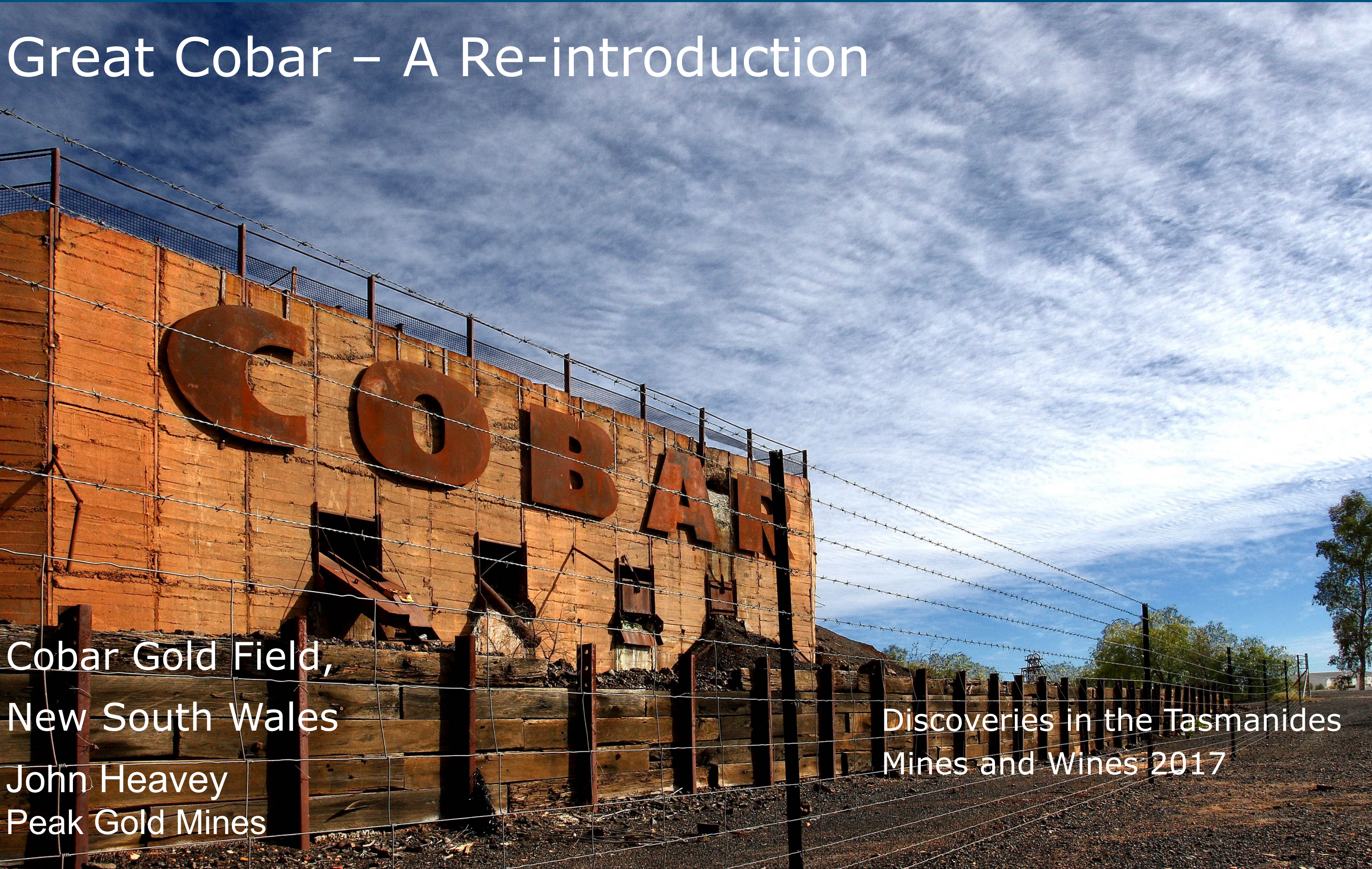
Great Cobar – A Re-introduction



Cobar Gold Field,

New South Wales

John Heavey
Peak Gold Mines

Discoveries in the Tasmanides
Mines and Wines 2017

Cautionary statement

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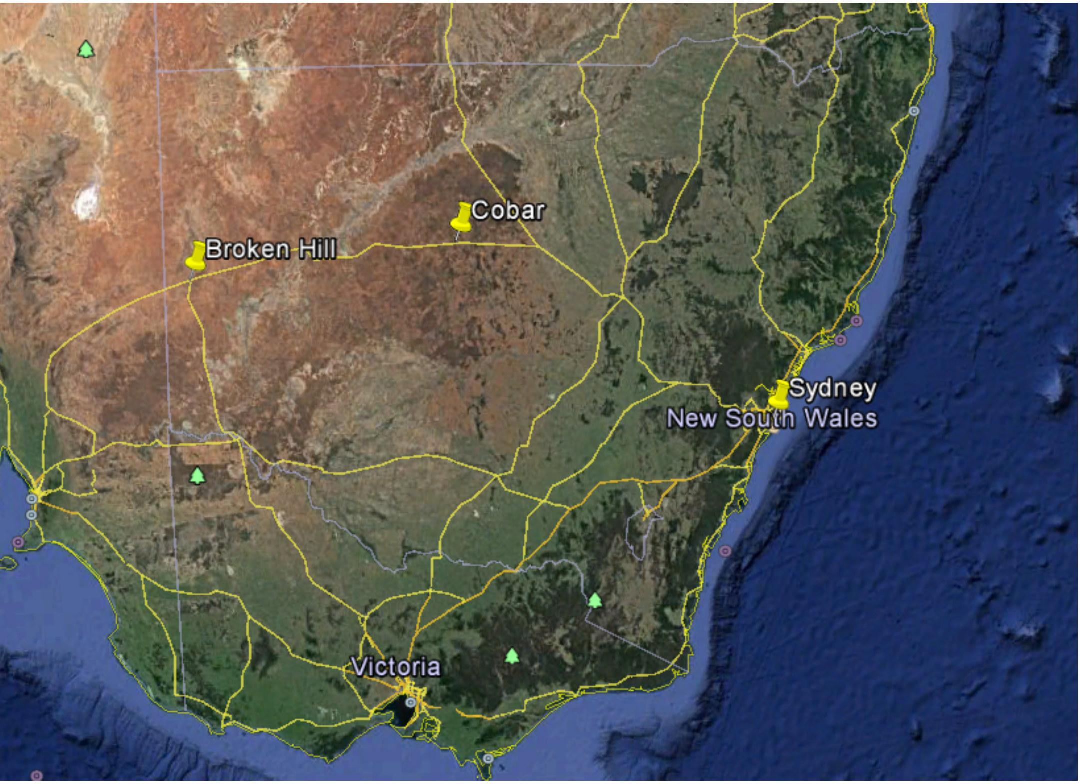
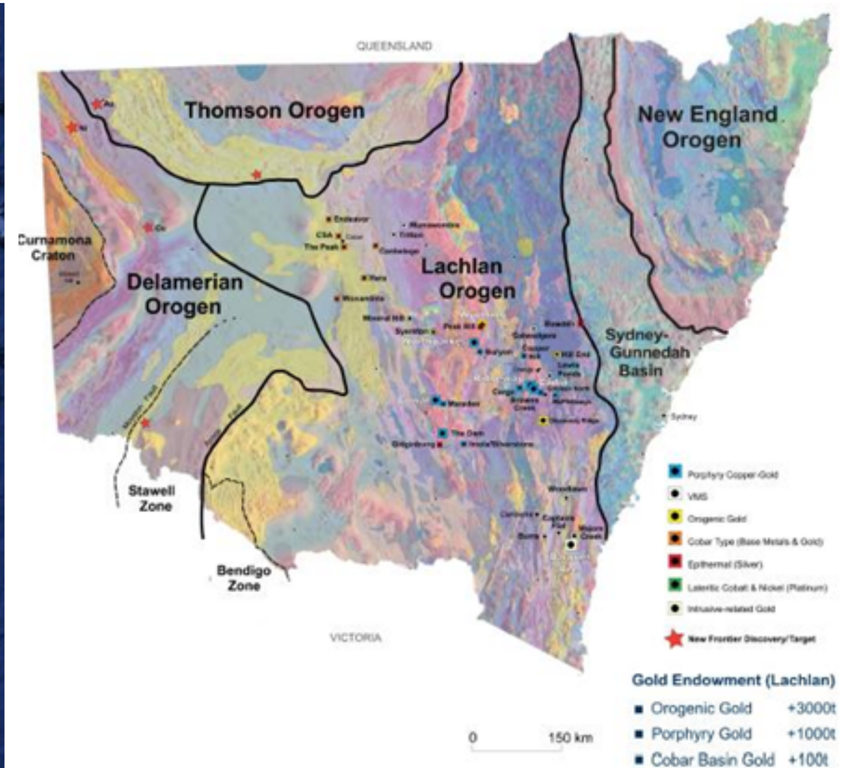
TECHNICAL INFORMATION
The scientific and technical information in this presentation has been reviewed by Mark Petersen, a Qualified Person under National Instrument 43-101 and an employee of New Gold.

Cobar Region





- ❑ 600 km west from Sydney, 450 km east of Broken Hill
- ❑ Population of the town is ~3,800 and the Shire ~4,700
- ❑ Elura, CSA, Peak Gold Mines - are it's closest operating mines

Regional Geology – PGM Tenements

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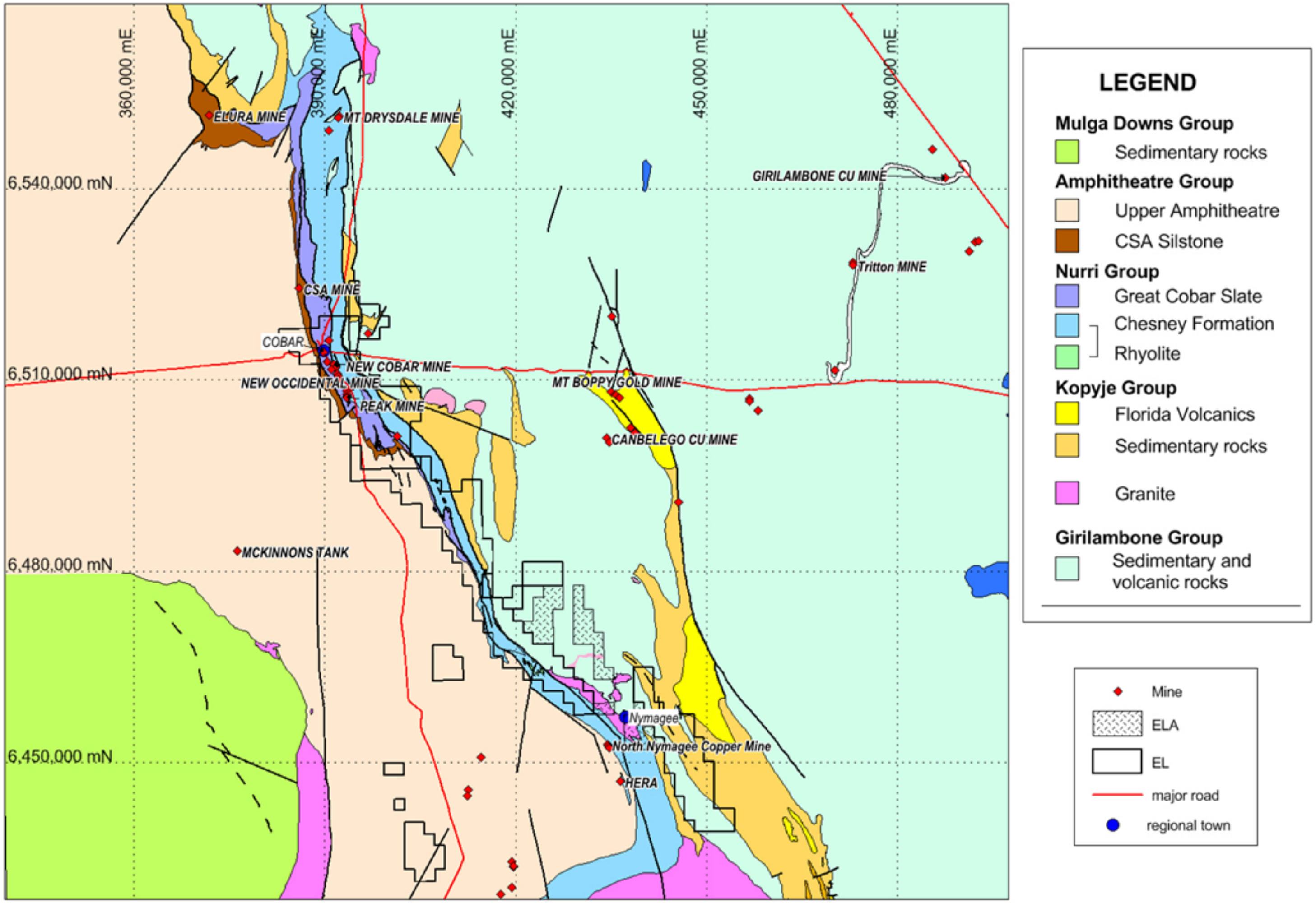
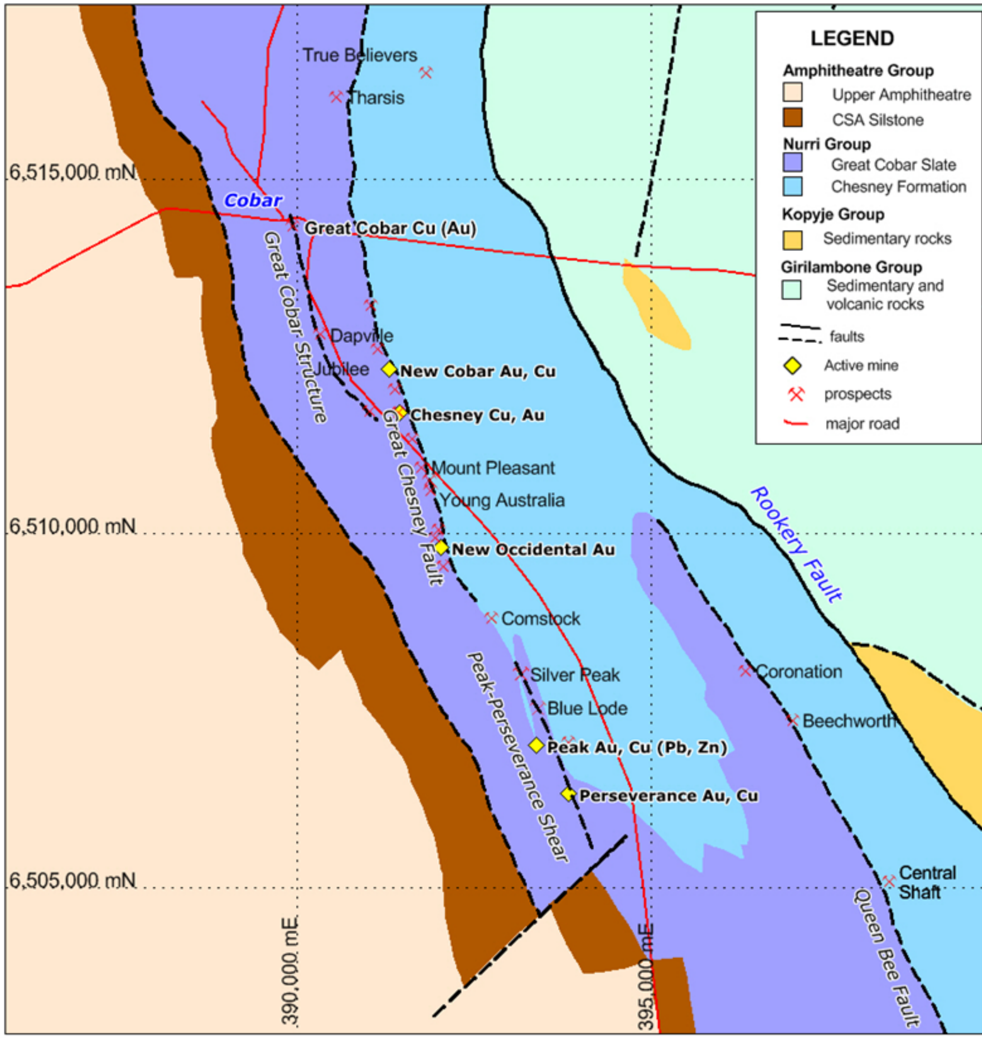
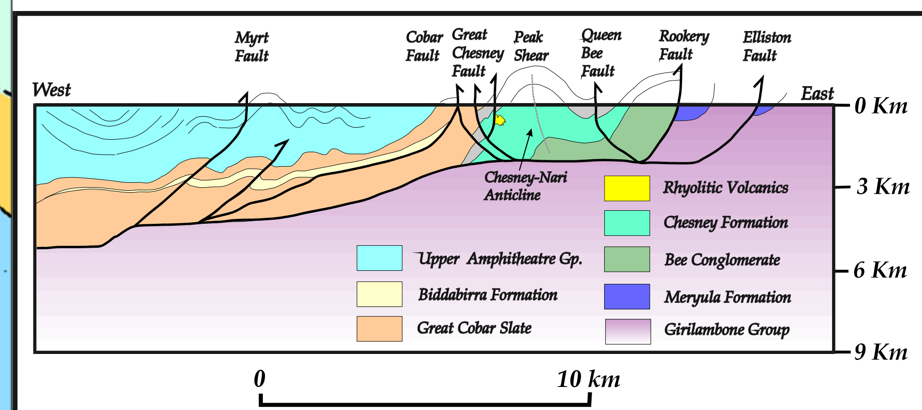


- Prospective ground from Cobar to Nymagee
- Potential for more blind Cobar-Style
- Potential for other sediment hosted styles e.g. MVT/Irish-Type?

Regional Geology – Cobar Gold Field

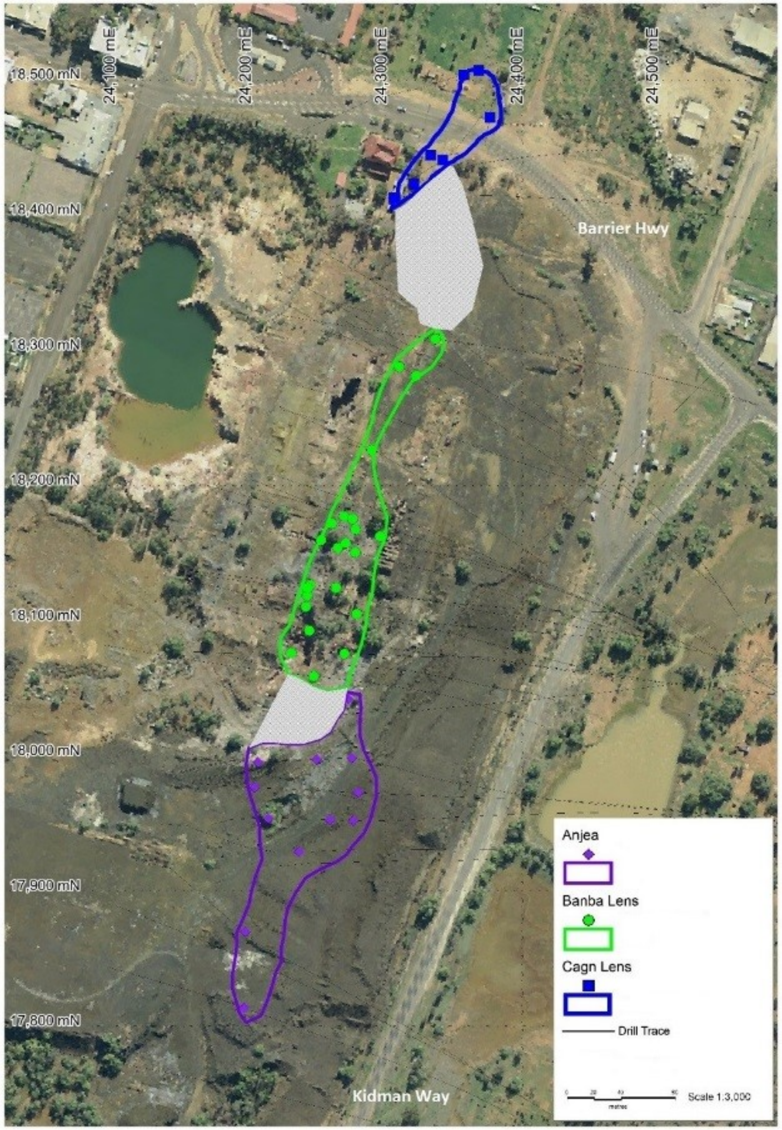


- Complex system of faults on eastern margin of the Devonian Cobar Basin
- Cu & Au-Cu lodes; echeloned, overlapping shear zones; major tecto-lineament on western limb of south-pitching anticlinorial belt
- CGF Ore Bodies; great vertical persistence
- depth many times strike length
- length greater than the worked width
- Shape of a flattened pipe or carrot



Schematic cross-section through the Cobar Gold Field, eastern margin of the Cobar Basin (Modified from Glen *et al.*, 1994).

The Great Cobar Deposit



- ❑ Polymetallic prospect
- ❑ Copper-Gold
- ❑ Lead-Zinc

- ❑ Initial Copper discovery in 1870; primarily worked 1871-1919; closed after World War One

- ❑ UG drilling data lost; success of introducing UG diamond drilling; unknown parallel lodes off stopes

- ❑ Drilling in the 1950s discovered that the shear was mineralized at much greater depths than previously known

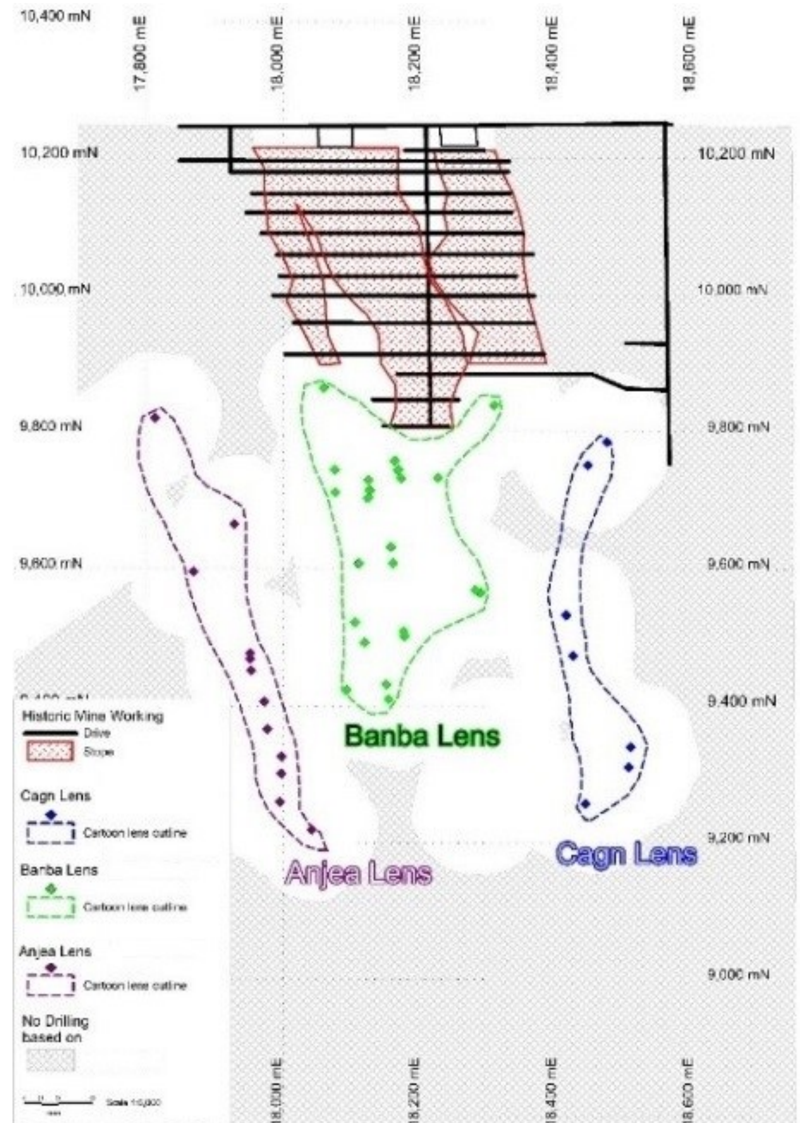
The Great Cobar Deposit

- 35 years of no exploration activity
- PGM began exploring under Great Cobar in 2004, 2010 & 2013

- Turning point; 2013 program
- 2014; 200m south from the historic workings
- Significant gold and massive sulphide from a prospect regarded as being gold poor

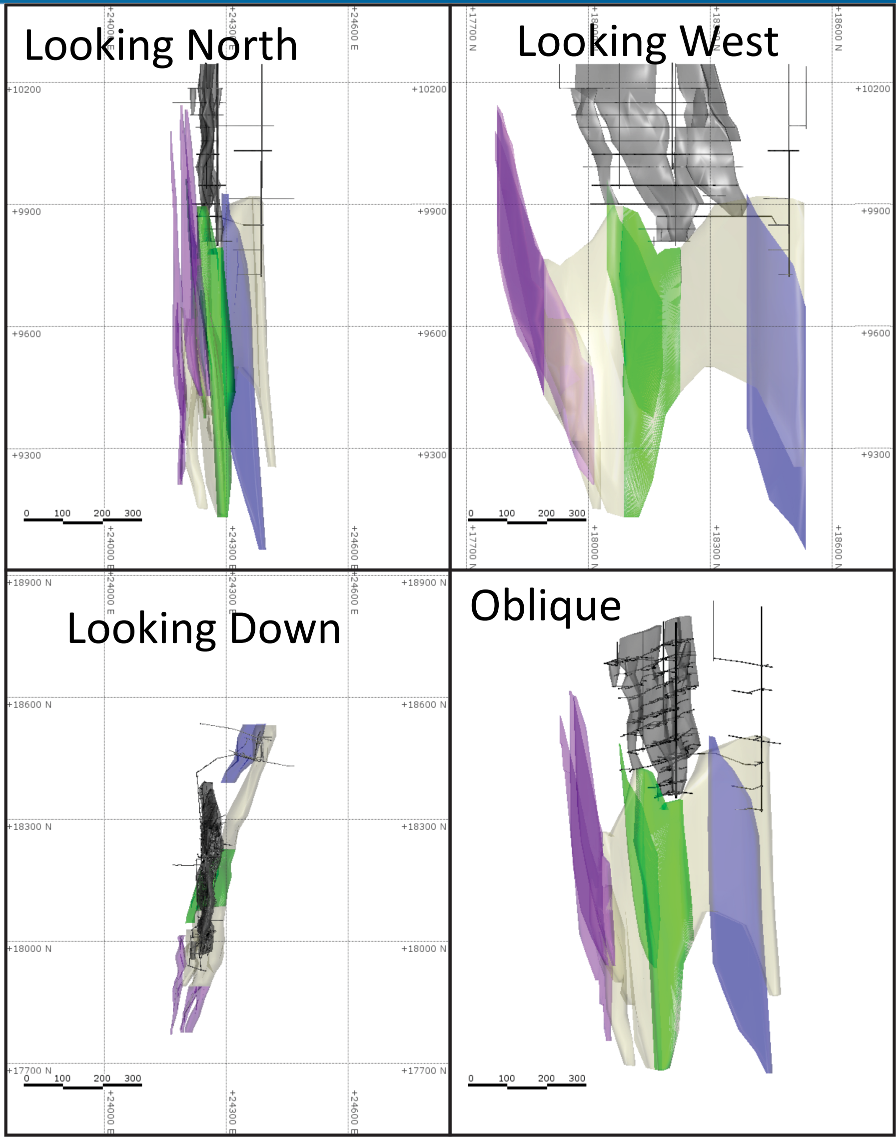
- Three conceptual lenses identified since 2015: Anjea, Banba and Cagn

- Anjea; further drilling allowed inclusion in New Gold's inferred mineral resource/reserve estimate in 2016.

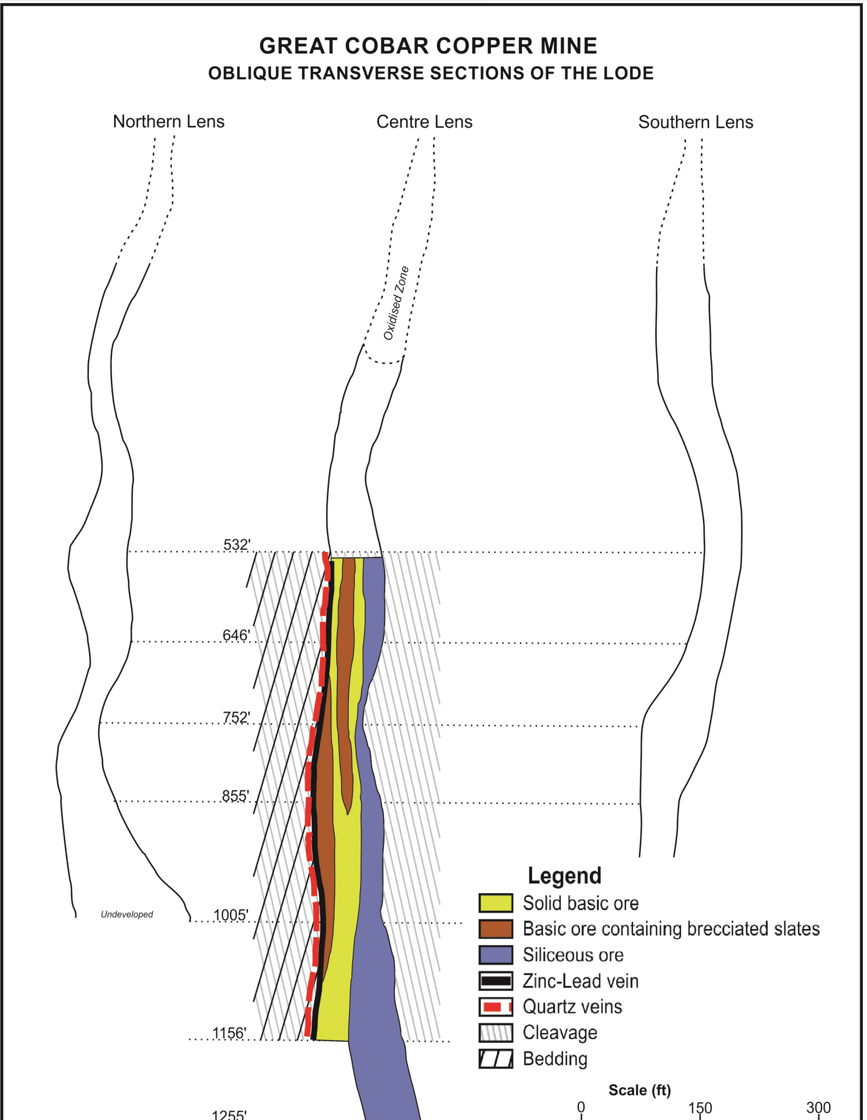


The Great Cobar Deposit

- Know most about Anjea & Banba
- Cagn to north is poorly understood
- Strike length ~800m
- depth >1,200m
- Unexplored strike 300m north of the highway
- Unexplored strike 800m south toward Dapville



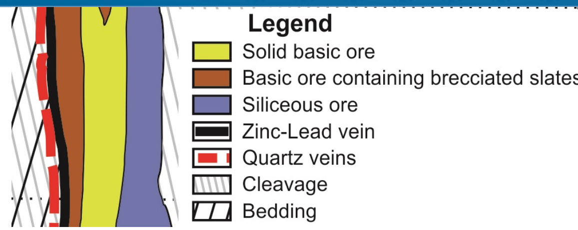
Morphology of the Ore Zones

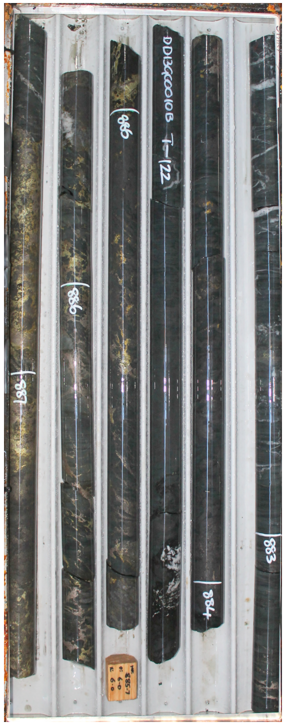


- West-east schematic XS modified from Andrews 1913
- Lens pinches and swells
- Strike approximately north-south
- Dip almost vertical
- The pitch steeply north
- Anastomosing shear zone within the Cobar Slate formation (Cobar Group)
- Additional complexity or parallel mineralisation west of the lodes we have focused on?
- Similarly, to the east?

Morphology - Selected Styles

West ← ← **East**

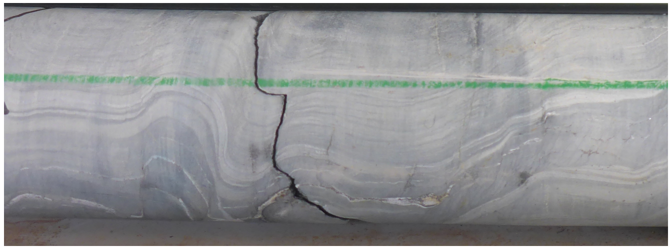




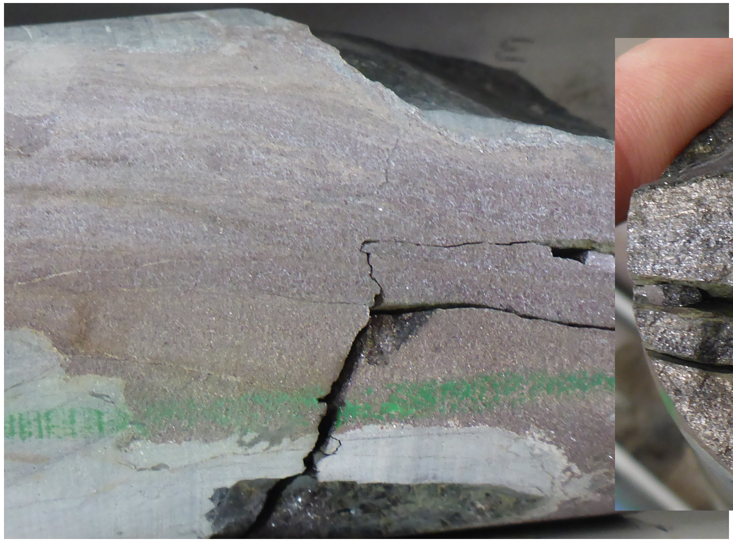
Zn/Pb ← **Semi-massive Cu** ← **Stockwork/spaced vein Cu**

Textures and Features

- ❑ Strongly altered juxtaposing weak alteration in ore zone
- ❑ Banded Sulphides

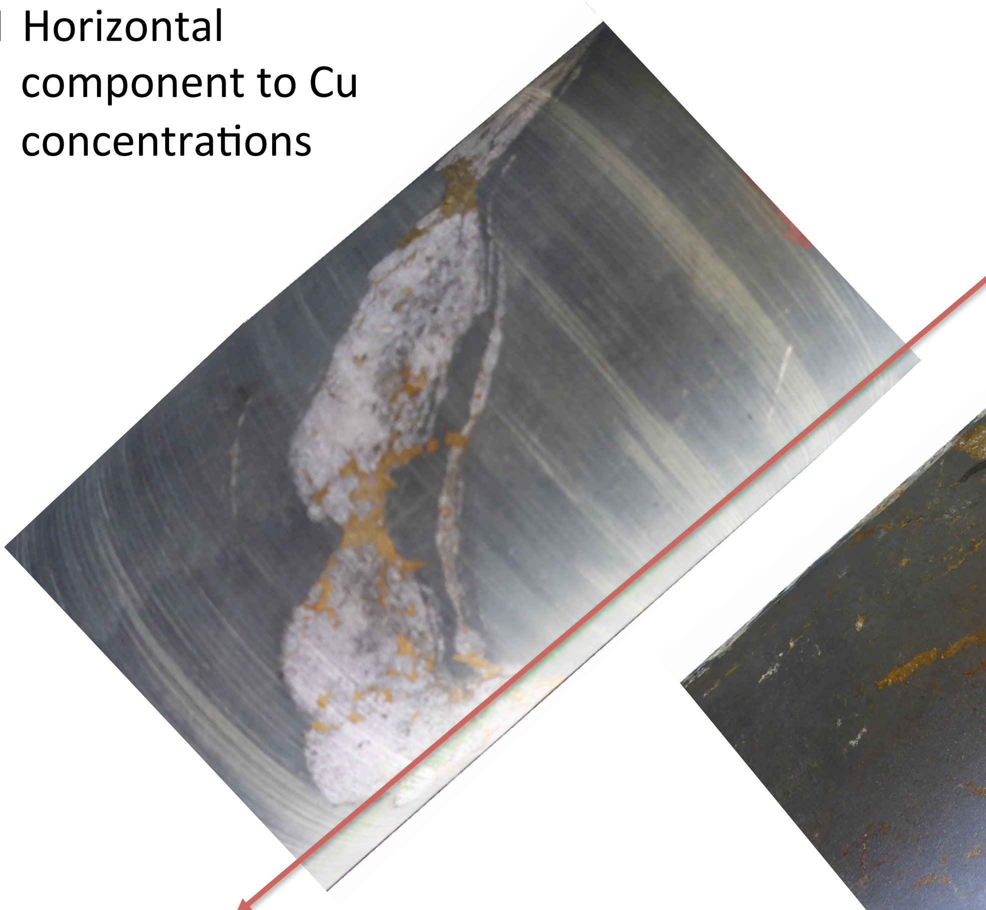


- ❑ Folds
- ❑ Lineations

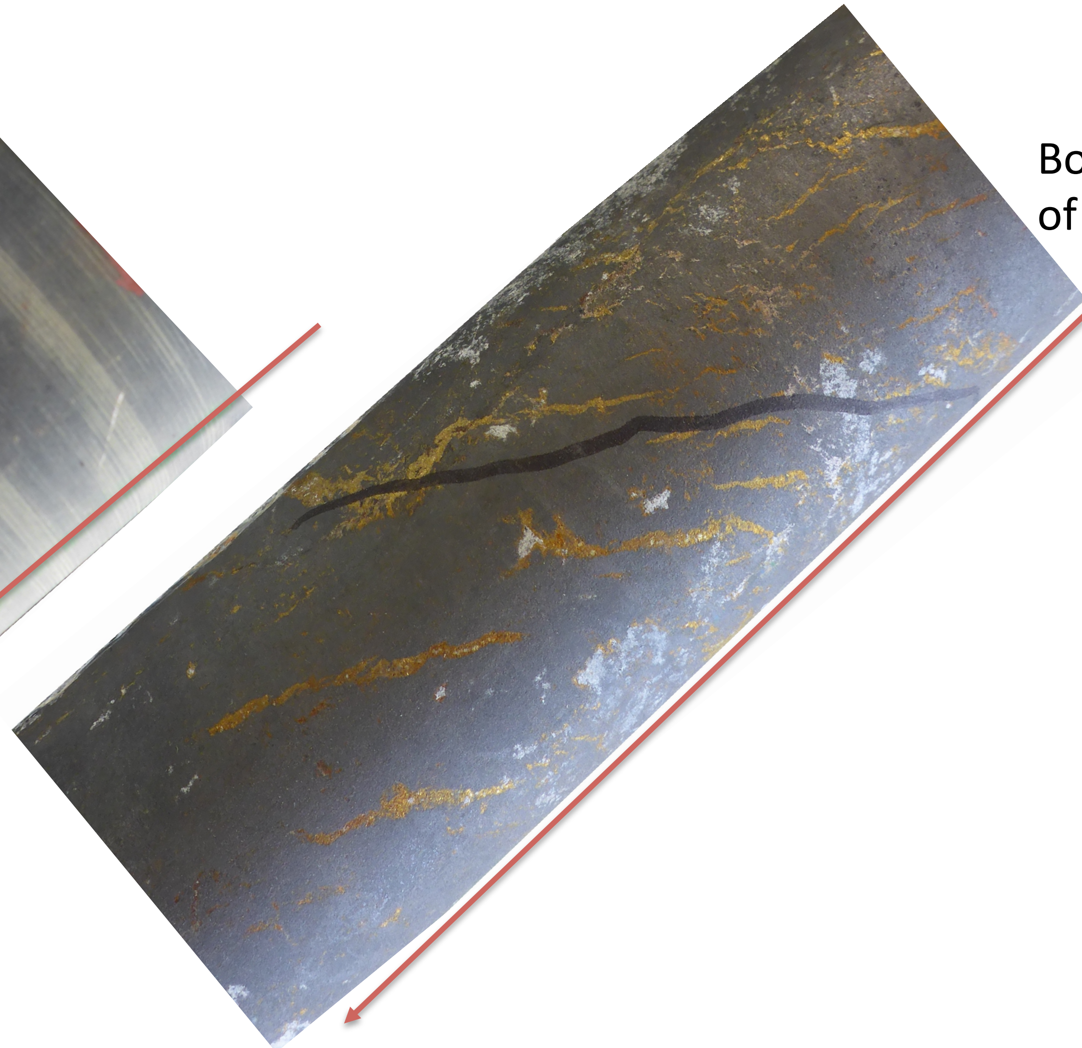


Textures and Features

- Fractal Features
- Horizontal component to Cu concentrations



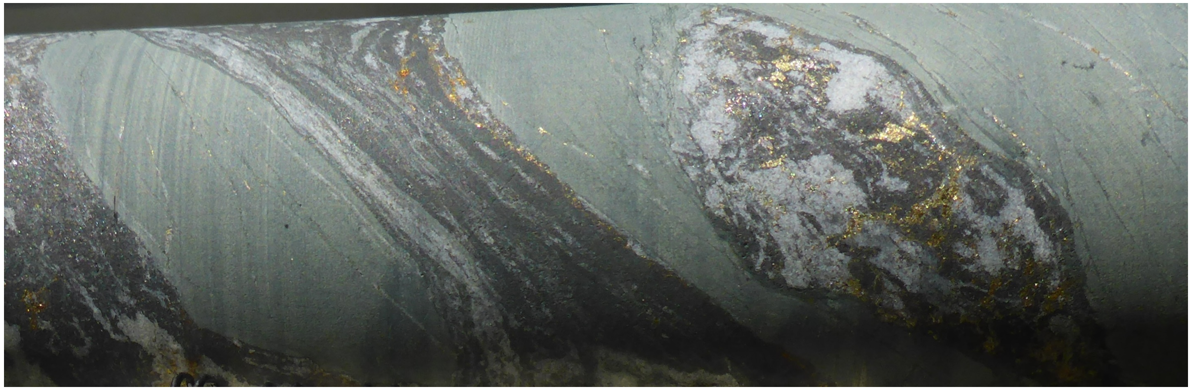
Bottom of hole



Bottom of hole

Textures and Features

❑ Isolated Clasts

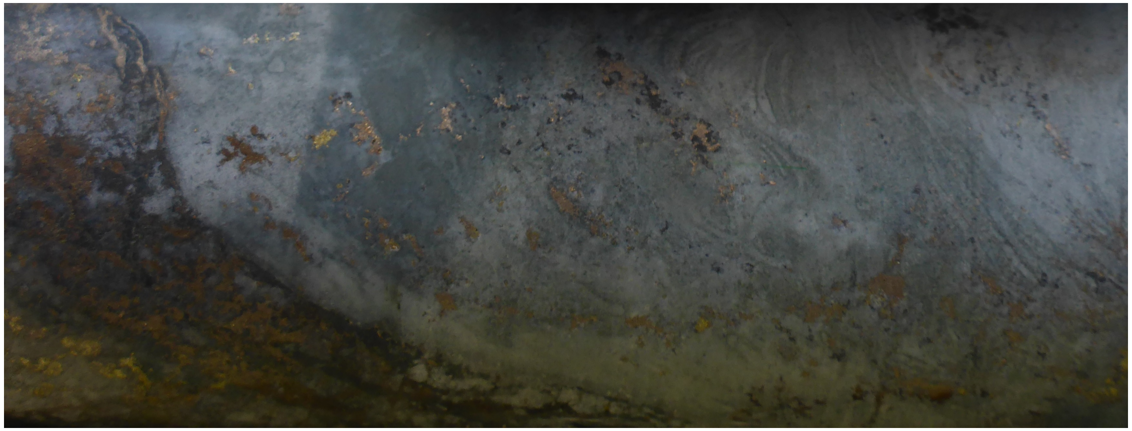


❑ Replacement

❑ Porphyroblasts

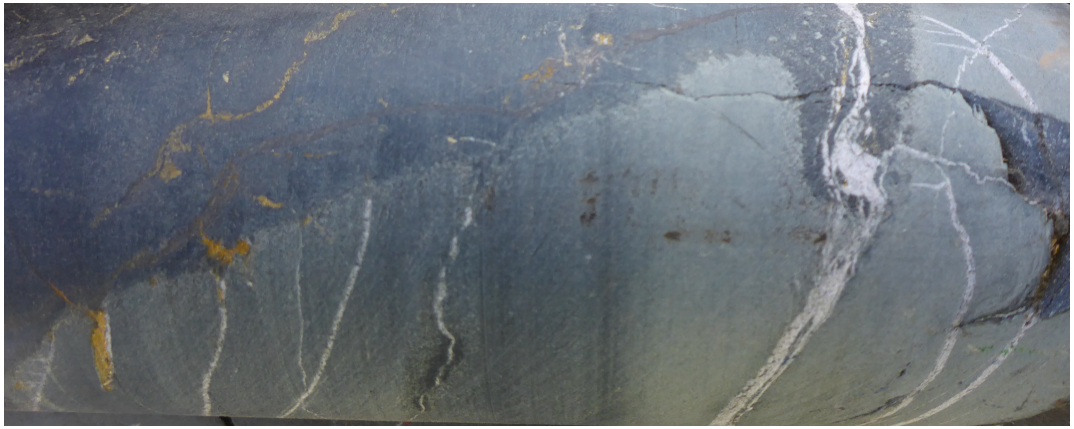
Textures and Features

- ❑ Magnetite phases
- ❑ Clast replacement

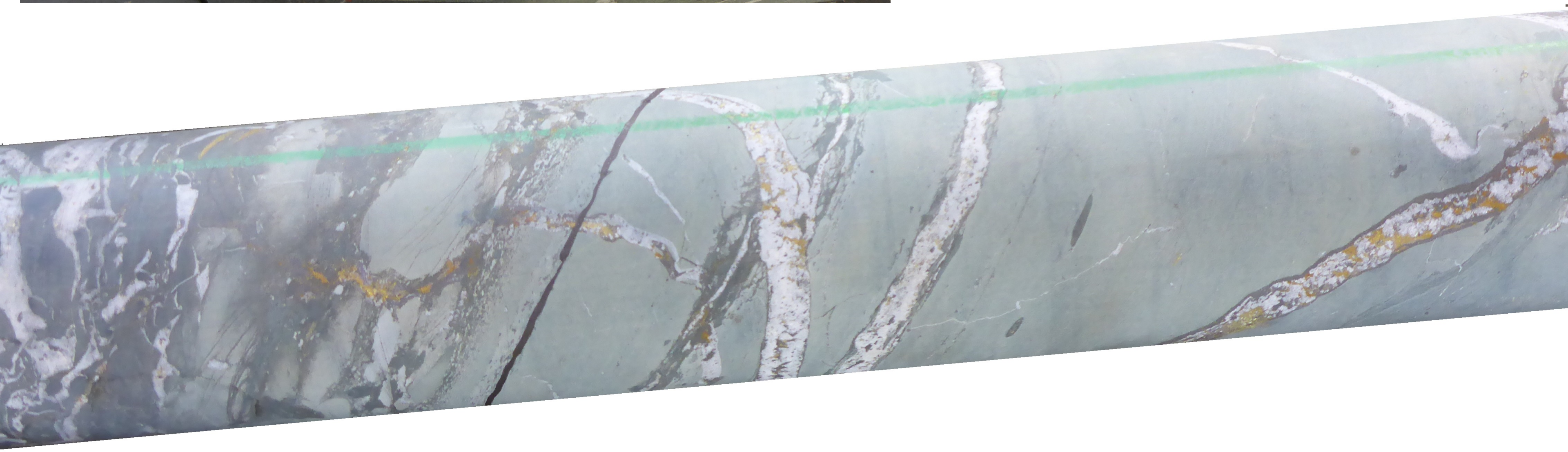


- ❑ Siliceous Magnetite
- ❑ Extremely Deformed

Textures and Features



- Complex deformation and mineralization history



Processing

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- Holes were drilled, surveyed, and logged in accordance with normal protocols
- Assay intervals were selected on basis of sulphide occurrence and alteration style. - Multi-element ICP for 32 elements

- Accurate determination of whole sample SGs obtained
- Magnetite alteration zones verified by magnetic susceptibility readings

Mineralisation

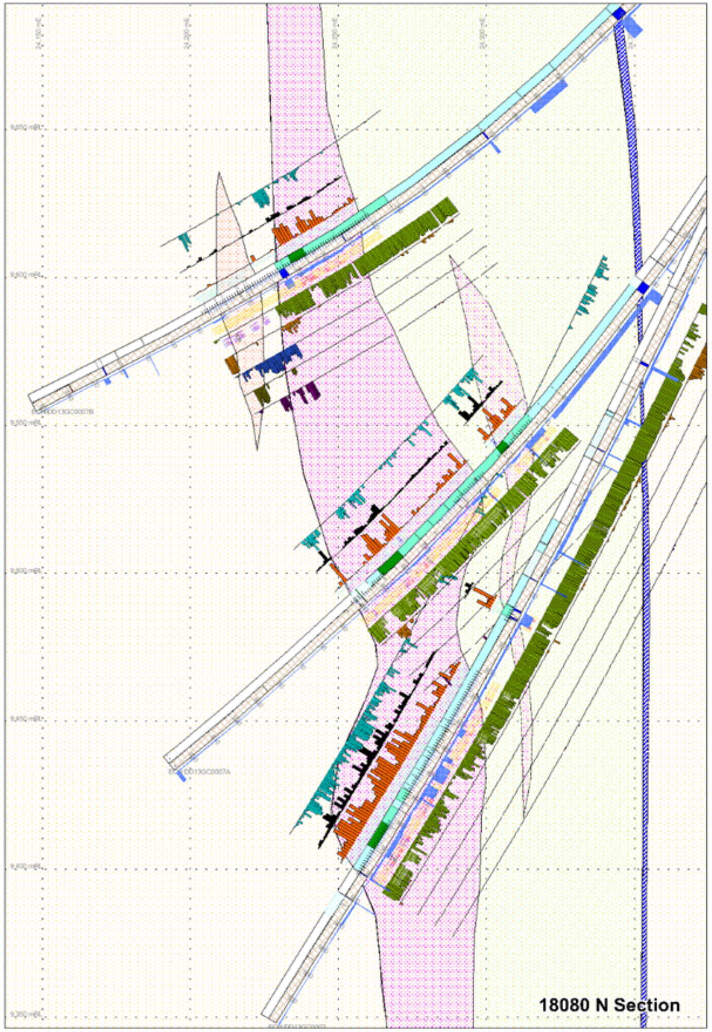
Fundamental observations:

- ❑ Mineralisation (Cpy,Po,Mt) are quartz/sulphide/magnetite vein specific
- ❑ Phylosillicate alteration associated with mineralisation is host rock specific
- ❑ Great Cobar Slate (well cleaved sandy siltstone) is the only stratigraphic unit in the prospect area.

- ❑ Cu mineralisation is hosted within a Fe chlorite alteration zone
- ❑ Asymmetrical distribution with alteration intensity increasing to the west

- ❑ Zn/Pb lode lies to the west of the Fe chlorite
- ❑ Is associated with Mg chlorite

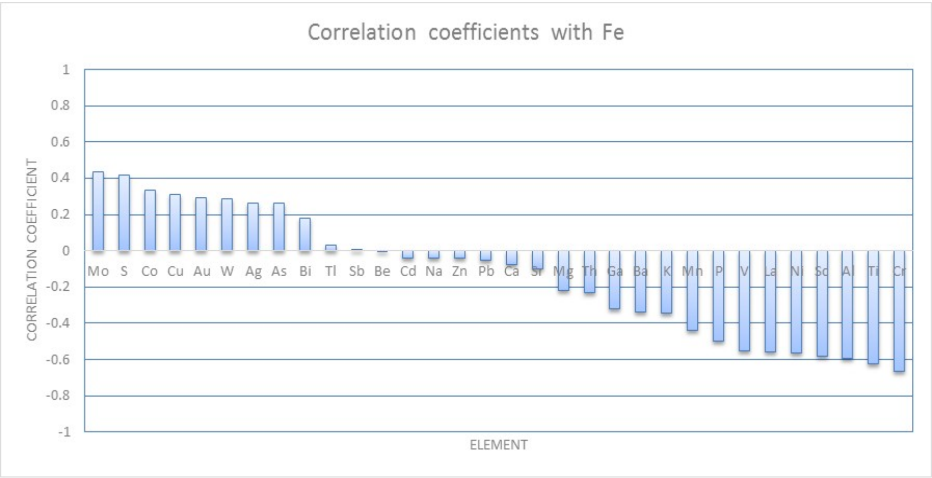
Spectral Scans

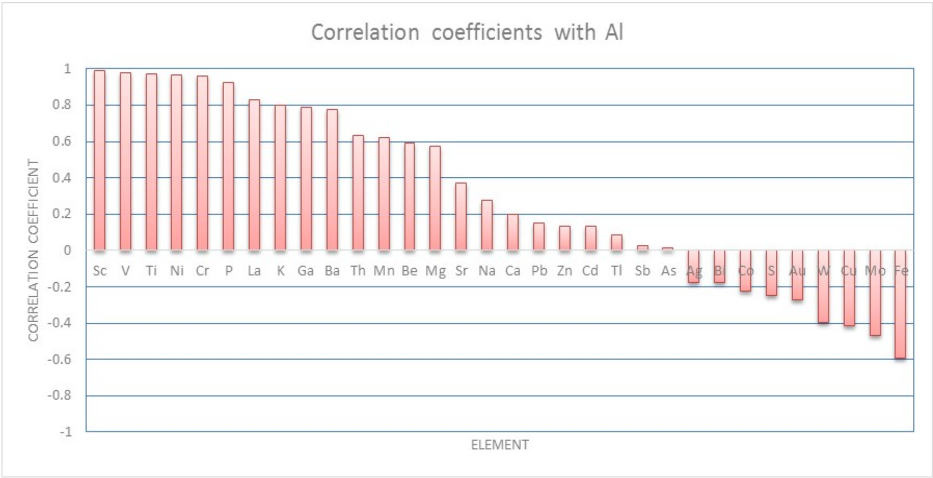


- Fe chlorite zone strongly matches logged Fe chlorite intervals
- Most "gaps" in Fe chlorite intensity are displacement of chlorite by magnetite, quartz and sulphides
- Iron magnesium, magnesium chlorite are restricted to a zone within and peripheral to the lead zinc lens
- Correlates well with the knife edge change in chlorite species noted in the logging

(From Barry Taylor 2013-14)

Correlation Coefficients





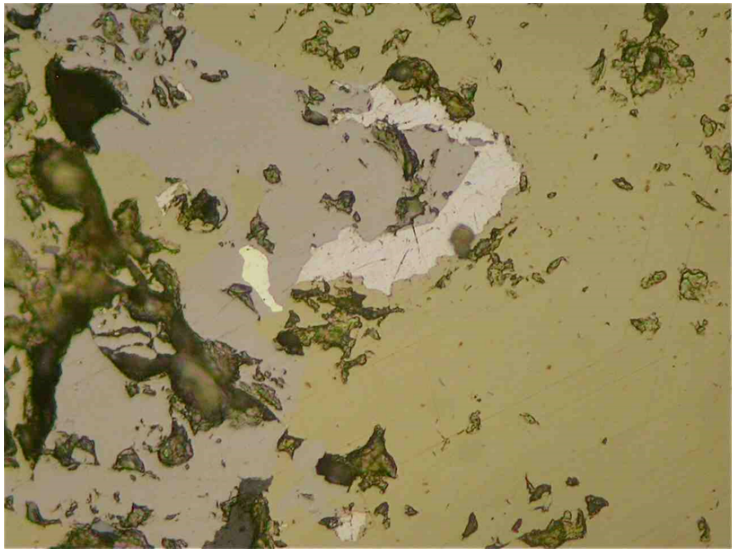
- Positive correlation between Cu, Au, S, Mo, Co, W, As, Ag, Bi and Fe
- Negative correlation with Al, Sc, Ni, Ti, Cr, P, La, K etc.
- Comparisons of element ratios relative to immobile element ratios
- Ti universally recognized immobile element - negative correlation between Ti and Fe & Cu, Au, S, Mo, Co, W, As, Ag, Bi probably displacement related

- If immobile is proportional to the amount of siltstone in the sample - displacement by sulphides, magnetite, and quartz, will result in a negative correlation for the sample
- But is not indicative that the amount of immobile per unit of mass of remnant siltstone varies

Petrographic Study

Paragenetic sequence recognized:

- magnetite and pyrite (with trace arsenopyrite) were deposited early
- followed by pyrrhotite
- then apparently by chalcopyrite, sphalerite, and galena (with associated bismuth)
- Sequence does not necessarily mean more than one phase of mineralization
- Simply reflecting the depositional sequence
- Drilling shows broad scale zonation from east to west
- Fe-Cu association →Fe (pyrrhotite-dominated) zone → Zn-Fe (-Cu-Pb) association
- Magnetite associated with pyrrhotite-chalcopyrite (-pyrite) in the Fe-Cu zone (Ashley, 2015; Ashley, 2016)



Grain of electrum (~20 µm across, just left of centre) and a larger, arcuate grain of a Bi mineral (bismuth or Bi telluride) associated with pyrrhotite (pale creamy brown) hosted in chalcopyrite (yellow). Plane polarised reflected light, field of view 0.25 mm across.

Petrographic Study

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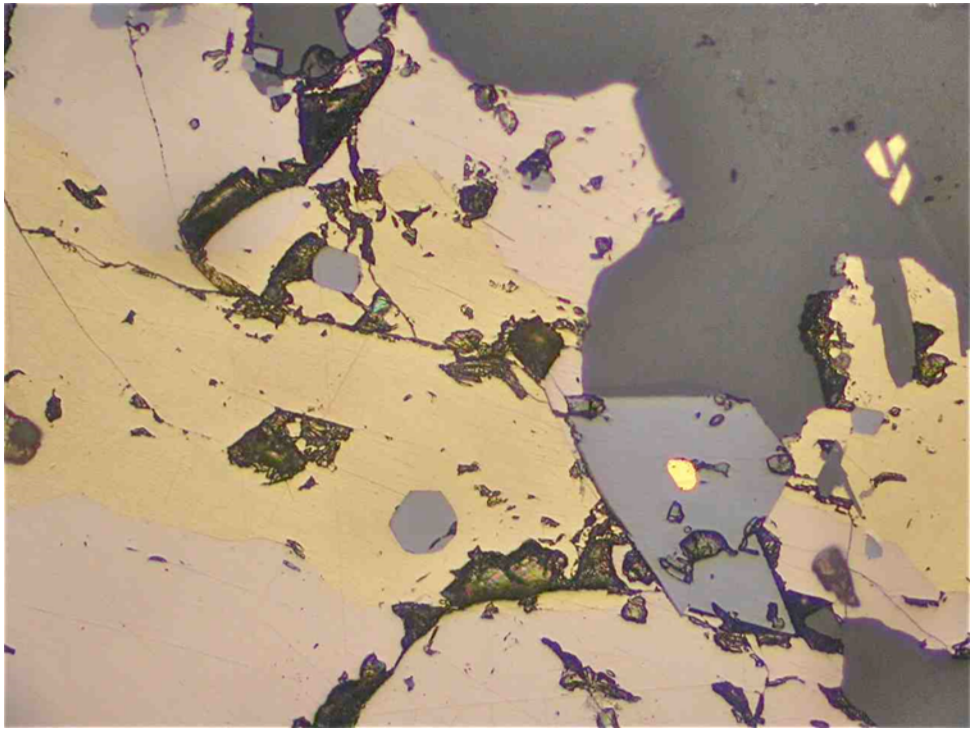
Current interpretation suggests the host rock material has undergone two main types of intense alteration:

a) Silicification, replacement by quartz (in places with minor chlorite, stilpnomelane, magnetite and sulphides)

b) Replacement by foliated, fine grained chlorite, but with varying proportions of magnetite, stilpnomelane, quartz and sulphides

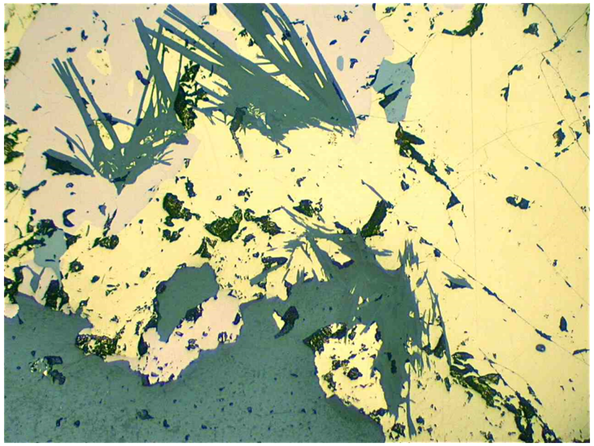


Single grain of gold ~15 µm across hosted in magnetite (lower right) that is part of a composite of chalcopyrite, pyrrhotite and magnetite occurring in quartz (dark grey). Plane polarised reflected light, field of view 0.5 mm across.

Petrographic Study

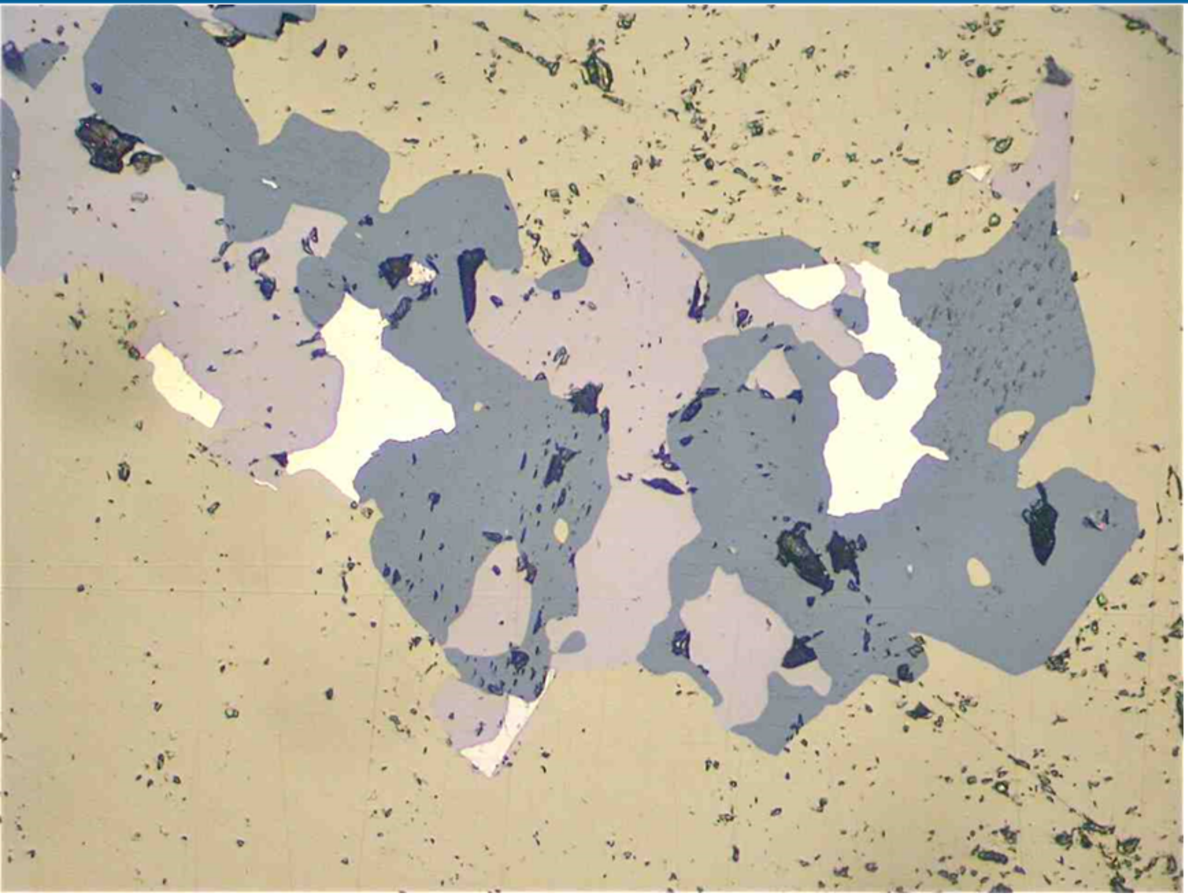
Syn-tectonic alteration of host rock, hydrothermal infill and mineralization indicated by :

- strong foliation in remnant chlorite-rich domains
- hydrothermal breccia containing deformed fragments and deformation textures in hydrothermal infill
- widespread occurrence of strain and recrystallisation phenomena in quartz, and locally within magnetite-rich aggregates (e.g. aligned fractures filled with cross-fibre stilpnomelane) and local foliation shown in stilpnomelane aggregates
- Chalcopyrite and pyrrhotite have textures indicative that they are paragenetically later than magnetite, are commonly intergrown with stilpnomelane (which can be foliated)
- The probability is that sulphides also initially crystallised syn-tectonically, but due to their ductility, were considerably recrystallised and locally mobilised into vein like masses (Ashley, 2015; Ashley, 2016)



Composite aggregate of chalcopyrite (yellow) and pyrrhotite (pale creamy brown) intergrown with flaky/acicular stilnomelane, and containing a couple of sphalerite inclusions (mid grey). Lower dark grey mass is quartz. Plane polarised reflected light, field of view 1 mm across.

Petrographic Study

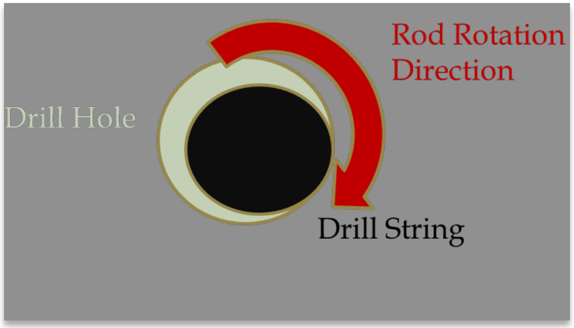


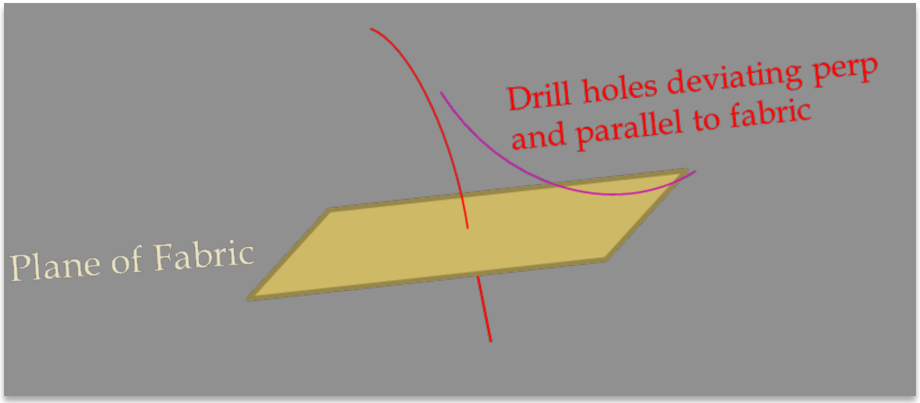
Composite aggregate of pyrrhotite (pale brown), sphalerite (mid grey) and grains of electrum (pale creamy and up to 100 µm across) hosted in chalcopyrite (yellow). Plane polarised reflected light, field of view 0.5 mm across.

Drilling Challenges

Great Cobar presented several challenges to managing complex drilling:

- ❑ Strong Fabric
- ❑ Variable Hardness
- ❑ Intense Magnetic Interference
- ❑ Thickness of Shear Zone





Ground Pull:

- ❑ Influences inhomogeneity in the rock mass have on deviating drill holes
- ❑ Bedding, cleavage, schistosity etc. give the rock a foliated fabric

- ❑ Drill holes will swing to trend perpendicular to this fabric or if sufficiently acute to the direction of the fabric they will swing in an attempt to run parallel with the rock fabric
- ❑ Ground pull can affect inclination as well as azimuth but is more commonly recognized when it influences azimuth.

Drilling Challenges

- ❑ We commonly use navi cuts

Theoretical azimuth change for a navi cycle:

Azimuth swing = Sin (Tool face direction)*Dogleg rate*navi cut length *Cos (hole inclination)

Dip Change can be expressed as:

Cos (Tool face direction) * Dogleg rate * length of cut

- ❑ Local rock, bit type, barrel configuration, and drilling style are the factors with the most influence
- ❑ Monitoring and timely intervention are critical factors
- ❑ Hitting targets should always remain a priority

Holes can be controlled by

1. Barrel length and stiffness
2. Bit configuration
3. Reamer configuration
4. Bit weight, rotation speed, muds and water used

A geologist cannot make good decisions in isolation, drillers know much more about drilling.

Further Work

- Look at the bigger picture - similar chemical associations elsewhere?
- Is Mg chlorite altered structure a fluid channel?
- Size of halo in enriched or depleted elements?
- Quality core logging - essential in providing the framework to give insight into the interpretation of the other inputs

Ask More Questions:

- How is the deposit structurally controlled? intersection of shears? fold hinges and faults on limbs and/or maximum extensional direction?
- Units, possible hereto undefined, within the sequence? Talcs, carbonates, 'strong' slate?
- Different orientations to the different assemblages? is gold on a cross structure?
- Are the mineralising fluids from a magmatic source or not?
- Are there signs of a large-scale feature that could indicate deep magmatic sources in the area?

Acknowledgements

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- Thanks to New Gold and Peak Gold Mines for permission to present this work. Thanks to all the past and present geologists, core yard staff, drilling contractors and everyone else at PGM and our business partners who help make the mine a success.
- Thanks to Paul Ashley for his invaluable petrographic work.
- Geological Survey crew for spectral work, discussions, ideas and more.
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- Thanks to Joel Tuffin for help with digitising images and Geotech insights.
- Barry Taylor for the initial modern discovery and continued mentorship and exploration wisdom
- **And finally thanks to the Mines and Wines organising committee for the opportunity to present and for putting on this conference.**

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Thanks for Listening!

Questions?