

The reconstruction of the geological history of a site on the west coast, Tasmania

12th Annual Tasmania Geoscience Forum


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1 December 2022

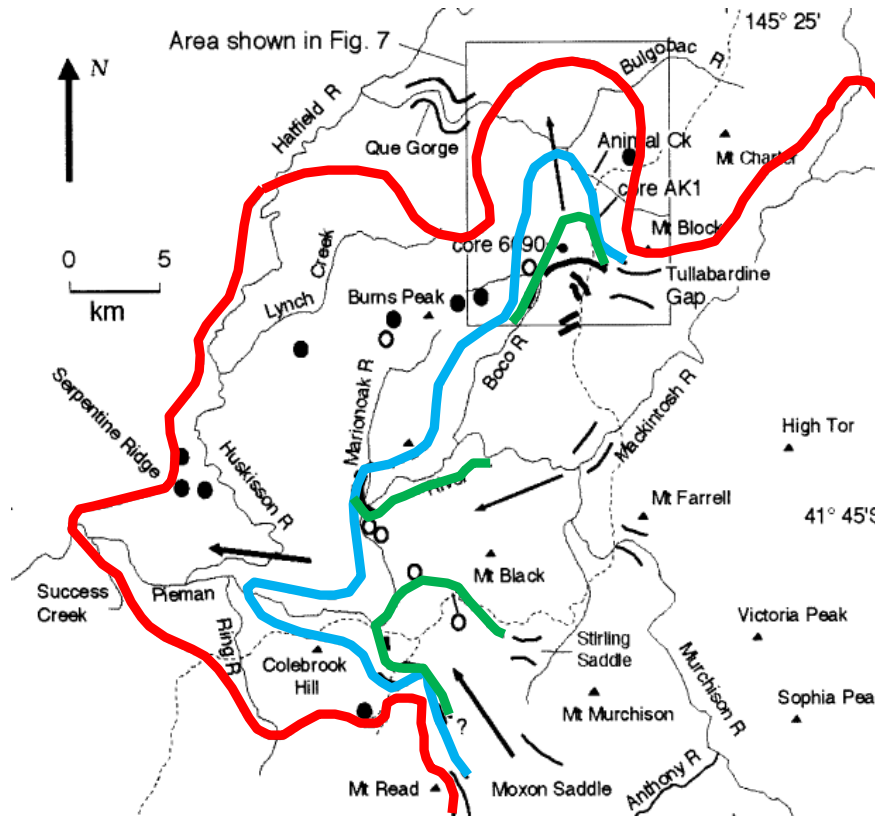


AIM – Demonstration of the importance of understanding the geological history of a site.

1. A brief overview of the glacial history of West Coast of Tasmania
2. Geotechnical challenges of glacial deposits
3. Site context – location / geology / topography / geomorphological features
4. Investigation overview and findings
5. Reconstructing the glacial history of the site

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- A woman with long dark hair, wearing a black top and blue jeans, is walking through a modern building hallway. She is carrying a white coffee cup and a bag. The hallway has large glass windows and a polished floor.
- Glaciation has occurred in Tasmania throughout the last 66 Ma
 - Pleistocene epoch of Quaternary period - 2.58 Ma to 11,700 the last “ice age”
 - Ice covered $\approx 7,000 \text{ km}^2$ of Central Plateau and western mountain ranges
 - Outlet glaciers generally to the north, south and west
 - Glaciation during the last 1 Ma is complex, with multiple ice advances/retreats
 - Each ice advance during this period covered a generally smaller area¹

¹ Colhoun, E.A., Kiernan, K., Barrows, T.T., and Goede, A. 2010. Advances in Quaternary studies in Tasmania. Geological Society, London. Special Publication. Vol. 346, pp 165 – 183.



Bulgobac Glaciation ~ 783,000 yr

Bobadil Glaciation ~ mid-Pleistocene

Boco ~ 130,000 yr

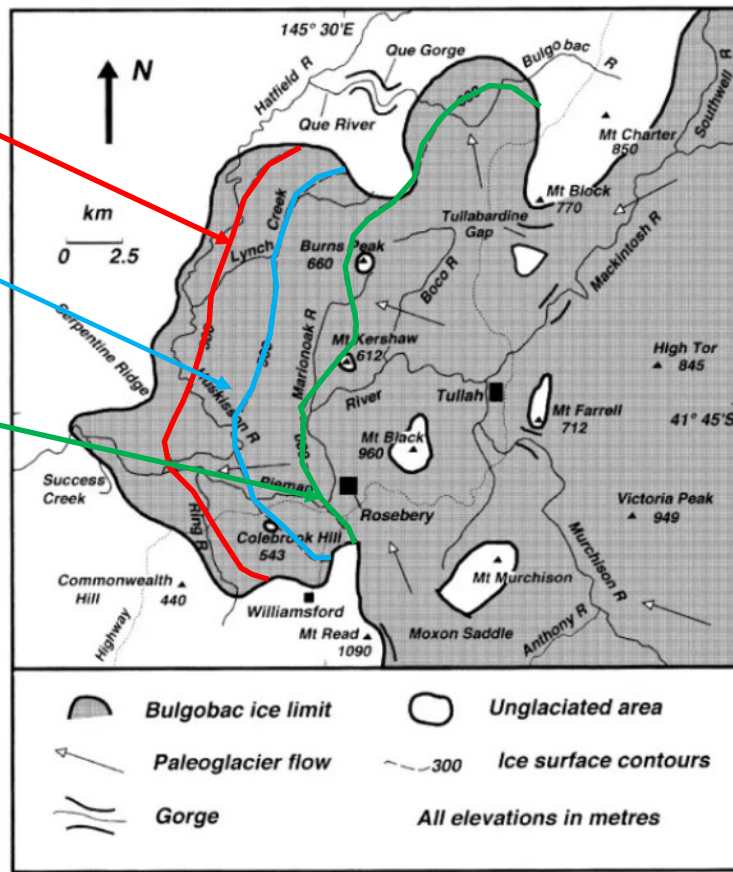
Figure from Augustinus, P. 1999. Dating the Late Cenozoic glacial sequence, Pieman River basin, western Tasmania, Australia. Quaternary Science Reviews 18 (1999) 1335-1350



300m \approx 2,500 kN/m²

500m \approx 4,500 kN/m²

600m \approx 5,000 kN/m²



Augustinus, P. 1999. Reconstruction of the Bulgobac Glacial System, Pieman River Basin, Western Tasmania. Australian Geographical Studies, 37(1):24-36



GEM 1.1, 1.2, 1.3, 4.3
 Da, Ea

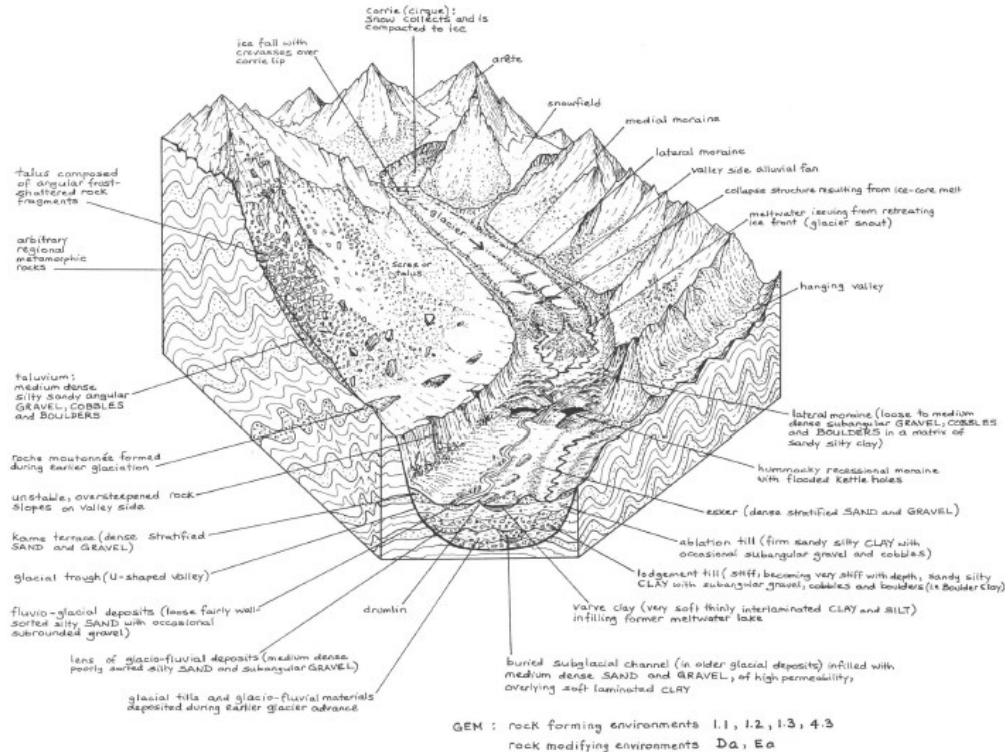


Fig. 29. Glacial valley landforms.

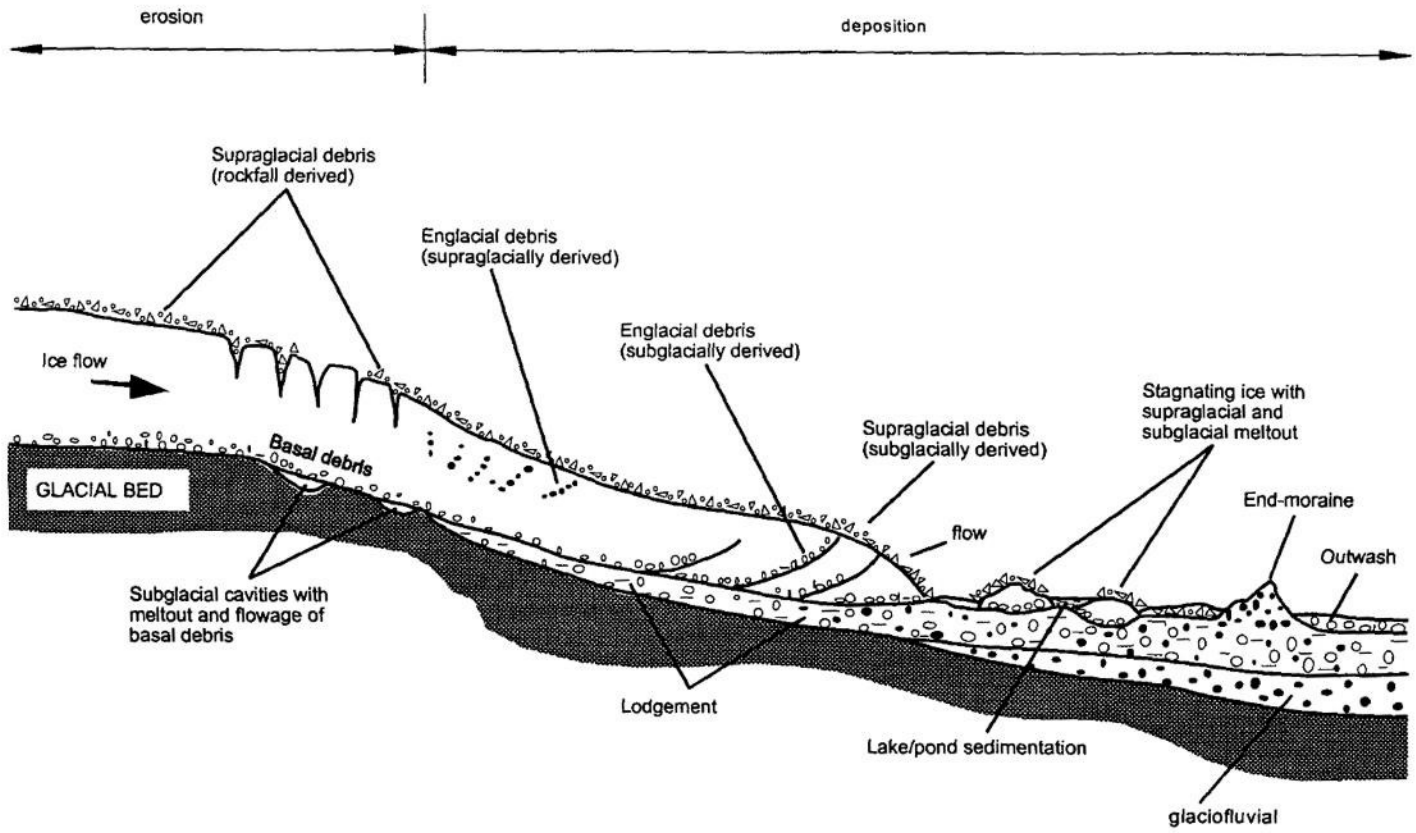
Fookes, P.G. 1997. The First Glosop Lecture. Geology for Engineers: the Geological Model, Prediction and Performance. Quarterly Journal of Engineering Geology, 30, 293-424. The Geological Society.

loose to medium dense angular GRAVEL, COBBLES and BOULDERS in a matrix of sandy silty clay)


recessional moraine
kettle holes

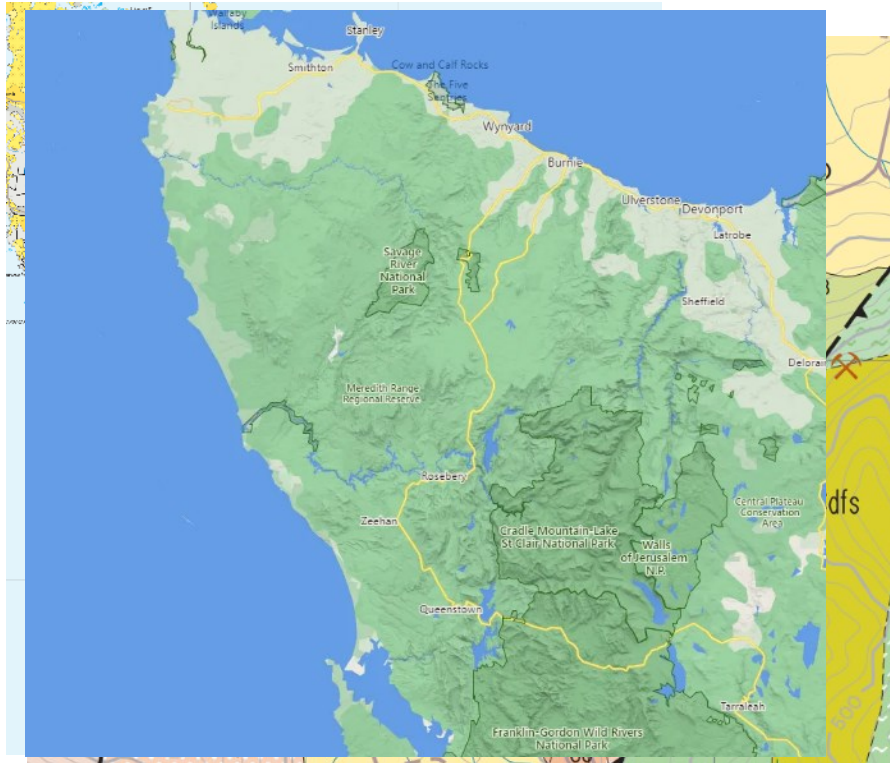
(firm sandy silty SAND and GRAVEL)

(firm sandy silty CLAY with cobbles)

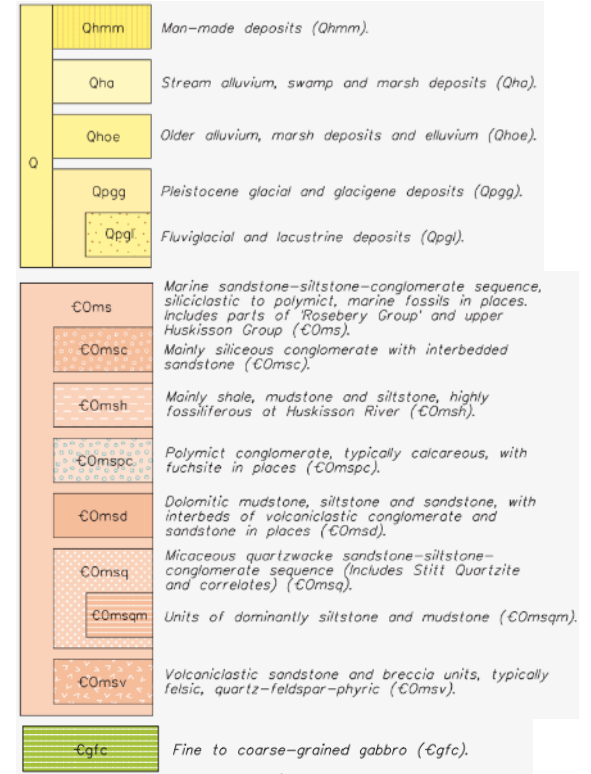


CIRIA C504

- 
- Variable and heterogenous – vertically and laterally
 - Complex groundwater conditions, high/low permeability zones
 - Density, strength dependent on mode of deposition not* stress history
 - Laminated lacustrine clays can have anisotropic strength, consolidation properties
 - Fissured stiff clays (tills/moraine) can have pre-sheared surfaces
 - Shearing of bedrock
 - {Periglacial issues (solifluction, cambering)}

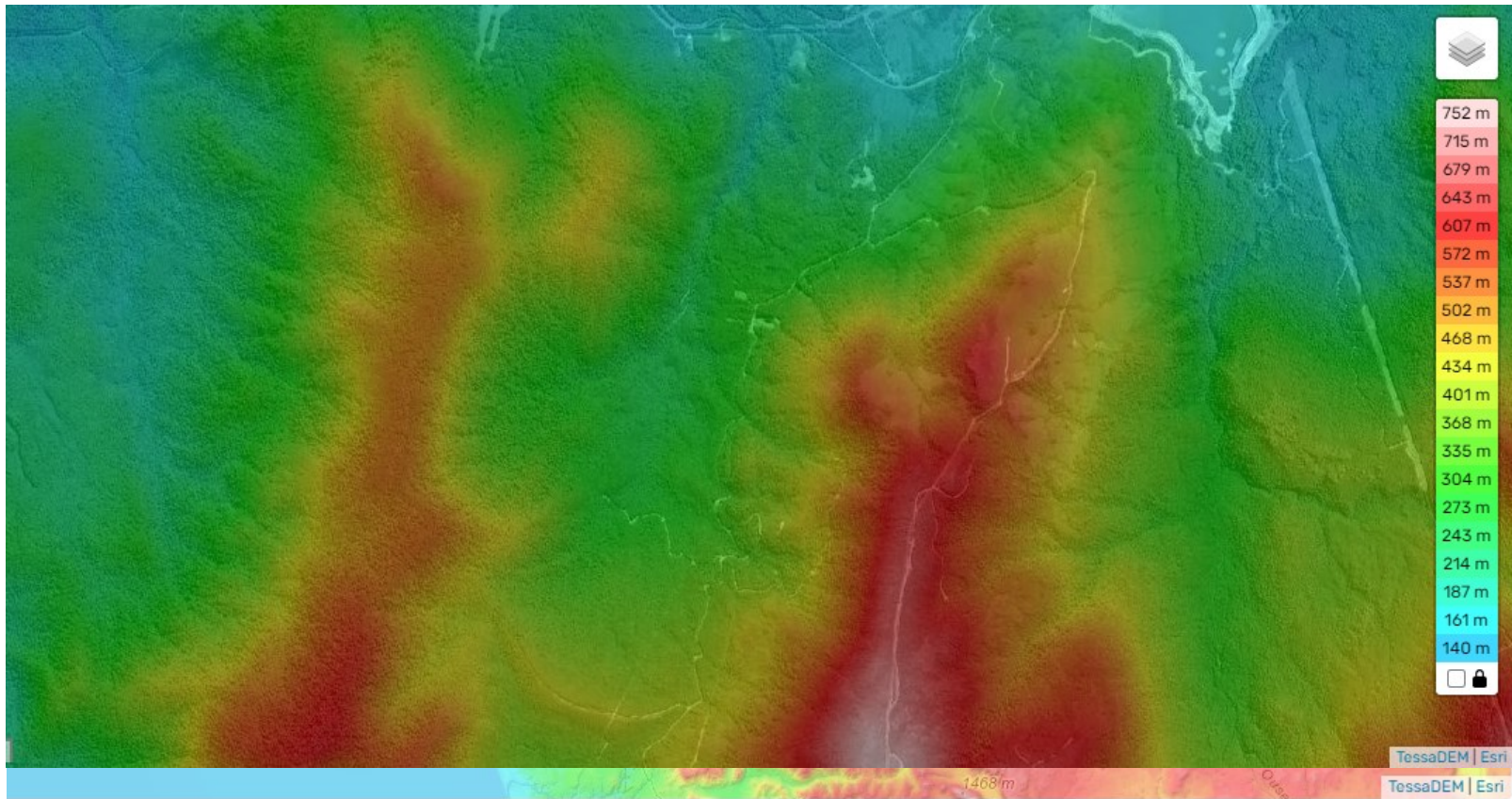


1:500,000 Geological Map of Tasmania – Mineral Resources Tasmania.

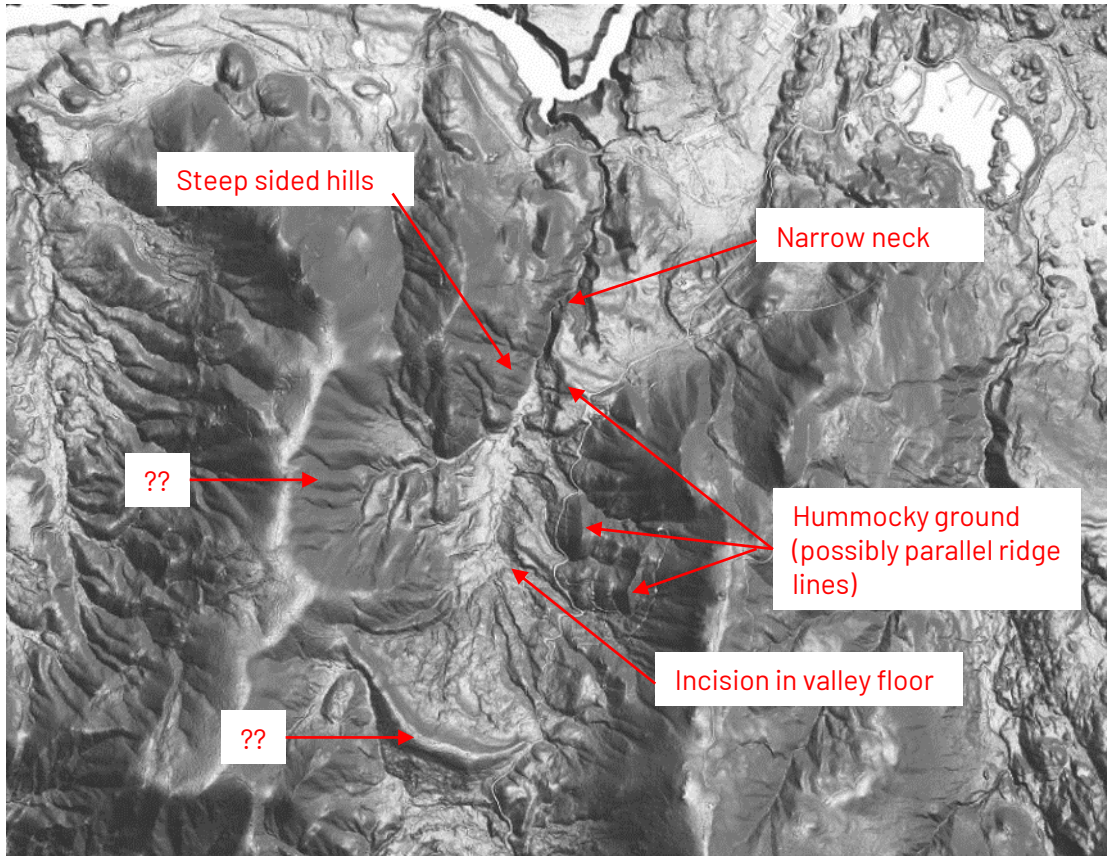


1:25, 000 Geological Map, Sheet 3637 –Mineral Resources Tasmania

Site Context – Location & Geology

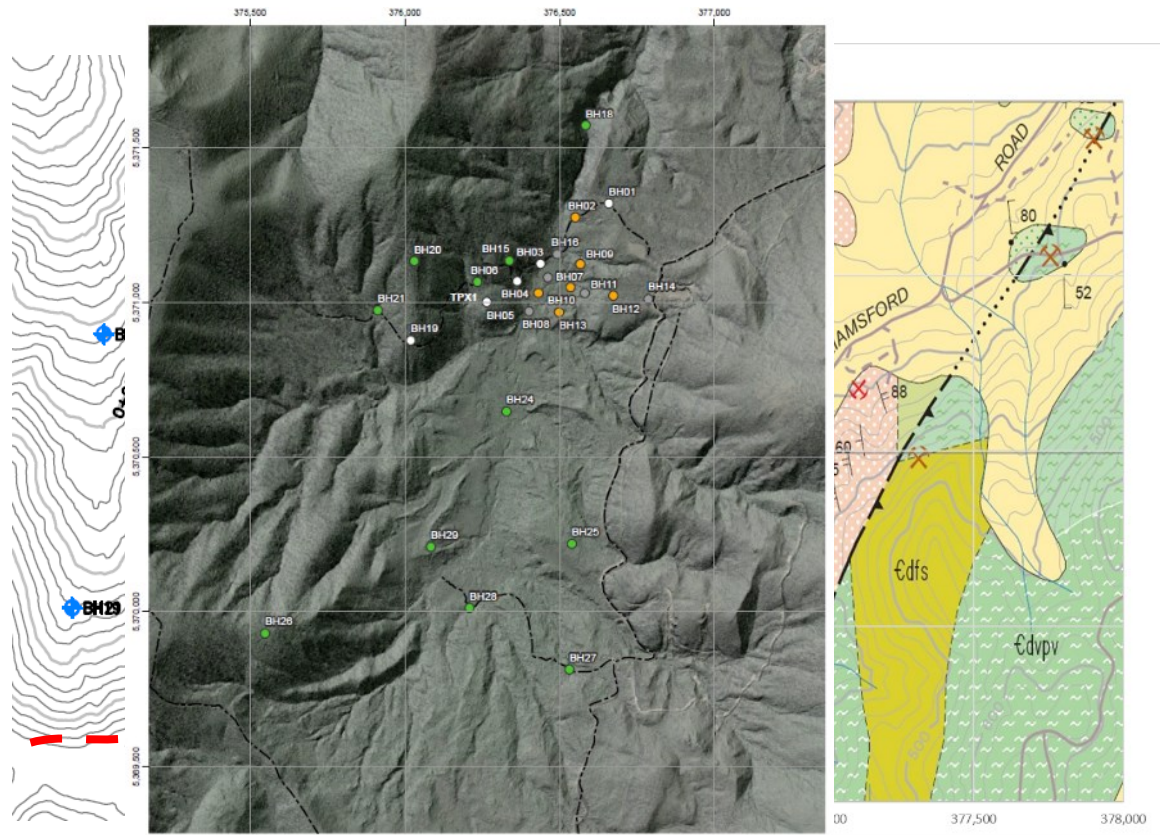


Site Context - Topography



Shaded relief map - Mineral Resources Tasmania

Site Context – Geomorphological features



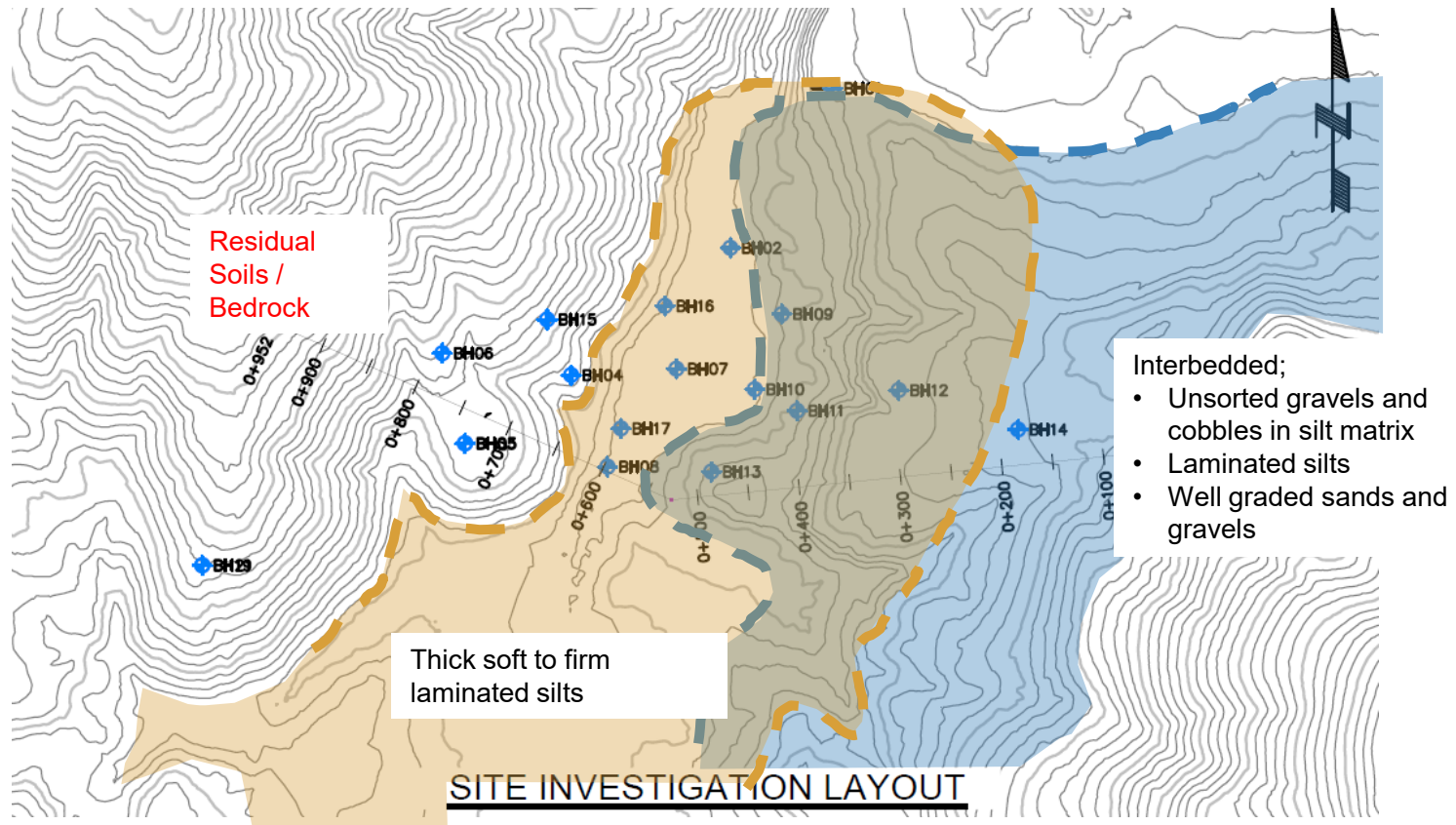
Investigation – layout



Investigation



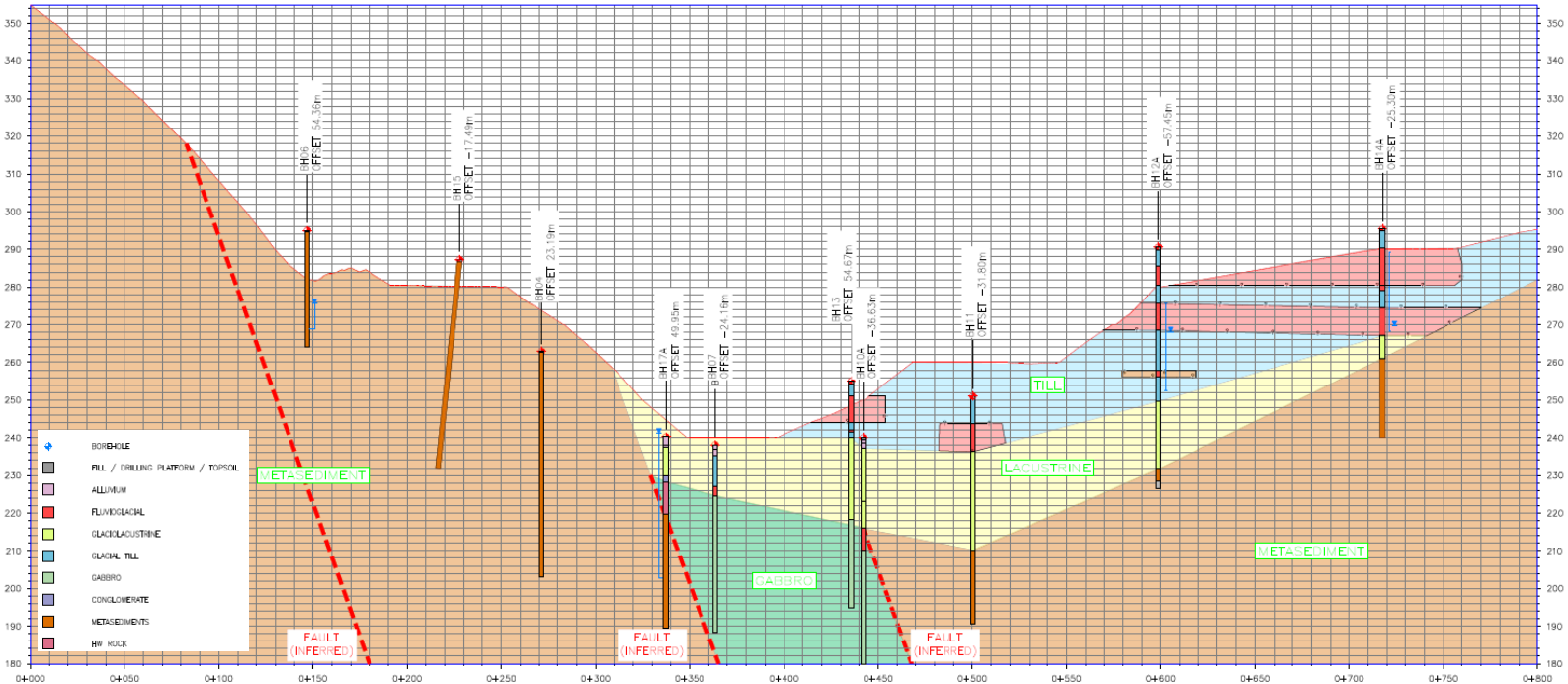
Investigation findings



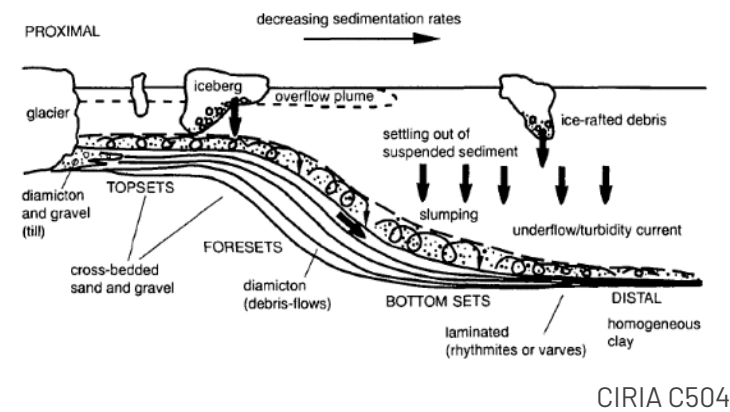
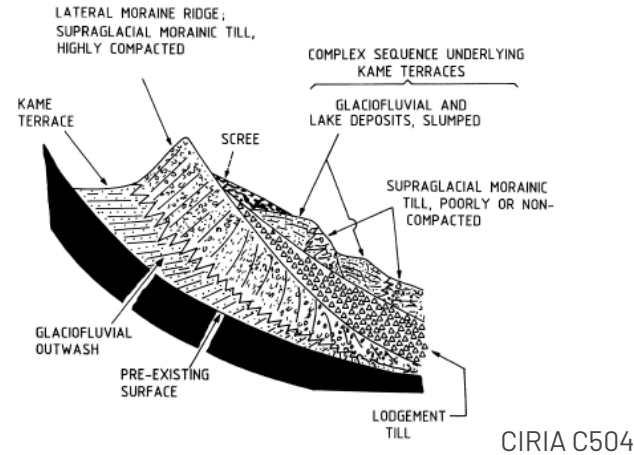
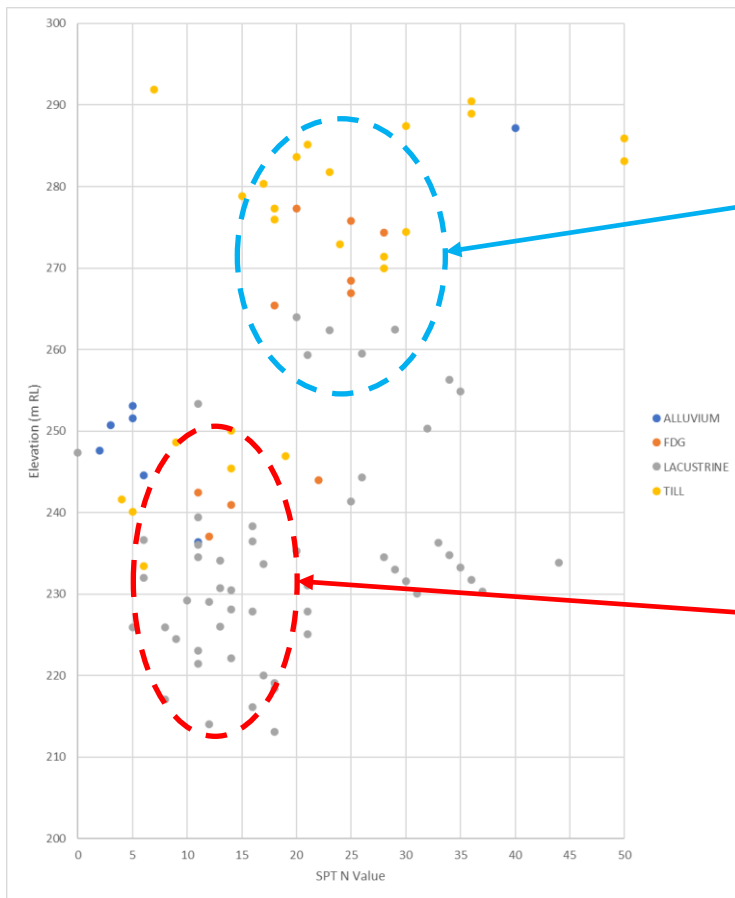


WEST

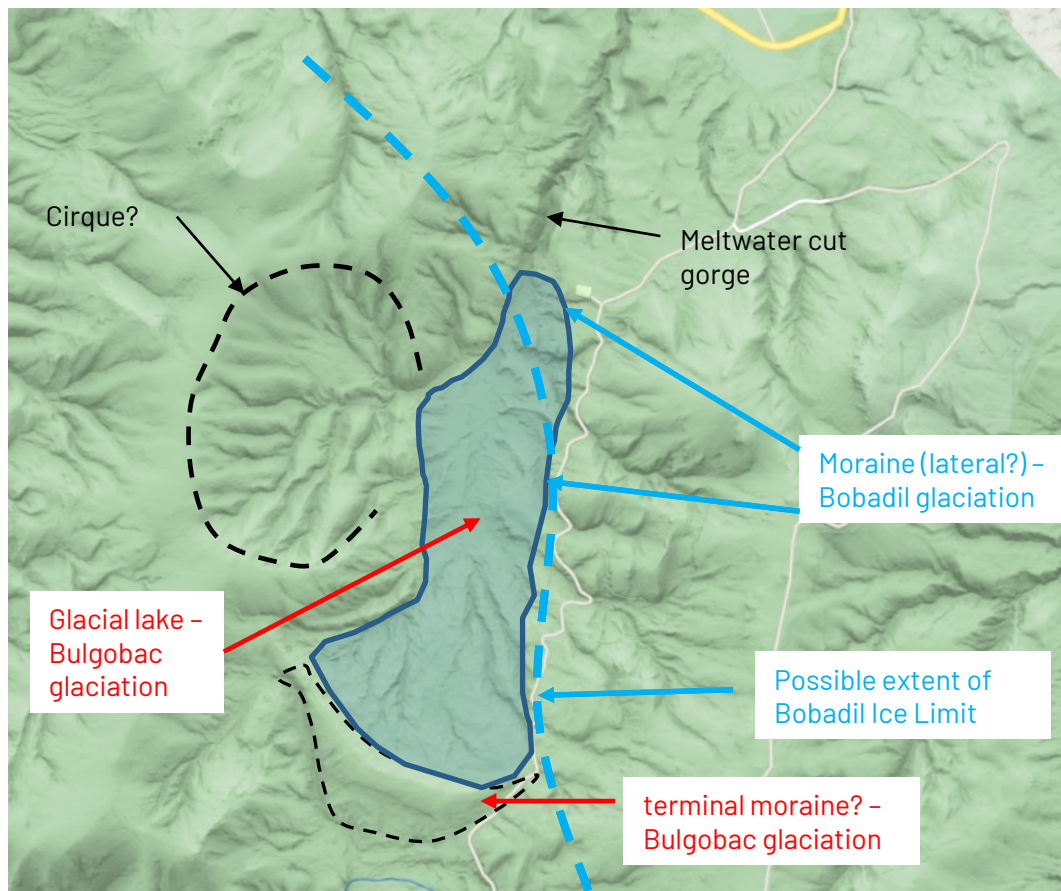
EAST



Investigation Findings



Investigation Findings



Bulgobac Glaciation ~ 783,000 yr

Bobadil Glaciation ~ mid-Pleistocene

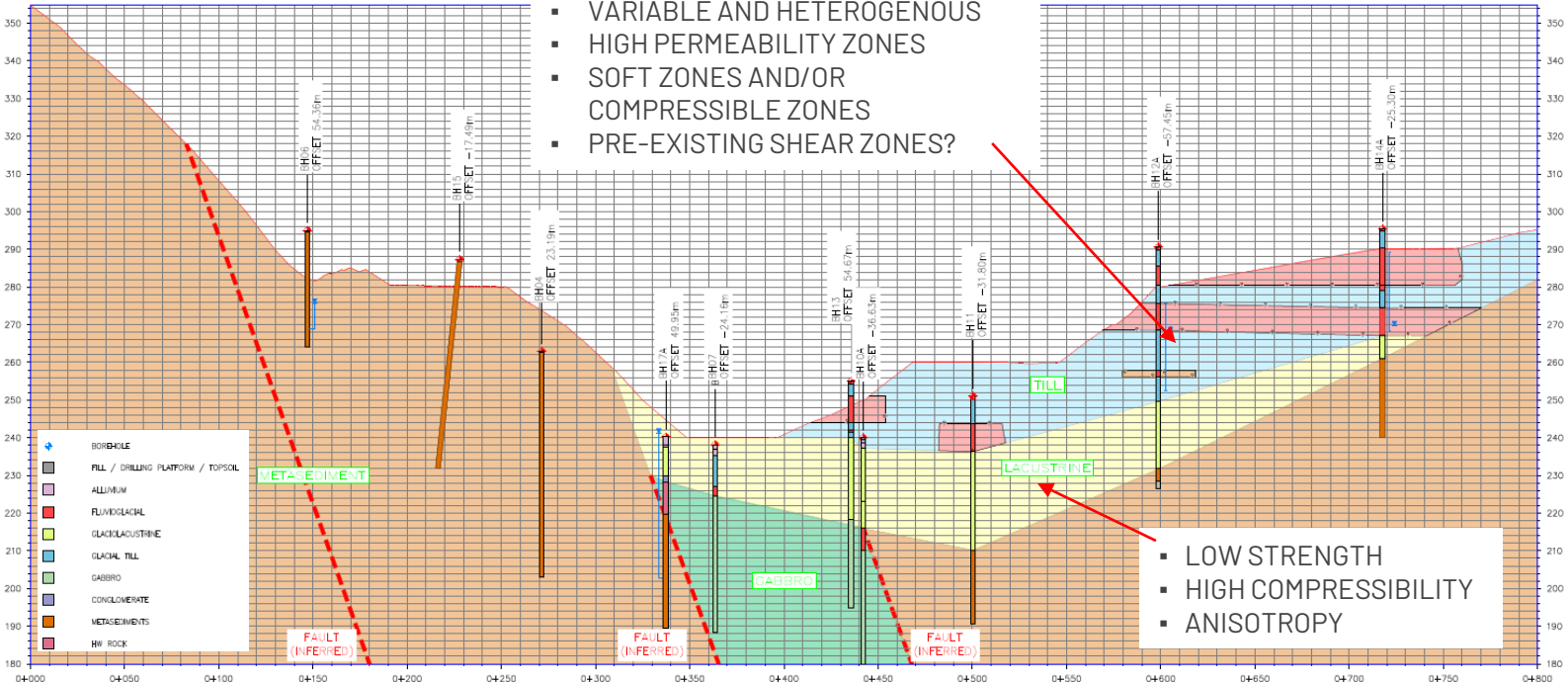
Boco ~ 130,000 yr

Tying it all together



WEST

EAST



- VARIABLE AND HETEROGENOUS
- HIGH PERMEABILITY ZONES
- SOFT ZONES AND/OR COMPRESSIBLE ZONES
- PRE-EXISTING SHEAR ZONES?

- LOW STRENGTH
- HIGH COMPRESSIBILITY
- ANISOTROPY

What does it mean?



THANKS!

Any questions?

Acknowledgements

- MMG
- KCB
- Rhona Cartwright



Platinum
member





- Augustinus, P. 1999. Dating the Late Cenozoic glacial sequence, Pieman River basin, western Tasmania, Australia. *Quaternary Science Reviews* 18 (1999) 1335-1350
- Augustinus, P. 1999. Reconstruction of the Bulgobac Glacial System, Pieman River Basin, Western Tasmania. *Australian Geographical Studies*, 37(1):24-36
- CIRIA. 1999. Report C504 Engineering in Glacial Tills. London
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- Mineral Resources Tasmania, 1:500,000 Geological Map of Tasmania.
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References