

# Acknowledgement of **Country**

The University of Queensland (UQ) acknowledges the Traditional Owners and their custodianship of the lands on which we meet.

We pay our respects to their Ancestors and their descendants, who continue cultural and spiritual connections to Country.

We recognise their valuable contributions to Australian and global society.





# 2D and 3D interpretation of Burneside Area, Pine Creek Orogen

S. Micklethwaite, G. Mitjanas, R. Valenta (SMI)  
P. Farias, J. Whelan (NTGS)





# 2D and 3D interpretation of Burneside Area, Pine Creek Orogen

S. Micklethwaite, G. Mitjanas, R. Valenta (SMI)

P. Farias, J. Whelan (NTGS)





PCO overview

Project architecture

Preliminary model

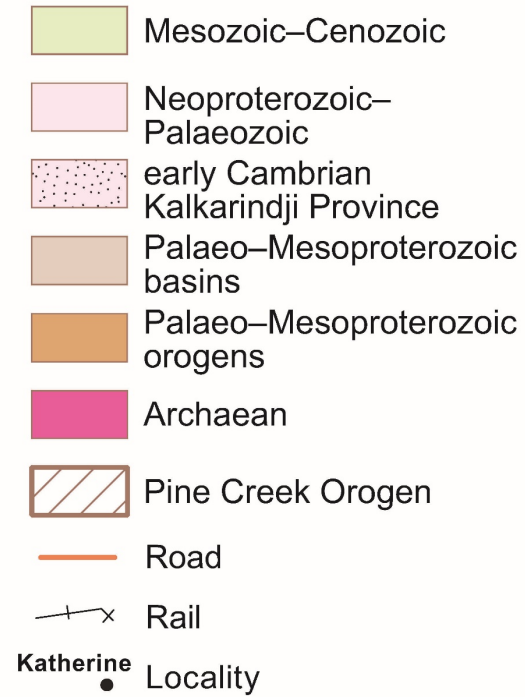
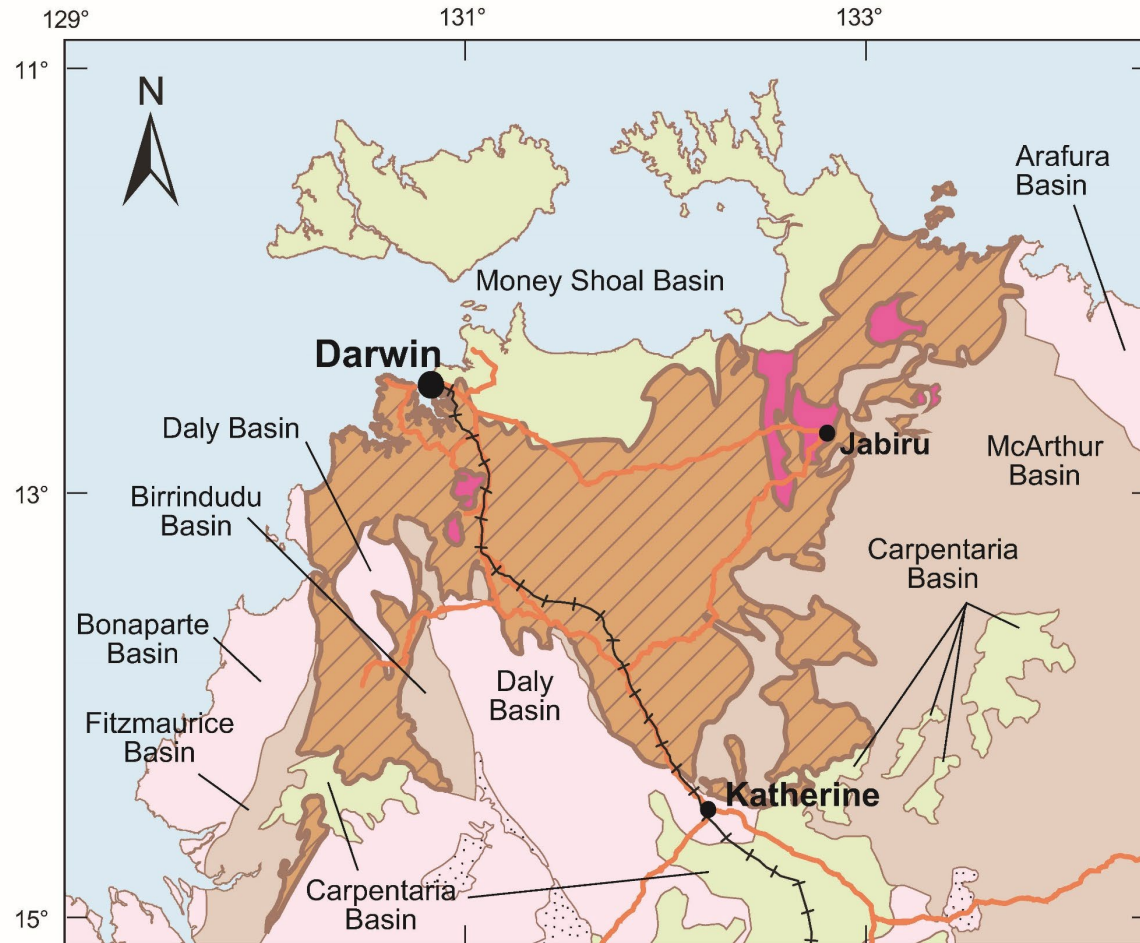
Early progress

Future tech

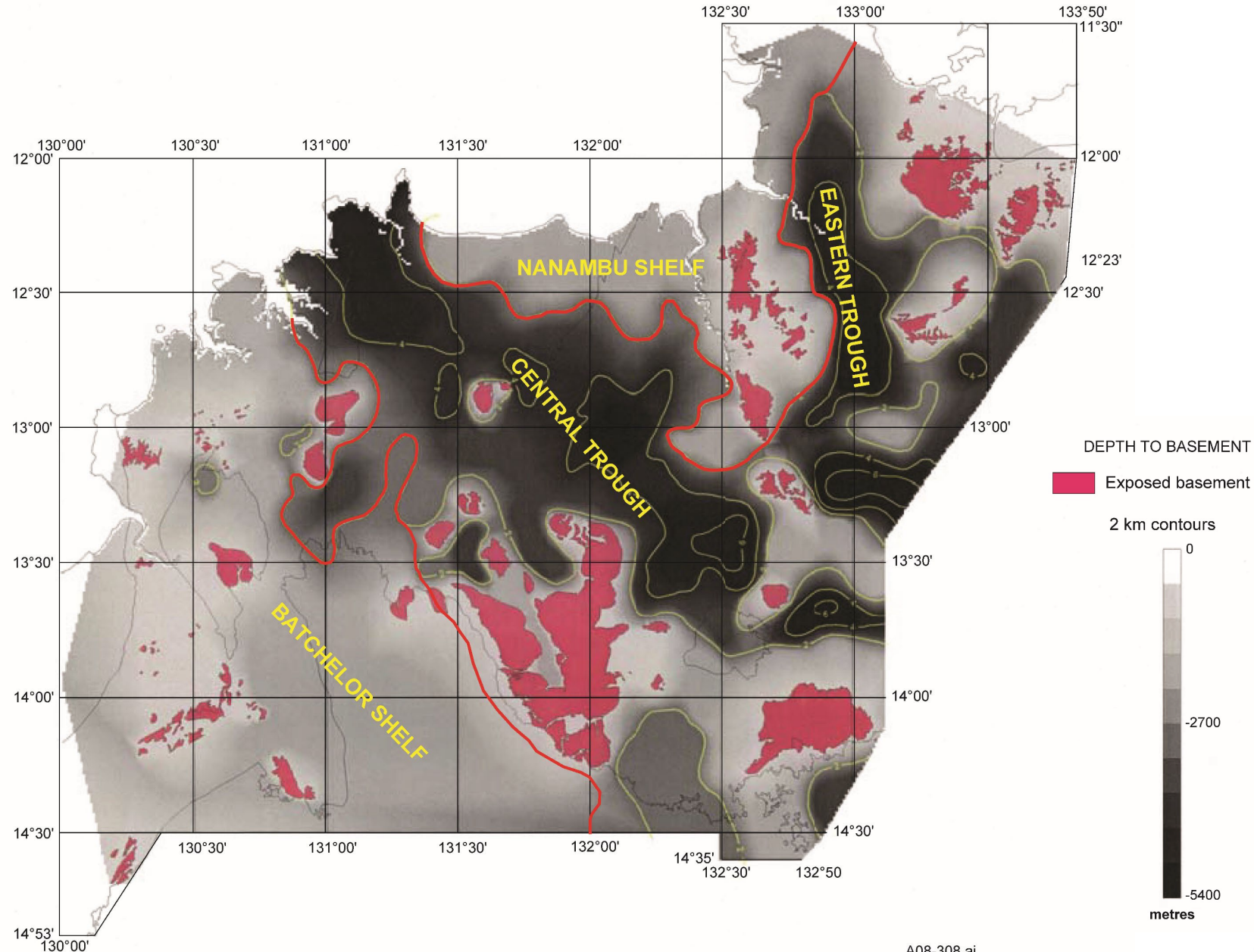
Get involved











3 domains, Litchfield, Central, Nimbuwah

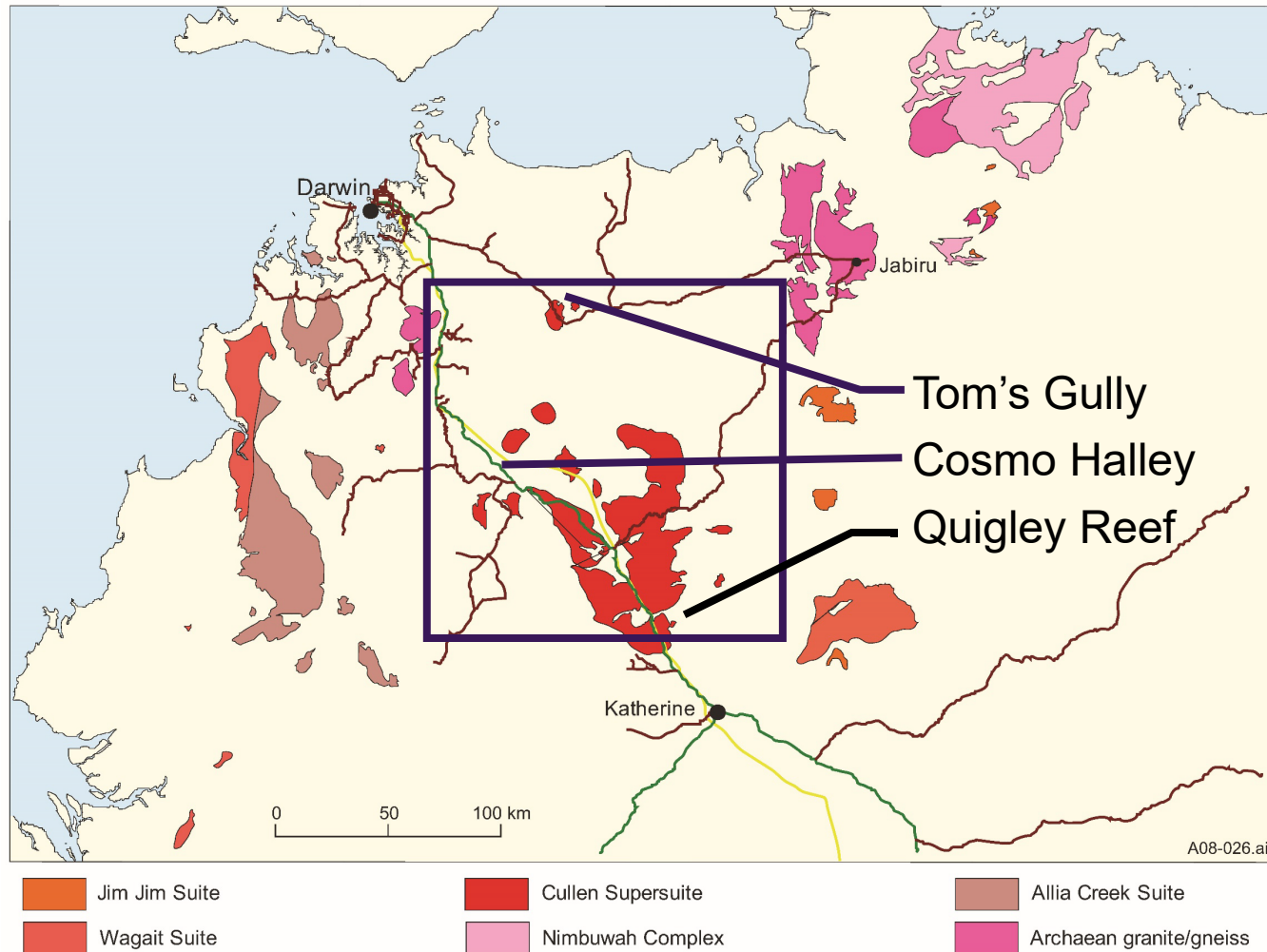
- Low P amphib-granulite
- Greenschist
- Mid P amphib

Sequence:

- 2 unconformable sequences Paleoproterozoic sedimentation.
- Def+metam+syn/late I-type intrusion (e.g. Cullen Supersuite; 1835-1820 Ma)
- Au (debate) – syn-intrusion or later regional hydrothermal event, in sheeted and lode-style
- Palaeo to Mesoproterozoic basin sedimentation (e.g. McArthur)

>4 km thick, Central domain, most complete stratigraphic sequence (incl Neoarchean)





- “Gold” province associated with 3-5 km radius of Cullen Supersuite
- Key authors, Needham, Hollis, Lally, Rasmussen, Ahmad, McCready, Heim, Worden, Skirrow and co-authors
- 10-20+ years ago

## Resourcing The Territory new focus on Pine Creek Orogen (Dot Close)

Rejuvenating the region:

Geophysics and other regional data review

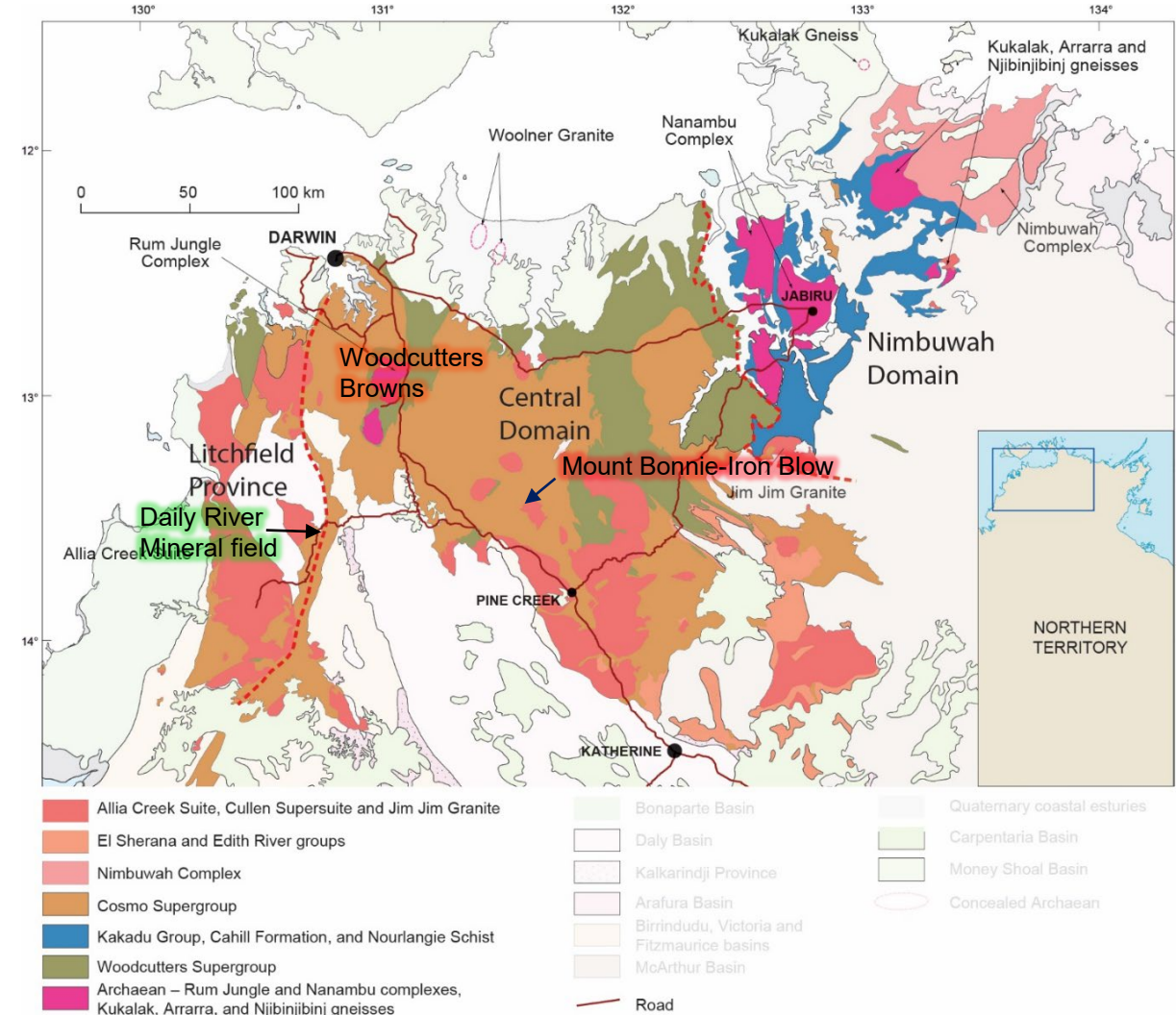
- where to infill, reacquire
- Line spacing, mislocation, data corruption, missing, anomalies from single pts



## A Polymetallic Province - Beyond Gold

**Base metal:** Pb-Zn-Ag (-Cu) (-Ni-Co)

- 1- **Daily River mineral field** (Empire and Mount Evelyn mines )
  - Structurally controlled Cu-rich veins in volcanic facies of Burrell Creek Fm
- 2- **Rum Jungle mineral field** (Woodcutters and Browns)
  - Hosted in lower Woodcutters Supergroup
  - **Similar to U mineralisation settings:**
  - Mineralisation occurred at ca 1.73—1.72 Ga and 1.6 Ga
  - Co-Ni minerals overprint Pb-Zn-Cu mineralisation
  - **Model:** Metal-bearing brines reacted with dolostone and precipitate metals (> Ph and lower T; chemical trap).
- 3- **Mount Bonnie- Iron Blow**
  - Hosted in SAG (Cosmo Supergroup)
  - Au – base metals + (Ni-Co)
  - VHMS? Syngenetic – epigenetic?
  - Age?
  - What is the role of the extensive mafic intrusions?





## A Polymetallic Province - Beyond Gold

### Pegmatite & greisen:

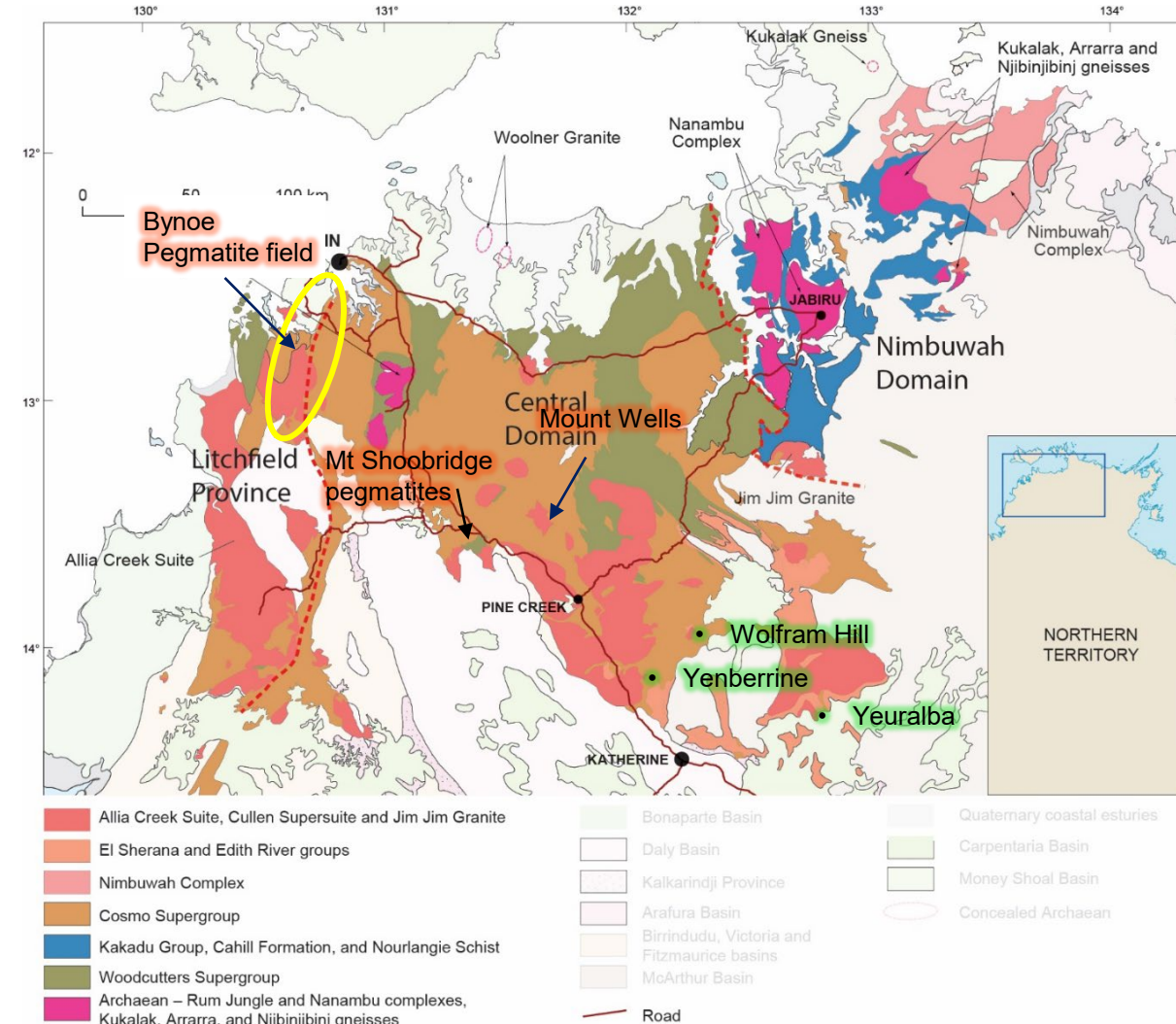
#### 1 - Tin-tantalum pegmatites

- Bynoe pegmatite belt (which includes the Mount Finniss field, Core Lithium)
  - Sourced from S-type granites
  - tantalite (Bynoe) 1.74-1.73 Ga
  - Parent granite is 1.86 Ga (?)
- Mount Shoobridge and Mount Wells pegmatites hosted in Burrell Creek Fm
  - Sourced from I-type granite

#### 2- Cu-W-Mo (-Sn-Bi-F) greisen of Cullen Supersuite

- Associated with metasomatism in the margins of Cullen Supersuite granites

+ others (Fe-ore, magnesite, phosphate)



## Vision

*New 2D and 3D geological interpretations for the region, easily consumed by users*

## Ambition

*Stimulate exploration and identify gaps (data, strata, structure) for recommendations towards future program of work*

## Objectives

(1) Review and update the 3D geological framework of the Aol, incorporating unpublished, exclusive industry data. (2) Review the potential mineral systems models of the region. (3) Deliver high quality map and 3D products, visualising the geological framework. (4) Summarise inconsistencies (especially strat). (5) Recommend geophysical, remote sensing and regional geochemical surveys to help stimulate exploration.

## Future

*Get in the field; Expand to entire Pine Creek Orogen, Digital twin; Mineral Systems Analysis in 3D for explorers (& under cover?)*

Metals without mining



Removing contamination



Water supply challenges



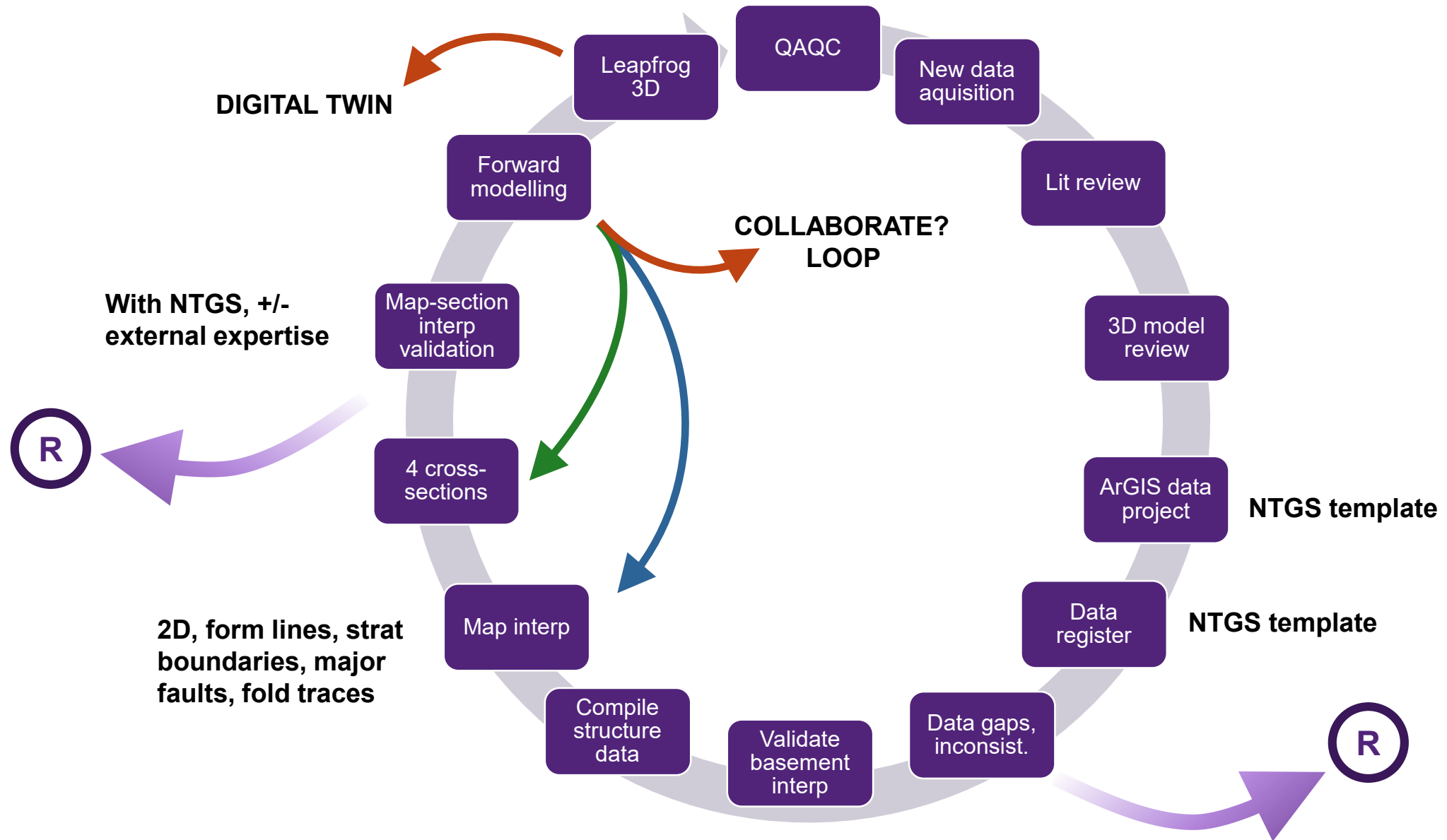
Novel critical metal extraction

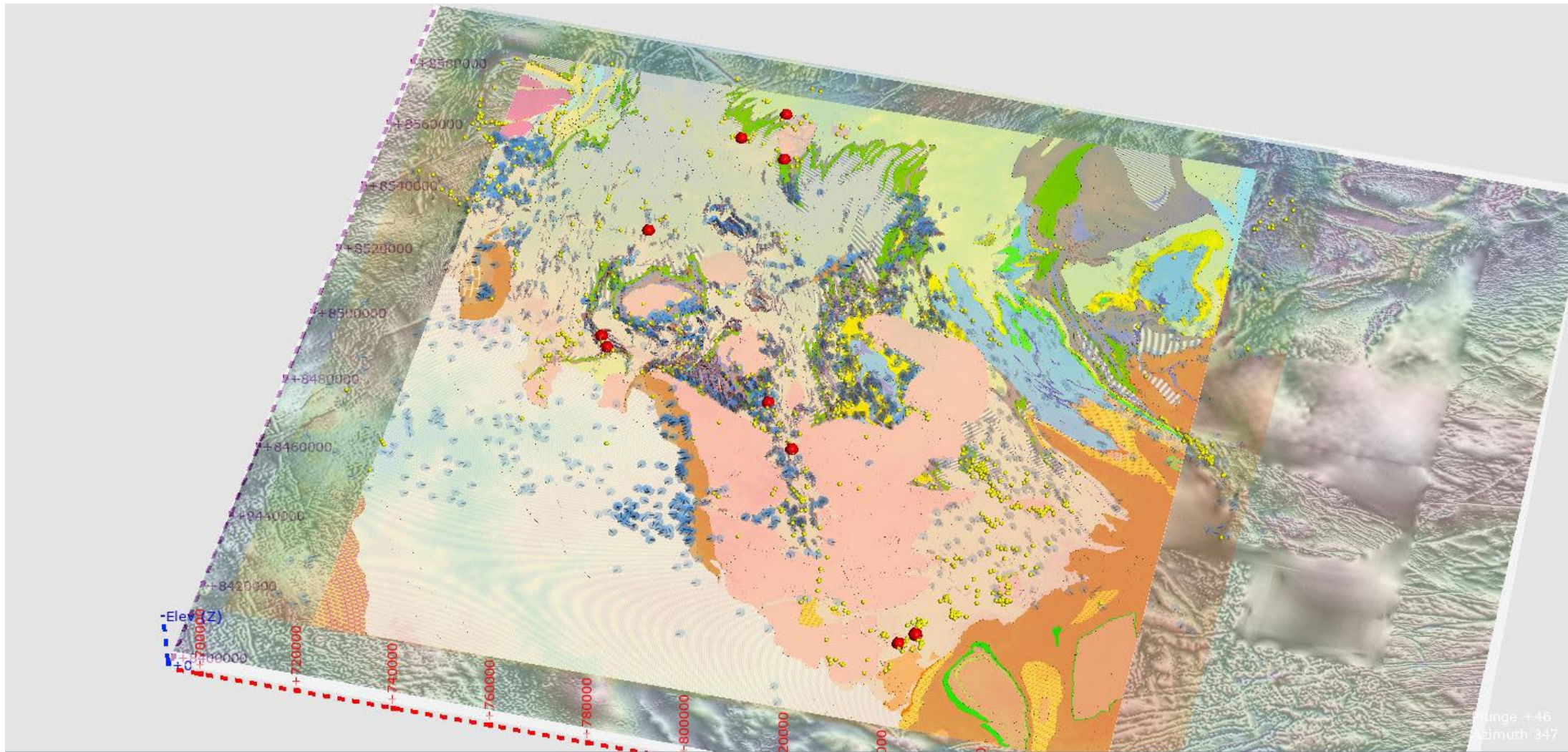


Mapping technical, environmental, social and governance challenges









Layer Name	Symbol	Color	Thickness	Other Properties
top_PSo		Red	Thick	
PCG_addnl_DDR		Blue	Thick	Flat colour
pcc_bedding_100k		Blue	Thick	Flat colour
StructData_250K_LF_area_bedding		Blue	Thick	Flat colour

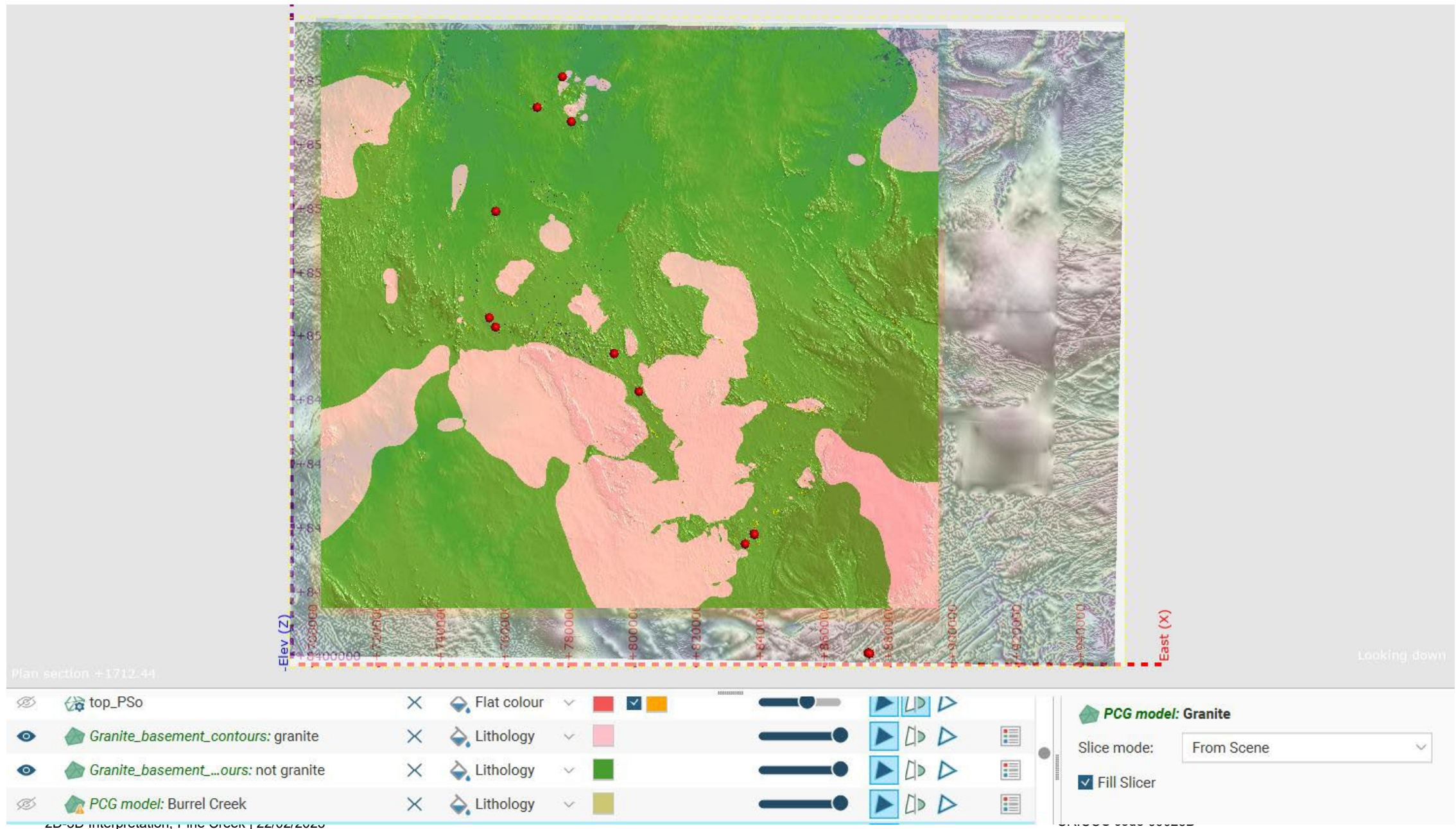
**StructData\_250K\_LF\_area\_bedding**

Slice mode: From Scene

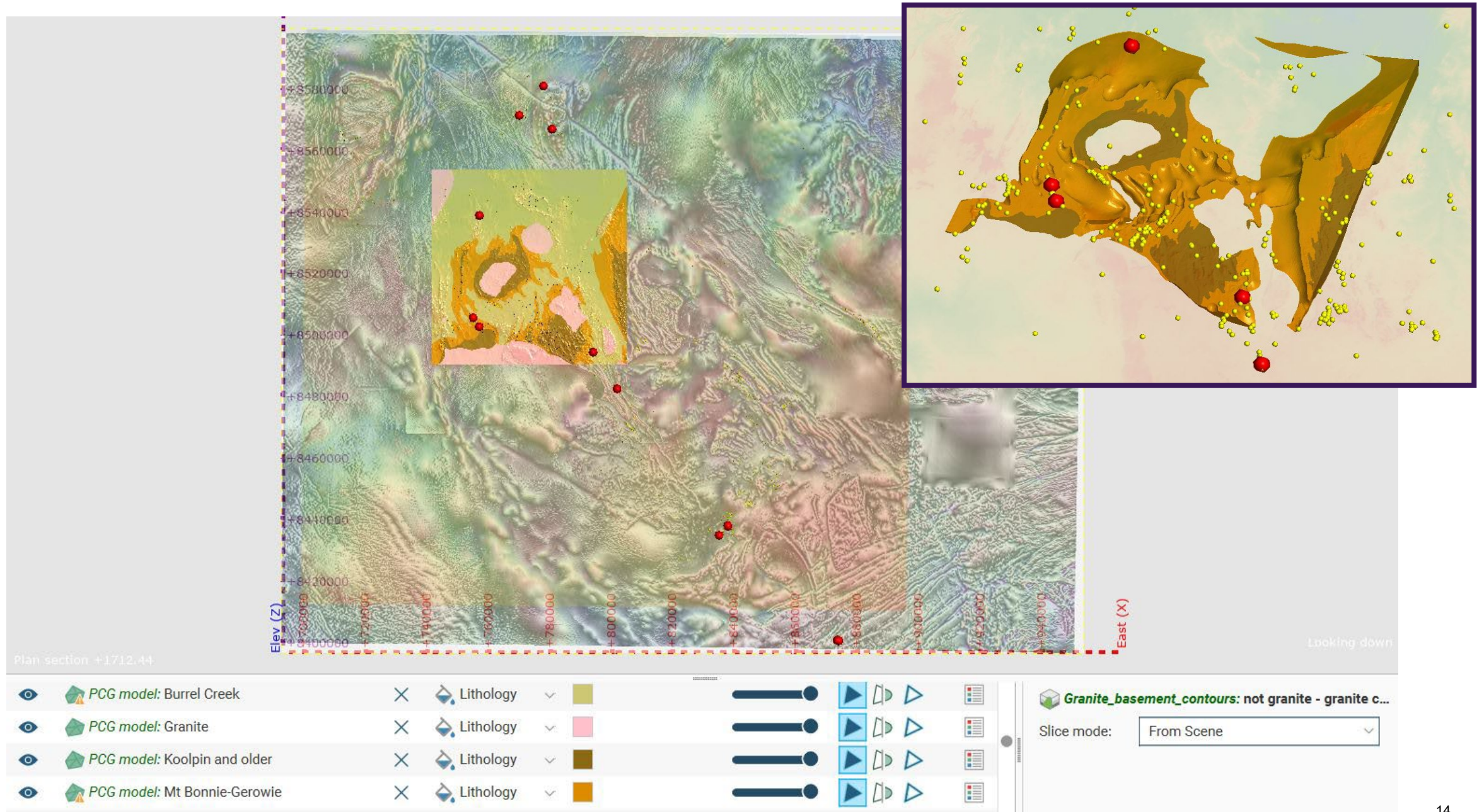
☒ Show down dip lines

Query filter: No Filter

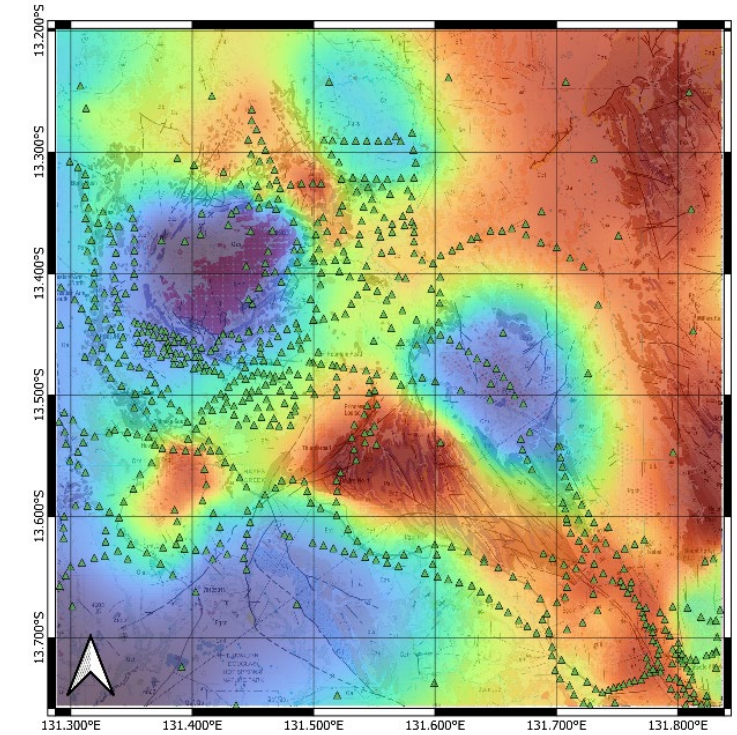
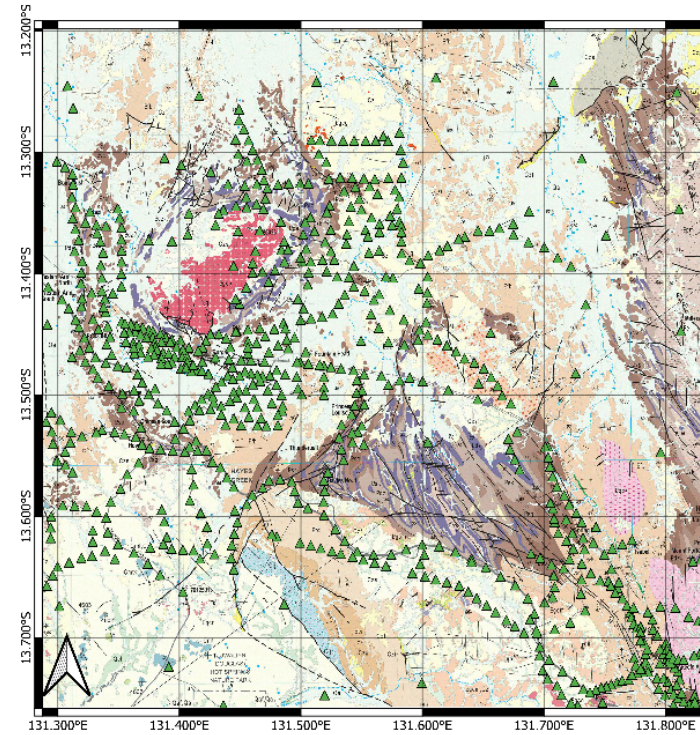
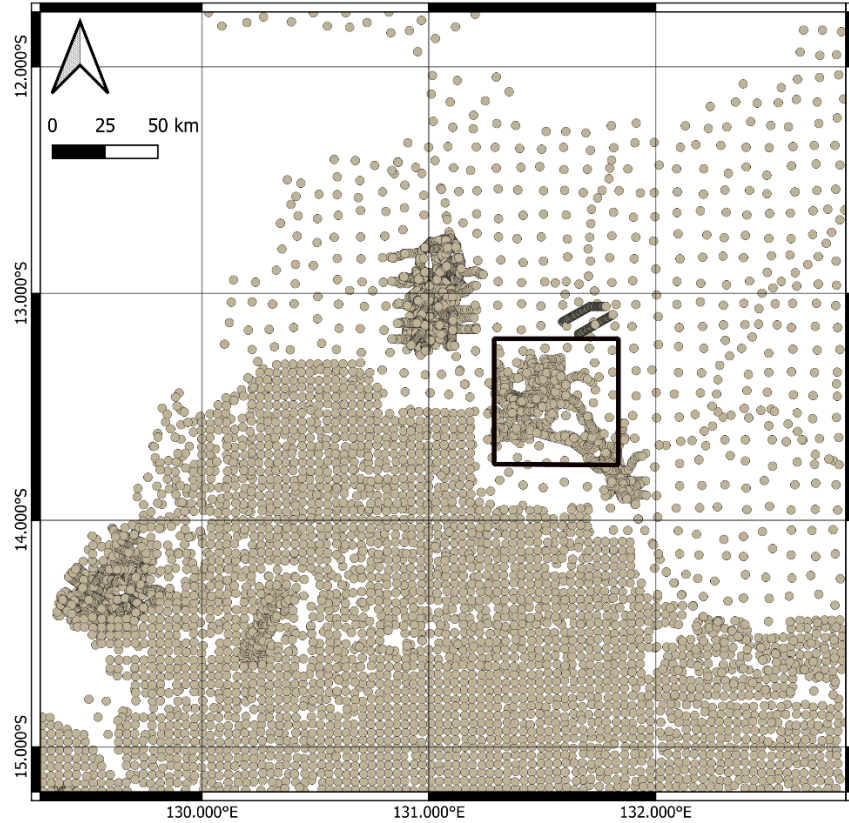












A) Geological map (200k PINE CREEK) with the gravity sites location. B) Geological map, gravity sites and residual gravity anomaly. Residual anomaly values: from -170 (blue) to 170 (red)



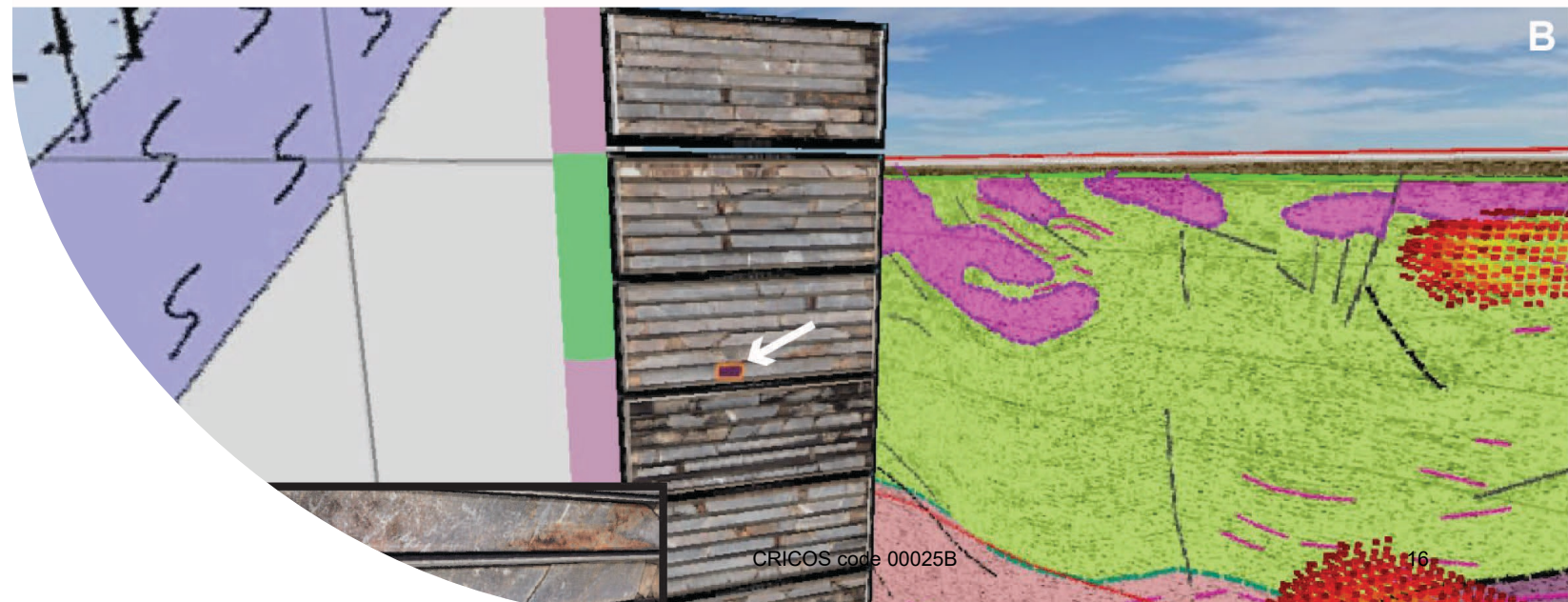
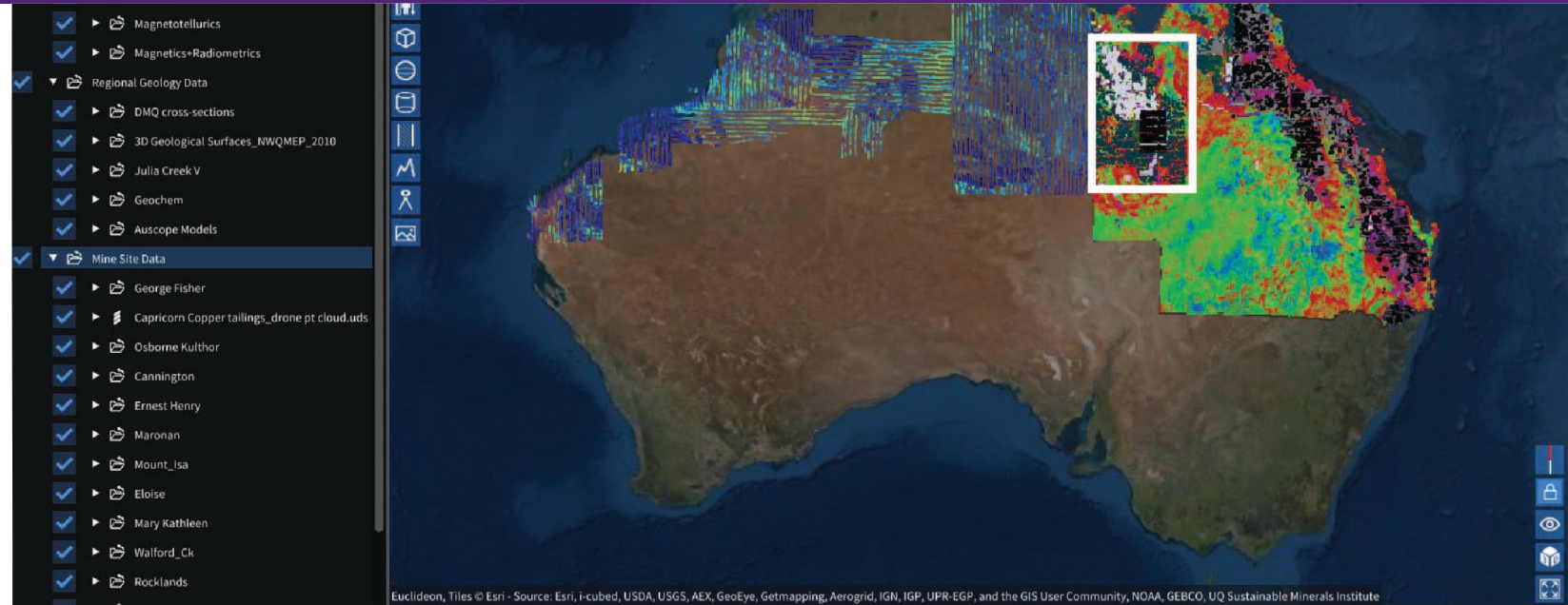
# Future

Field validation

**Impact** – new program of works  
(mapping campaigns,  
geophysics/remote sensing and  
revision of regional stratigraphy)

3D Mineral Systems Analysis

Digital twin compilation





# Proof-of-Concept: *Digital Earth 2021-2022*

## Automatic pipeline

- GSQ Open Data Portal

## Data conversions & visualizations

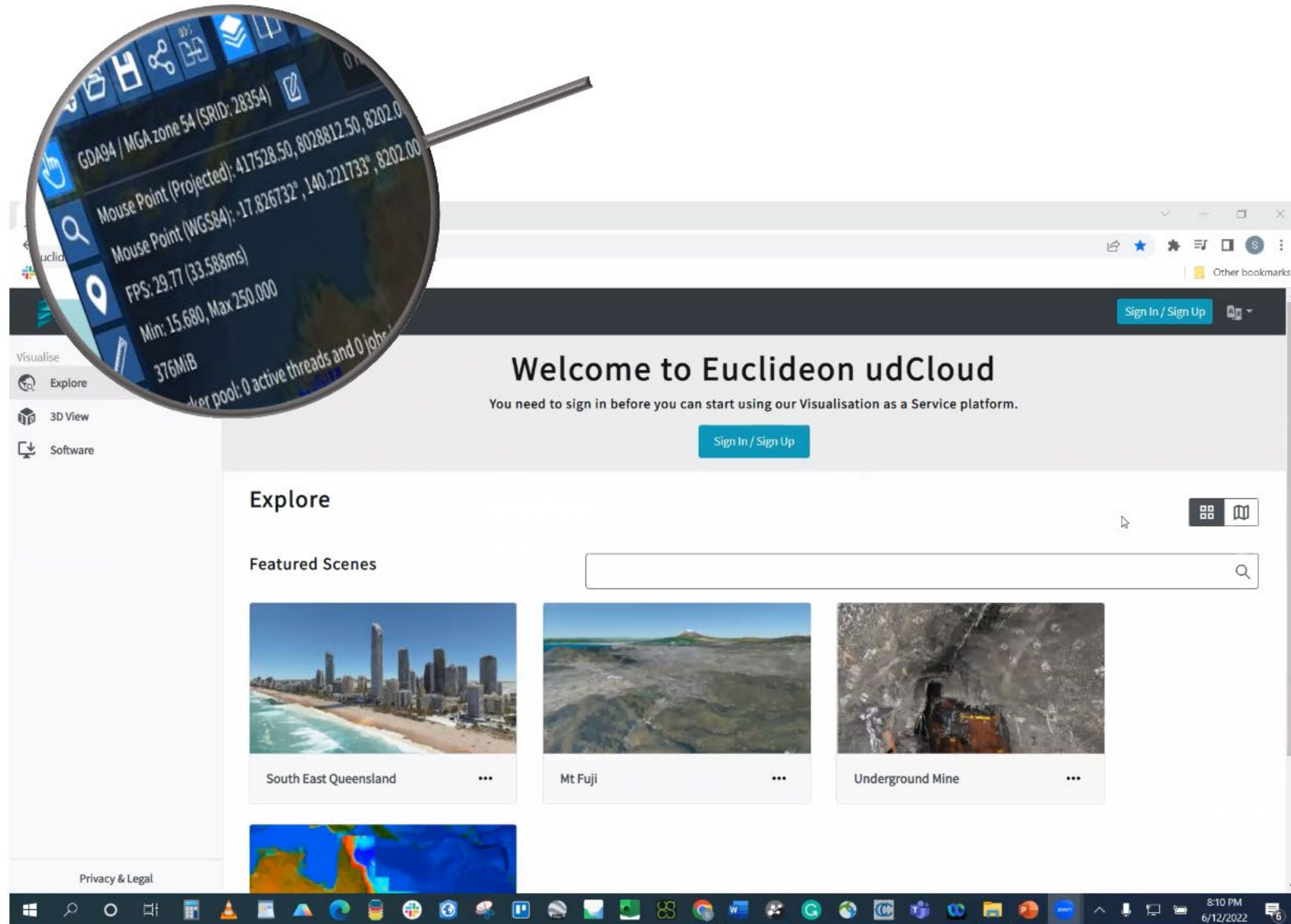
- Drillcore (photos, scans, lith., assays)
- Seismic, AEM, Magnetotelluric, Gravity, Aeromag, LiDAR, photogram
- Maps, Cross-sections, Surfaces
- Roads, Rail, State boundaries etc

## Web integration capability

- ESRI, CESIUM
- GeoResGlobe

## Standalone viewer

- Bespoke inspector tools (query, filter)



# Proof-of-Concept: *Digital Earth 2021-2022*

## Automatic pipeline

- GSQ Open Data Portal

## Data conversions & visualizations

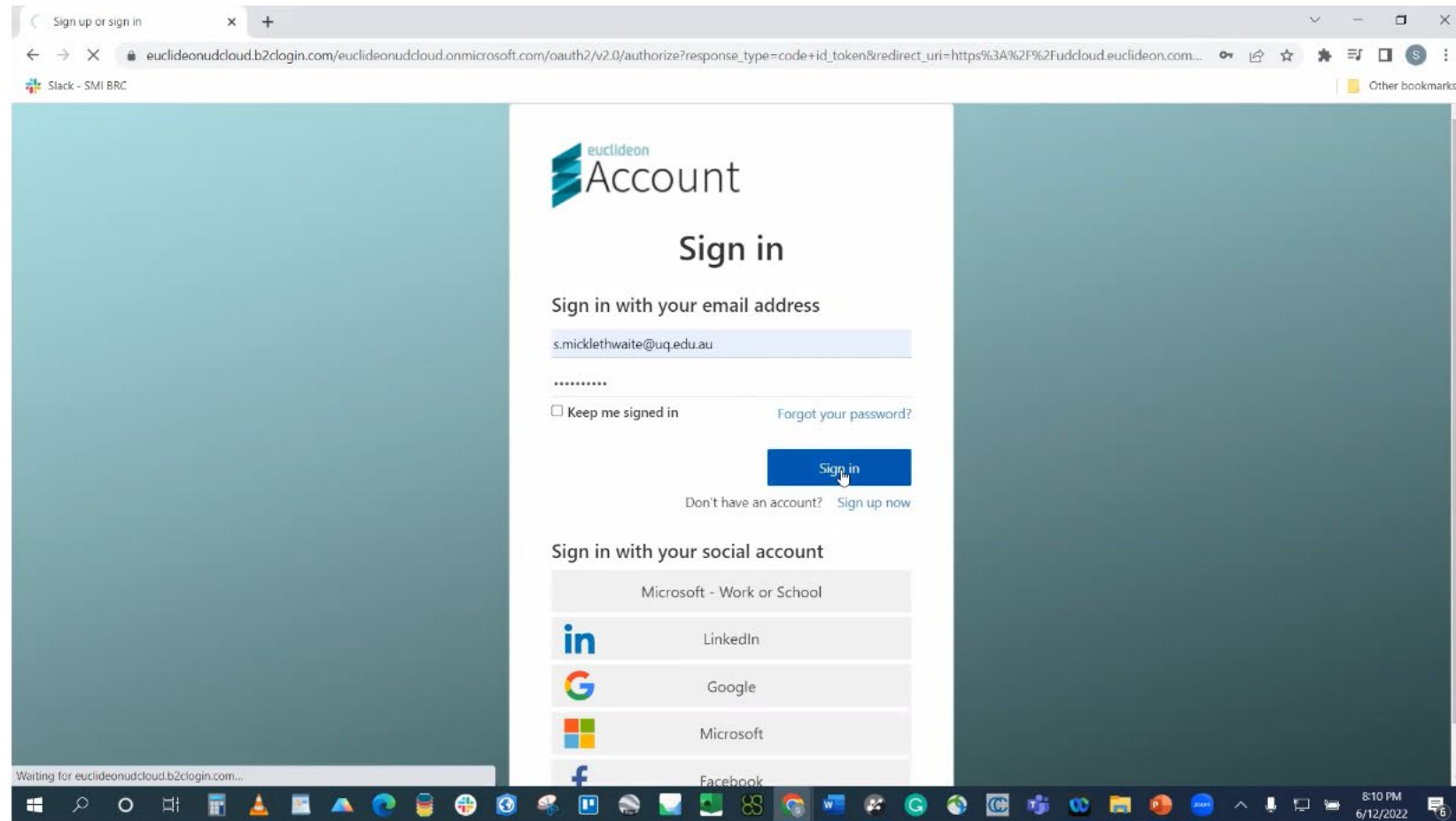
- Drillcore (photos, scans, lith., assays)
- Seismic, AEM, Magnetotelluric, Gravity, Aeromag, LiDAR, photogram
- Maps, Cross-sections, Surfaces
- Roads, Rail, State boundaries etc

## Web integration capability

- ESRI, CESIUM
- GeoResGlobe

## Standalone viewer

- Bespoke inspector tools (query, filter)





# Proof-of-Concept: *Digital Earth 2021-2022*

## Automatic pipeline

- GSQ Open Data Portal

## Data conversions & visualizations

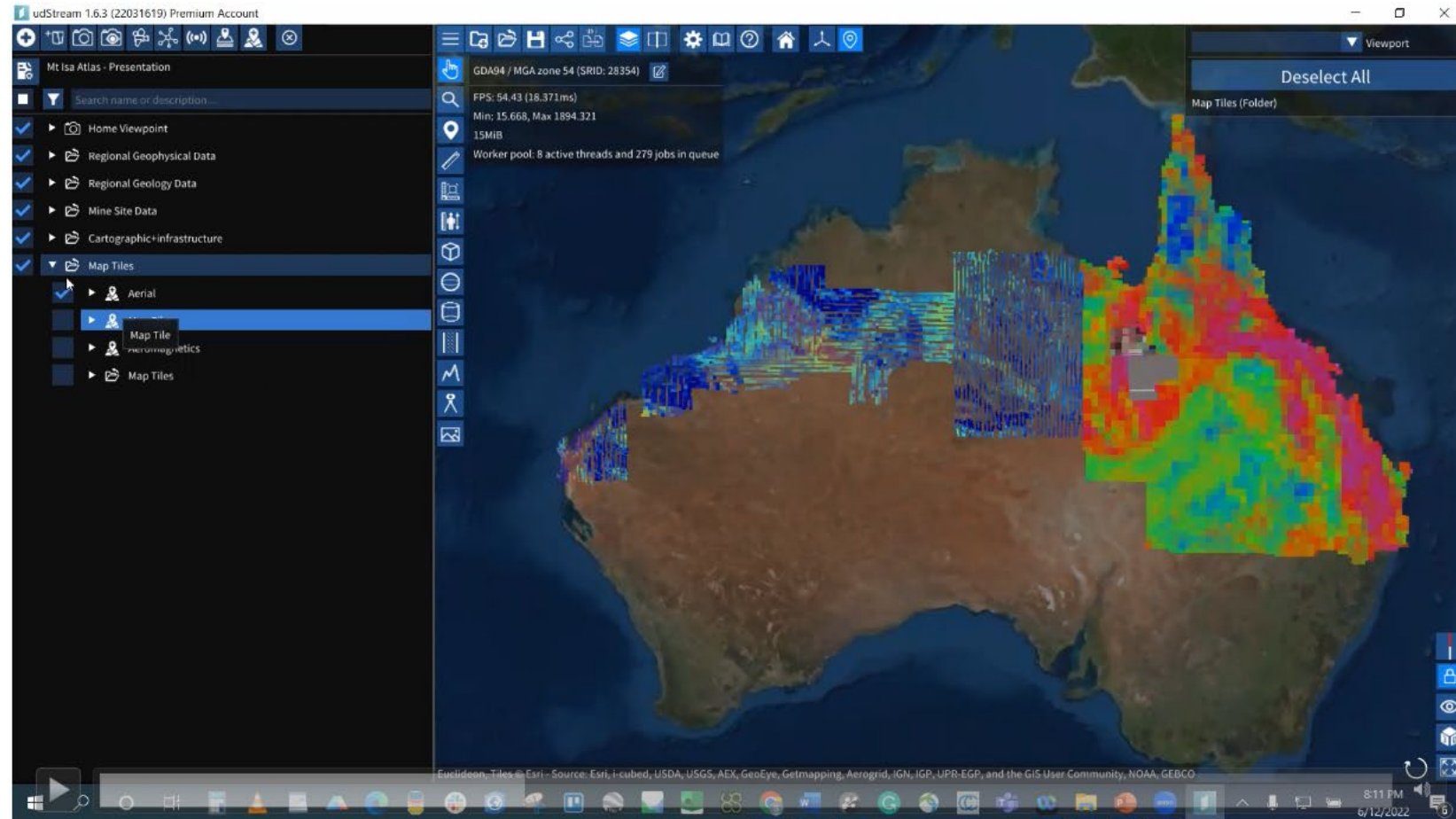
- Drillcore (photos, scans, lith., assays)
- Seismic, AEM, Magnetotelluric, Gravity, Aeromag, LiDAR, photogram
- Maps, Cross-sections, Surfaces
- Roads, Rail, State boundaries etc

## Web integration capability

- ESRI, CESIUM
- GeoResGlobe

## Standalone viewer

- Bespoke inspector tools (query, filter)



# PARTNERSHIP

## Get involved

*(thx Agnico Eagle, PNX Metals,  
Desoto Resources)*

## DATA

Key past studies, researchers  
and datasets recommended?

Most useful outputs that you  
would consume?

Collaborations to add value?