Federation Zn-Pb-Au-Cu-Ag Deposit, Nymagee District NSW

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ASX Code: AMI

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Discovery Period (YTG-Aurelia)

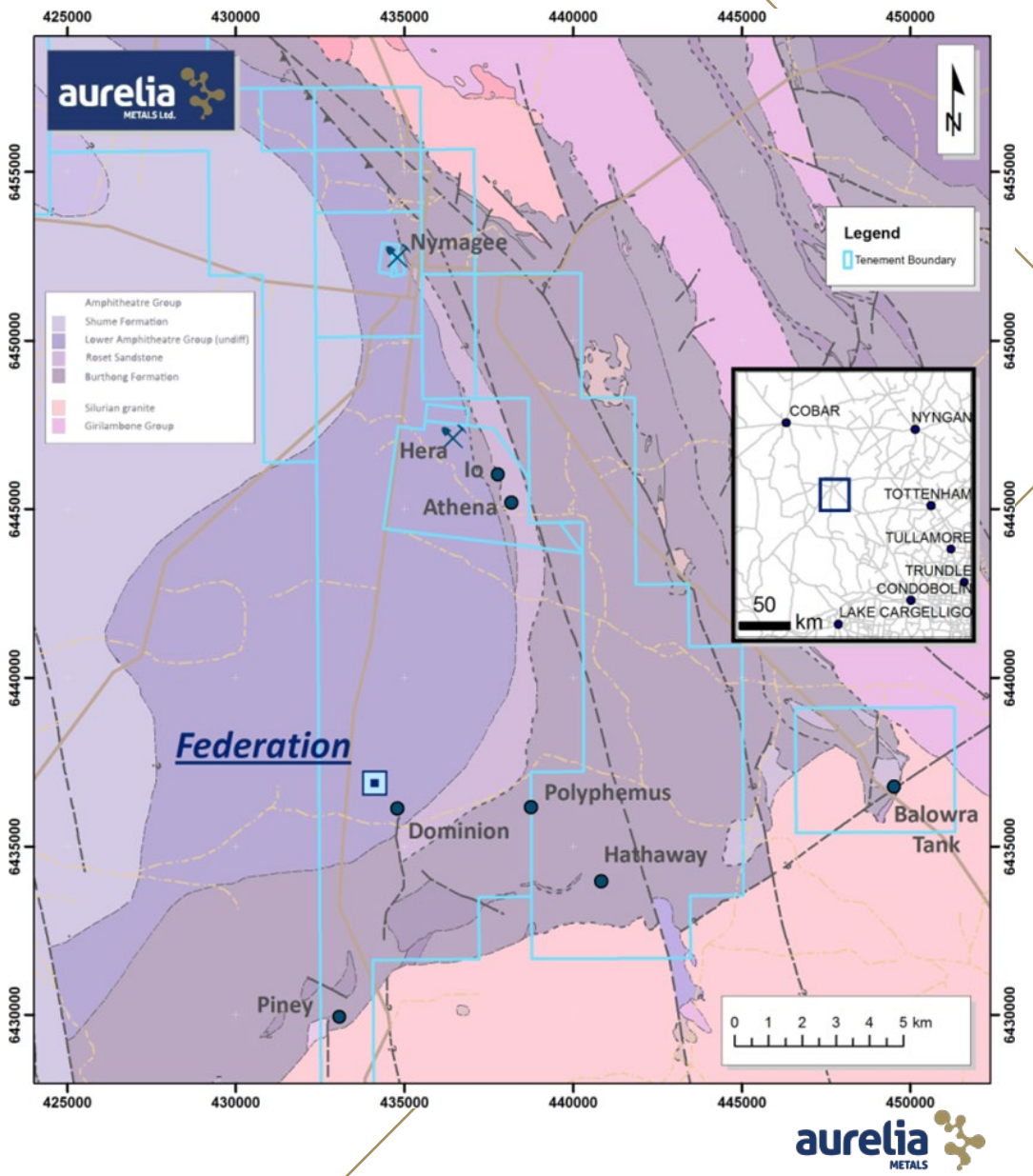
Ian Cooper, Adam McKinnon, Michael Thompson, Scott Munro, Dan Taylor, Hugh Bannister

Current and past Aurelia Hera Exploration Team

Todd McGilvray, Peter Smith, Will Porter, Owen Thomas, Justin Walsh (MGS), Karl de Groot (MGS), Cody Beaumont (MIME), Nathan Ward, Dan Cronin

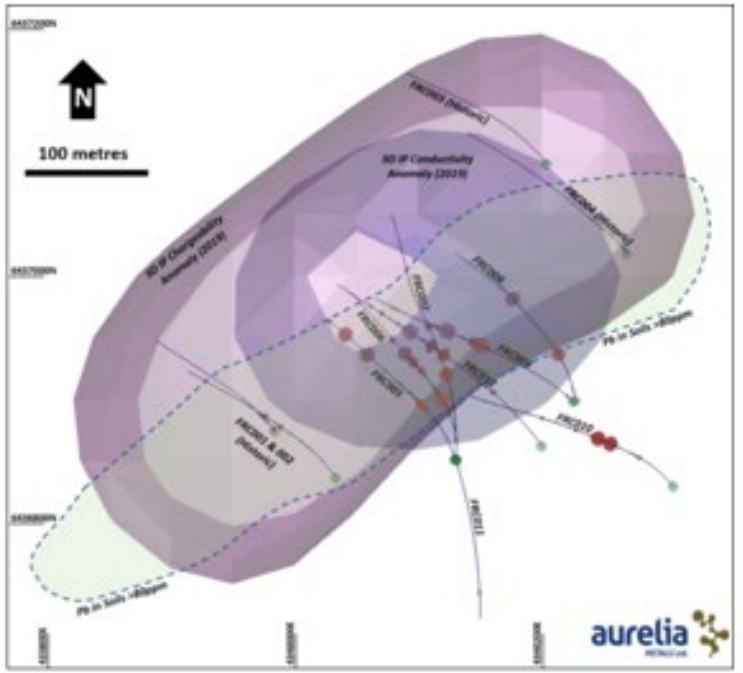
Location and Regional Geology

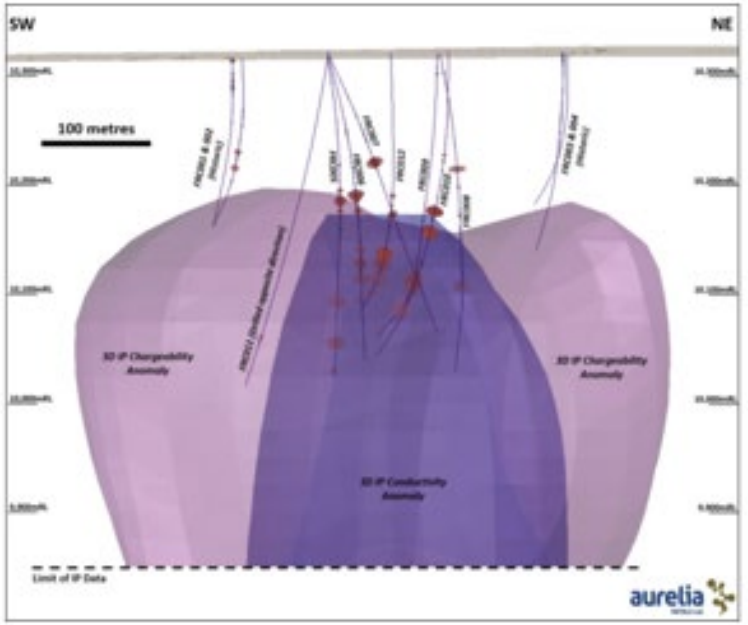
- Southeastern margin Cobar Basin
- 10km SSW of Hera mine
- Early Devonian undifferentiated lower Amphitheatre Group – calcareous mudrocks and fine-grained sandstones
- Near contact with underlying siliciclastic Mouramba Group
- NE-SW striking structural grain
- 5-7km from Rookery Fault
- Low strain - open parasitic folds with sub-vertical axial plane cleavage
- Erimeran Granite (Silurian) – buttress to south



Discovery History

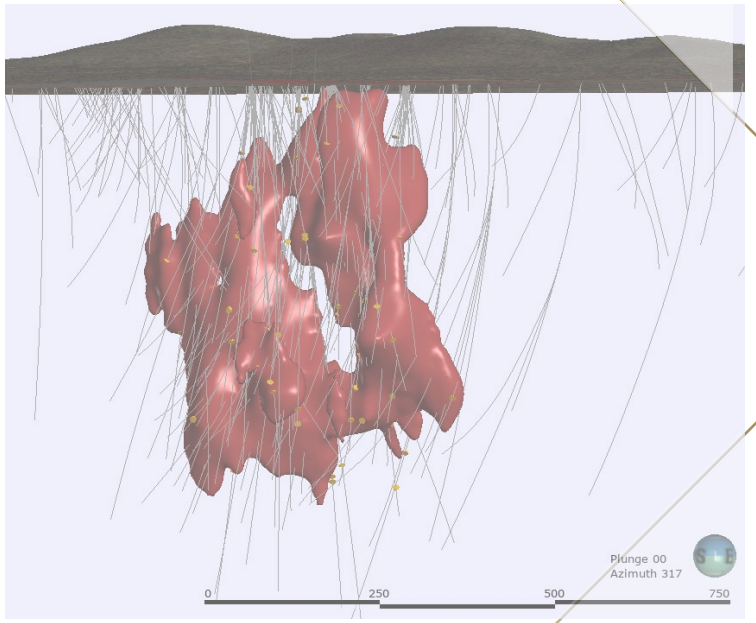
- YTC Resources identified Au and Pb anomalism on a low topographic rise 1km NNW of the Dominion prospect, on EL6162 south of Hera
- 4 hole reconnaissance RC drill program produced minor anomalous Pb-Zn (max 1-2% Pb + Zn)
- Mineralisation is not exposed - minor silicified siltstone subcrop only
- Near-surface eastern area covered by ferricrete and alluvial gravels in a linear palaeovalley
- 2019 – 25.7 line km Pole-Dipole IP survey identified coincident chargeability 20mV/V and conductivity anomalies
- April 2019 RC drilling program targeting IP chargeability, conductivity and Pb geochemistry
- Western Lens discovered with shallow RC and deeper diamond tails
- October 2019 RC drilling with 150m step out to NE discovered high grade NE Lens outside the modelled IP anomalies starting from around 60m below surface





Federation Mineral Resource

- Over 125,000m combined diamond and RC drilled since discovery
- Updated Resource expected mid-2022
- Depending on Feasibility Study Outcomes, Maiden Ore Reserve and Production Target
- Deposit open along strike in both directions and at depth
- Exploration program ongoing to step out along strike within alteration system

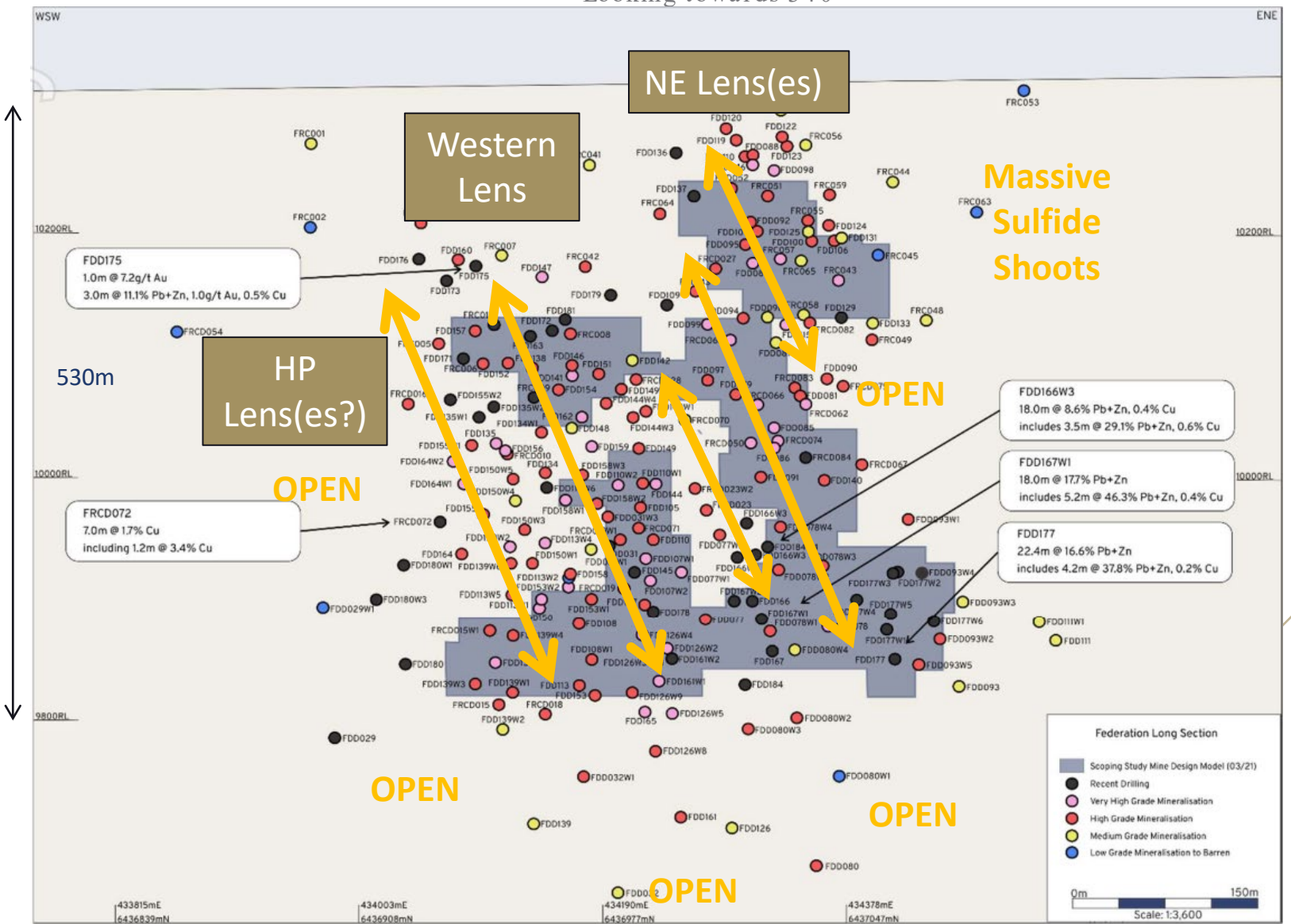


- **Table 1.** Mineral Resource Estimate for Federation as at 30 June, 2021

Class	Tonnes (kt)	Au (g/t)	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)
Indicated	1,500	2.2	0.4	6.1	10.1	8
Inferred	3,500	0.3	0.3	5.2	9.0	7
Total	**5,100**	**0.9**	**0.3**	**5.5**	**9.3**	**7**

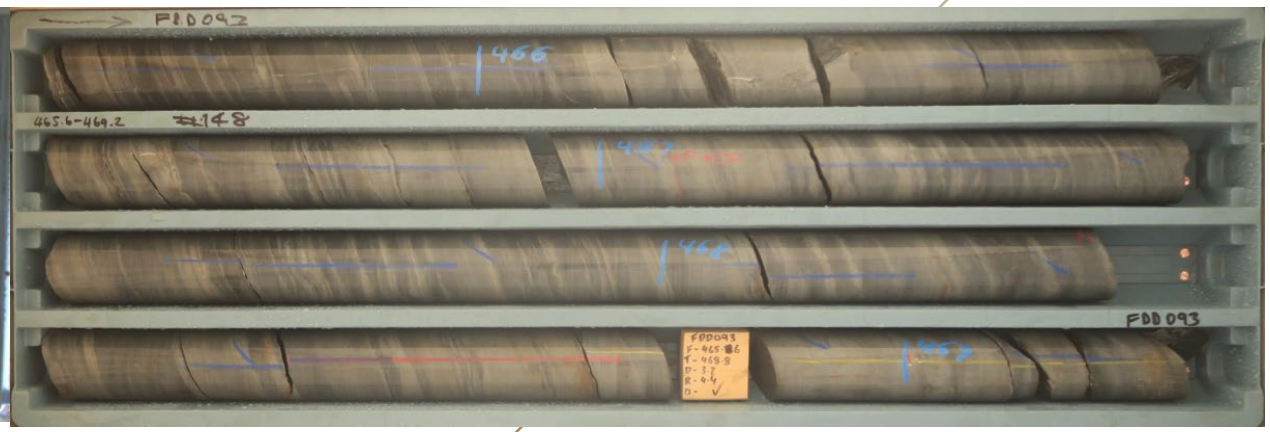
Deposit Geometry – Long Section

Looking towards 340°



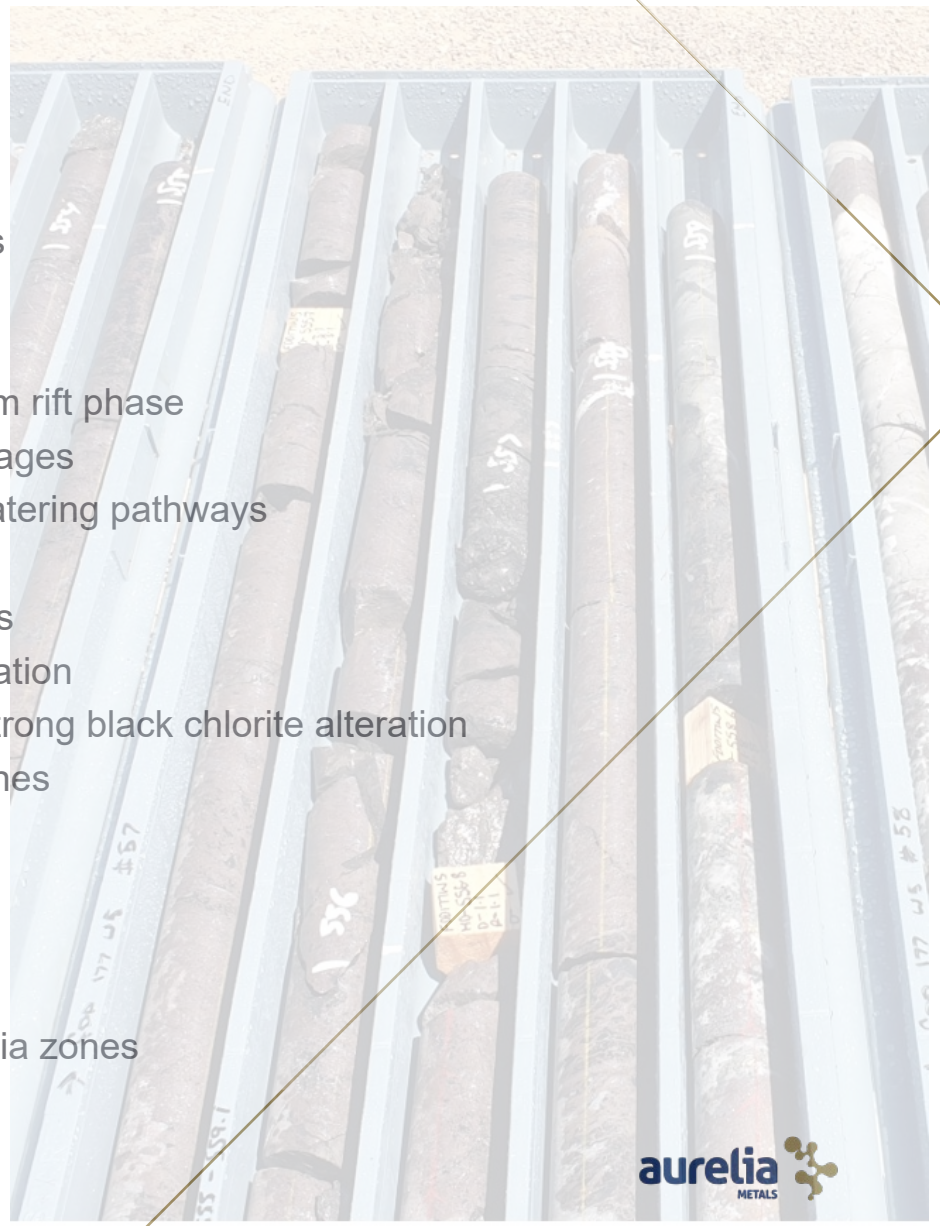
Host Rocks – Undifferentiated Lower Amphitheatre Group

- Laminated mudrocks and variably calcareous siltstone and fine-grained sandstone
- Outer shelf/slope environment
  - Bioturbated calcareous mudrocks dominant
- Gradational contact with siliciclastic turbidites at depth
- Mouramba Group – quartz-lithic sandstone with graded beds and ripple cross lamination
- Inferred that change in bulk composition influenced later alteration and mineralisation



Controls on Mineralisation

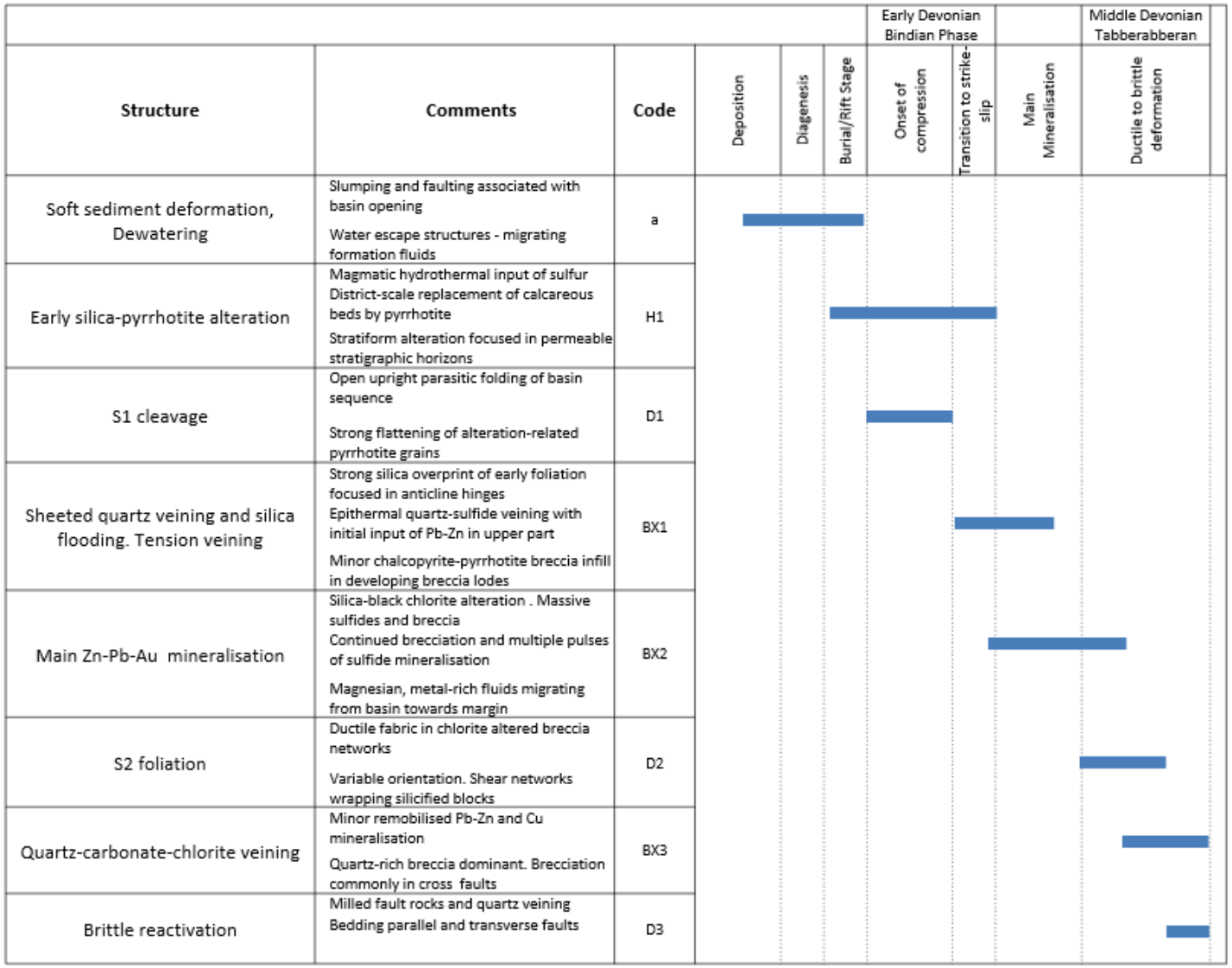
- **Sediment Dewatering and Syn -sedimentary Tectonism**
  - First stages of fluid movement
  - Tectonically active basin
  - Syn-sedimentary fault zones reactivated in later deformation events
- **Stratiform Alteration**
  - Silica-pyrrhotite alteration focused in specific ?siliciclastic units
  - ?Magmatic hydrothermal input of sulfur driven by residual heat from rift phase
  - Produced rheology contrasts with adjacent chloritic mudrock packages
- **Early open folding and S1 cleavage formation** enhanced the early dewatering pathways
  - Same orientation – nearby transverse or growth faults?
  - NE-SW trending fold axis/cleavage – preferential plane of weakness
  - Parasitic anticline closures localised later brecciation and mineralisation
- **Silica flooding and multiphase veining (with sulfides)** progressing to strong black chlorite alteration
  - Breccia/massive sulfide mineralisation in developing steep fault zones
  - Multiphase brecciation and infill in mineralised lenses
- **Faulting and shearing** focused in chlorite altered domains
  - Shear related mineralisation (possibly remobilised).
  - Local S2 foliation (bedding and or S1 cleavage parallel)
  - Focused in chlorite altered bands wrapping silicified blocks in breccia zones
- **Reactivation** of major bedding-parallel faults (inferred thrusts)
  - Minor offset of mineralisation
  - Coarse quartz veining with minor sulfides (?remobilised)



General Timing on Mineralisation

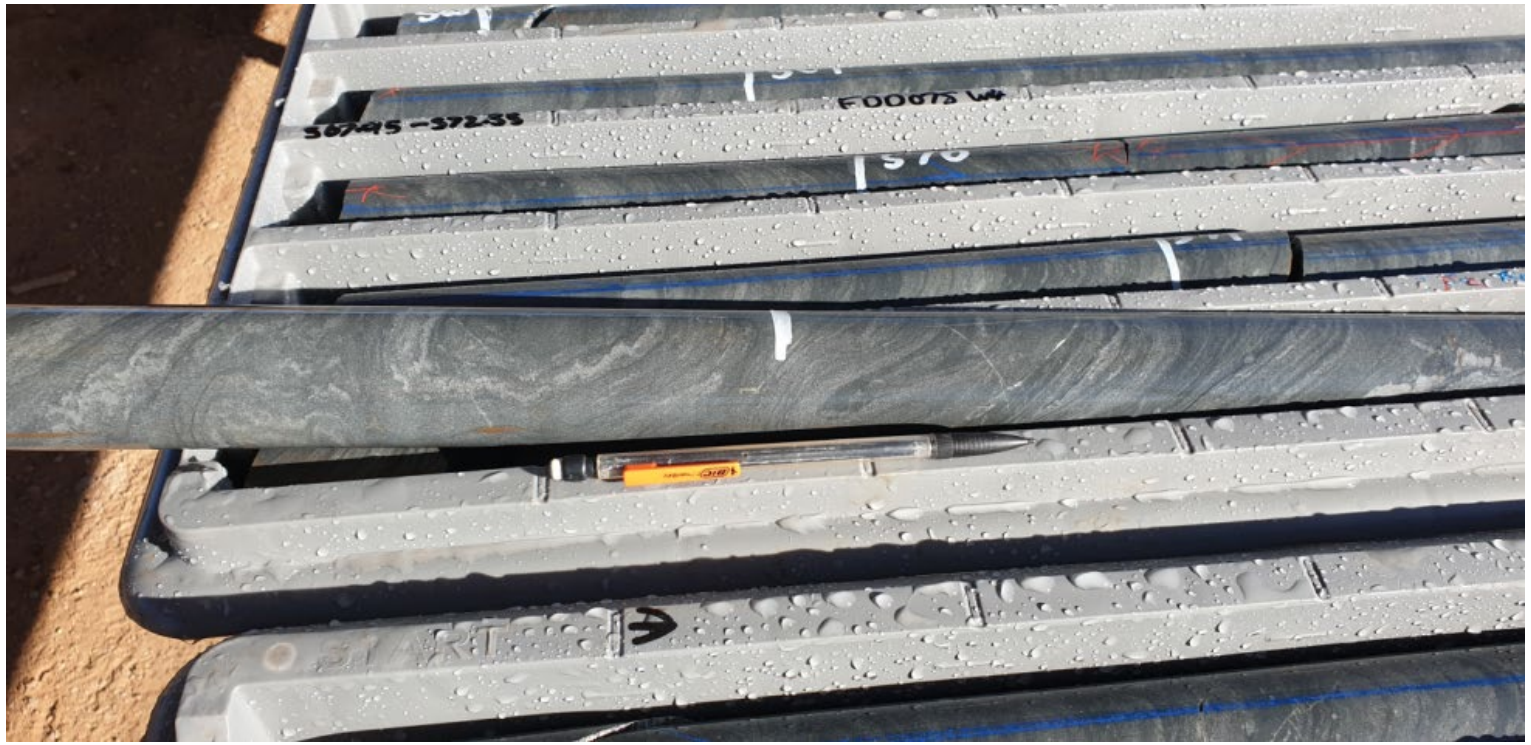
~410-400 Ma ~400-380 Ma

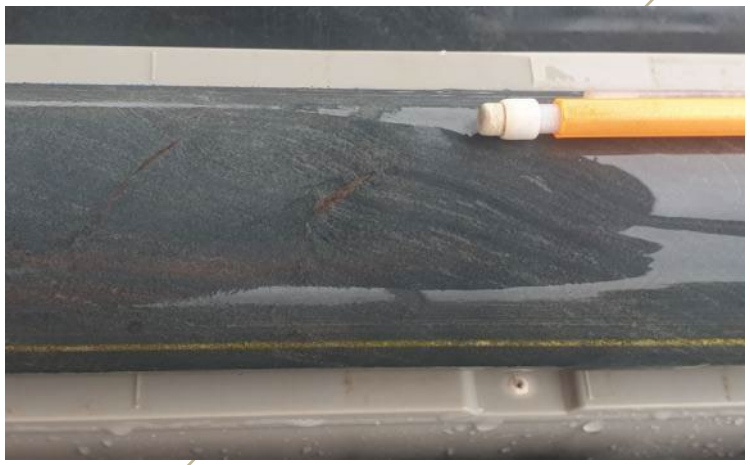
Structure	Comments	Code
Soft sediment deformation, Dewatering	Slumping and faulting associated with basin opening Water escape structures - migrating formation fluids	a
Early silica-pyrrhotite alteration	Magmatic hydrothermal input of sulfur District-scale replacement of calcareous beds by pyrrhotite Stratiform alteration focused in permeable stratigraphic horizons	H1
S1 cleavage	Open upright parasitic folding of basin sequence Strong flattening of alteration-related pyrrhotite grains	D1
Sheeted quartz veining and silica flooding. Tension veining	Strong silica overprint of early foliation focused in anticline hinges Epithermal quartz-sulfide veining with initial input of Pb-Zn in upper part Minor chalcopyrite-pyrrhotite breccia infill in developing breccia lodes	BX1
Main Zn-Pb-Au mineralisation	Silica-black chlorite alteration . Massive sulfides and breccia Continued brecciation and multiple pulses of sulfide mineralisation Magnesian, metal-rich fluids migrating from basin towards margin	BX2
S2 foliation	Ductile fabric in chlorite altered breccia networks Variable orientation. Shear networks wrapping silicified blocks	D2
Quartz-carbonate-chlorite veining	Minor remobilised Pb-Zn and Cu mineralisation Quartz-rich breccia dominant. Brecciation commonly in cross faults	BX3
Brittle reactivation	Milled fault rocks and quartz veining Bedding parallel and transverse faults	D3



Sediment De-watering and Syn-sedimentary Tectonism

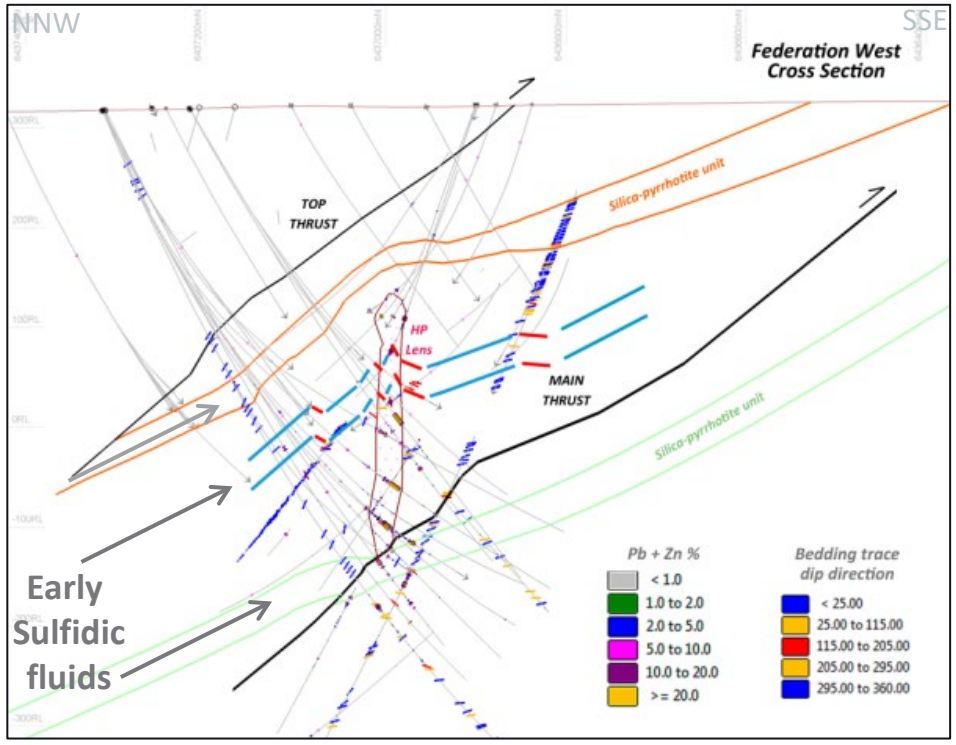
- Soft-sediment faults and dewatering pathways coaxial with later folding
- Growth/transform faulting
- Enhanced by D1 folding and cleavage formation
- Preferential plane of weakness exploited during later faulting and vein breccia mineralisation

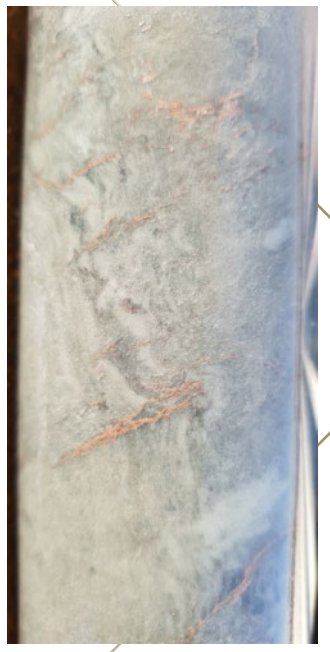




Stratiform Alteration – Early Silica-Pyrrhotite

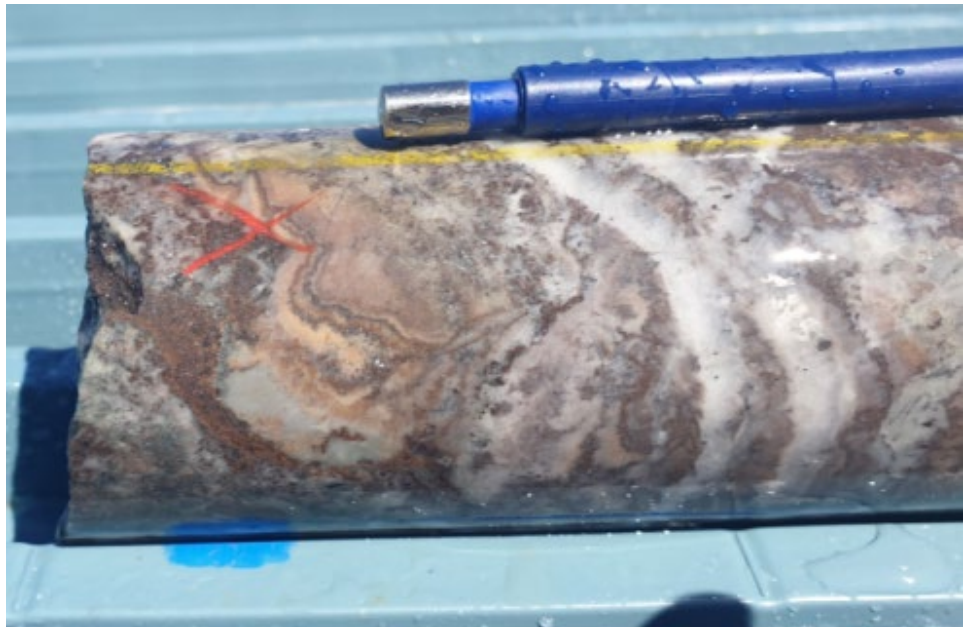
- Stratiform rheology contrasts produced by intense silica -sericite - pyrrhotite alteration
- Early open folding
  - Cleavage is NE-SW oriented
- Brecciation in brittle silicified units in anticline closures
- Early pyrrhotite a sulfur source scavenged during mineralisation?
- Replaced by sphalerite-galena-chalcopyrite





Silica Flooding – Multi-phase Vein Breccia Mineralisation

- Multi-phase quartz-sulfide breccia focused in steeply plunging lenses/shoots
- Simple sulfide mineralogy
  - Sphalerite, galena, chalcopyrite, minor pyrrhotite
- Early silica-rich breccia phases with base metals
- Sheeted veining with silica flooding
- Rare banded ‘epithermal’ textures preserved at periphery of later high grade
- Overprinted by later sulfide-rich breccia phases



Breccia and Massive Sulfides with Black Chlorite Alteration

- Massive sulfides with black chlorite and/or silica gangue
- Complex proximal breccia with silicified siltstone clasts in black chlorite - sulfide infill matrix
- Highly variable tectonic overprint
  - Foliation and shearing developed in black chlorite zones
  - Shear fabrics also developed in cross faults

FDD175W5

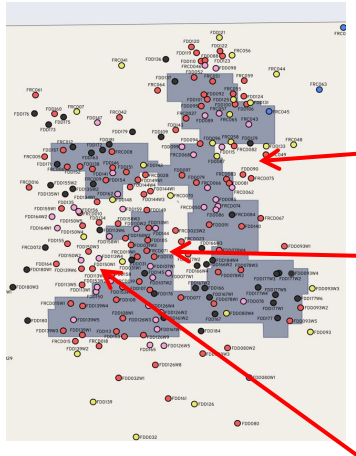
Breccia and Massive Sulfide

FDD164W2– Federation massive sulphides rich in low-Fe sphalerite and galena (Hesperides Lens – Federation West)

FDD086 (386m – 387m)

Visible Gold – 20.6m @30.9g/t Au

Similar Sulfide Mineralogy Across the Deposit



Low Fe sphalerite, galena, chalcopyrite +/ -minor pyrrhotite

Northeast Lens

FDD085:
21.6m @ 44.8% Pb+Zn, 31.9 g/t Au from 372.4m
incl. 6m @ 54.7% Pb+Zn, 110.9 g/t Au

Western Lens

FDD159:
18.6m @ 48.1% Pb+Zn, 1.3g/t Au from 346.4m
incl. 10m @ 61.6% Pb+Zn, 0.8g/t Au

HP Lens

FDD164W2:
8.2m @ 34.4% Pb+Zn, 13.1g/t Au,
incl. 5m @ 62.7% Pb+Zn, 47.2g/t Au

Proximal Alteration

Moving laterally away from the massive sulfide shoots

- Variably sheared black chlorite–sulfide-infill breccia
- Multi-phase vein/ breccia-style, black chlorite selvage
- Sulfide stringer veins
- Replacement of bedding-controlled pyrrhotite with sp–gn□cpy (background Federation system)

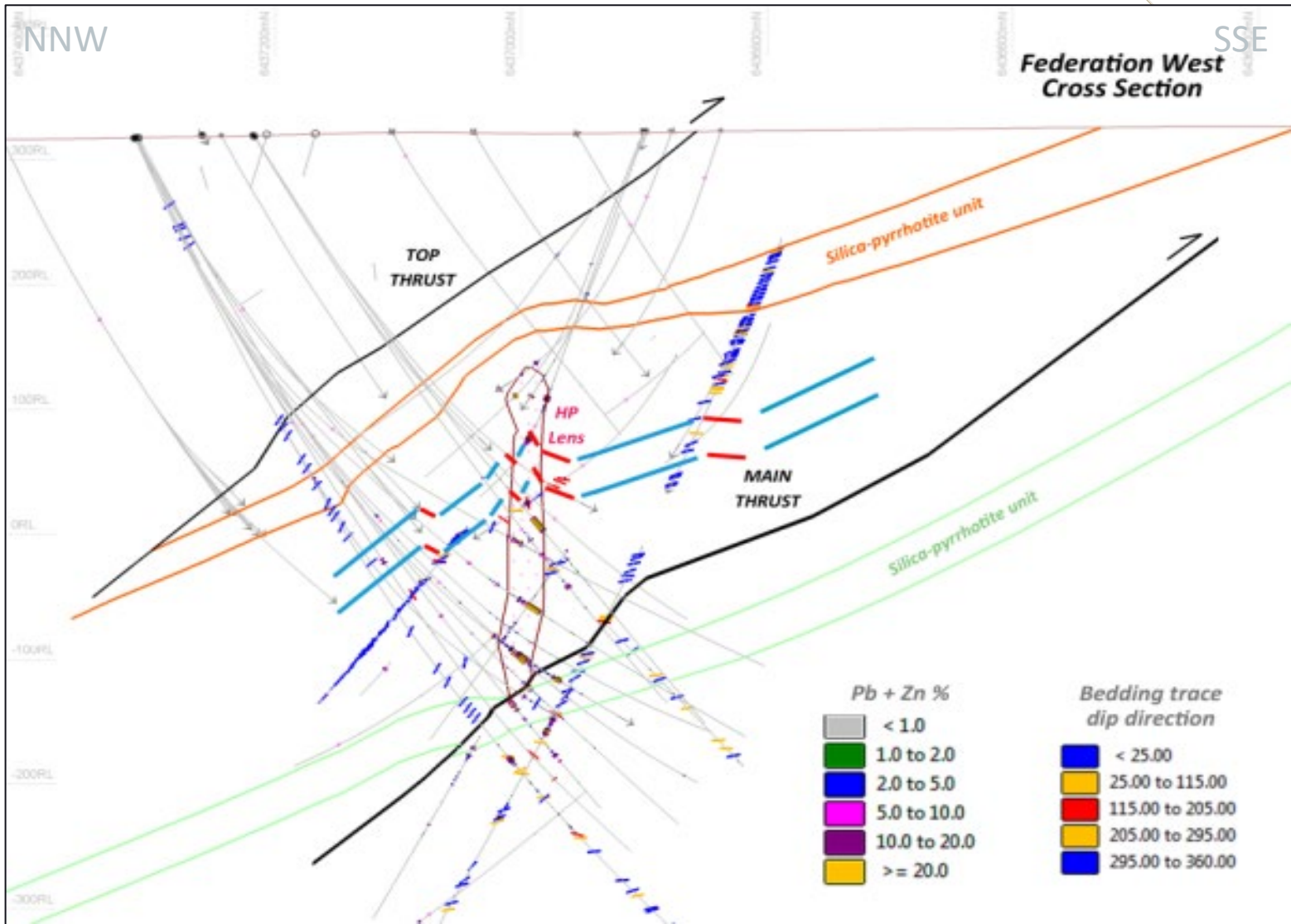
Late Faulting and Shear Overprint

- Tabberabberan overprint
- Late chlorite / talc shears
- Bedding parallel brittle faults
- Very minor remobilised mineralisation

Structural Architecture

Main features

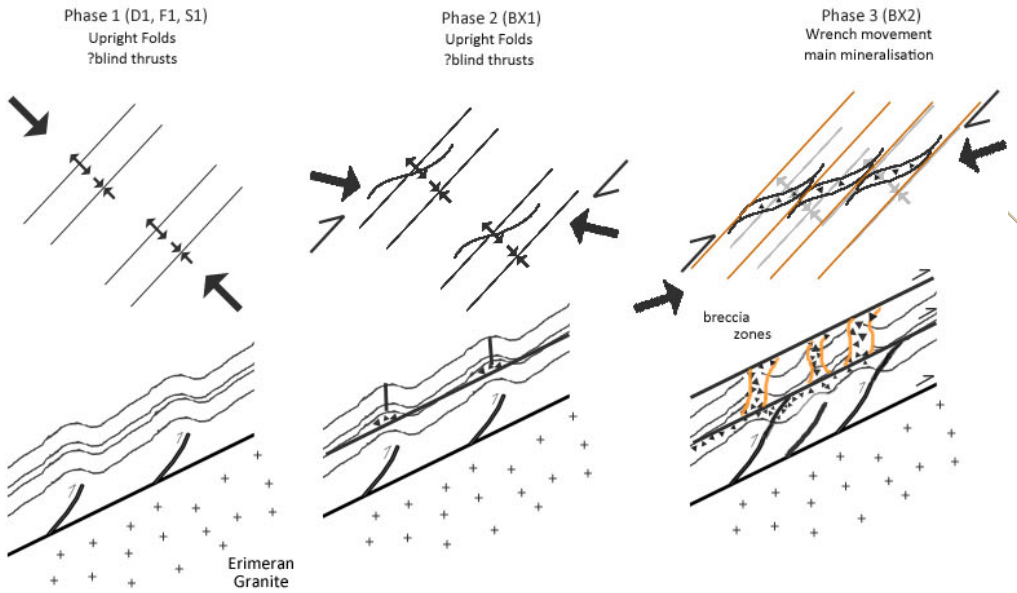
- Bedding parallel to low angle faults along rheology contrasts
- Open parasitic folding – southeast vergence (towards basin margin)
- Subvertical cleavage – preferential plane of breakage - brecciation and veining
- Fold closures - Roll-over to SE dips localises mineralisation
- High grade lenses indicate dextral sense of shear during dilation

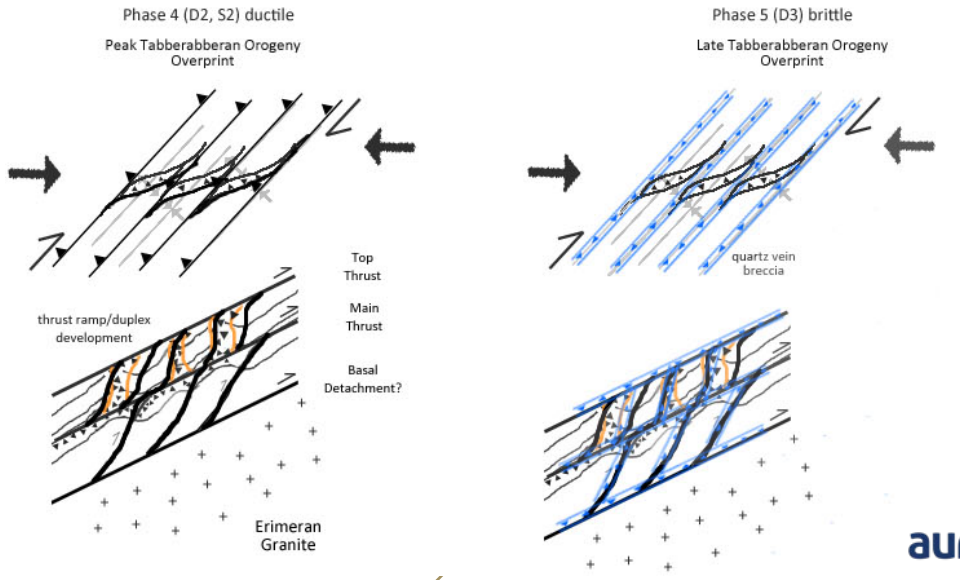


Simplified Structural History

- NE-SW striking bedding, cleavage folds
- Mineralisation strikes approx. 073°
- Dilation during phases of dextral strike-slip related to basin inversion to north

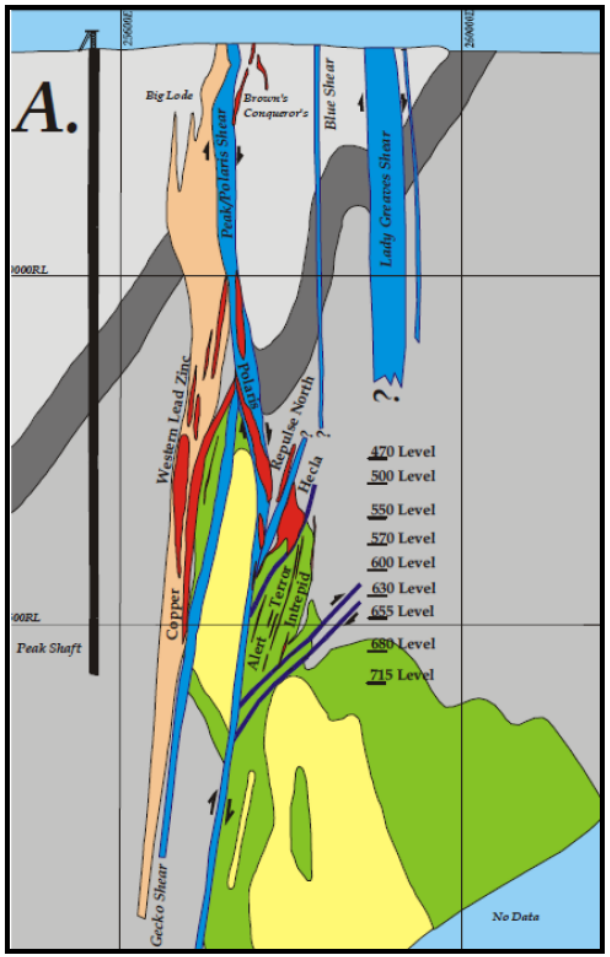
- Tabberabberan overprint with reactivation of faults and local foliation development
- Late brittle movement with fault gouge and extensive quartz vein breccia





Cobar Type Similarities

- Reactivated basin margin fault systems
- Cobar Basin sedimentary host
- Early folding and cleavage development - Anticlinal traps above thrust ramps
- Competency contrasts localise mineralisation
  - Stratiform silica -pyrrhotite alteration
- Steeply plunging high grade shoots
- Dilational corridors created through periodic strike -slip/wrench movement accompanied by pulses of mineralisation



Cobar Type Differences

- Highly oblique to the eastern basin margin/Rookery Fault
- Early open folds and cleavage preserved
- Main rheology contrasts produced by stratiform alteration
- Rare ‘Epithermal’ breccia phases preserved
- Weak Tabberabberan deformation overprint only – minor remobilised sulfides
- Probably only minor throw on thrust faults

Implications for Southern Cobar Basin Exploration

- Identify 2 nd order, oblique structural corridors centred on transform faults
  - Seismicity and early fluid migration may be important
  - Enhanced preservation potential away from faulted margins
  - Lesser effect of basin inversion
  - Early alteration systems preserved intact
  - intersection of transverse faults with margin -parallel structures
- Boundary between siliciclastic sandy units and calcareous mudrock packages
  - Rheology contrasts enhanced by early stratiform alteration (silica -pyrrhotite vs chlorite)
  - Exploited during fault movement/brecciation in later mineralising events
- Induced Polarisation (IP) surveying to locate district alteration system (pyrrhotite)
- Geochemistry (preferably Pb) to locate near surface polymetallic deposits within the large long -lived alteration systems

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First Blast of the Box Cut – Federation 8th April 2022