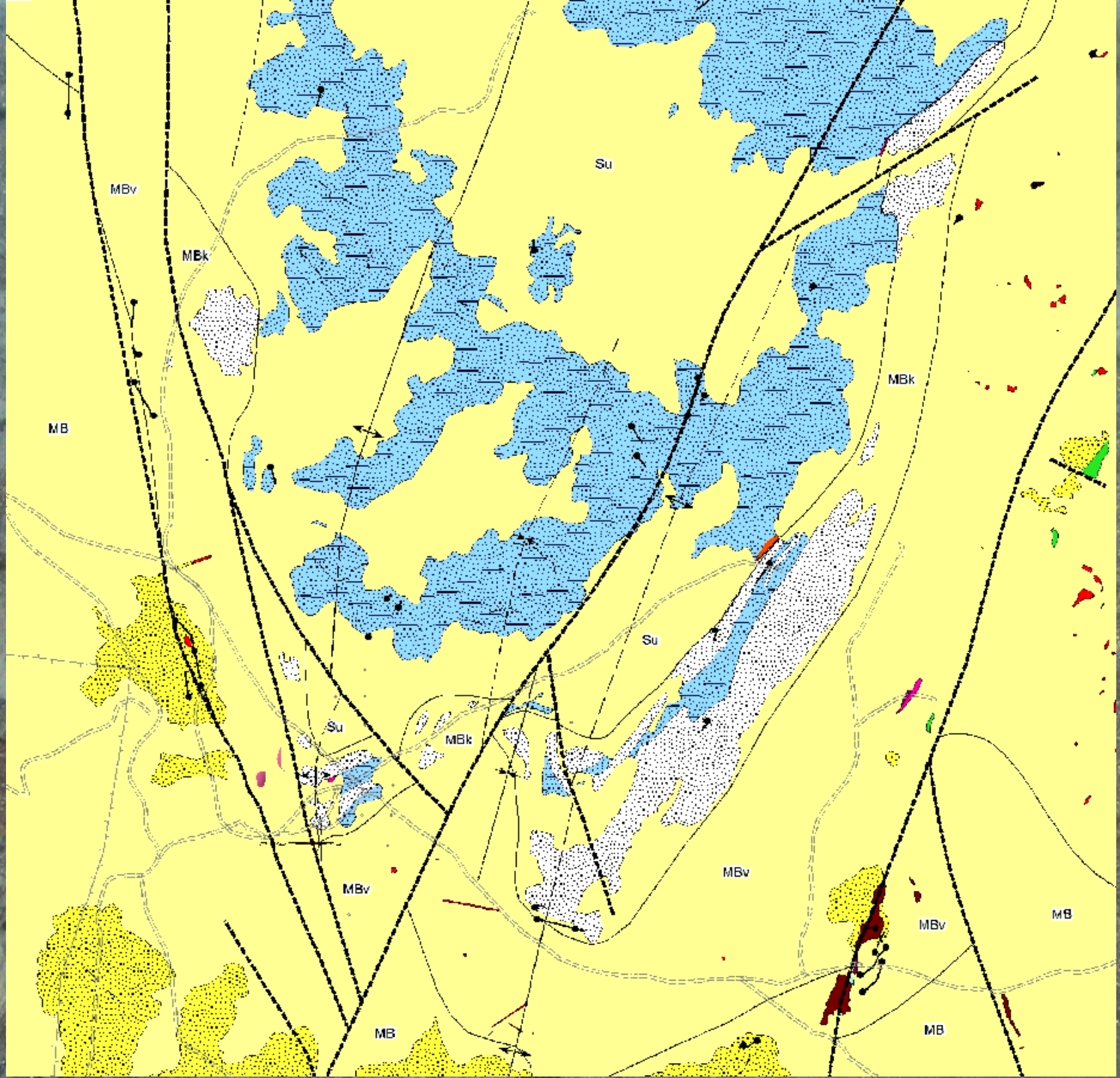
Mallee Bull Deposit



Mallee Bull Deposit – Local Stratigraphy



Idealised section looking east-west


Su
MBv
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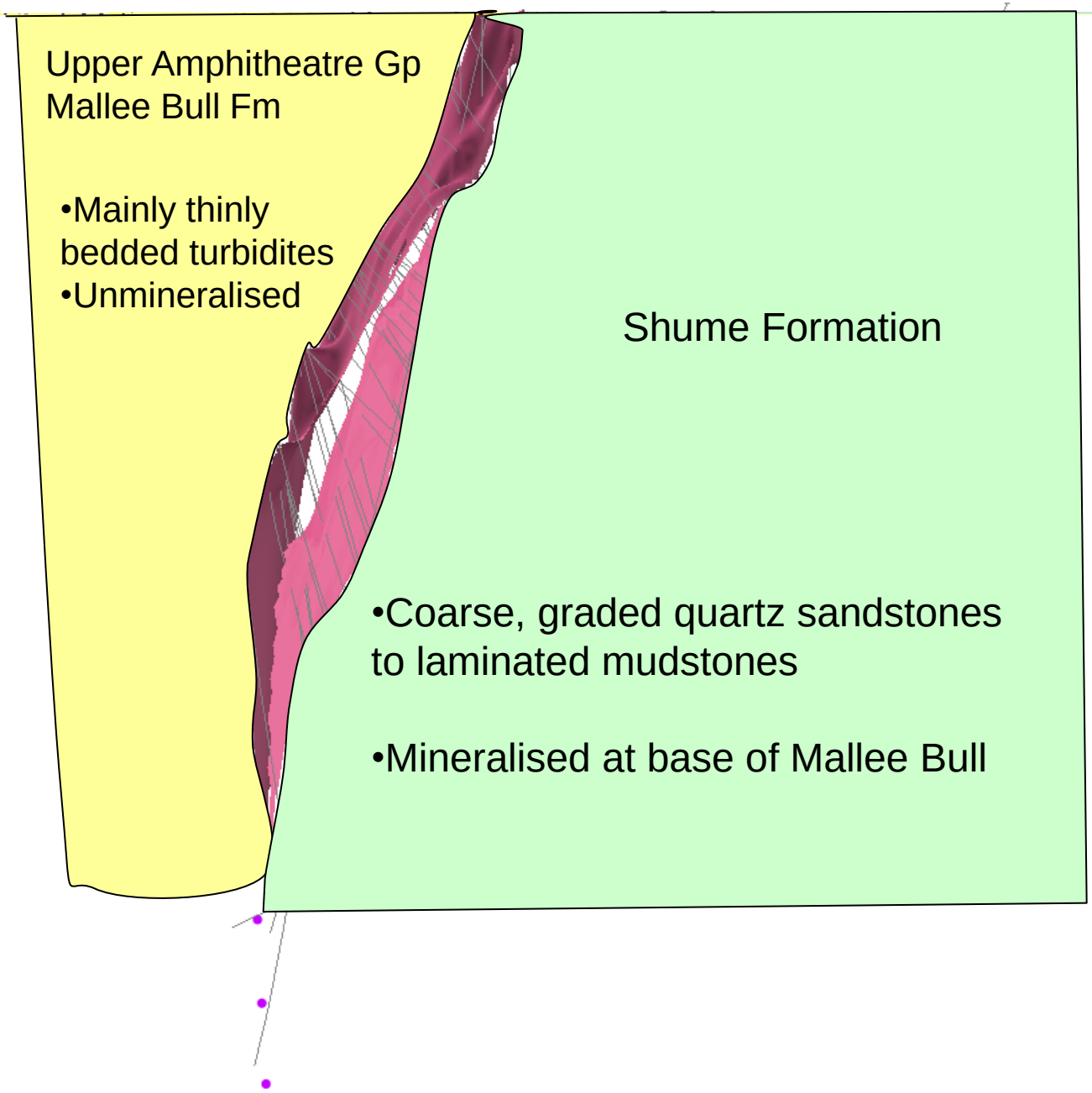
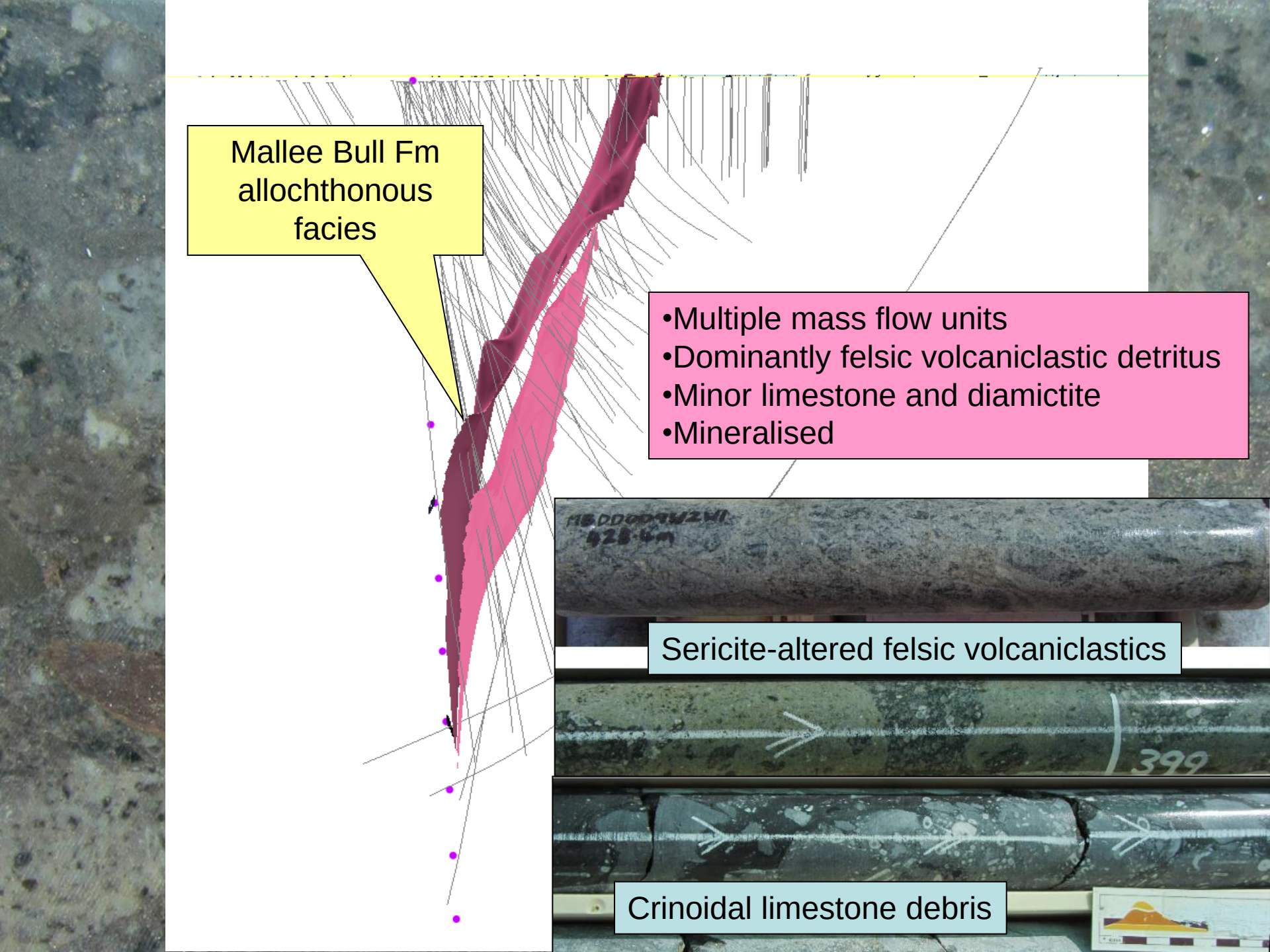
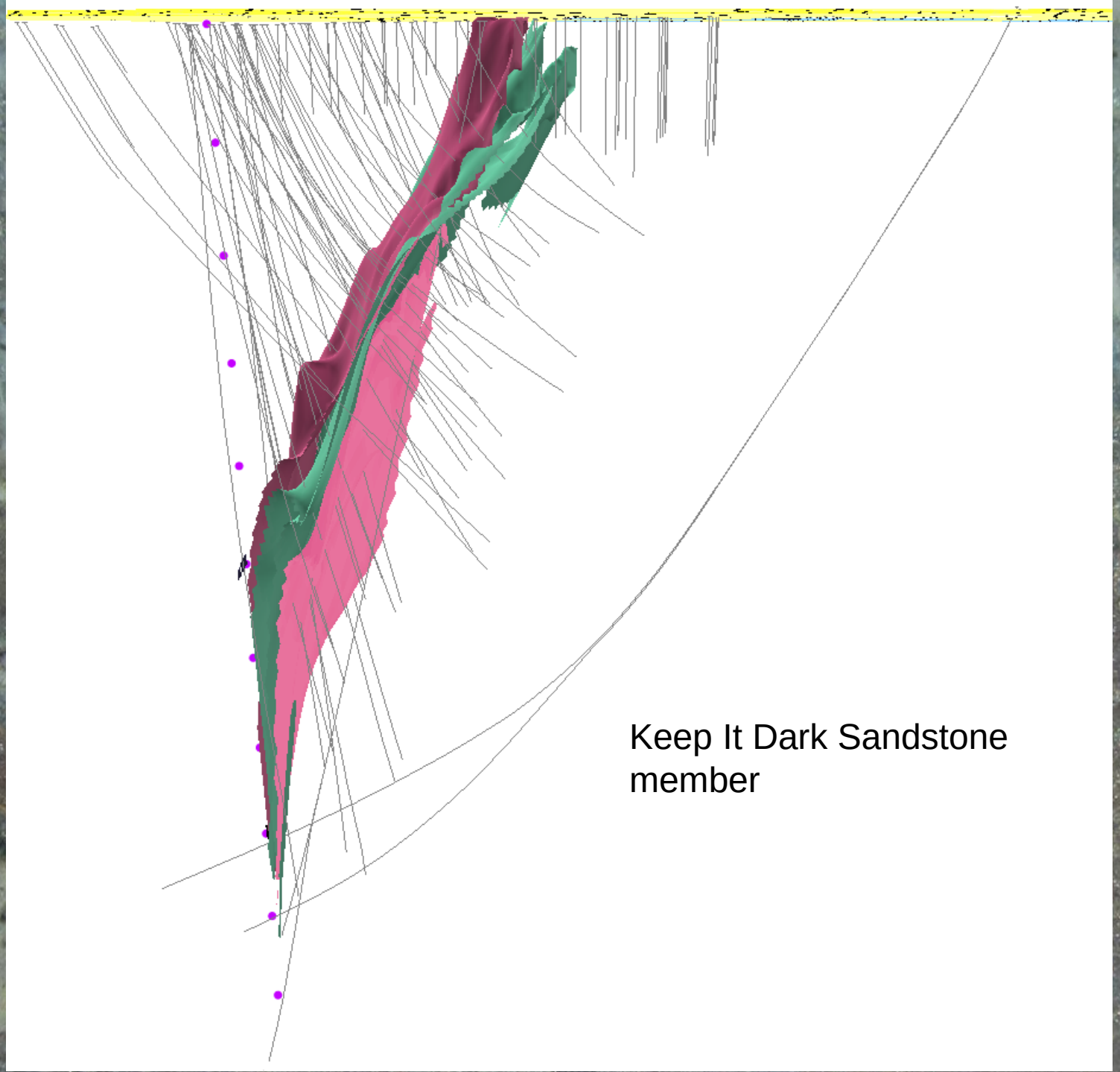
Viewed north




Mallee Bull Fm allochthonous facies
•Multiple mass flow units
•Dominantly felsic volcaniclastic detritus
•Minor limestone and diamictite
•Mineralised
Sericite-altered felsic volcaniclastics
Crinoidal limestone debris



Keep It Dark Sandstone member

Keep It Dark Sandstone member

- Massive quartz sandstone
- Local thin laminated sections
- Marks top of major mineralisation

Mallee Bull Deposit – Host Rock Petrography

Clastic sedimentary rocks include quartz (-lithic) sandstone and siltstone, mudstone, and felsic (dacitic) volcaniclastics (crystal-vitric tuff, epiclastics).

Penetrative deformation, 1-2 foliations, syn-tectonic veining and hydrothermal breccia. Metamorphosed to biotite grade.

Alteration contemporaneous with deformation and metamorphism.

Two major types of alteration: chloritisation – mainly affecting clastic sedimentary rocks, and sericitisation – affecting clastic sedimentary and volcaniclastic rocks. Local intense silicification.

Alteration minerals: Fe-rich and Mg chlorite, quartz, sericite, minor pyrrhotite, carbonate, albite, stilpnomelane, biotite, magnetite.

Inferred hydrothermal mobility of silica (Mg, Ca, Na, K) and addition of S, Fe, base metals, As, Sb, Ag and CO_2.

Mallee Bull Deposit Mineralisation

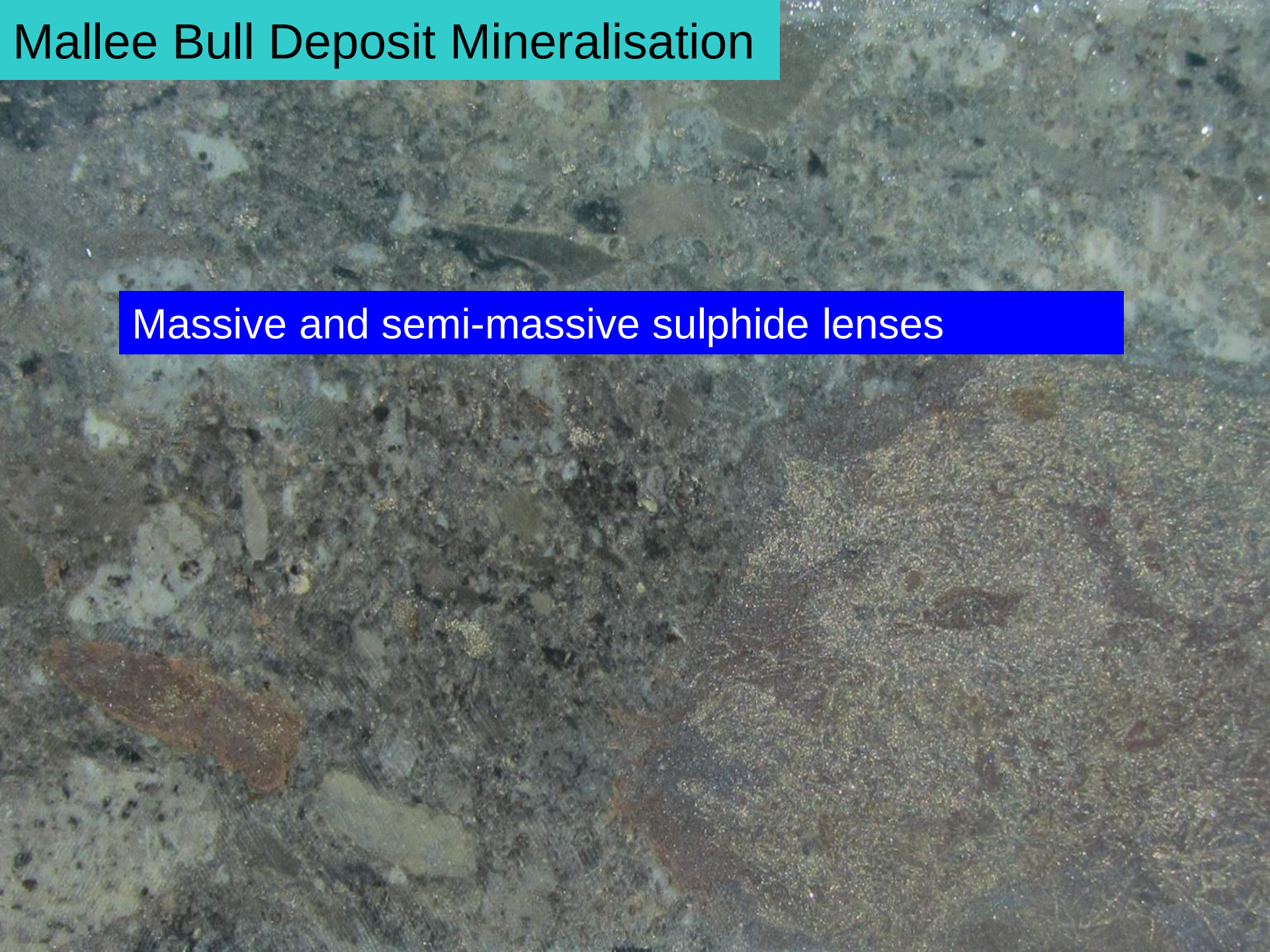
Sulphides occur in massive to disseminated form, in stringer veins and hydrothermal breccia infillings.

Structural control evident, with alignment of sulphides on foliation and syn-tectonic vein and breccia infillings.

Textures include replacement of host rocks, infill, and syn-tectonic recrystallisation and localised mobility of ductile sulphides.

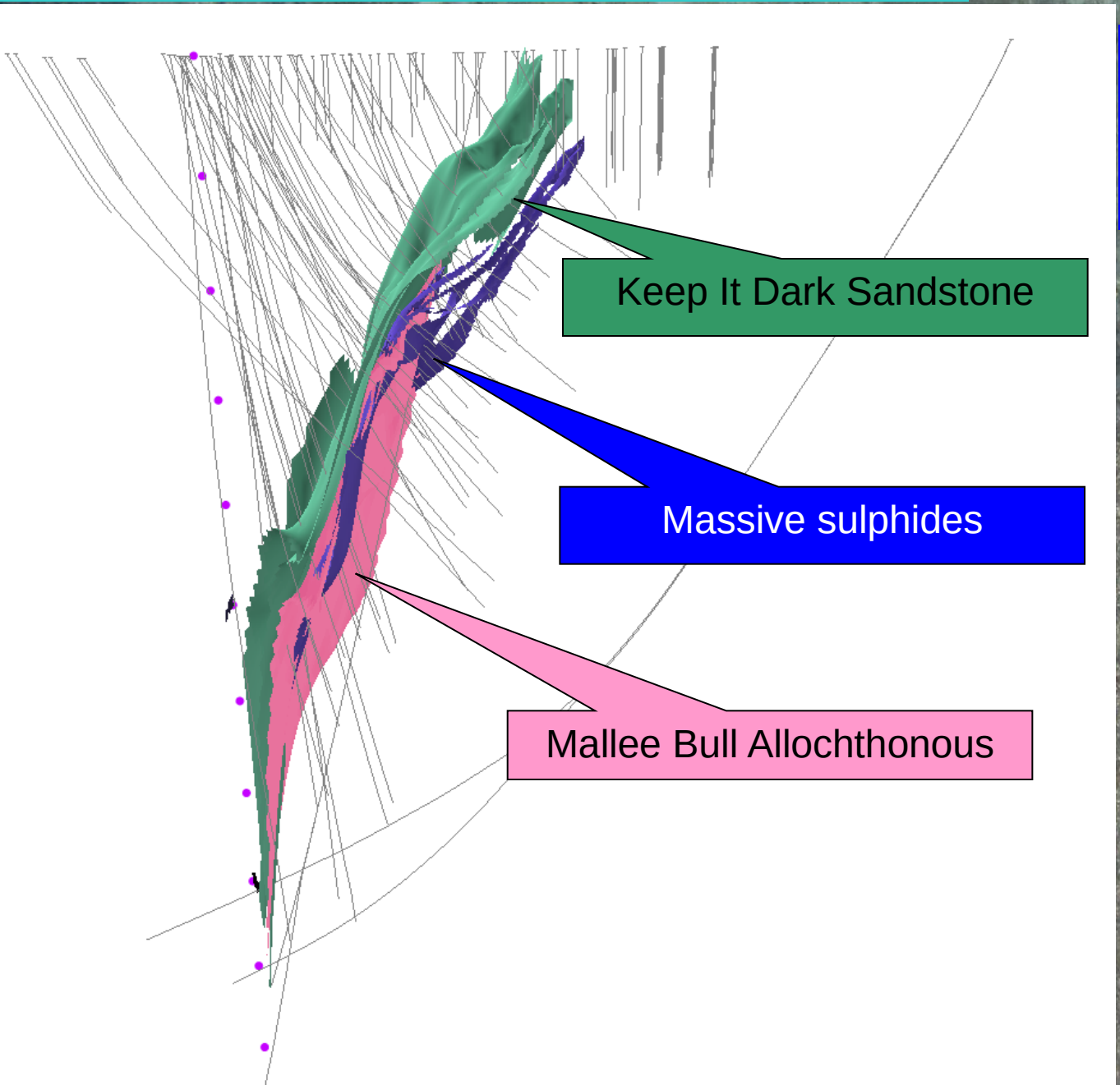
No evidence for syngenetic or diagenetic base metal sulphides.

Mallee Bull Deposit Mineralisation



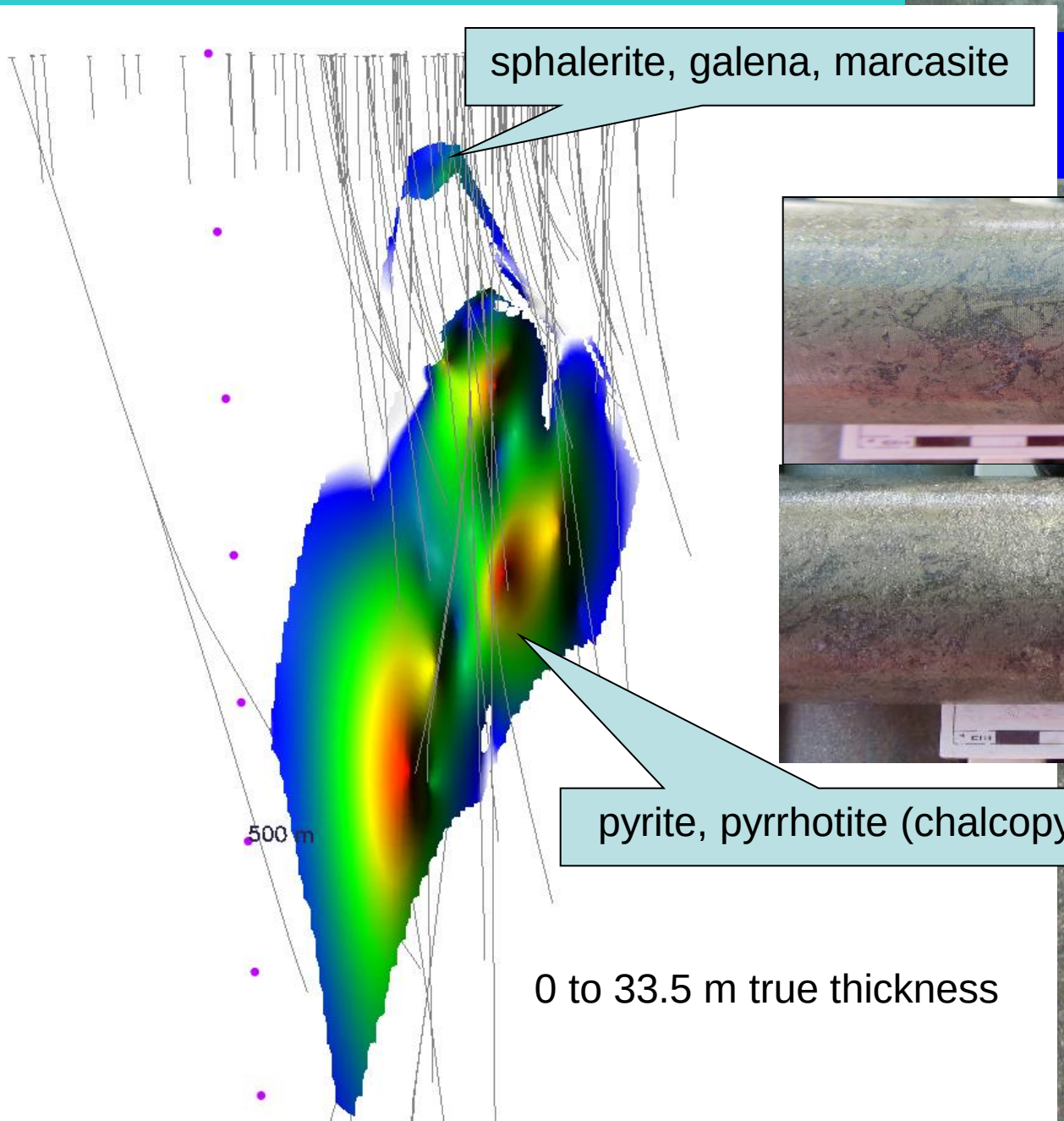
Massive and semi-massive sulphide lenses

Mallee Bull Deposit Mineralisation

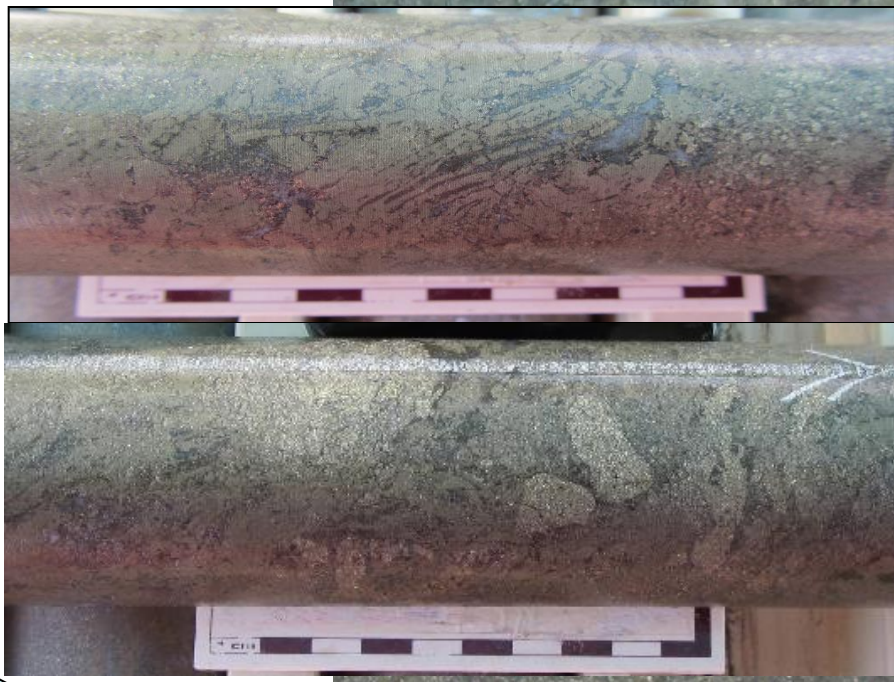


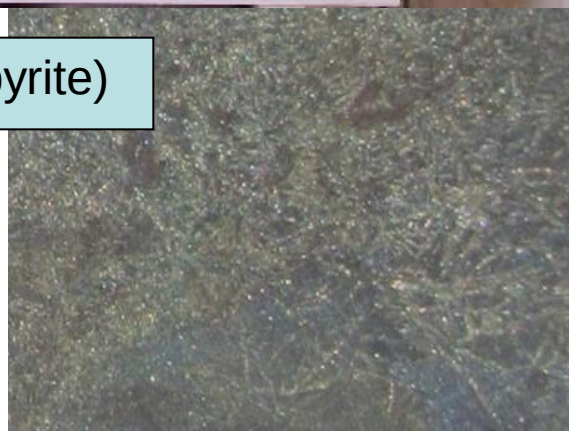
Massive and semi-massive sulphide lenses

Mallee Bull Deposit Mineralisation



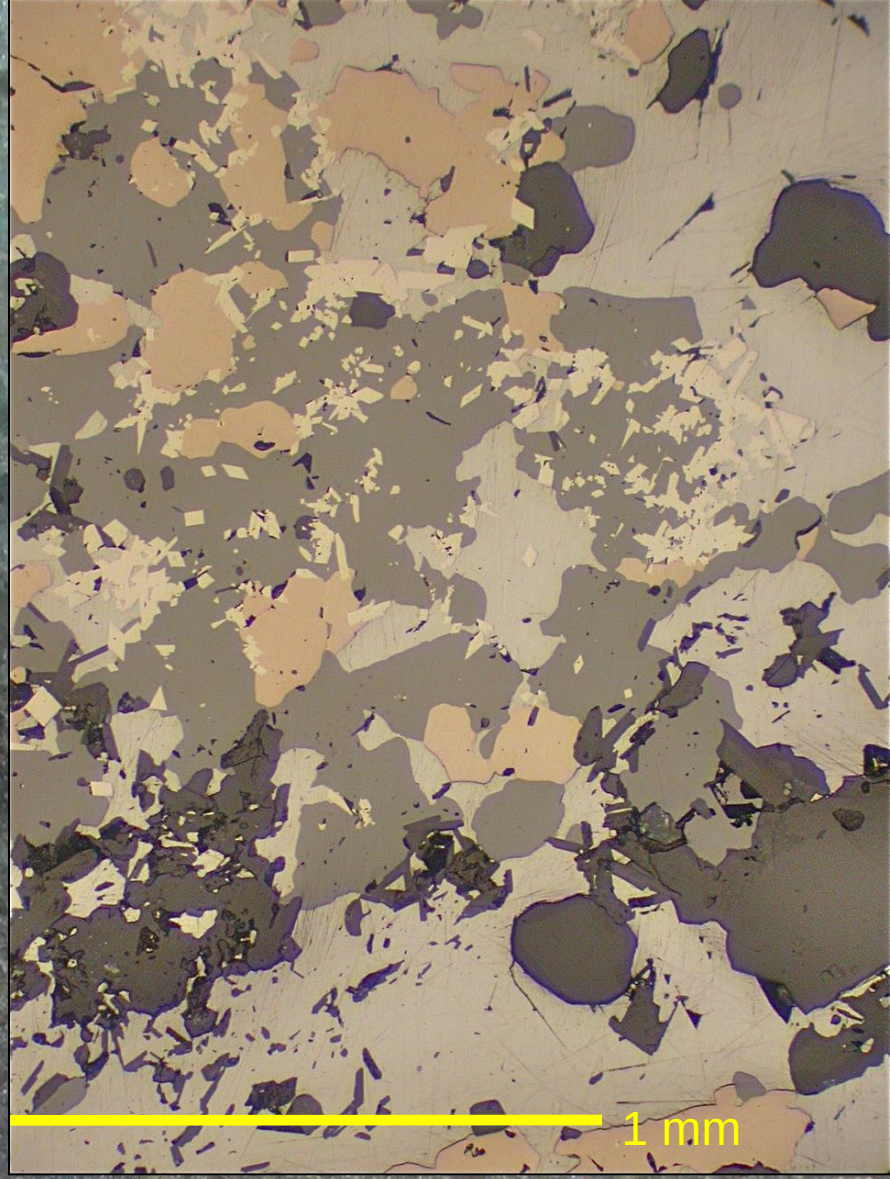
Massive sulphide lenses





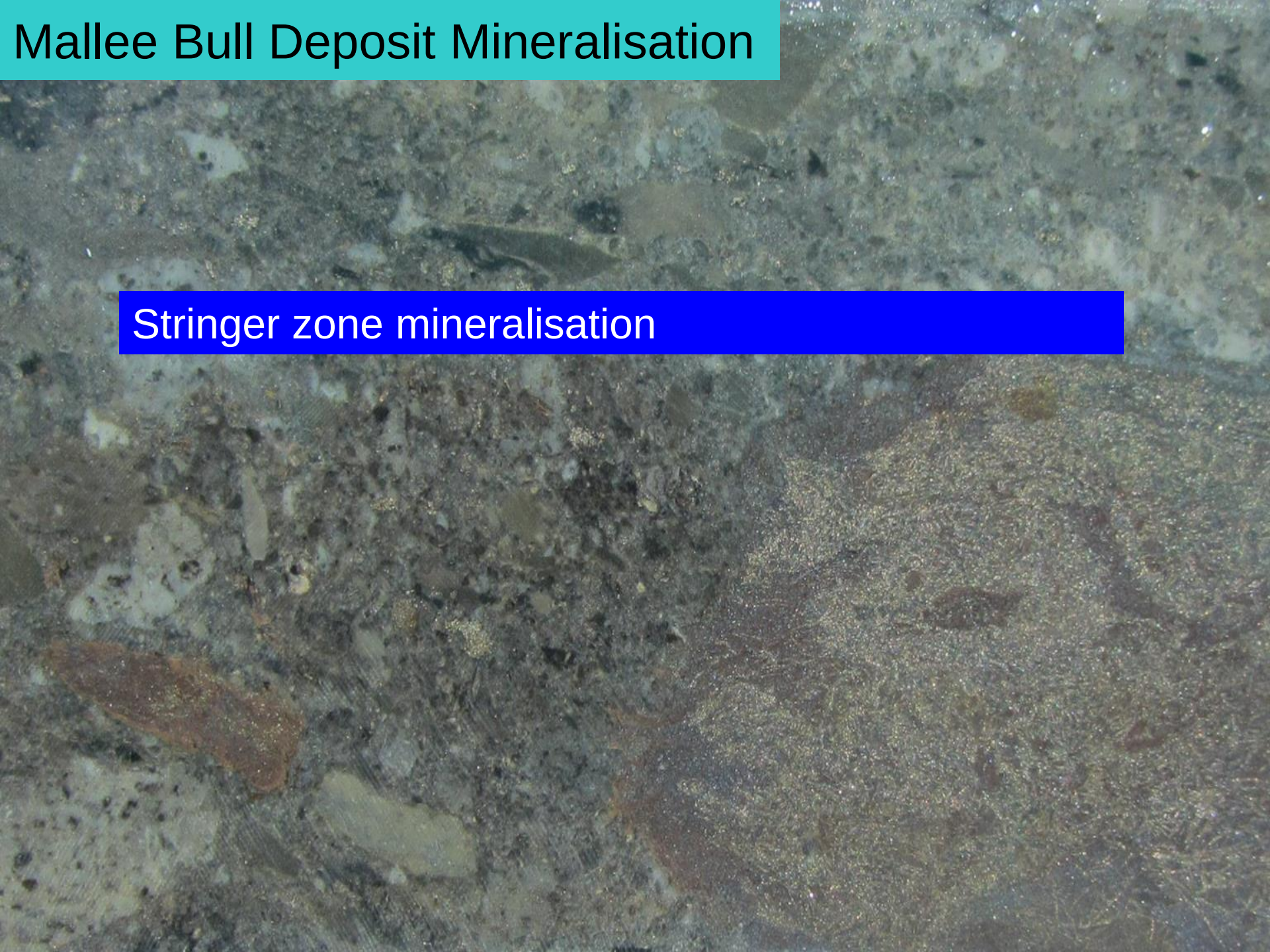
0 to 33.5 m true thickness

Massive sulphides: sphalerite, pyrrhotite and galena, locally abundant pyrite, chalcopyrite, arsenopyrite, traces of boulangerite, tetrahedrite, bismuth, bismuthinite.



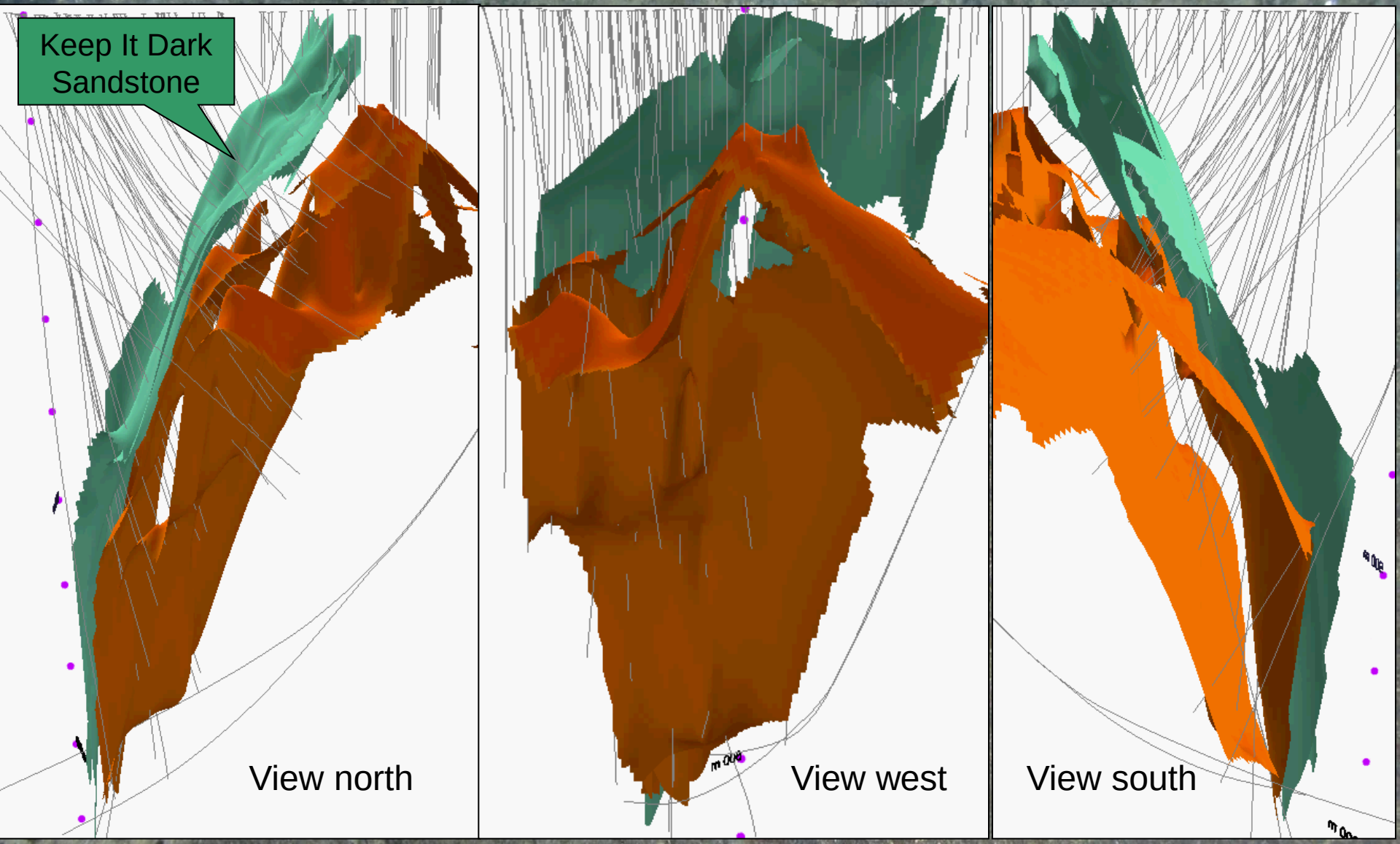
Massive recrystallised sulphides with abundant galena, sphalerite and pyrrhotite, and minor arsenopyrite

Mallee Bull Deposit Mineralisation

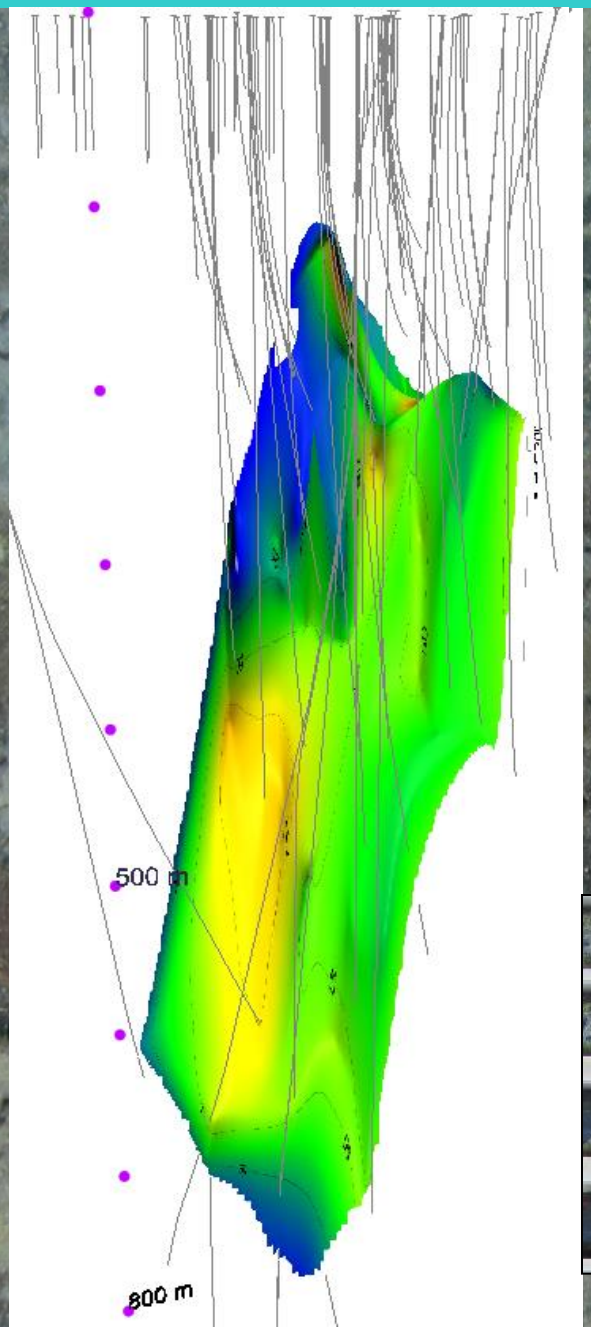


Mallee Bull Deposit Mineralisation

Stringer zone



Mallee Bull Deposit Mineralisation



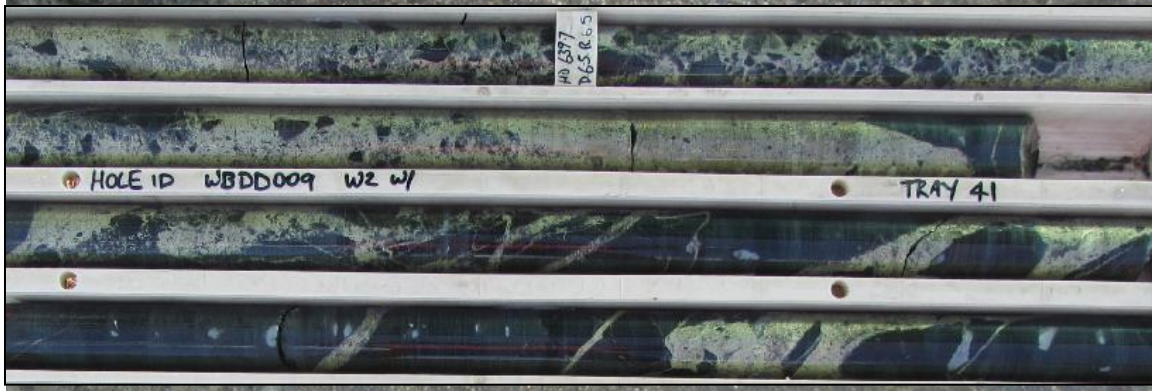
Viewed east

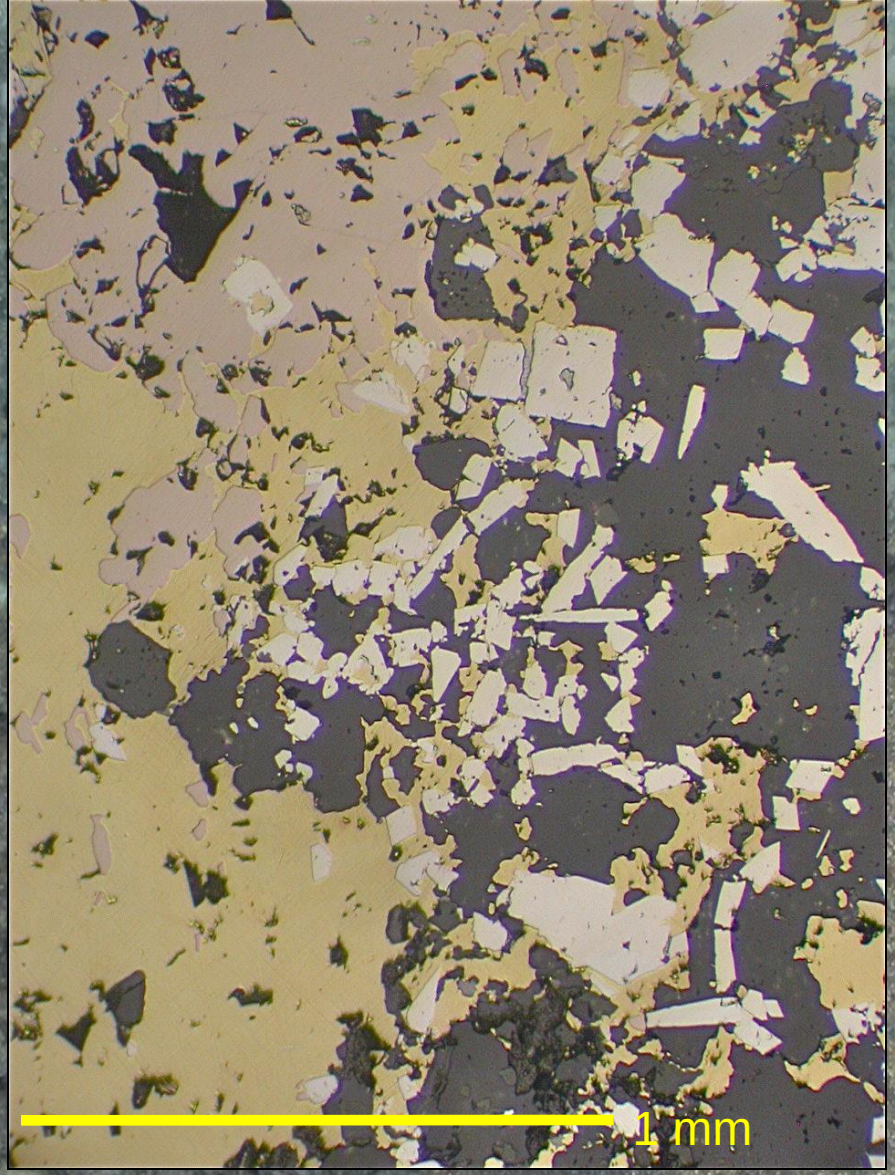
Stringer zone

Stringer and breccia-hosted sulphides: pyrrhotite, chalcopyrite and locally common sphalerite, galena, pyrite, arsenopyrite, traces of boulangerite, 2 forms of cassiterite, bismuth, bismuthinite, magnetite, rare gold.

stringer veins locally remobilised

0 to 145 m true width, but strongly mineralised intervals less than that





Stringer zone sulphides with abundant chalcopyrite and pyrrhotite, and disseminated arsenopyrite, minor pyrite

Mallee Bull Deposit Mineralisation

Disseminated

- strongest from base of Keep It Dark Sandstone within allochthonous rocks
- clast-replacement and intergranular textures common
- sphalerite, pyrrhotite and galena, locally abundant pyrite, chalcopyrite, arsenopyrite, traces of boulangerite, tetrahedrite, bismuth, bismuthinite.

Backdrop image shows mass flow gravel with intergranular and clast-replacement sulphides. Field of view ~6cm

Mallee Bull Deposit – Recent Exploration

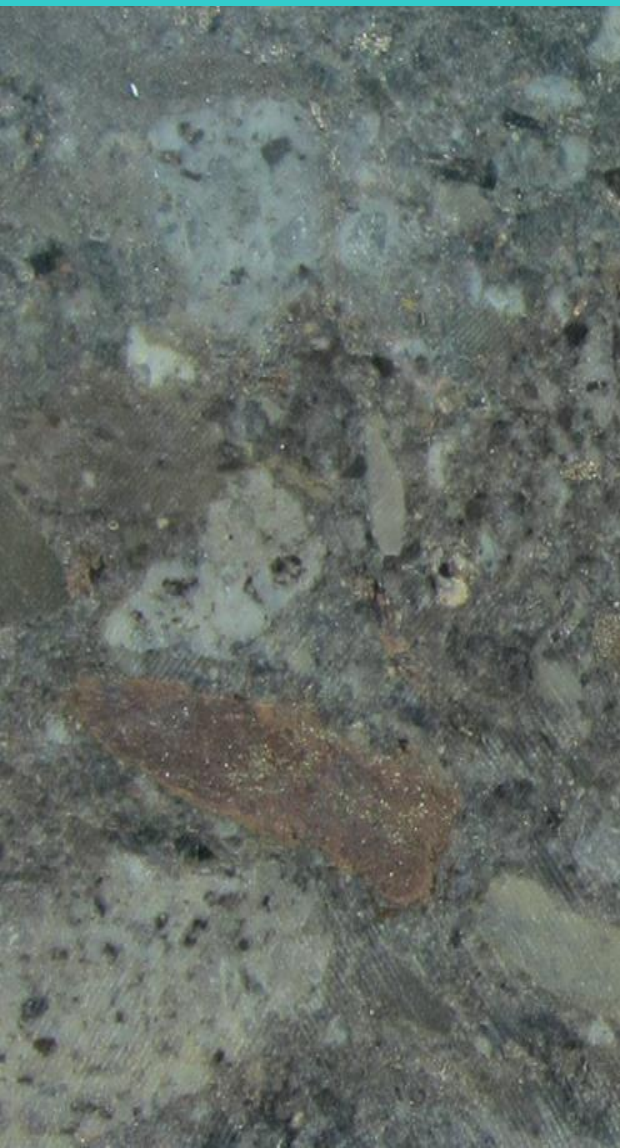
2013 – 2014 additional 15.5 km diamond and RAB drilling intercepted strong Cu mineralisation at depth and extended mineralised zone to >800 m below surface

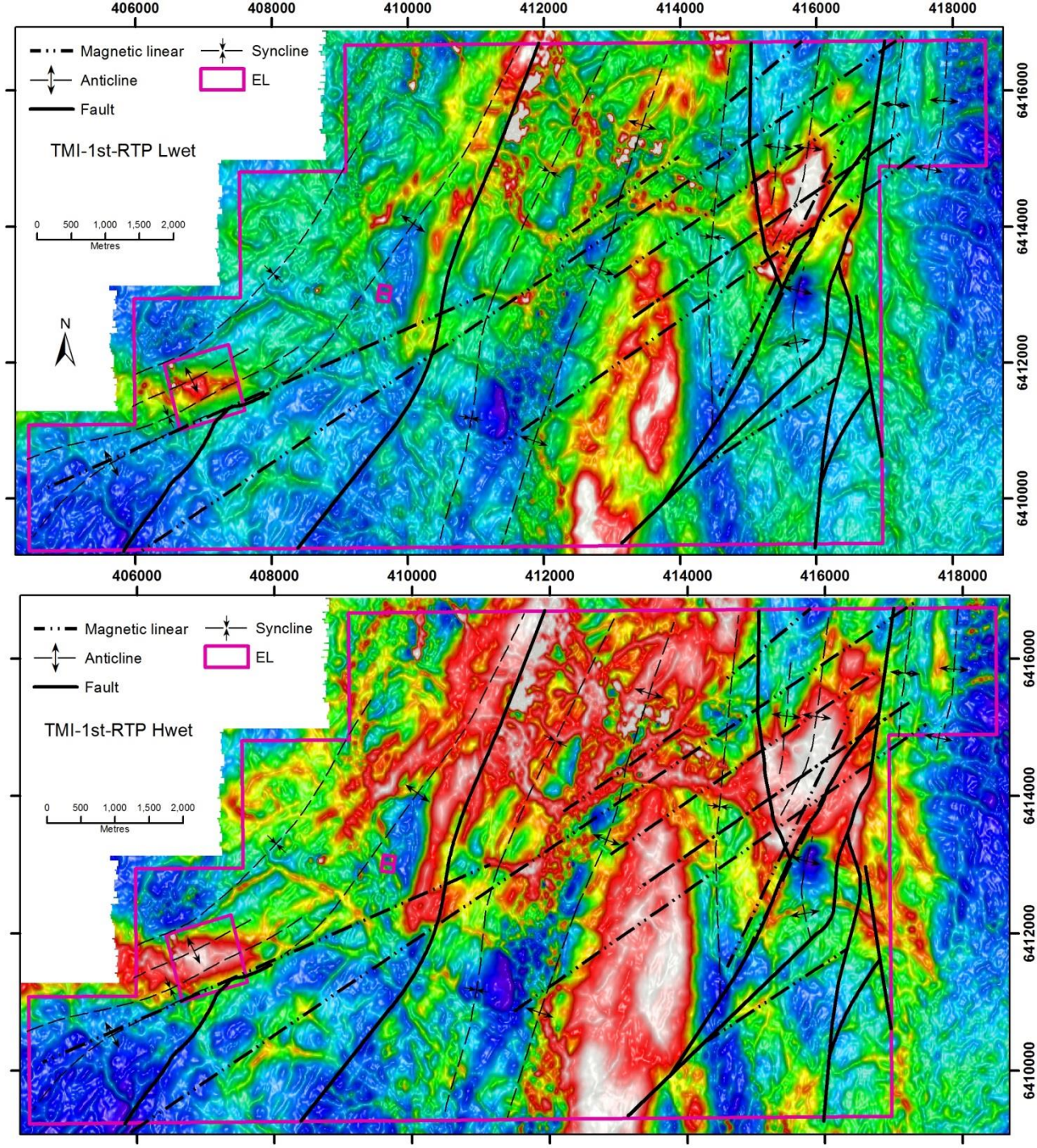
High resolution aeromagnetic survey – 50 m line spacing

Orion 3D DC-IP-MT survey

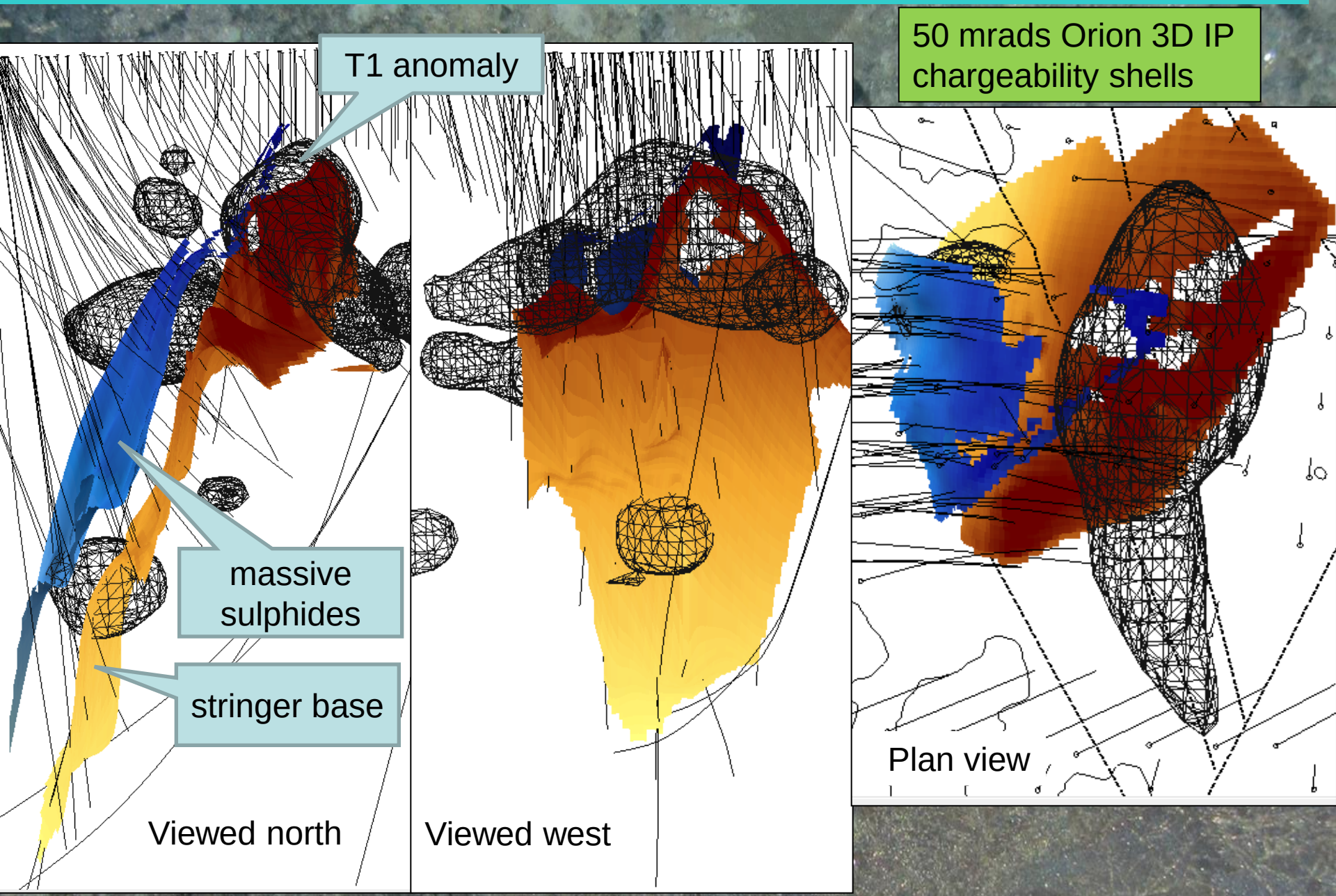
DC (direct current), IP (induced polarisation) and MT (magnetotellurics) data acquired in multiple directions

Mallee Bull Deposit – Recent Exploration



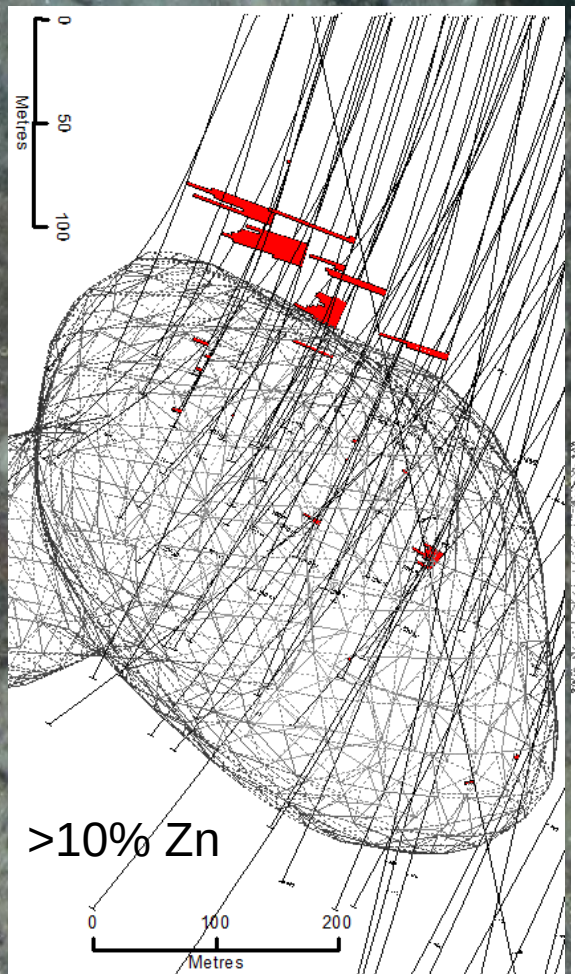


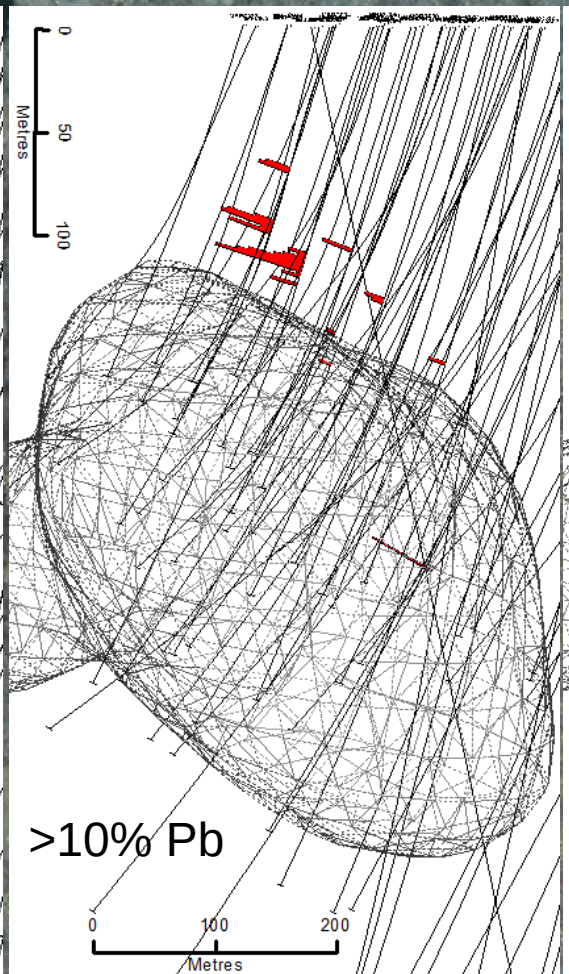
Mallee Bull Deposit – Recent Exploration – T1 Anomaly

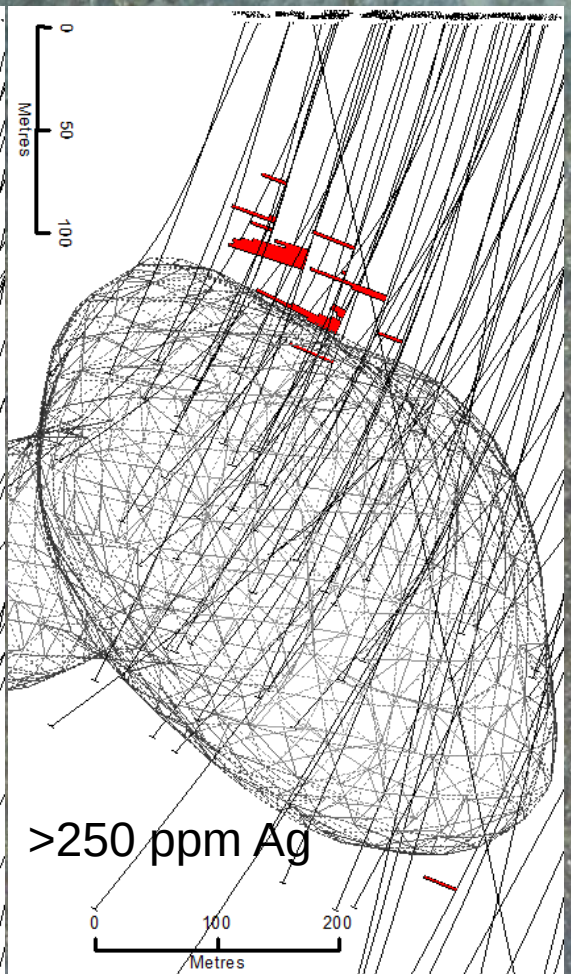


Mallee Bull Deposit – Recent Exploration – T1 Anomaly

A 45 hole RC drilling program identified significant Zn-Pb-Ag-Au in massive sulphide, disseminated and stringer zones within the T1 anomaly







Mallee Bull Deposit – Recent Exploration – T1 Anomaly

Hole No	From (m)	Width (m)	Zn	Pb	Ag (g/t)	Au (g/t)
MBRC018	106	10	15.8%	7.6%	322	1.28
MBRC021	95	6	10.3%	4.98%	159	0.76
MBRC024	83	12 Including 7	20.30% 31.44%	14.81% 19.37%	308 440	1.59 2.53
MBRC028	71	7 Including 5	21.39% 29.54%	12.74% 17.52%	203 280	0.58 0.80

Mallee Bull Deposit – Resource Modelling

A program of resource evaluation commenced in early 2014, involving validation of all drilling data, and producing mineralisation models from assay and empirical data

The resource model excluded Pb and Zn, focusing on Cu-Ag-Au

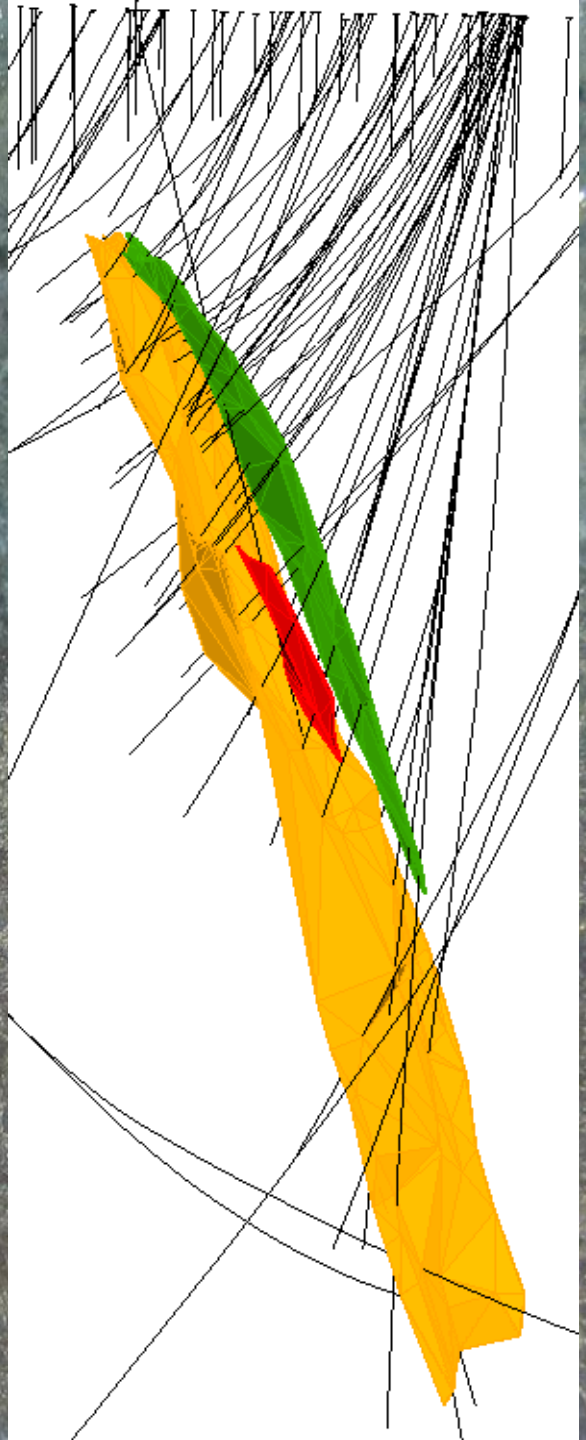
The model identified 3 high grade resource zones:

Mallee Bull Deposit – Resource Domains

Hangingwall zone

Central zone

Footwall zone



Maiden resource estimate released May 2014

1% Cu equivalent cutoff (Cu+Ag+Au)

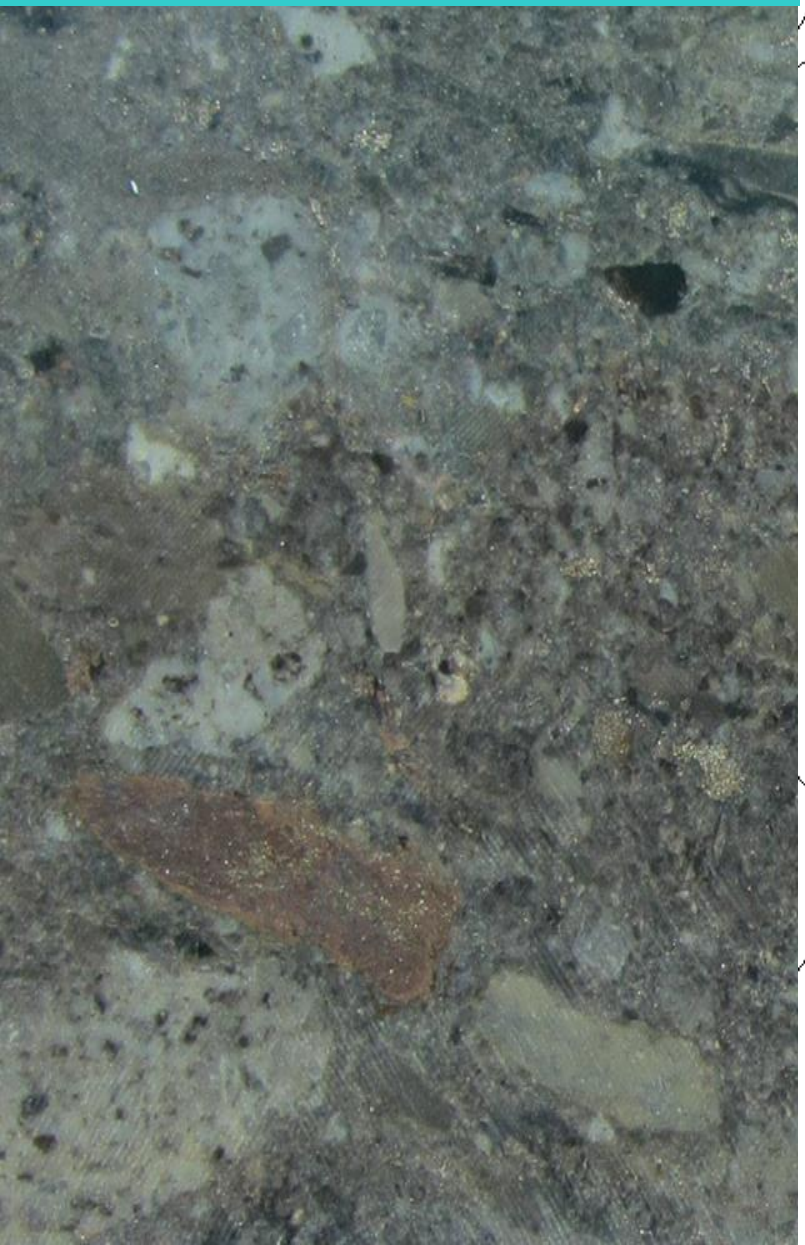
620 Kt indicated

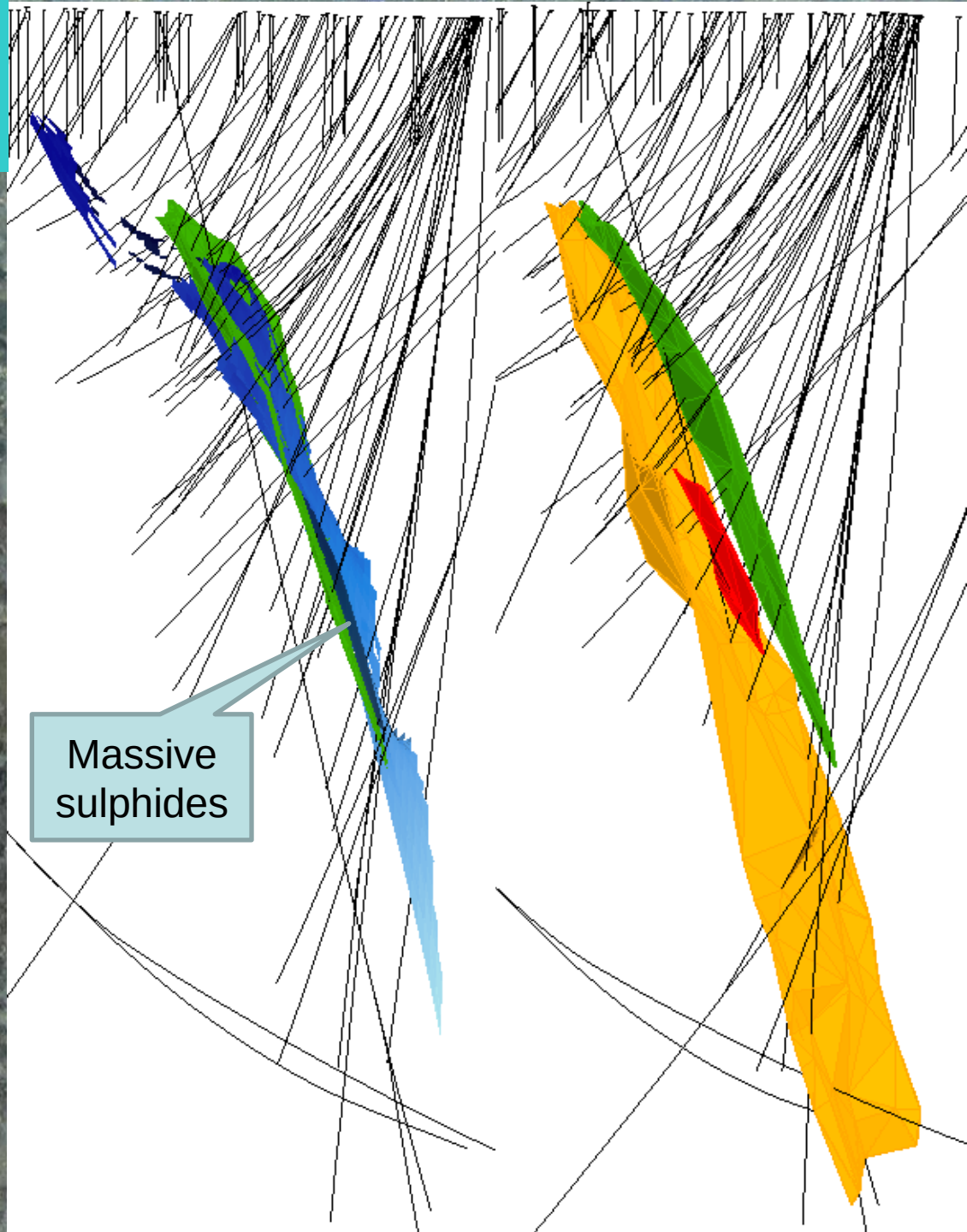
3300 Kt inferred

3920 Kt total

Details in Abstract volume

Mallee Bull Deposit – Resource Domains





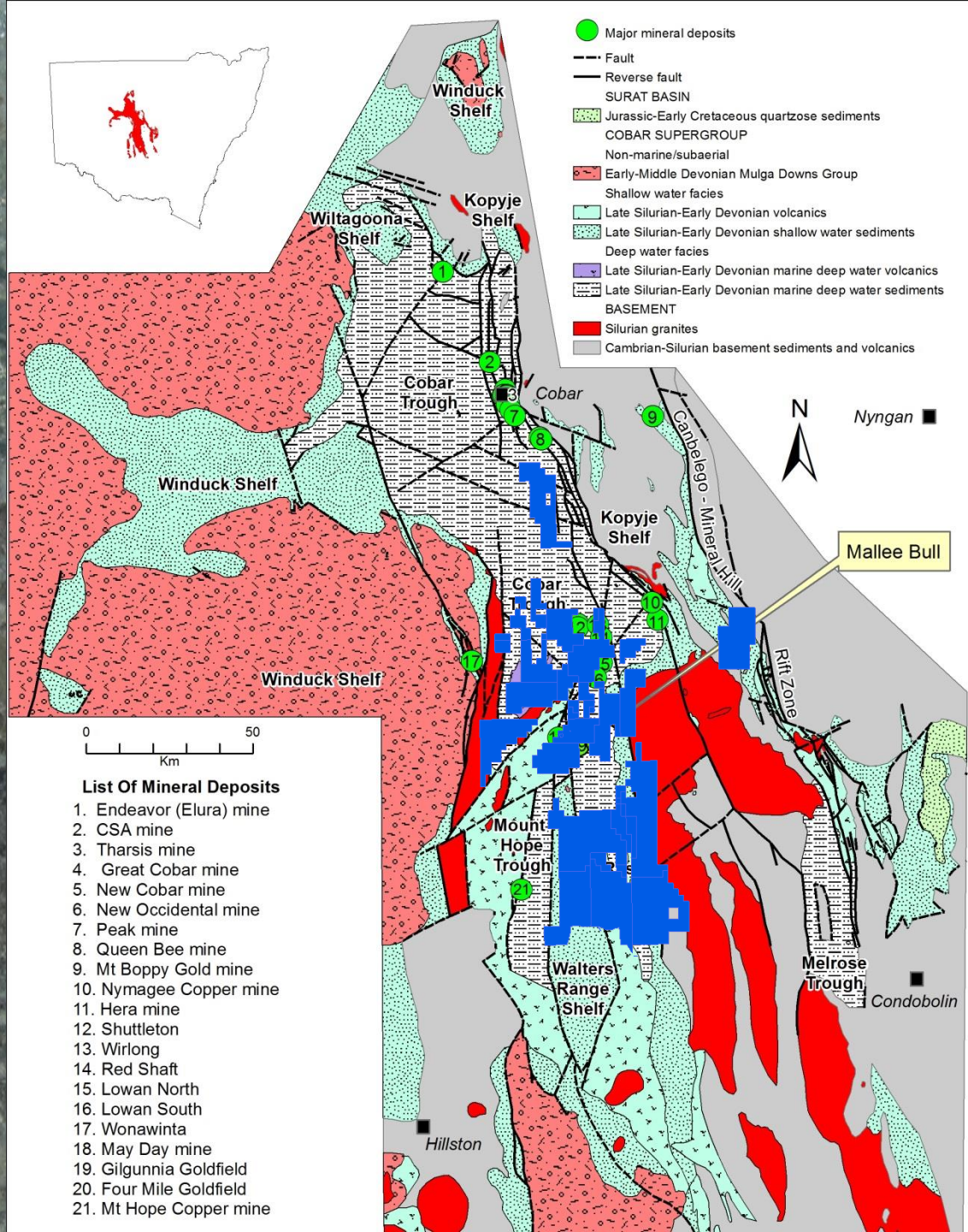
Mallee Bull Deposit – Resource Modelling

Scoping study initiated after resource estimate

Scoping study demonstrated the need to increase resource size to make Mallee Bull viable

Subsequent focus on locating extensions to Mallee Bull and discovering new, local deposits to increase overall resource

Peel's Holdings ELs and ELAs



Mallee Bull Deposit – Regional Analogies

Significant Mallee Bull characteristics provide model:

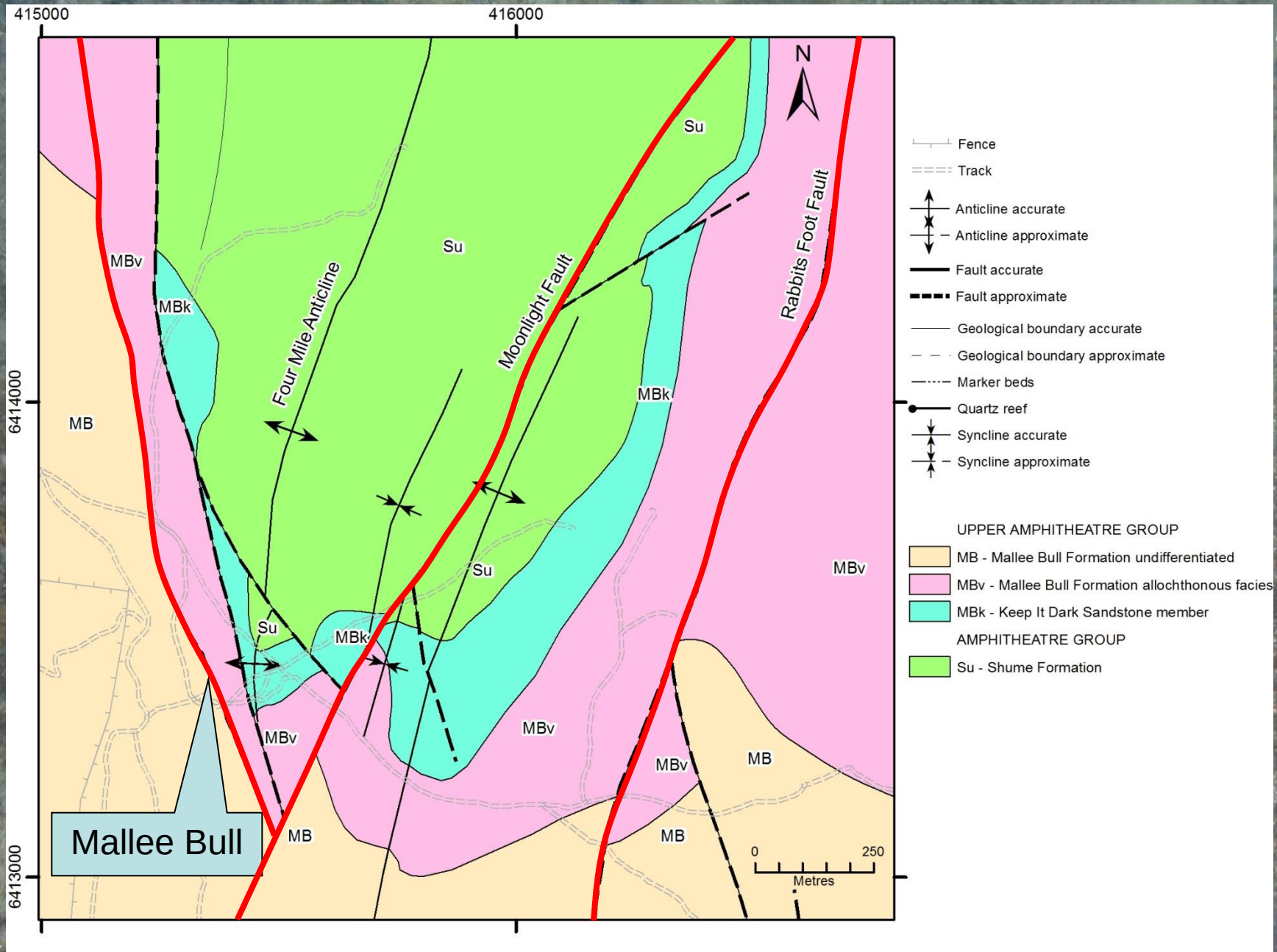
Very close to intimate spatial association with sandy or gravelly, allochthonous volcaniclastics – an aquifer for mineralising fluids

Close spatial association with a regional-scale fault - hundreds of metres distant – a fluid conduit

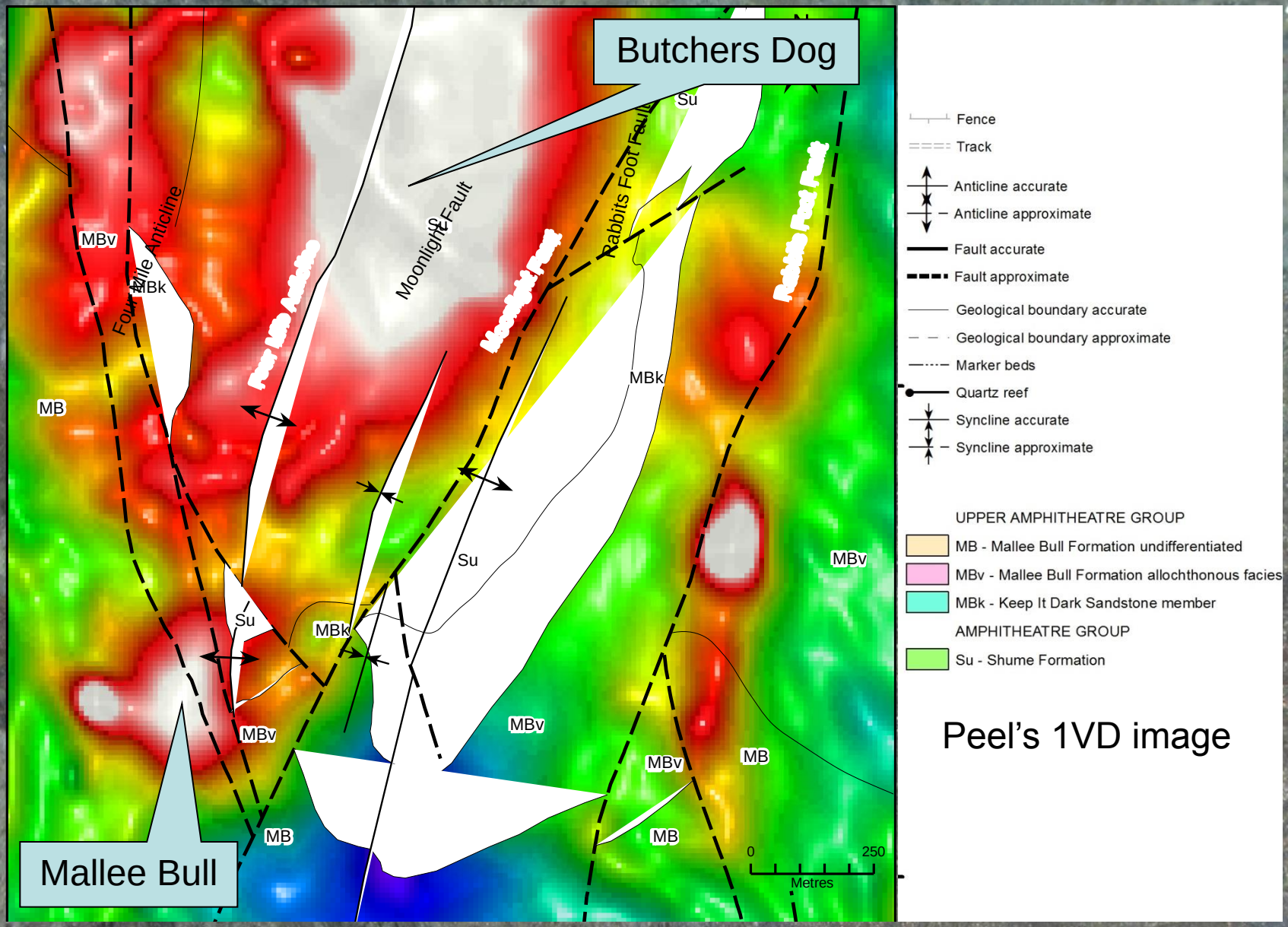
A structural or lithological trap to focus mineralisation – essential to prevent diffusion throughout aquifer strata

An anticline to provide a pressure gradient leading to a trap site

Mallee Bull Deposit – Regional Analogies

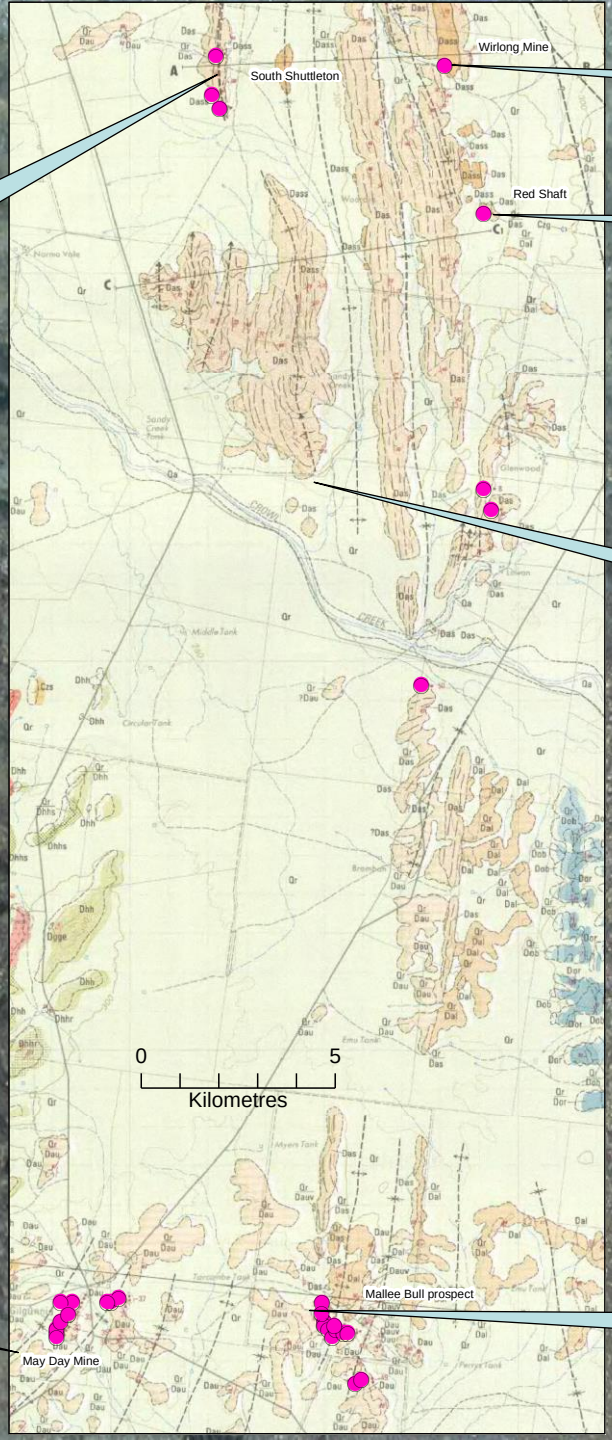


Mallee Bull Deposit



Peel's 1VD image

Mallee Bull Deposit
Regional Analogies



Shuttleton

Wirlong

Red Shaft

Sandy Creek

Mayday

Mallee Bull

Mallee Bull Deposit – Regional Analogies

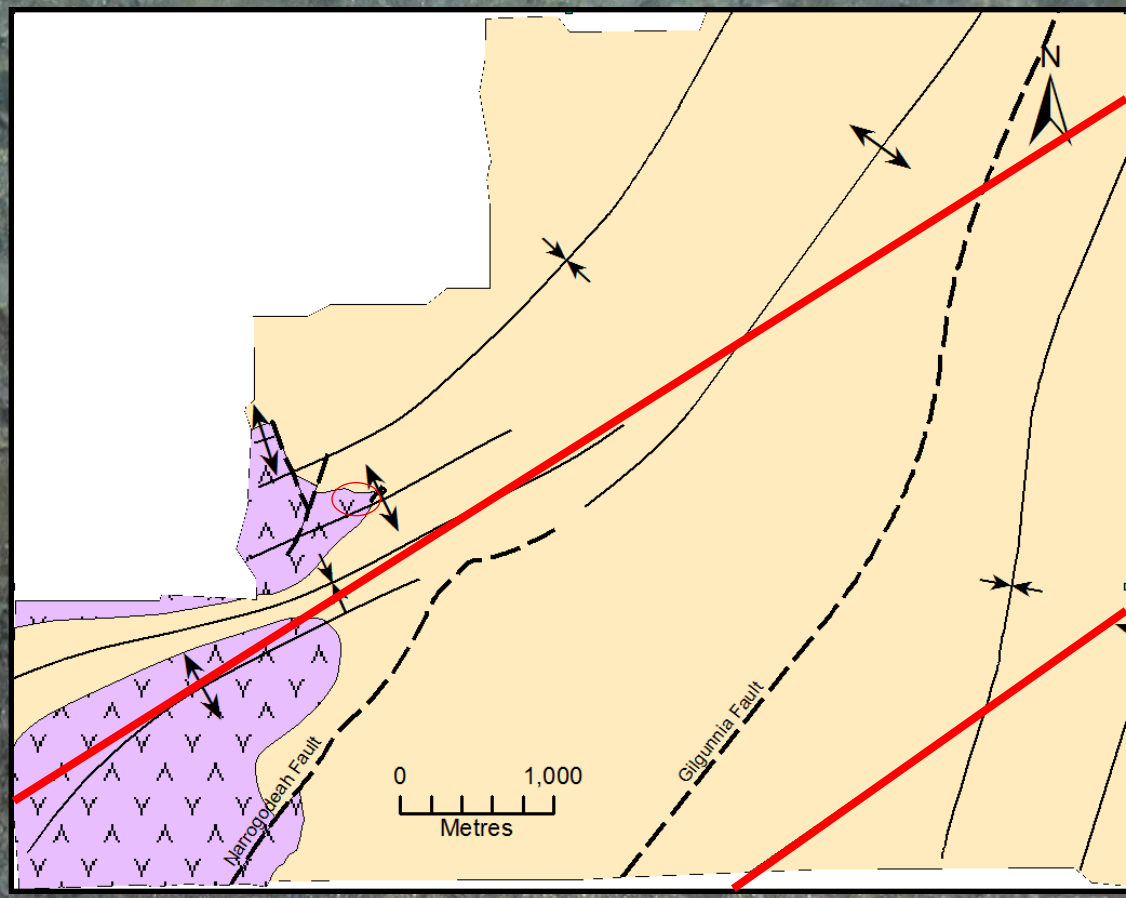
Mayday mine

Identical stratigraphic position to Mallee Bull

Hosted by coarse, pebbly volcaniclastics

Adjacent to regional-scale structural corridor and a regional change in fold plunge direction

On anticlinal flank



Mallee Bull Deposit – Regional Analogies

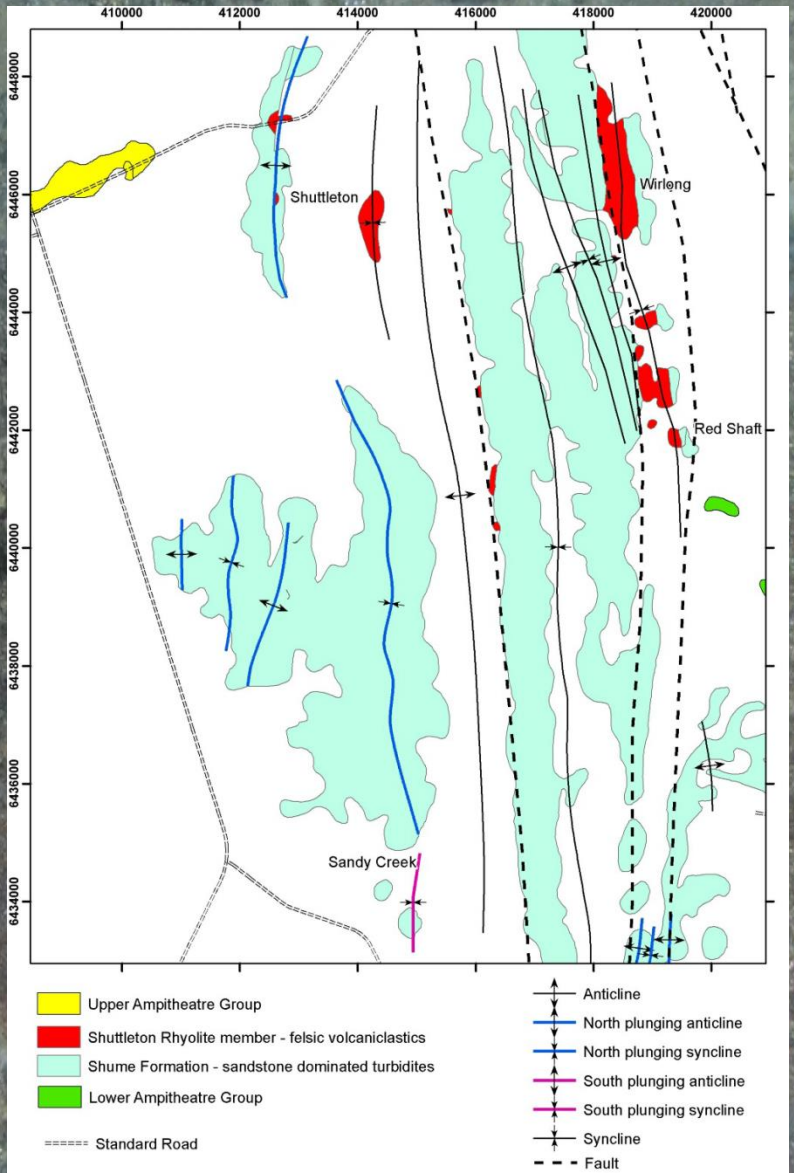
Wirlong-Red Shaft-Shuttleton-Sandy Creek

Most in identical stratigraphic position to Mallee Bull. Sandy Creek beneath Shume Fm

Hosted by coarse volcaniclastics and adjacent turbidites

Adjacent to regional-scale or major local faults

Sandy Creek at site of change in regional-scale fold plunge



Mallee Bull Deposit – Recent Research - Geochemistry

Enrichment in mineralisation: Cu, Pb, Zn, Ag, As, Au, Bi, Sb, Sn and Co

Element distribution reflects subtle and variable zonation, with overall vertical Pb-Zn-Ag rich top and Cu-rich at depth

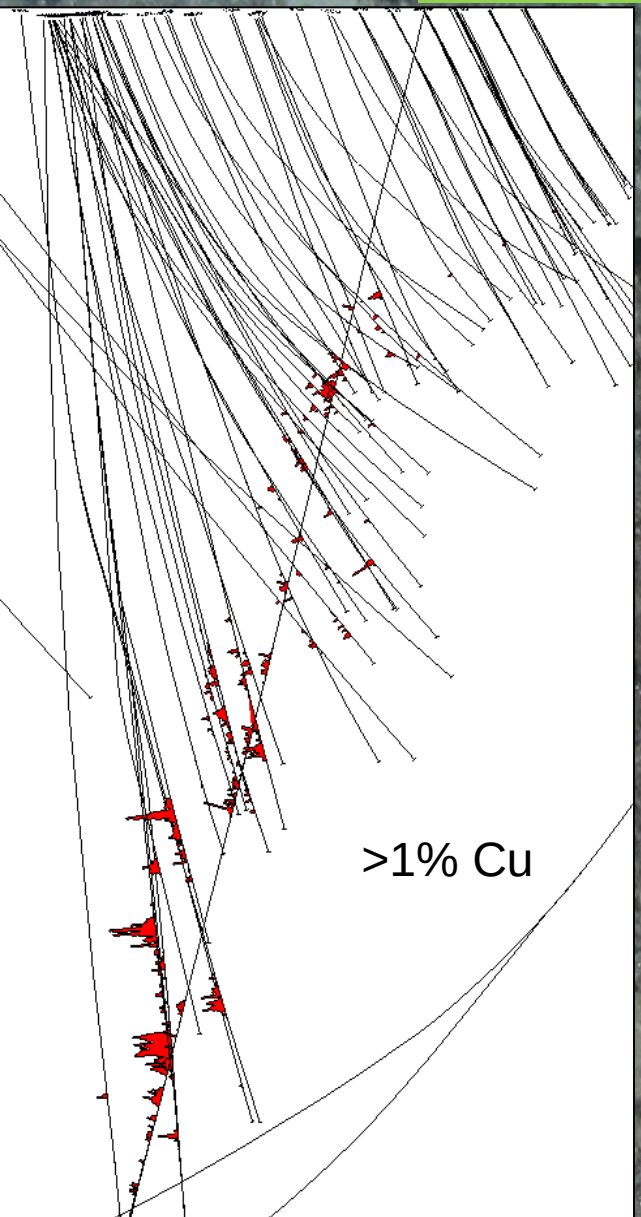
Strong +ve correlations between Cu-Ag, Bi-Co, Bi-Cu, Sb-Ag, Co-Au and Zn-Pb

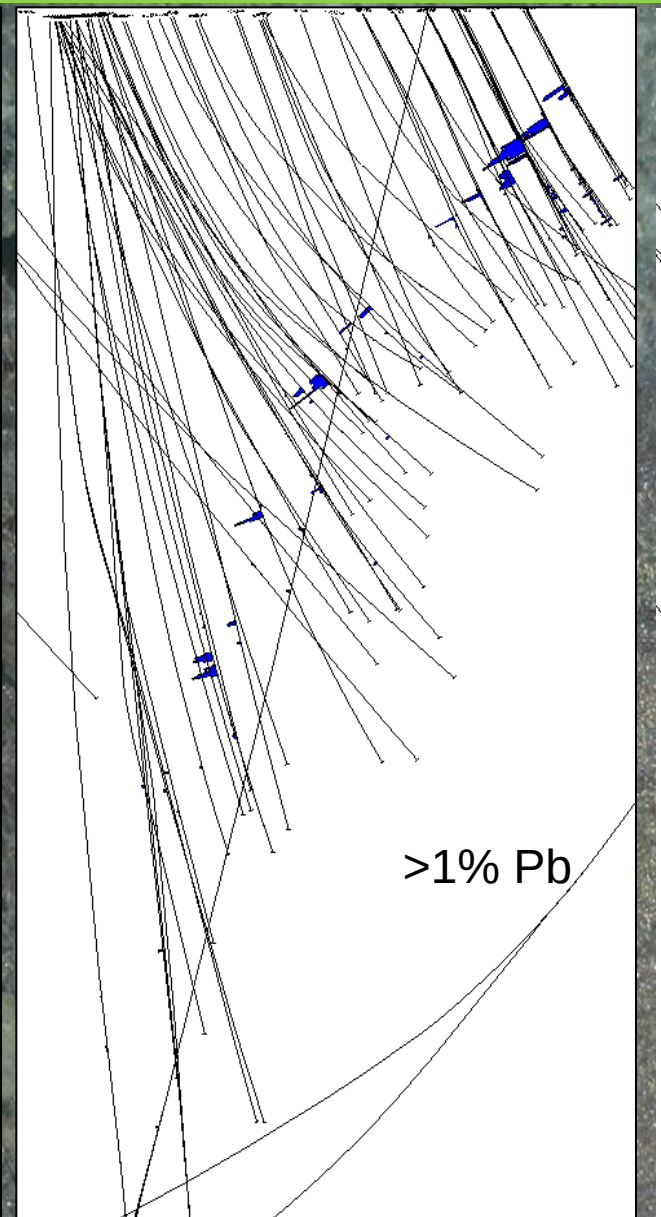
Poor correlations between Cu-Pb, Cu-Zn. Au and As correlate poorly with all other metals

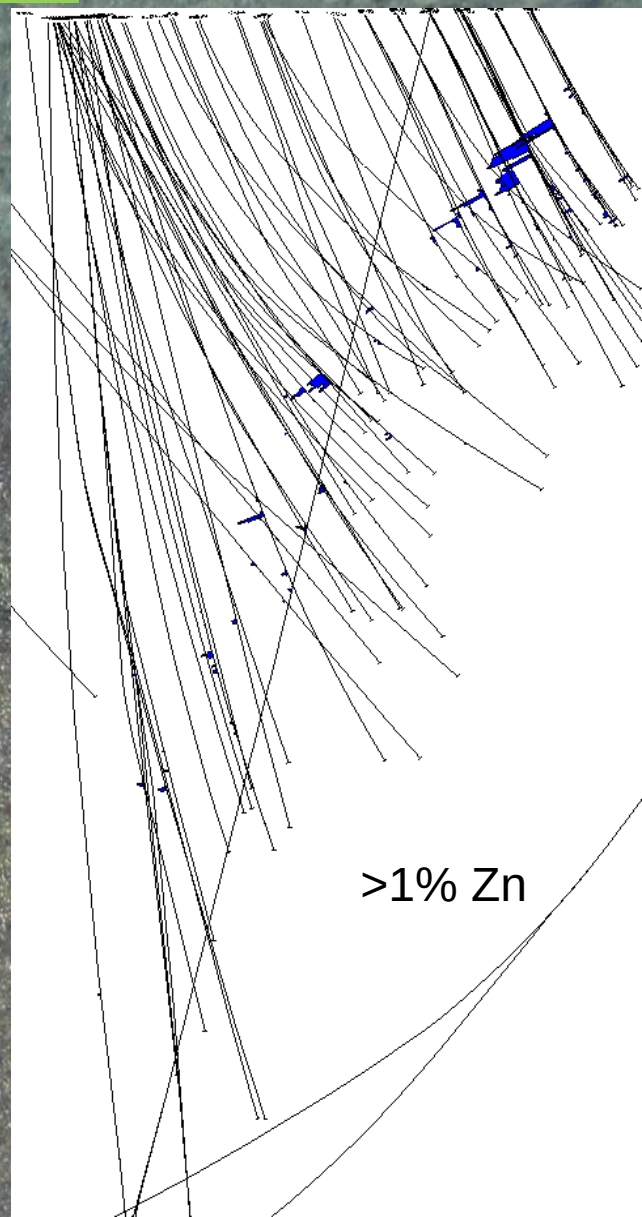
Strong enrichment of Fe and S, variable depletion of Na, K, Ba, Ca, Sr, Mg

Mallee Bull Deposit – Recent Research

Geochemistry – metal zonation

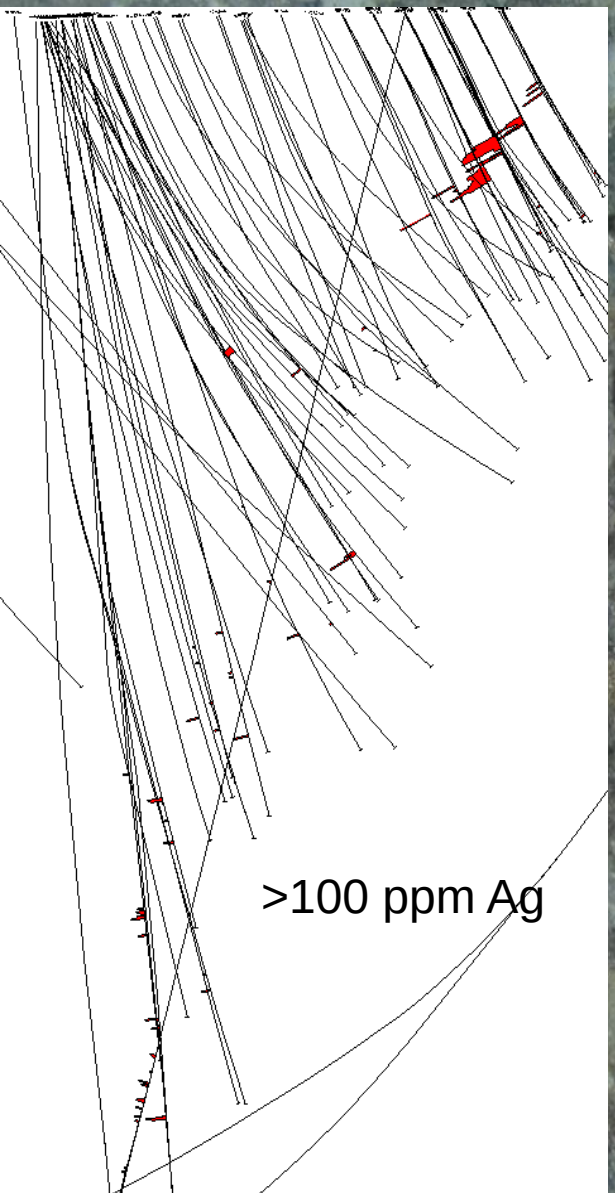


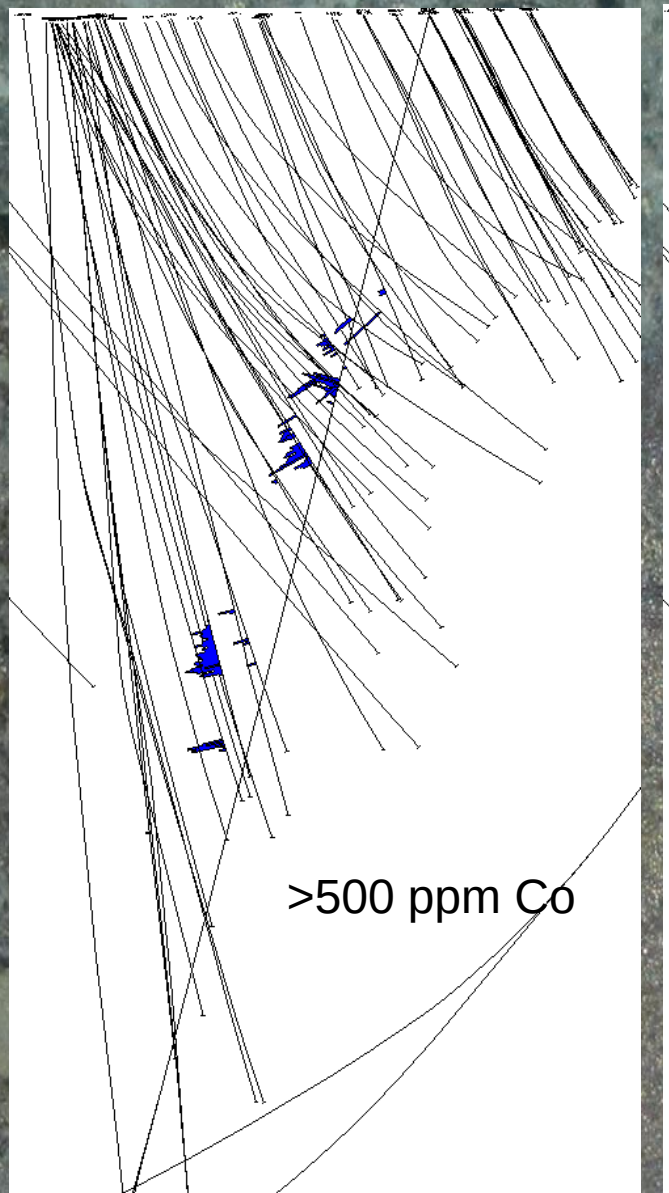


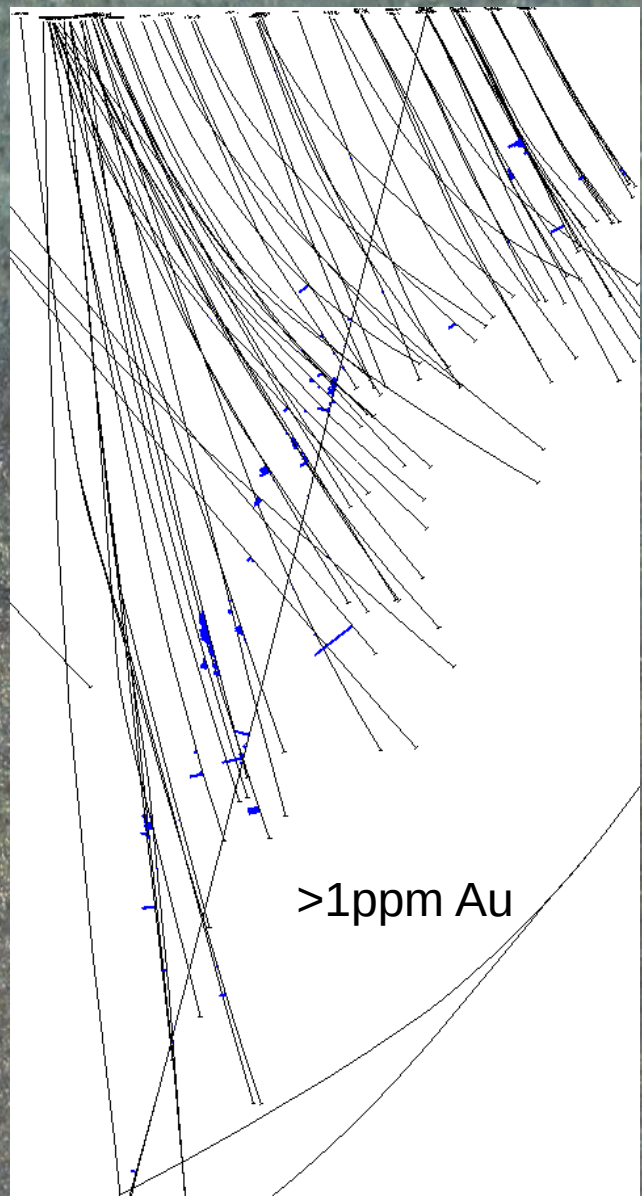


Mallee Bull Deposit – Recent Research

Geochemistry – metal zonation







Mallee Bull Deposit – Recent Research - Sedimentology

Mass flows mark break between post-rift, low energy Upper Amphitheatre Group and syn-rift, high energy Shume Formation turbidites.

Widespread mass flows in the southern basin are believed to have formed from a significant seismic event which modified basin geometry and ended Shume deposition.

Similar volcaniclastic-rich strata associated with turbidites at Wirlong, Red Shaft, Shuttleton and Mayday are also interpreted to be mass flows associated with this same event. Not submarine volcanic centres, so VMS deposits unlikely.

Mallee Bull Deposit – Origin

Hand specimen and petrographic evidence demonstrates syn-tectonic emplacement of mineralisation with minor local remobilisation. Mineralisation emplaced during basin inversion with local metamorphic conditions attaining biotite grade.

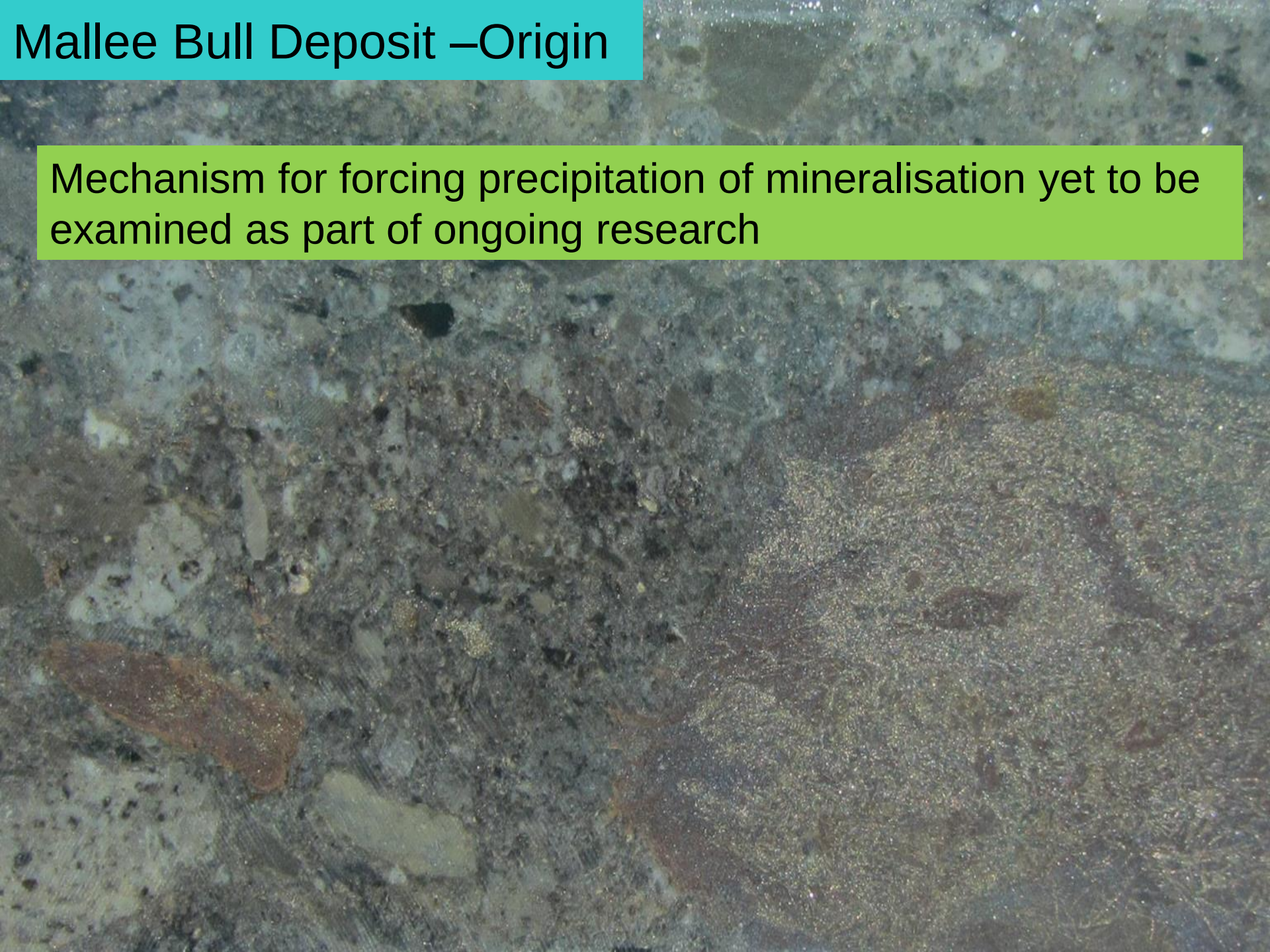
S-isotope data (NSWGS) indicate basinal origin for fluids. Pb-isotope data (NSWGS) indicate a basement origin for Pb which is interpreted as reworked basement detritus within the basin.

Major, regional-scale faults transported mineralised basinal fluids which were intercepted by high porosity, permeable sandy and gravelly strata (allochthonous units)

Concentration beneath impermeable cap rock on flank of developing anticline (pressure gradient in aquifer)

Mallee Bull Deposit –Origin

Mechanism for forcing precipitation of mineralisation yet to be examined as part of ongoing research



The End

Watch this space……