

Integrating surficial geology & the sedimentary record into tectonic driven landscapes

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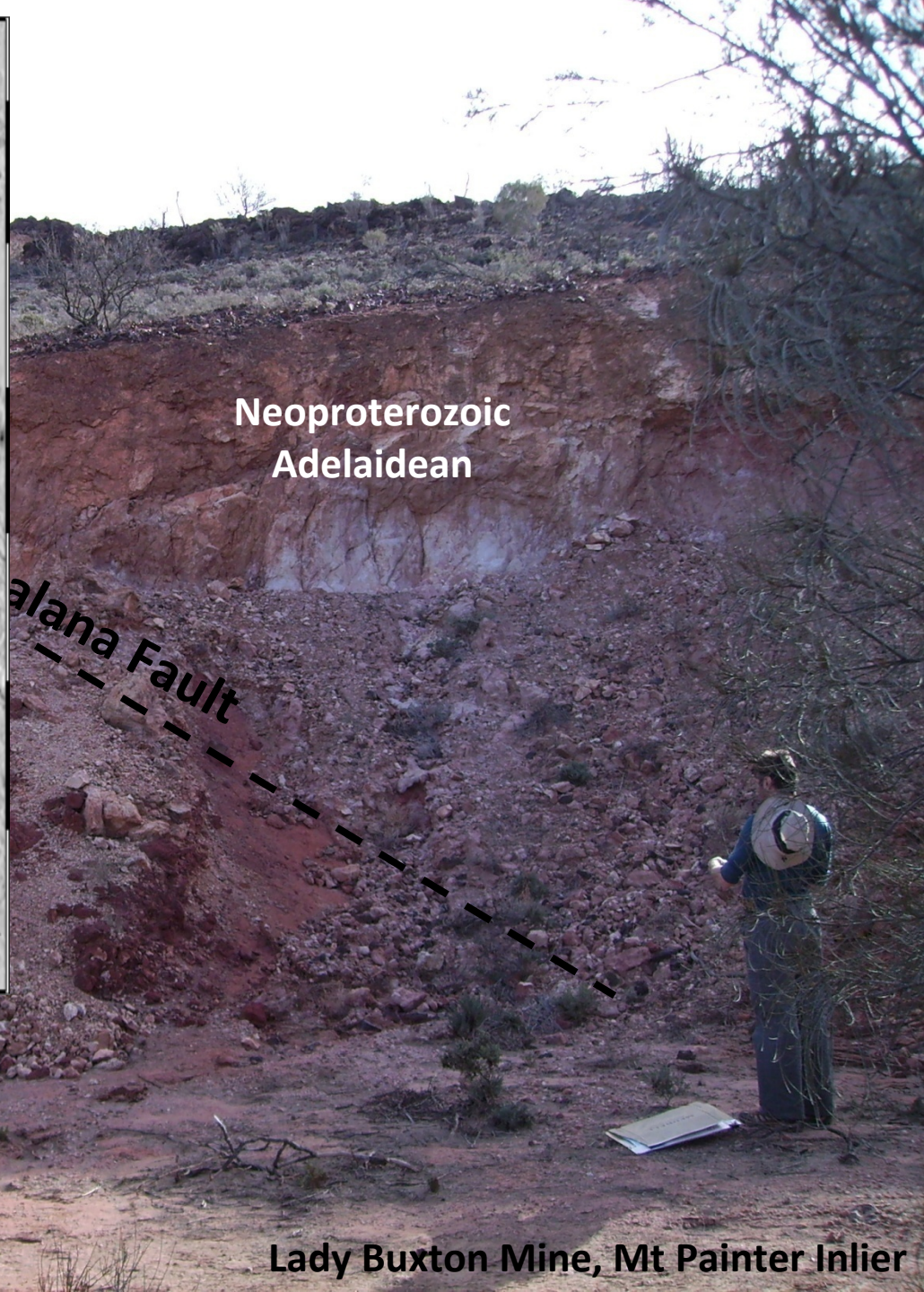
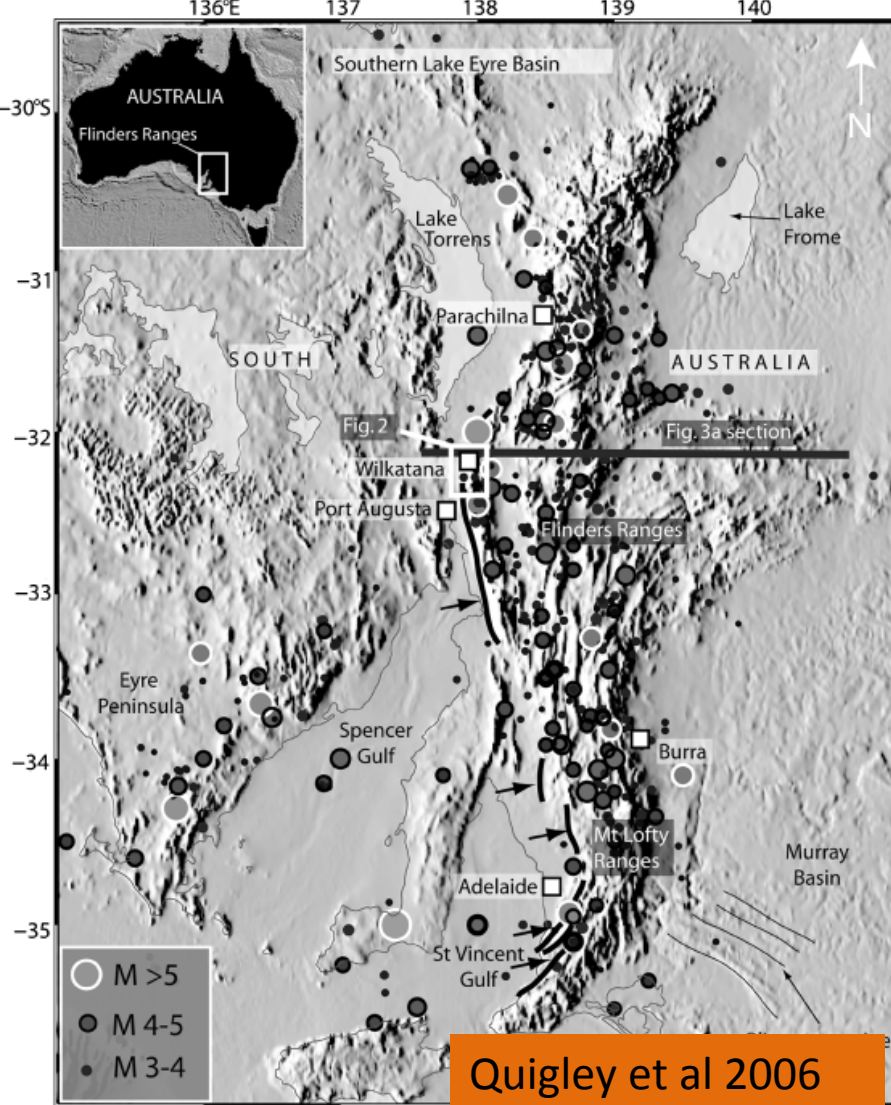
1. Australian School of Petroleum, Santos Petroleum Engineering Building

2. CRC LEME, Department of Geology & Geophysics, University of Adelaide



Mesozoic terraces, Gunpowder Bore, Moolawatana





Lady Buxton Mine, Mt Painter Inlier

- 
- For the past 300 Ma the northern Flinders Ranges area existed as a flat-lying peneplain
 - Minimal tectonism in the area since the Delamerian Orogeny
 - Uplift that formed the ranges has occurred in the past 6 Ma (mostly the past 80 Ka)
 - Denudation 123 m Ma / Uplift 160 m

OR.....

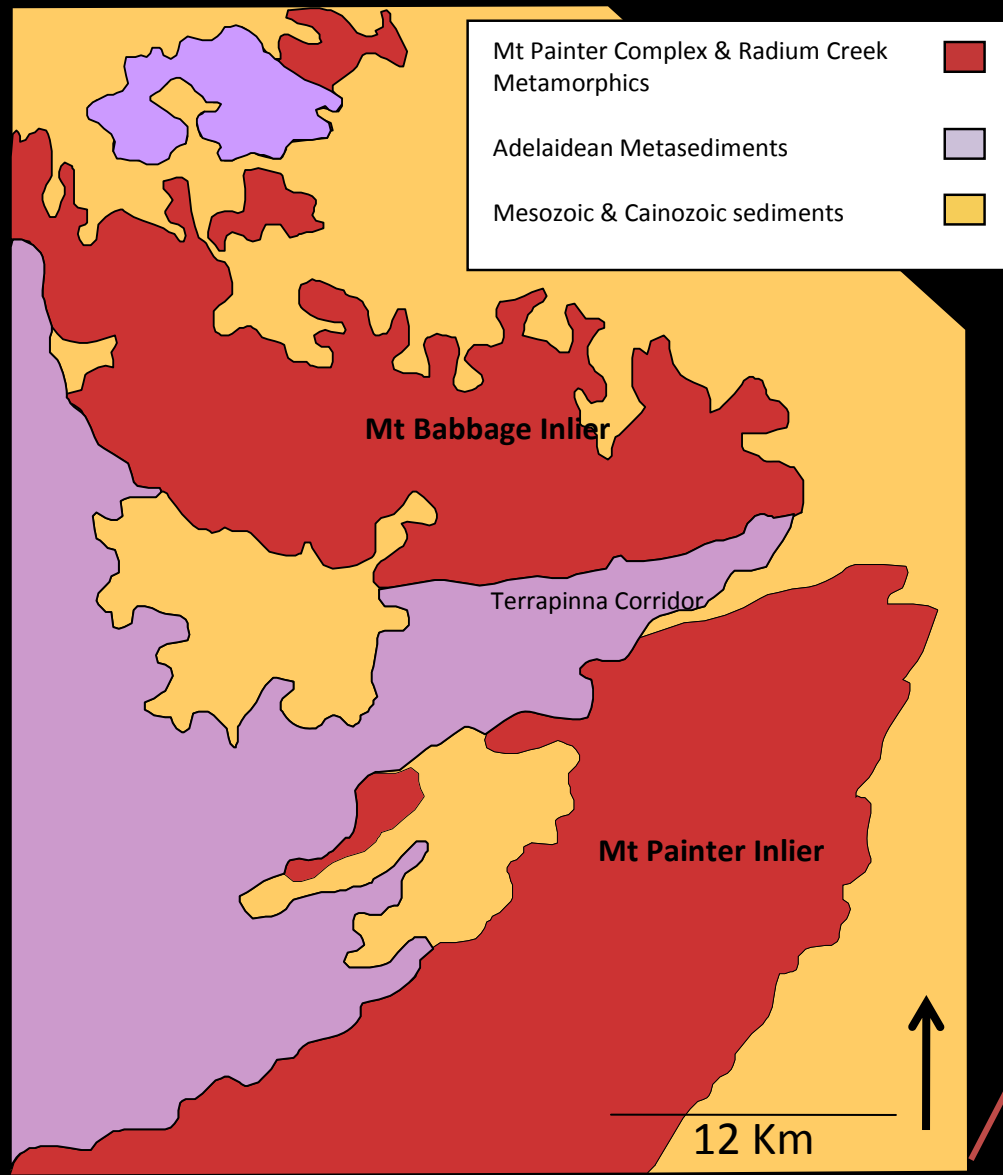
- Ancient landscape
- Stable interior with minimal denudation and tectonism

The problem.....

The complexity of landforms and modern day processes has hindered the development and understanding of the geological and environmental evolution of the northern Flinders Ranges

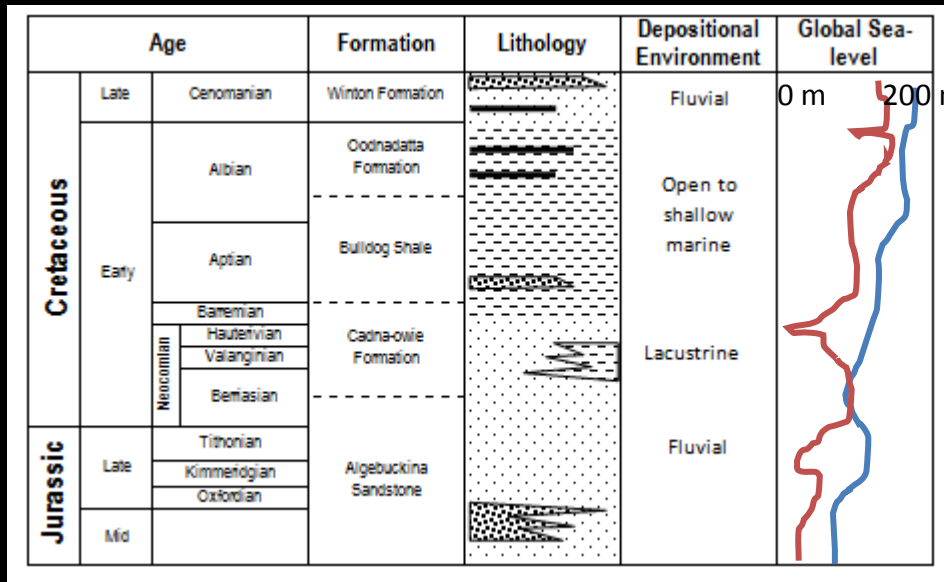
“The key to new discoveries is not in having new landscapes, but rather in having new eyes....”
Marcel Proust

The Northern Flinders Ranges.....





Eromanga Basin



Global Sea-level curves adapted from [Exon Mobil 2003](#) & [Haq 1983](#), displaying relative to current palaeo sea-level interpretations



- Formation involves a complex interaction of lithospheric deformation and surficial response
- Geomorphic evolution is easily recognised
- Modern analogues make it easy to understand the processes
- Margins provide exposures of deeper inaccessible features
- Local and regional perspectives

The key parameters are preserved within the sediments and their relationship with the landscape

- Surficial Geology
 - Mapping – geological, structural, geomorphological
 - Mineralogy – hand sample and thin section
 - Palaeocurrent analysis – primary structure measurements, clast analysis & thin sections
 - Stratigraphic architecture
- Sedimentology
 - Depositional environment analysis
 - Landscape controls
 - reconstructions
- Palaeogeographical analysis

- Defining sediment extent and abundance
 - Abrupt boundaries defined by the Mt Painter Inlier, granitic 'inslebergs' and rises, and shore lines
- General north west palaeocurrent direction in the north of the area, highly variable in the central region, typical north east in the south of the area
- Variations in deformation within sediments
 - Folding in Jurassic-Cretaceous sediments, but not late Cretaceous
- Palaeochannels, lake systems & mound springs
- Shorelines

Surface mapping.....

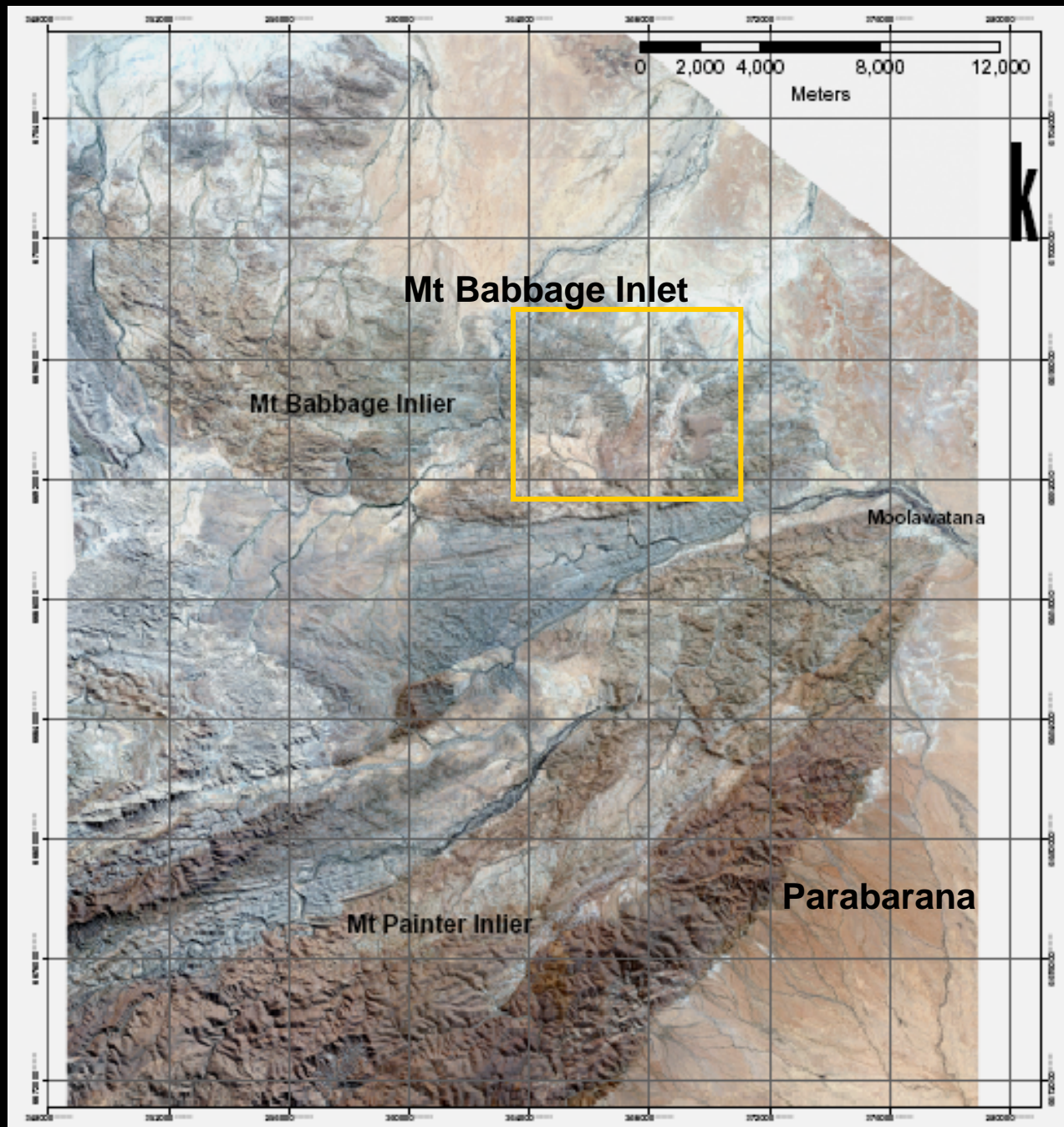
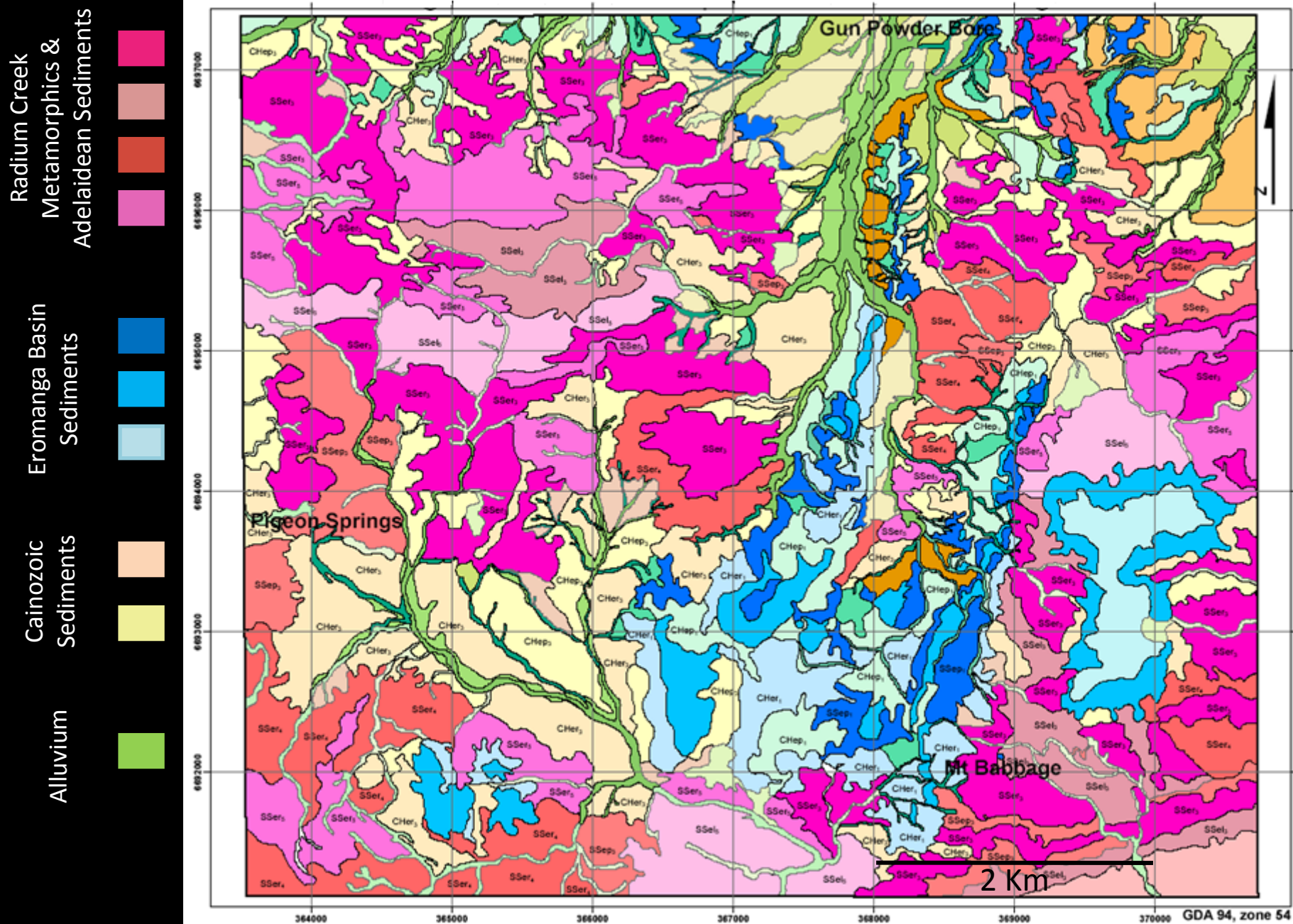


Image adapted from the Northern Flinders Ranges Quickbird, courtesy of Heathgate Resources

Mt Babbage Inlet 1:25,000 Surficial Geology Map



Mt Babbage Inlet 1:25,000 Simplified Geological Map

Bedrock



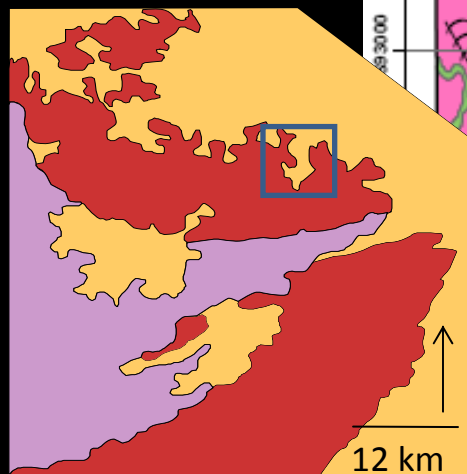
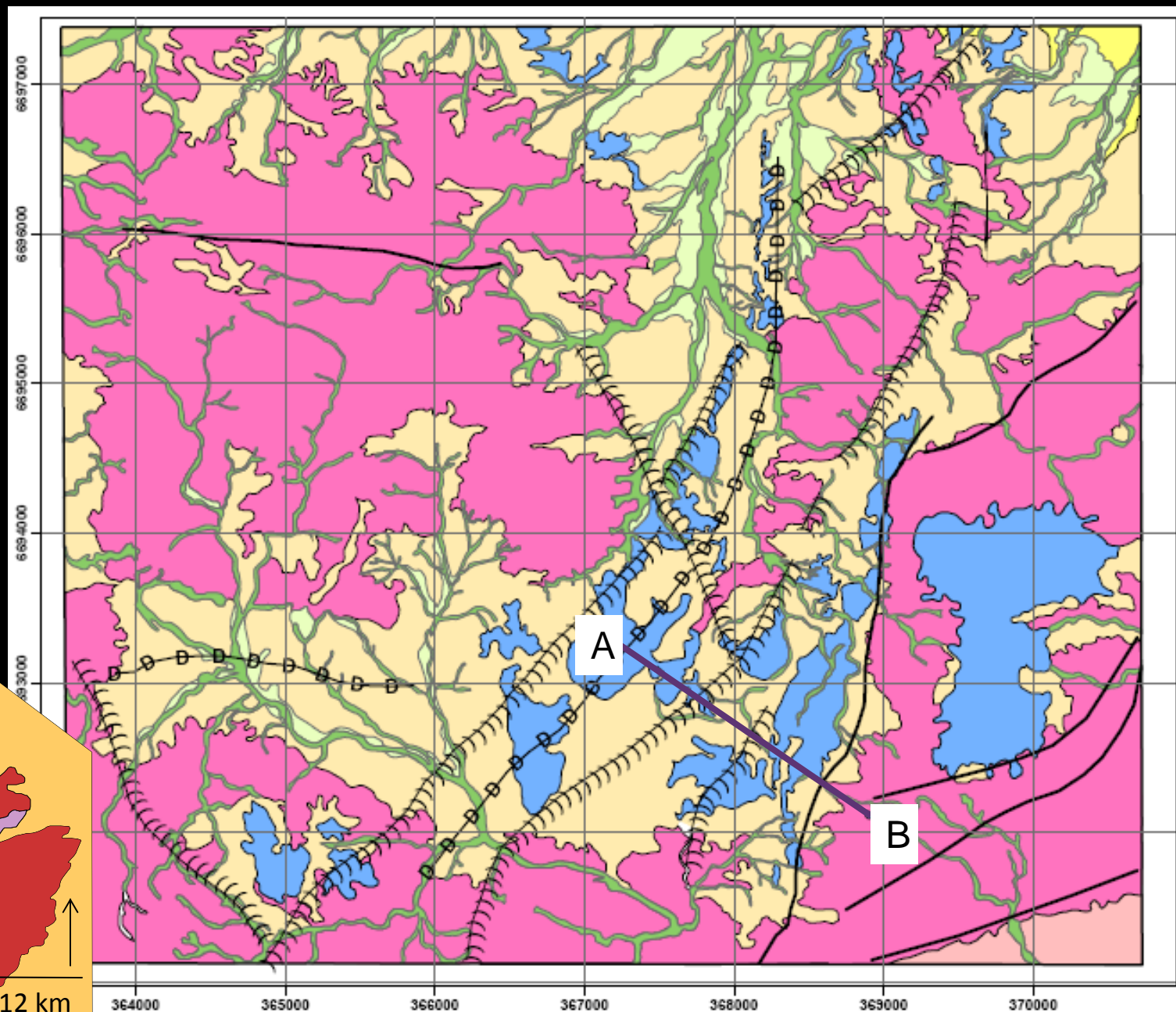
Mesozoic
Sediments

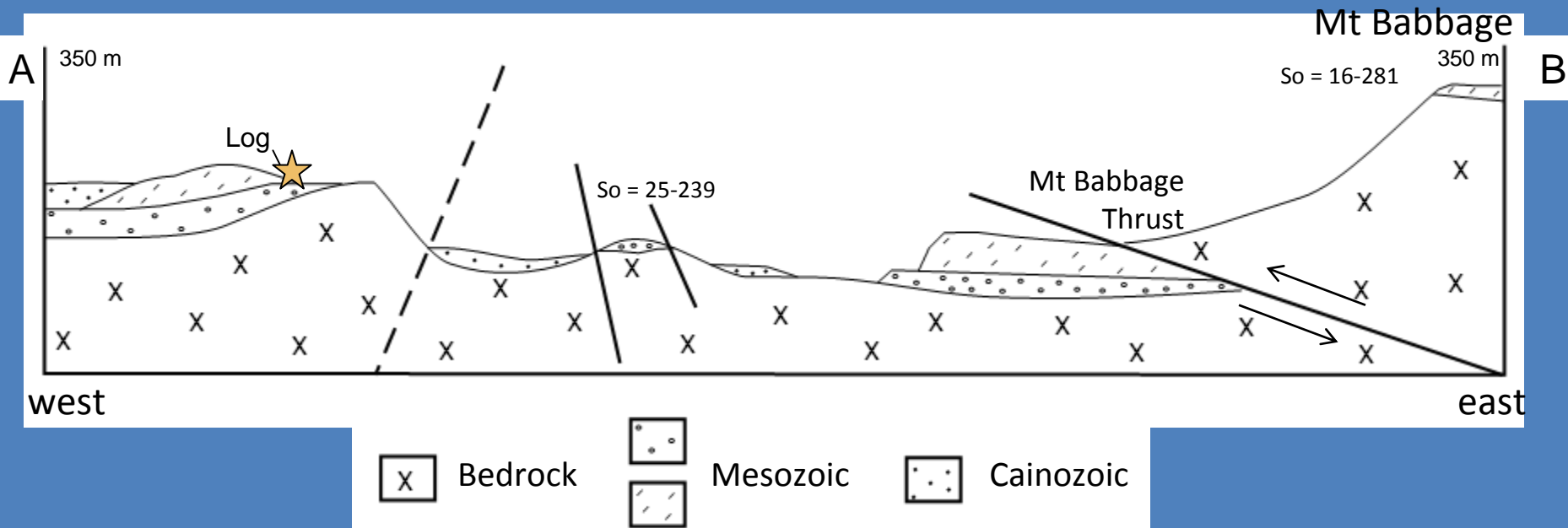


Cainozoic
Sediments



Alluvium

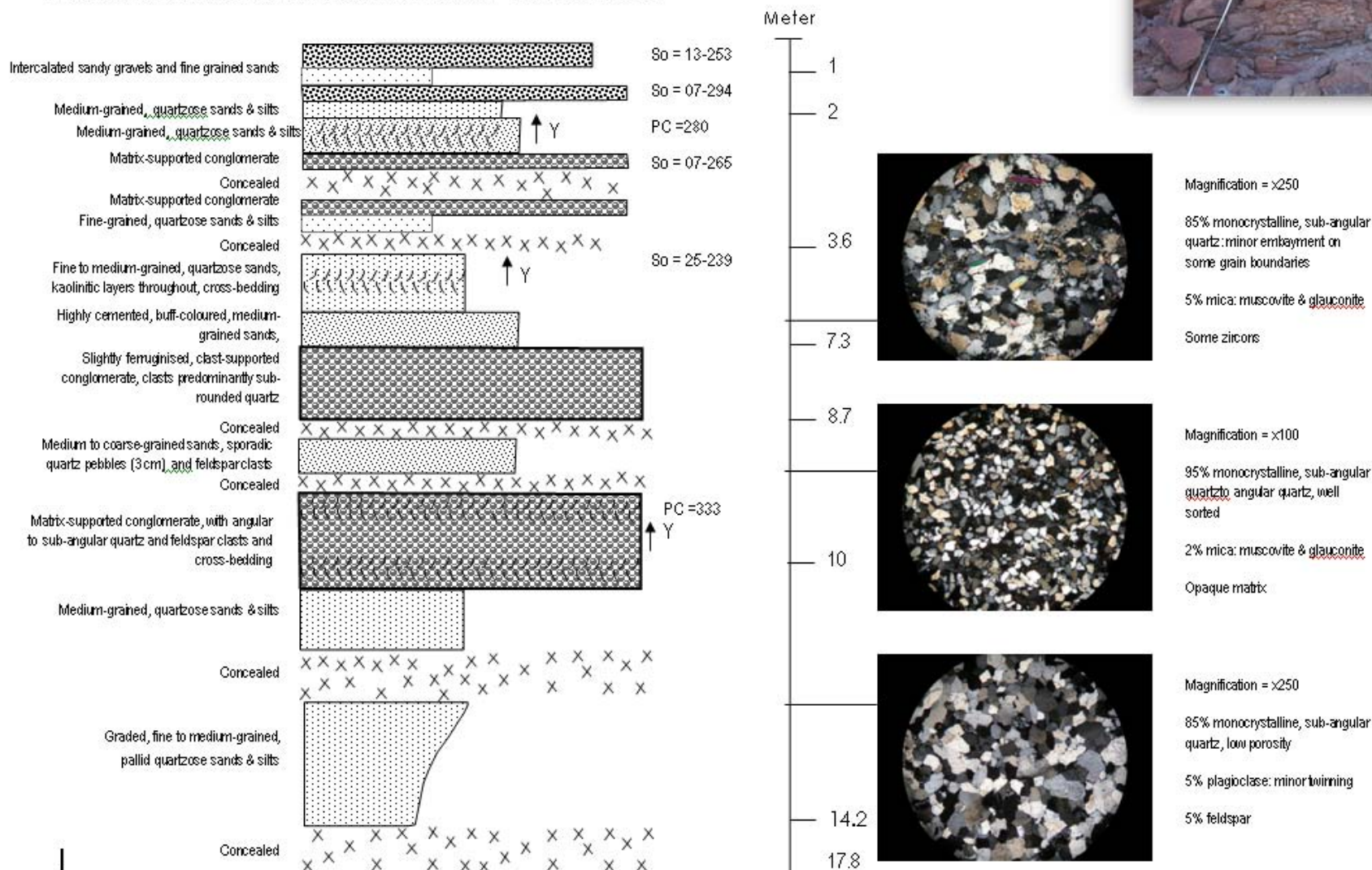




Mt Babbage Inlier #3

Location: Mt Babbage Inlier: 0367857-6694904

Description: Fault bound mesa exposure of Alge buckina Sandstone – Cadna-owie Formation

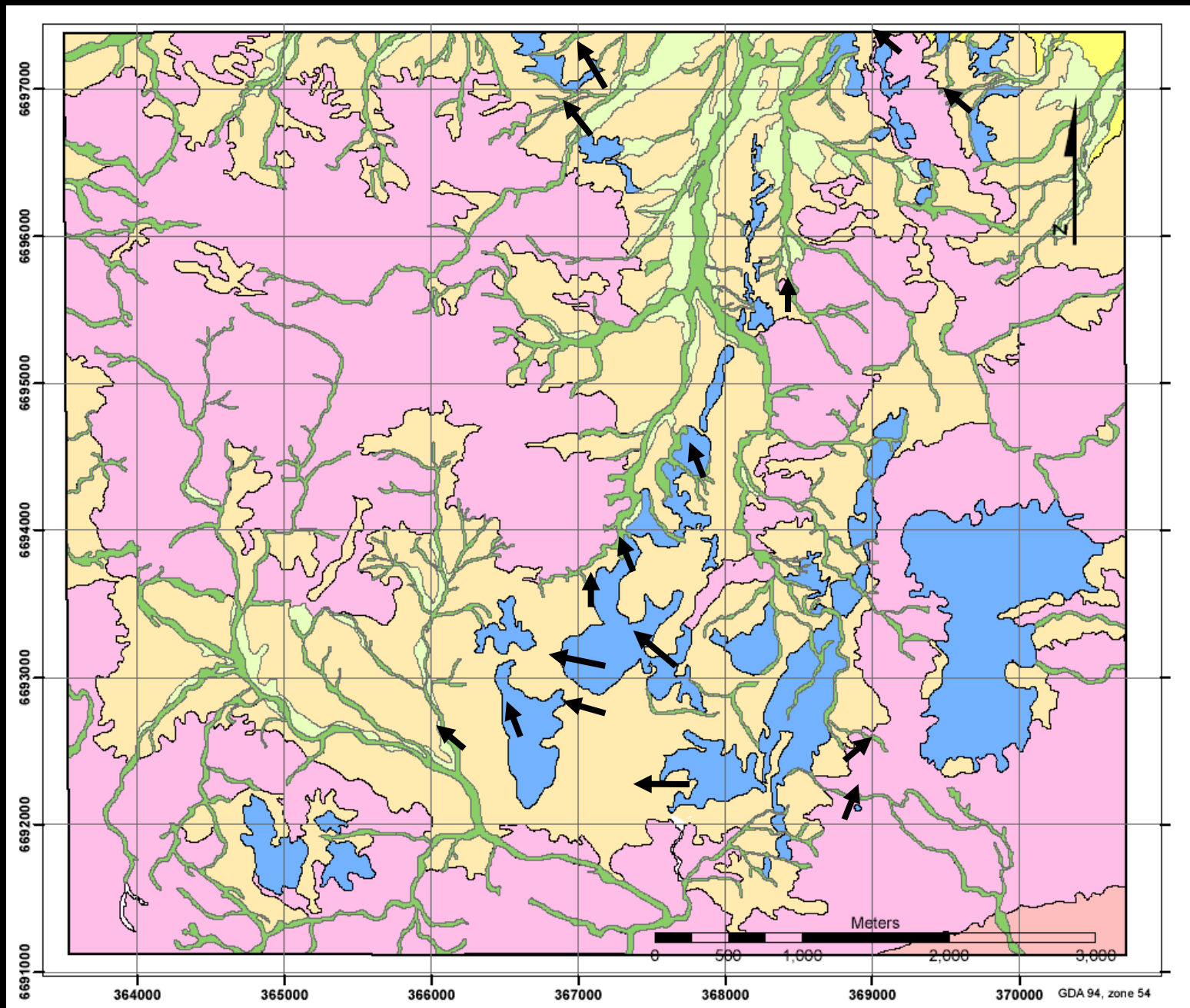




A photograph of a geological outcrop showing two distinct rock units. The upper unit is a dark, reddish-brown shale, while the lower unit is a lighter, yellowish-brown sandstone. The boundary between them is marked by a pink line. A geological hammer is placed against the lower unit for scale. The background shows a dry, hilly landscape with sparse vegetation.

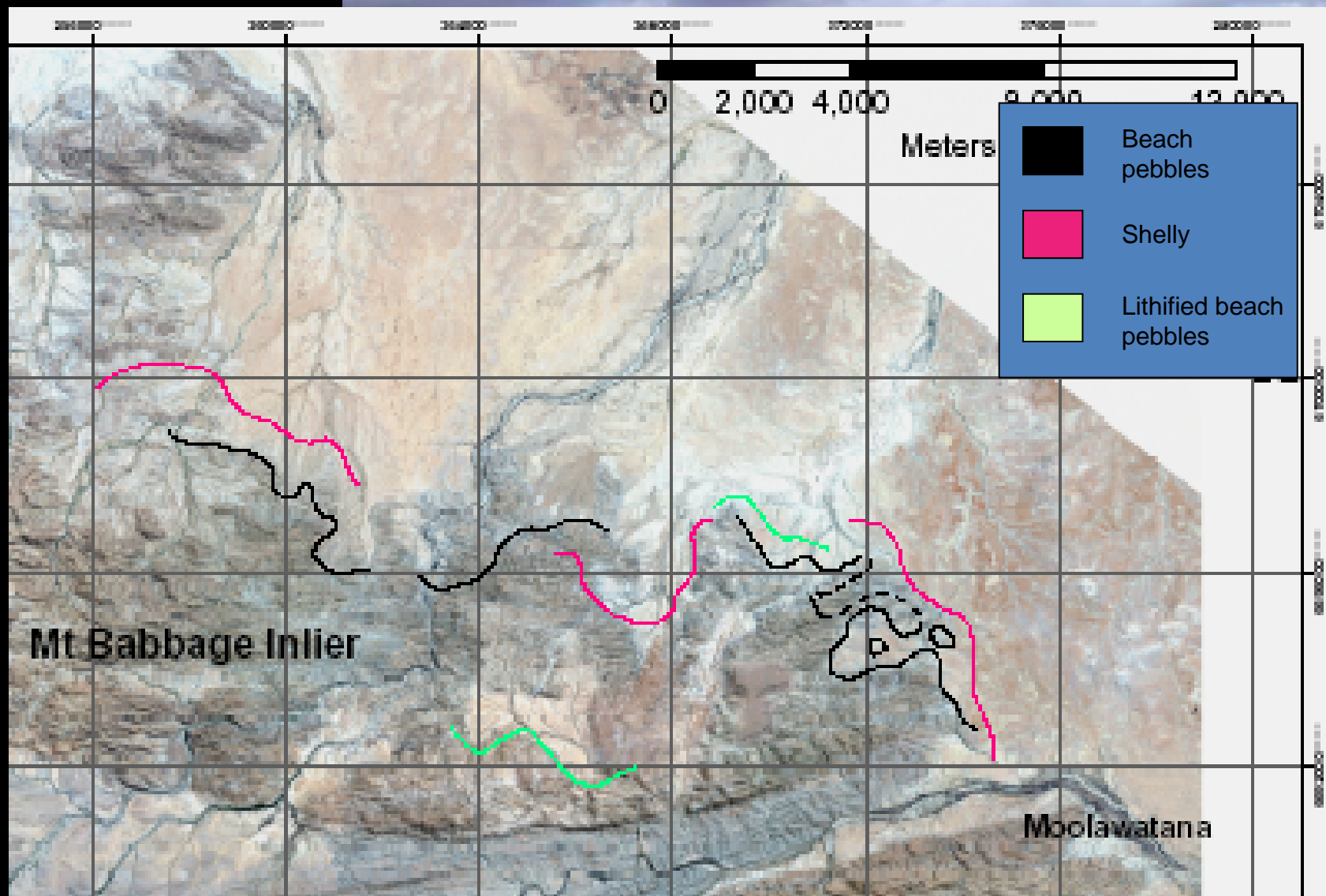
Bulldog Shale

Cadna-owie



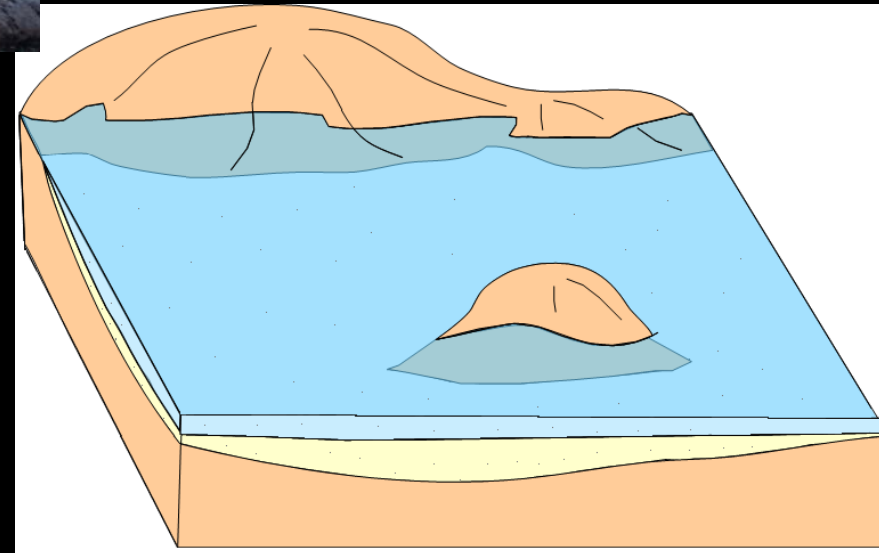
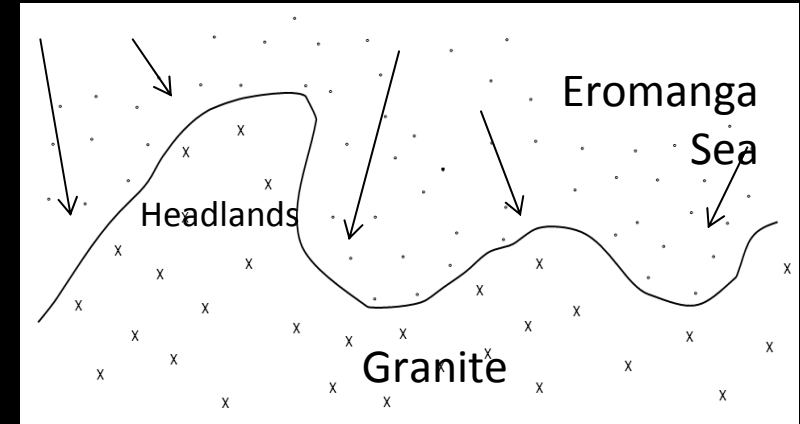
General north west flow direction

Shorelines.....



Throughout the area shorelines surround granitic rises and inslebergs.....

Shorelines.....



This indicates that there was some relief within the landscape during this time



Palaeochannels....

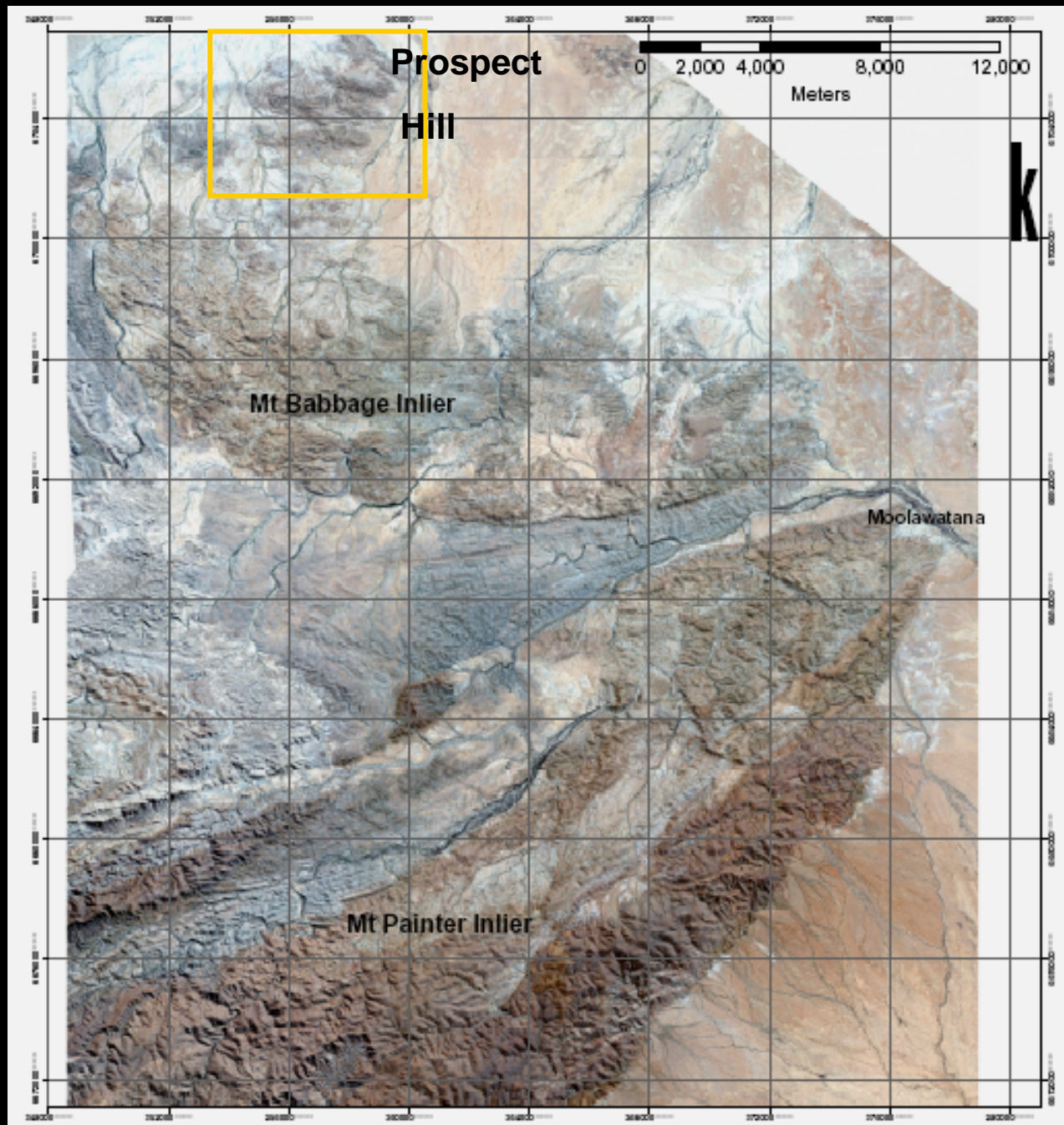
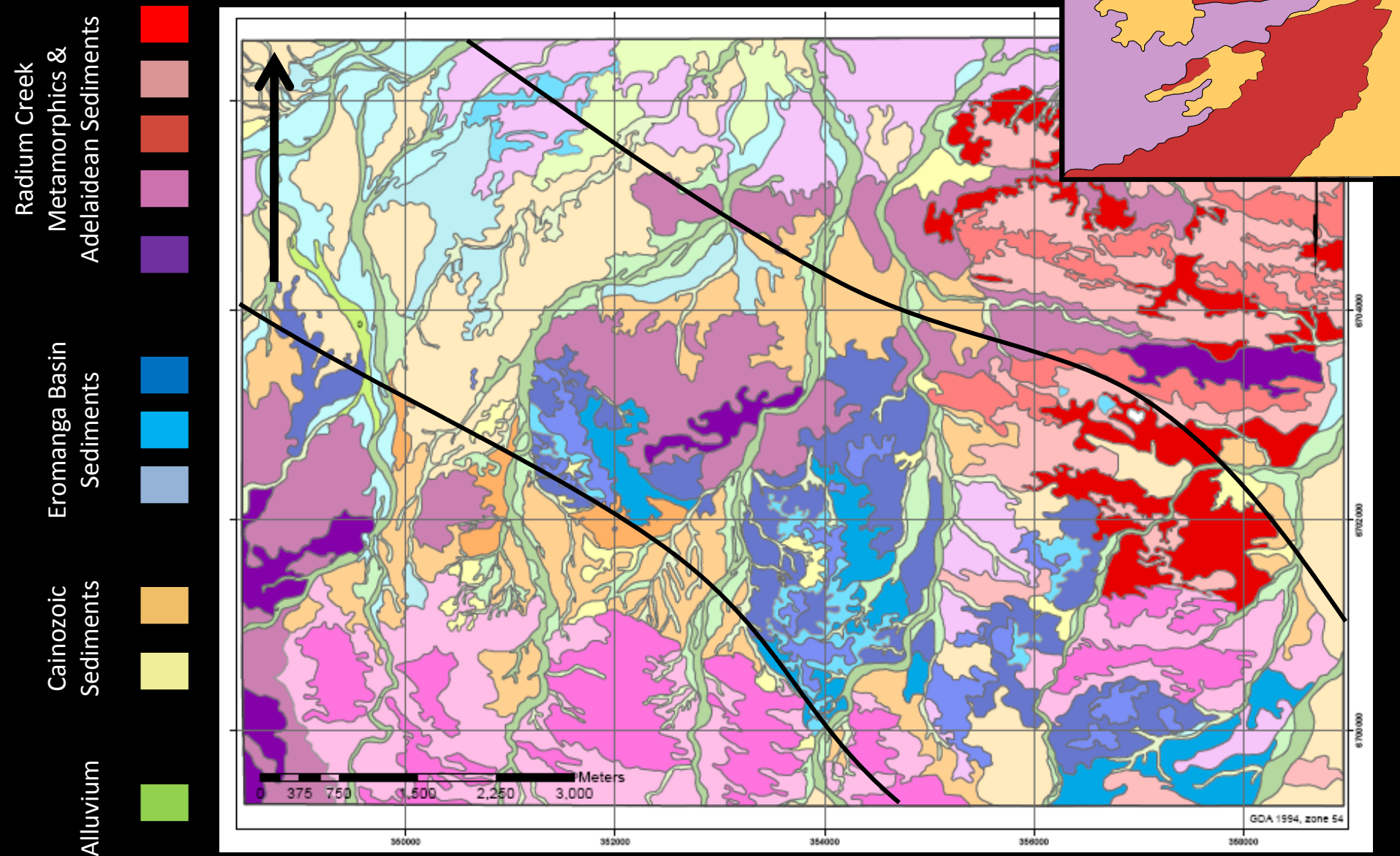
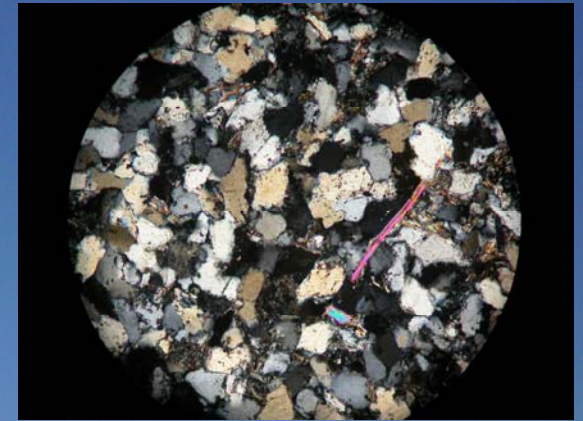


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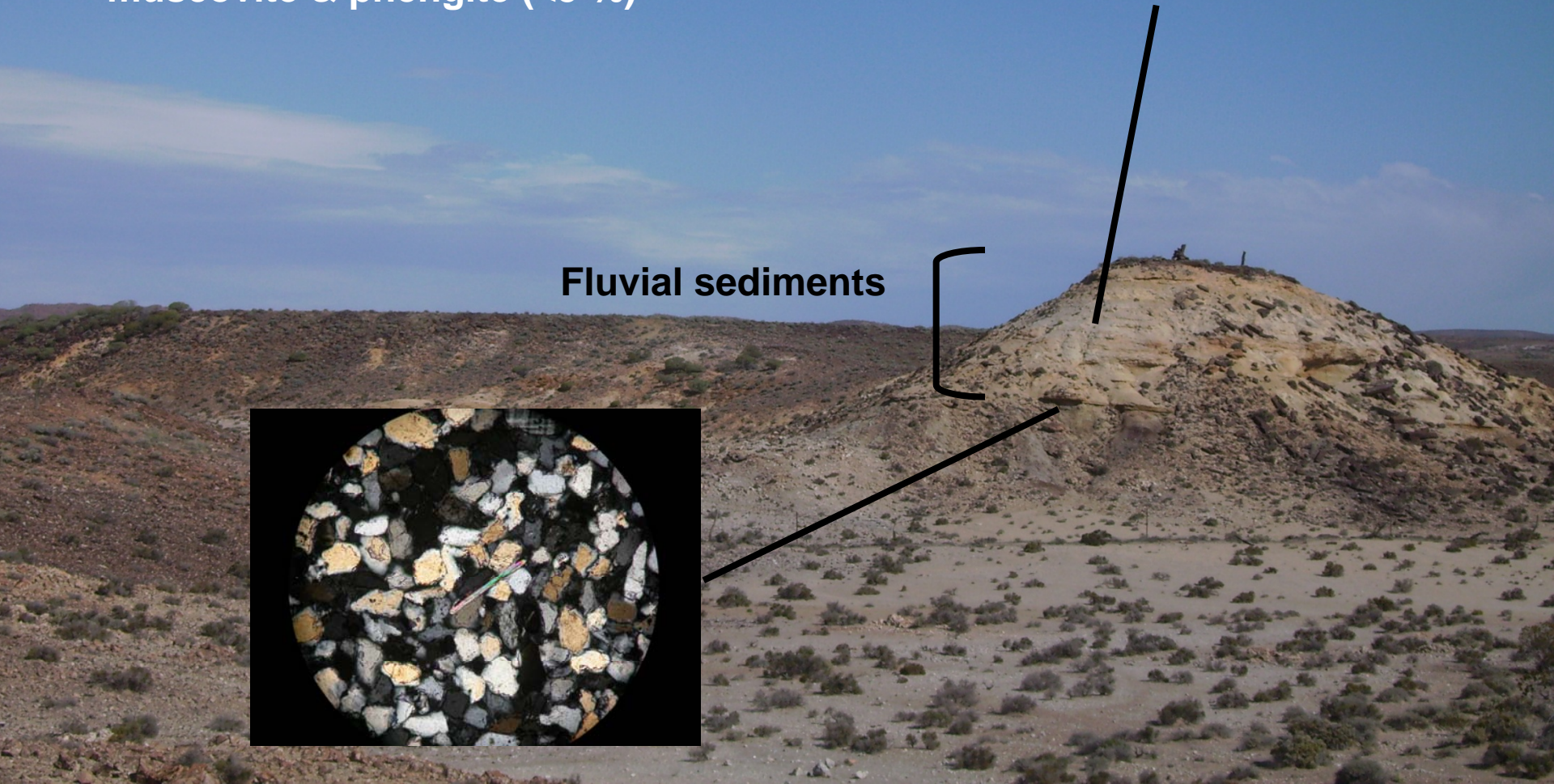
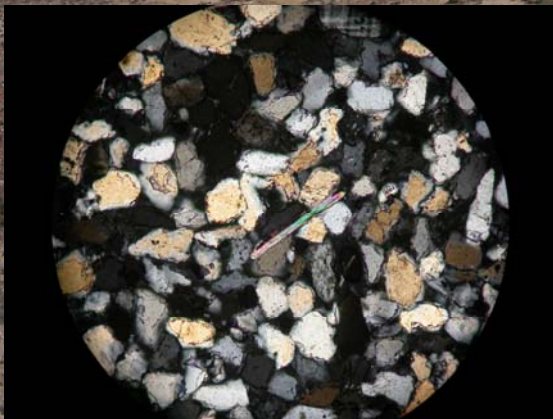
Prospect Hill 1:25,000 Surficial Geology Map



- Angular to sub-rounded monocrystalline quartz (85 %)
- Some glauconite and pyrite
- Lithic fragments
 - plagioclase and K-feldspar (<10 %)
 - muscovite & phengite (<5 %)



Fluvial sediments



- pre Mesozoic landscape: low hills and rises in the t Babbage inlier and hills and mountains in the Mt Painter Inlier
- tectonics active since pre Mesozoic, during deposition of the Eromanga Basin and still active now
- considerable erosion of Mesozoic sediments, but some more resistant or shielded lithologies have been preserved
- palaeochannels are prominent throughout the area – mineral prospectively!!!!
- the basin is an analogue for the contemporary landscape



Acknowledgements.....

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