

Leighton Asia, India and Offshore C822 Technical Site Visit - Pat Heung Site

with GSL Hong Kong Regional Group

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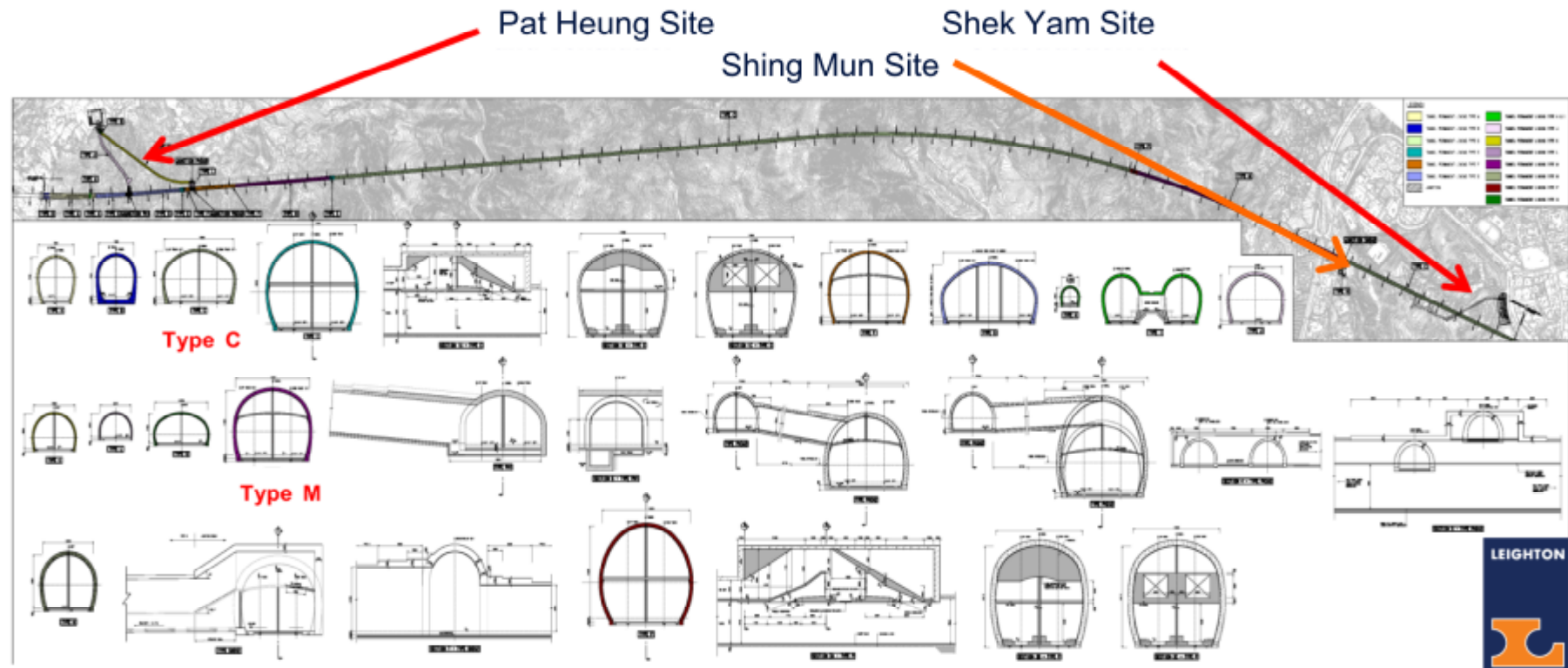
Part I

- Project scope



Scope

- over 7.7 km twin-track single bore main tunnel plus
 - about 2 km adits
 - a 80 m deep shaft for emergency access point (EPA)
 - 2 ventilation buildings (VB4 and VB5)
 - permanent lining
- drill & blast



Shek Yam Site

- Portal
- Temporary construction adit



Shek Yam Site

- Conveyor system spoil stockpile



crusher and conveyor



conveyor and spoil stockpile

Pat Heung Site

- 4 portals
 - ventilation adit
 - vehicular access adit
 - 2 single track tunnels
- 2 temporary construction adits
- 2 ventilation connection adits
- 1 ventilation building (VB4)



Temporary Access Ramp &
Steel Platform Deck



vehicular access adit (blast door)

Pat Heung Site

- portal site formation
 - slope stabilisation
 - pipe piling
 - natural stream diversion



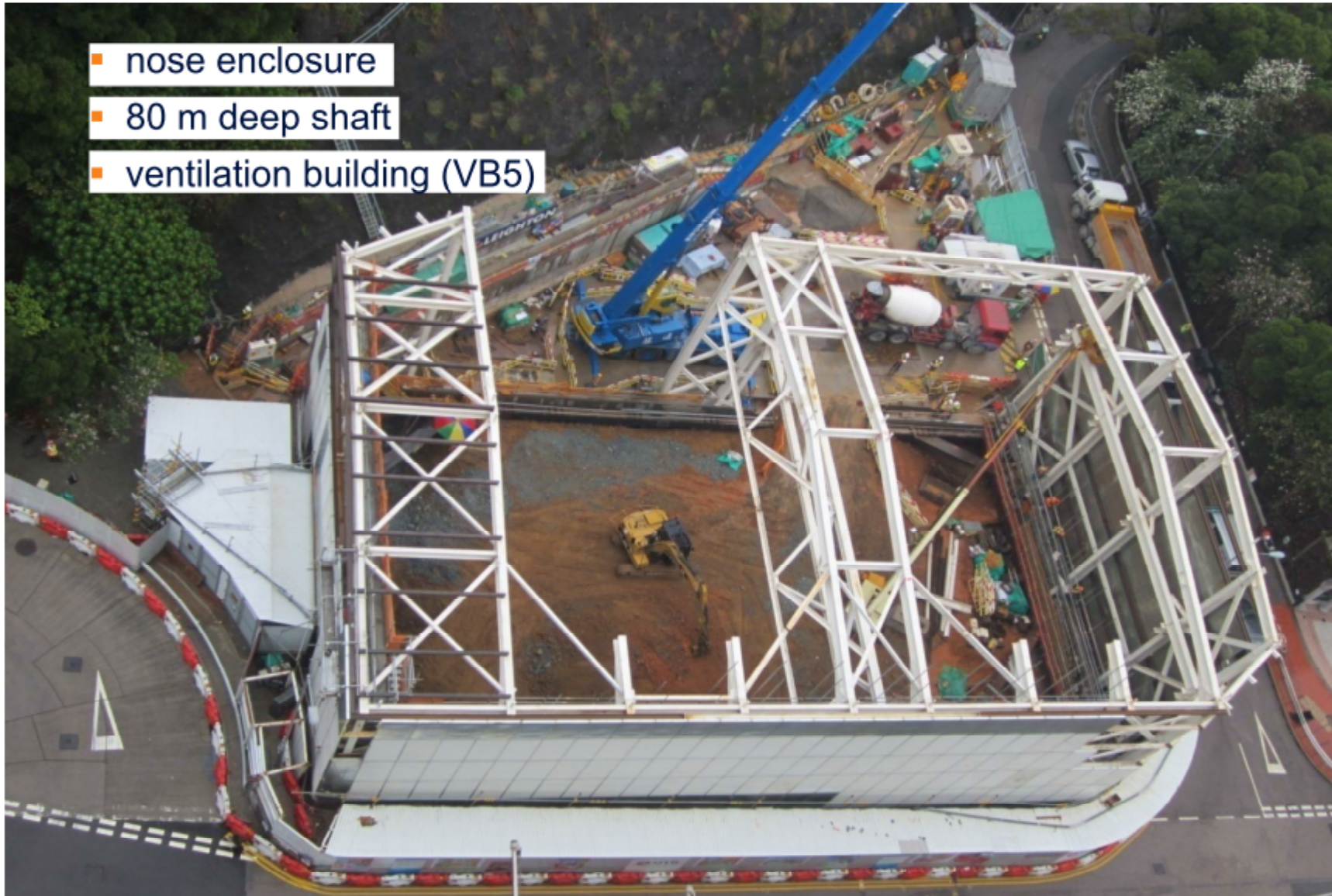
Pat Heung Site

- ventilation building (VB4)
- temporary slope cuttings
- rock slope stabilisation



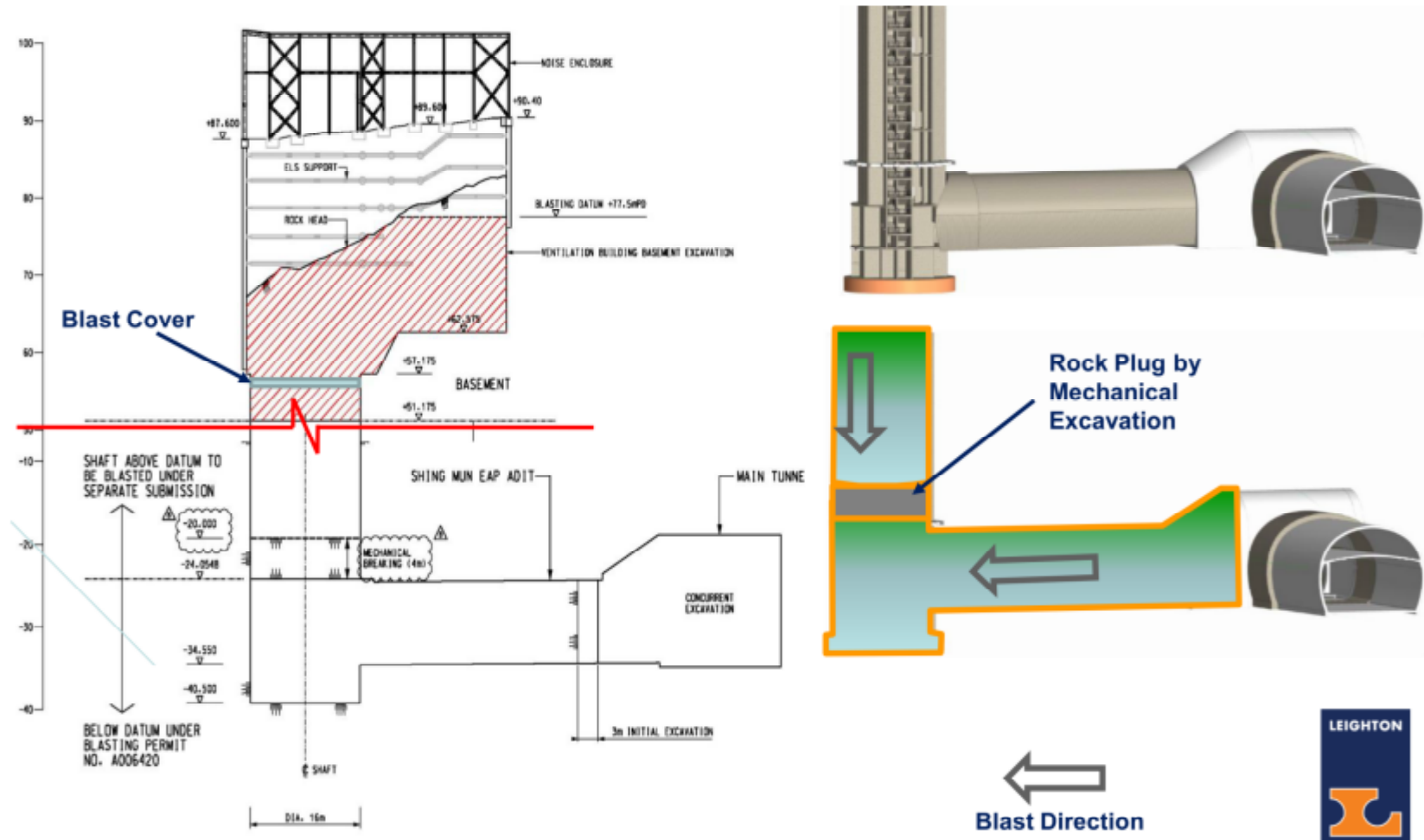
Shing Mun Site

- nose enclosure
- 80 m deep shaft
- ventilation building (VB5)



Shing Mun Site

- ventilation building (VB5)
- EAP adit



Permenant lining



lining formwork shutter



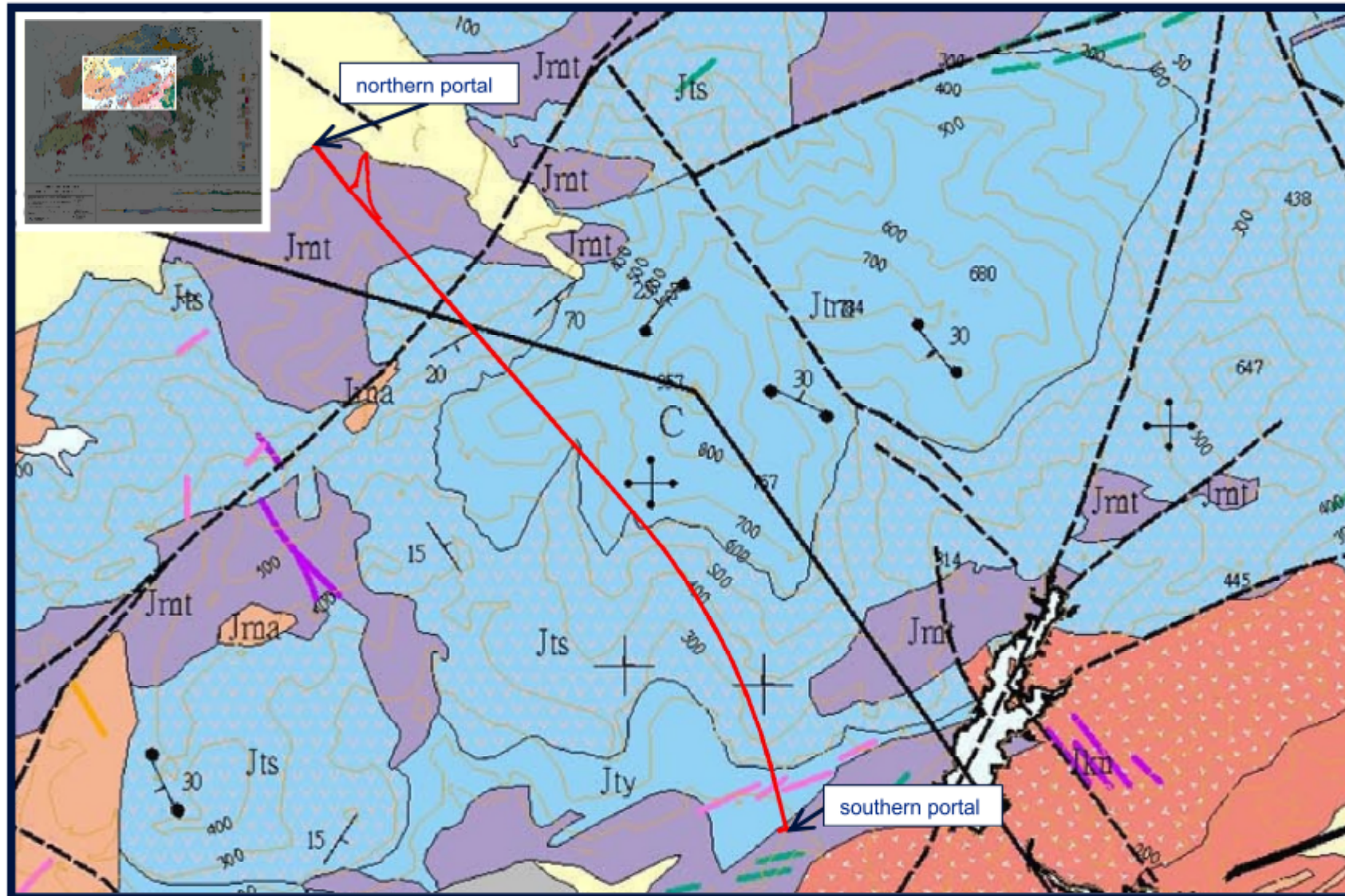
permanent lining completed
with waterproofing

Part II

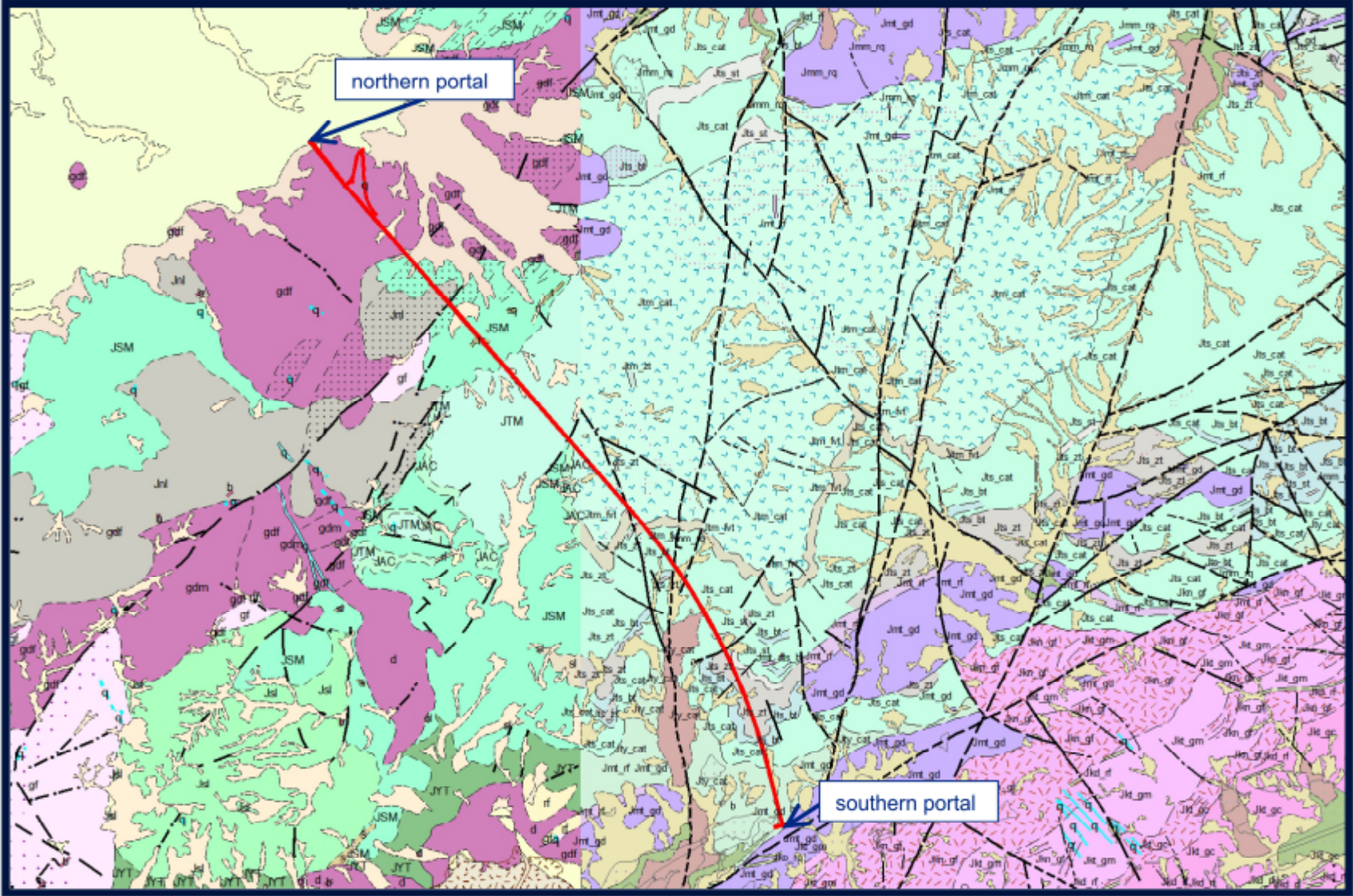
- Desk study



1:100,000 Geological Map



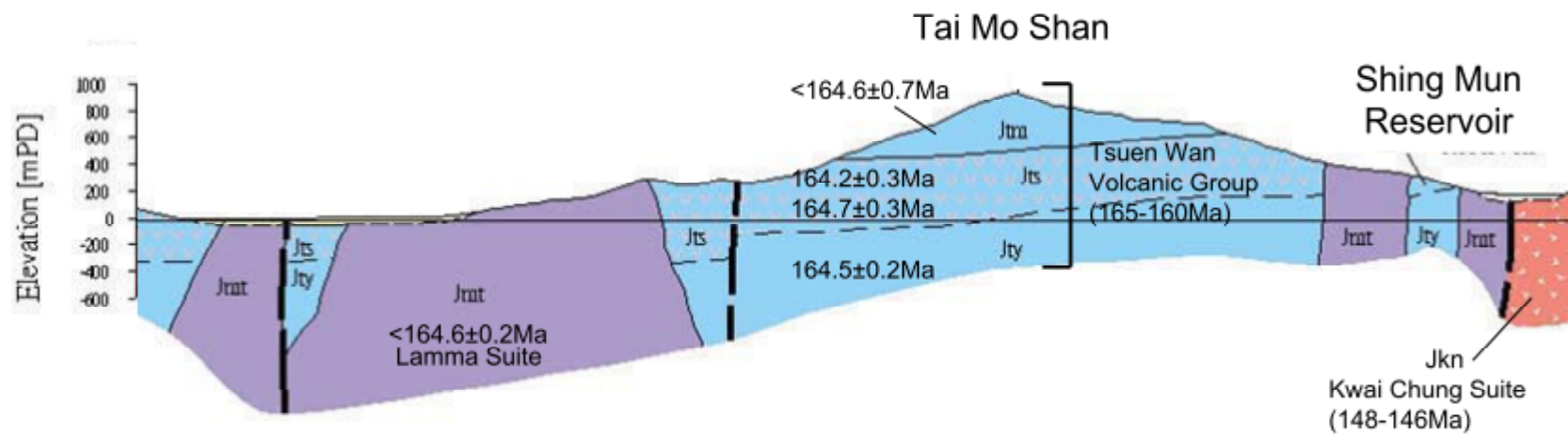
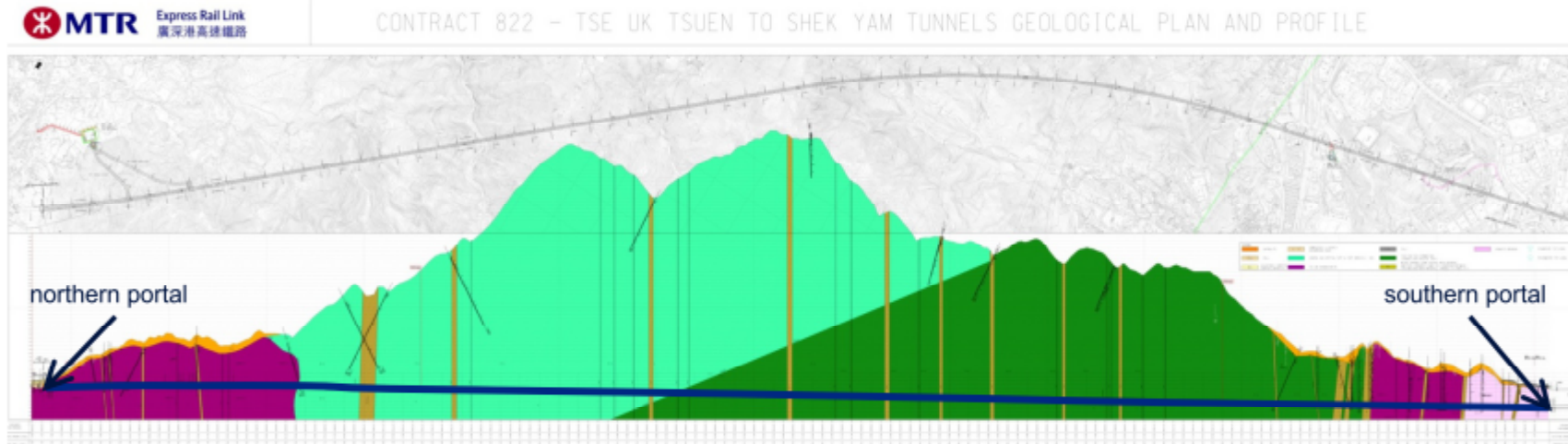
1:20,000 Geological Map



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Geological Section

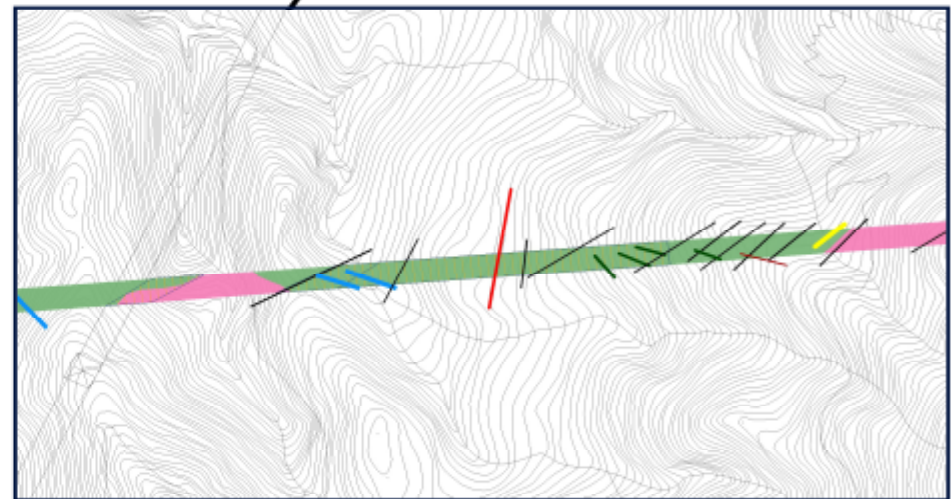
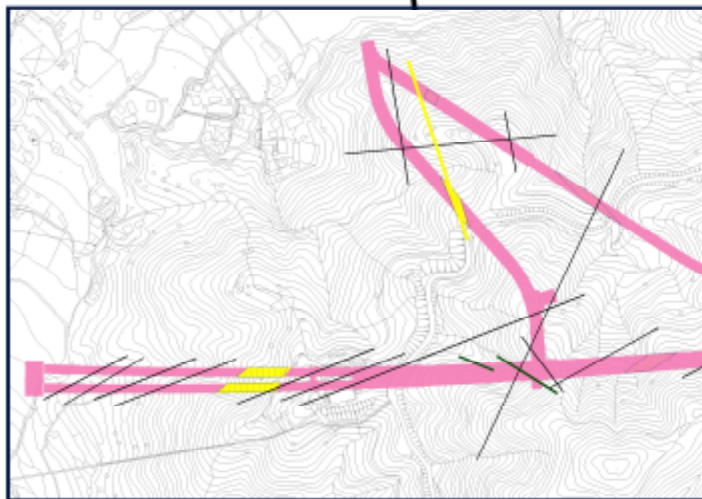
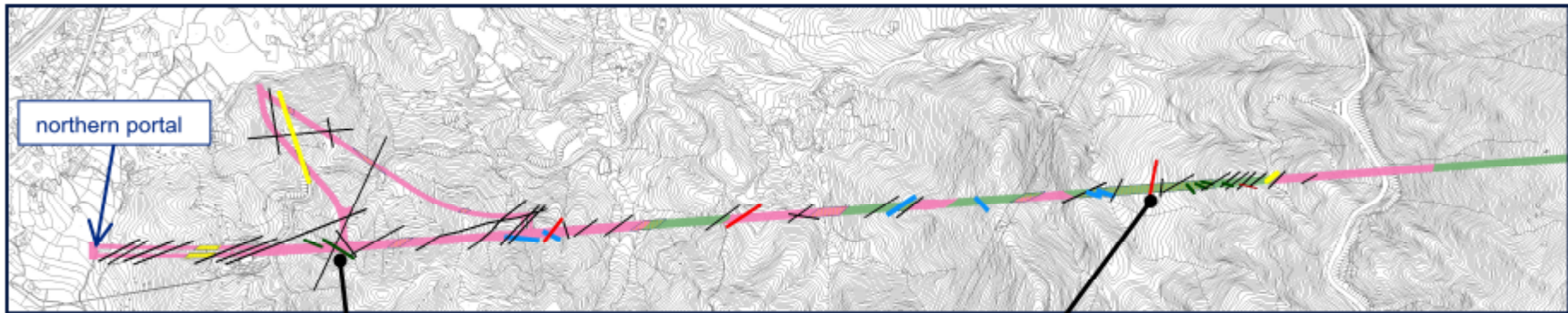


Part III

- Site geology



Site geology



Legend

RockType

- grandiorite
- quartzphyric rhyolite
- tuff

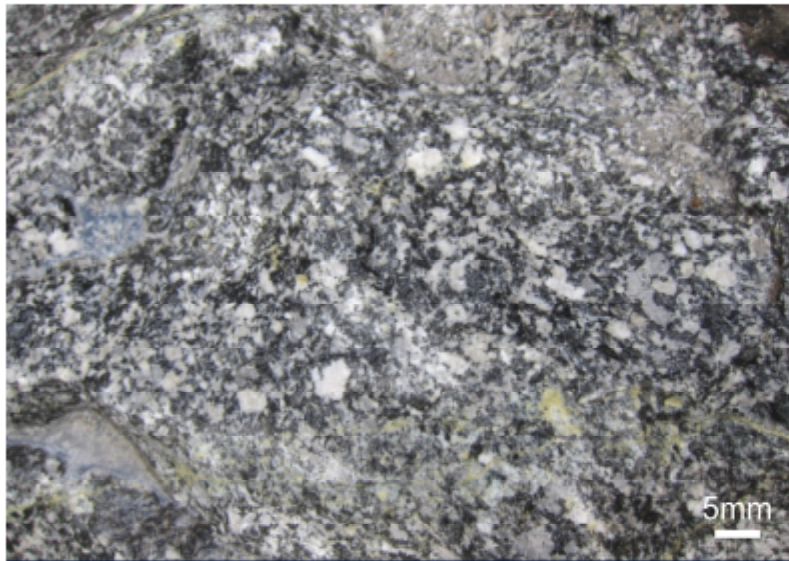
Structural lines

- fault
- mafic dyke
- quartz vein
- shear plane

weak / fracture zones



Intrusive rock



porphyritic granodiorite



aplite

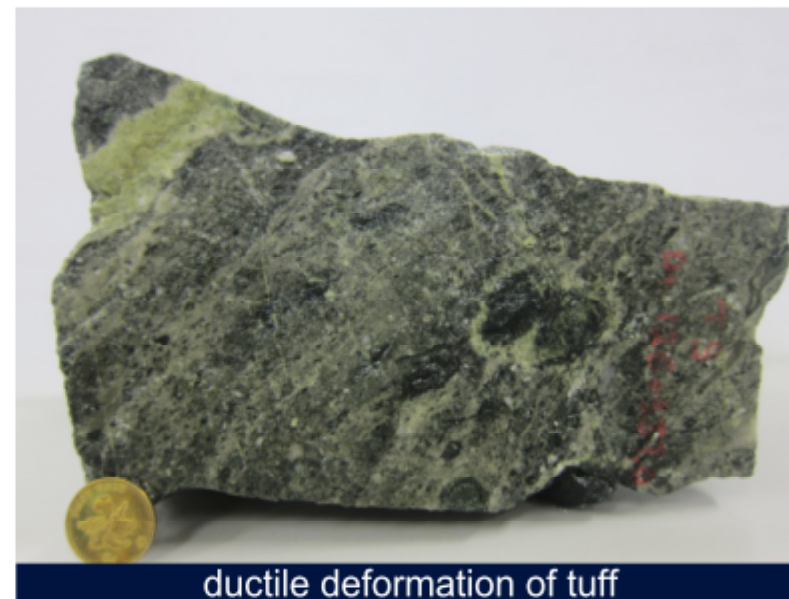


quartzphyric rhyolite

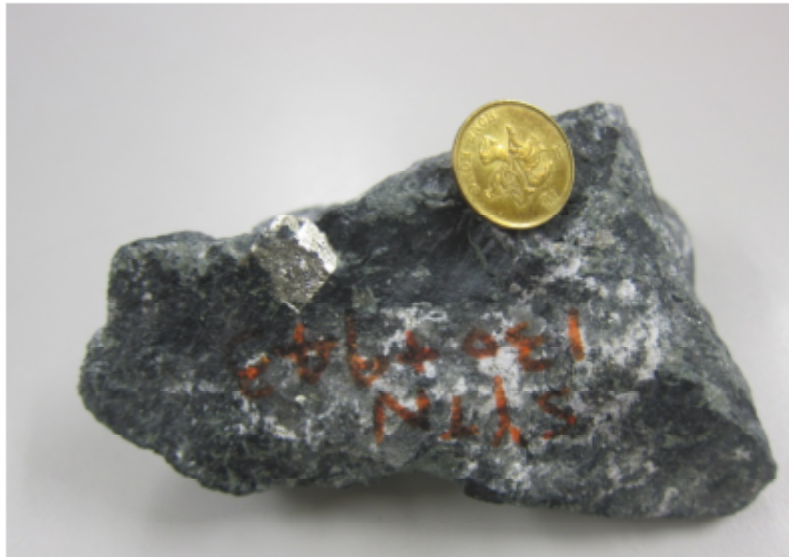


mafic dyke

Volcanic rock



Minerals



pyrite



galena

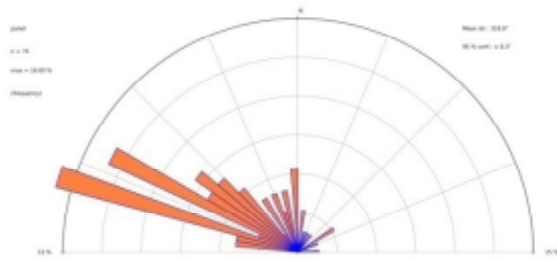


calcite

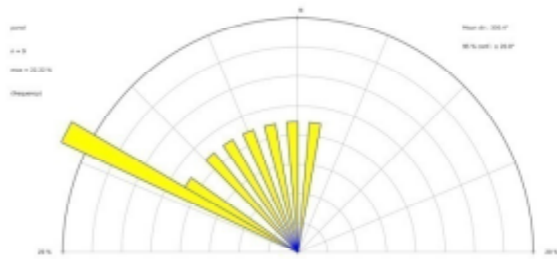
Low grade metamorphism



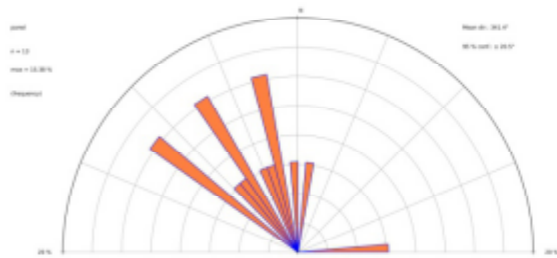
Structural geology



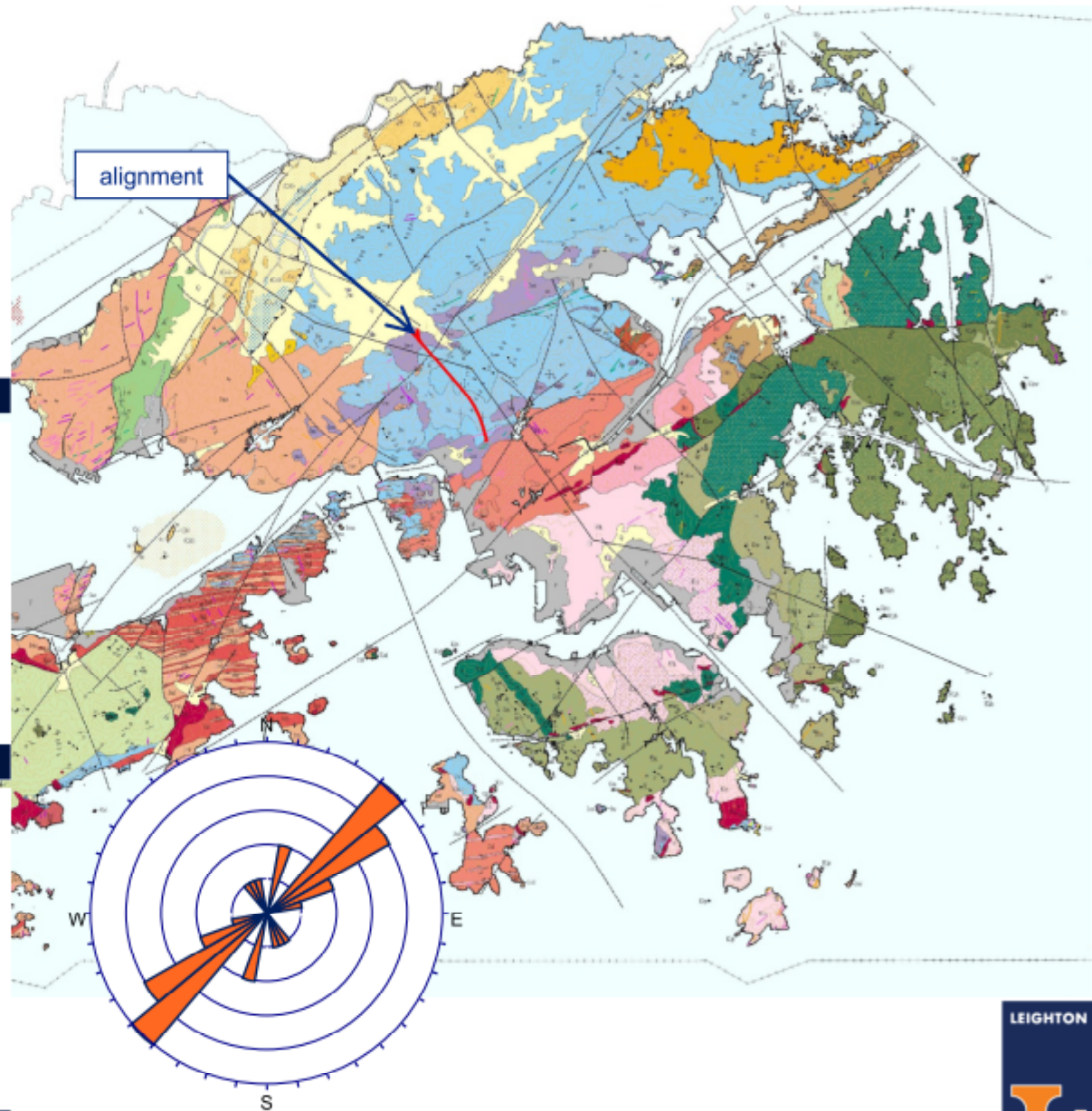
weak zones



dykes



veins



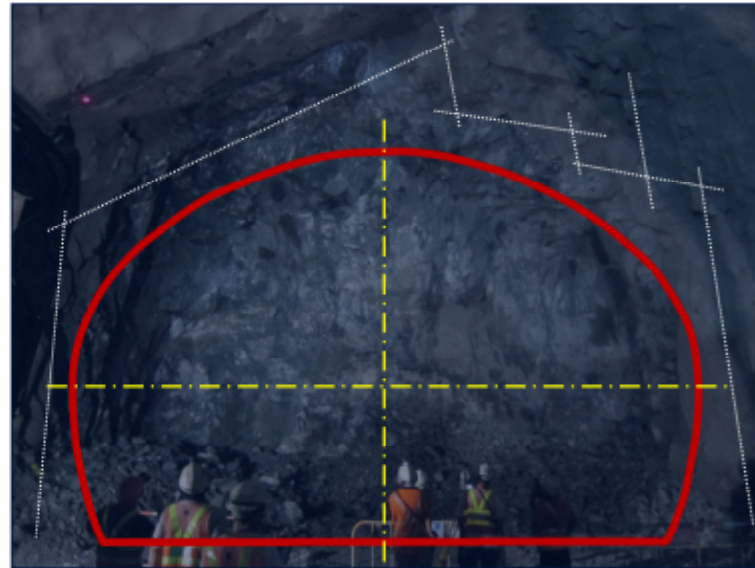
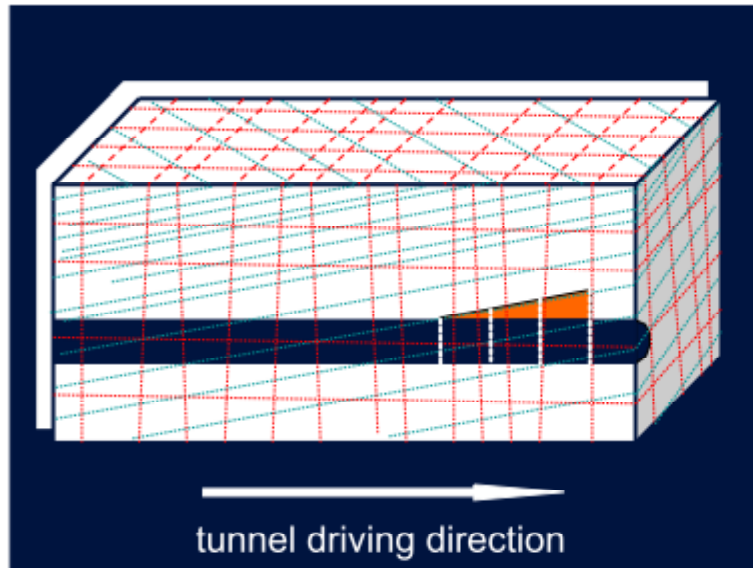
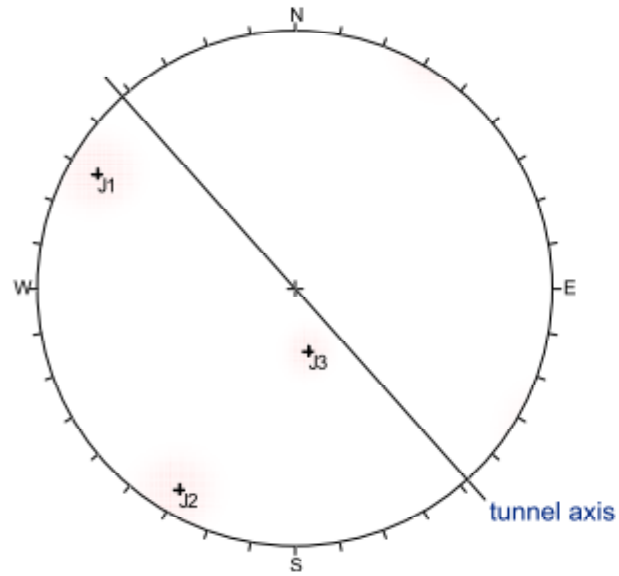
faults from GeoMap

Part IV

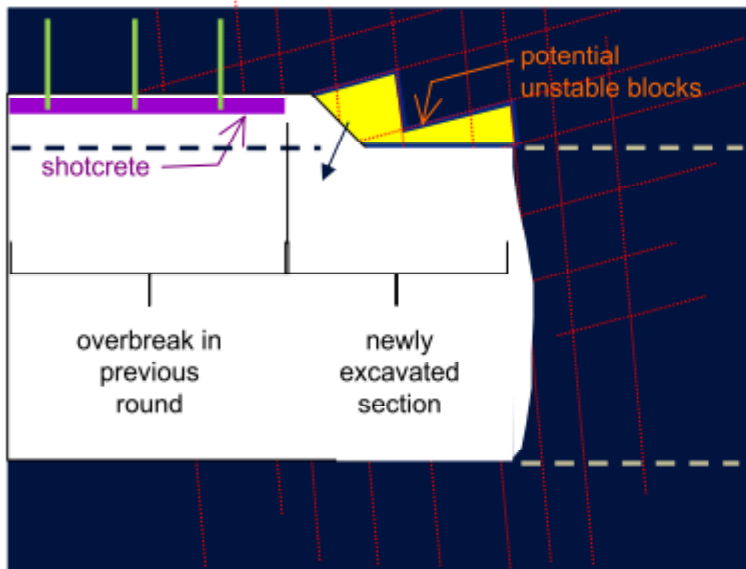
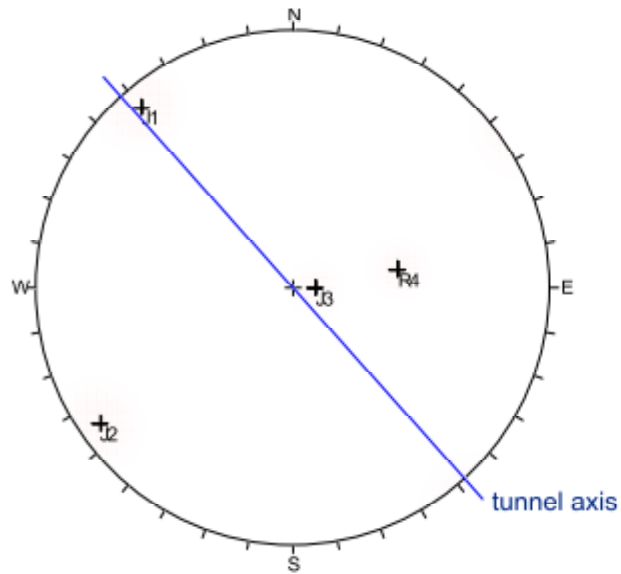
- Geological / Geotechnical challenges



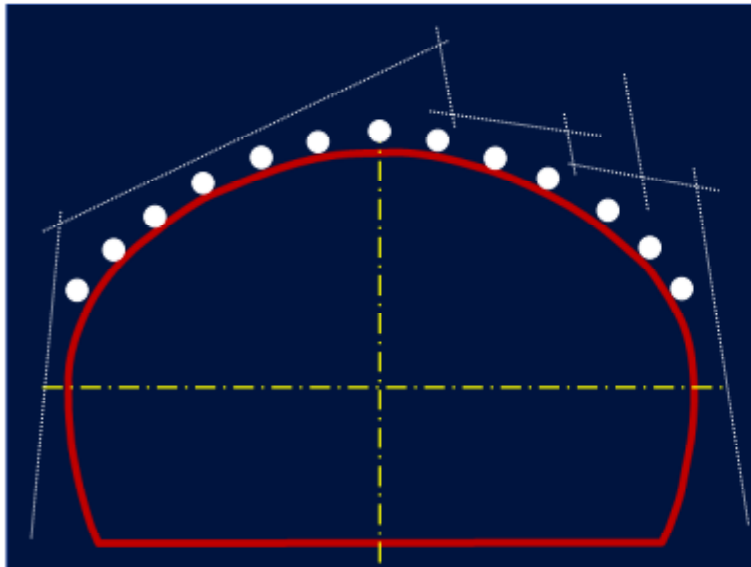
1) Overbreak



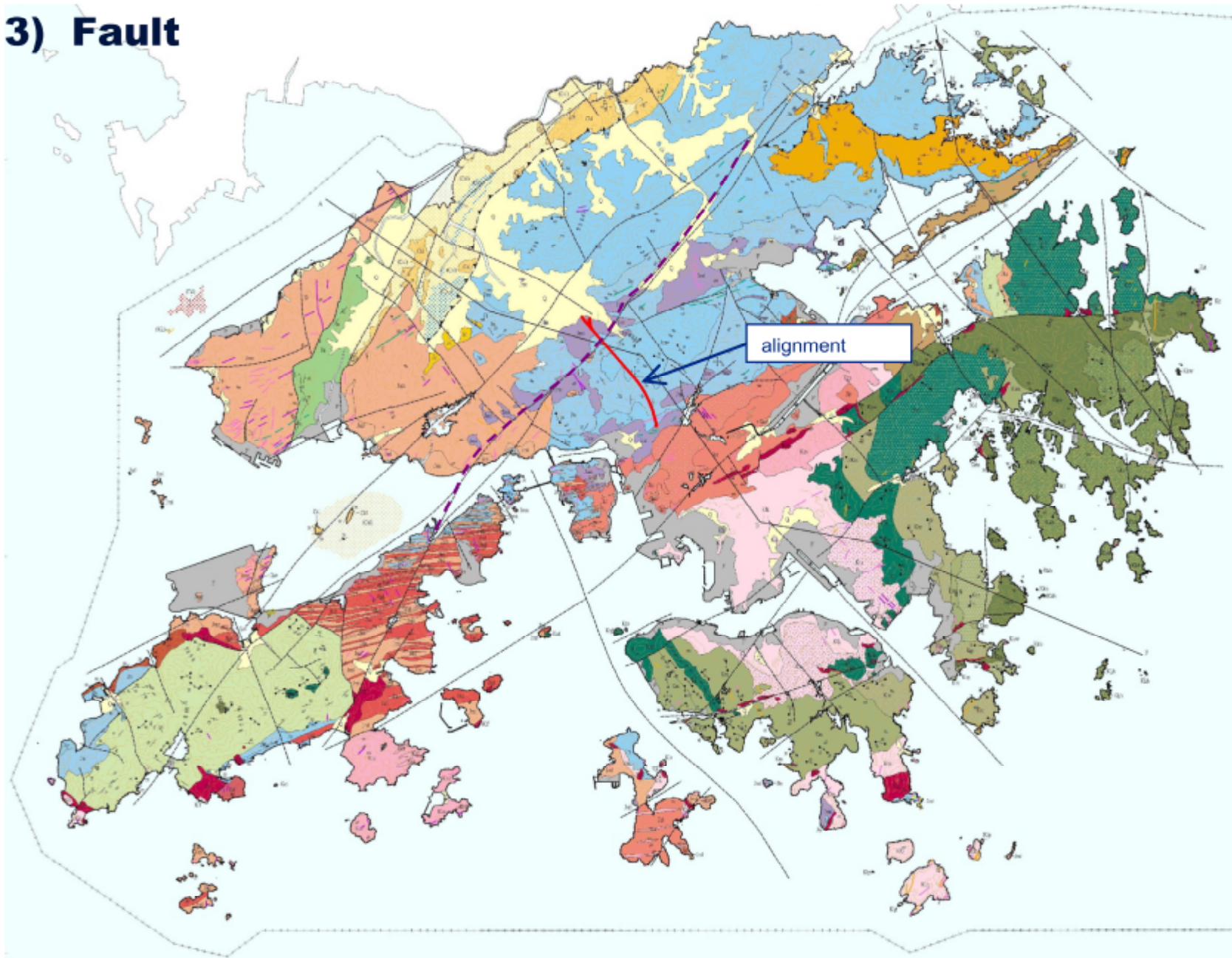
2) Rock fall



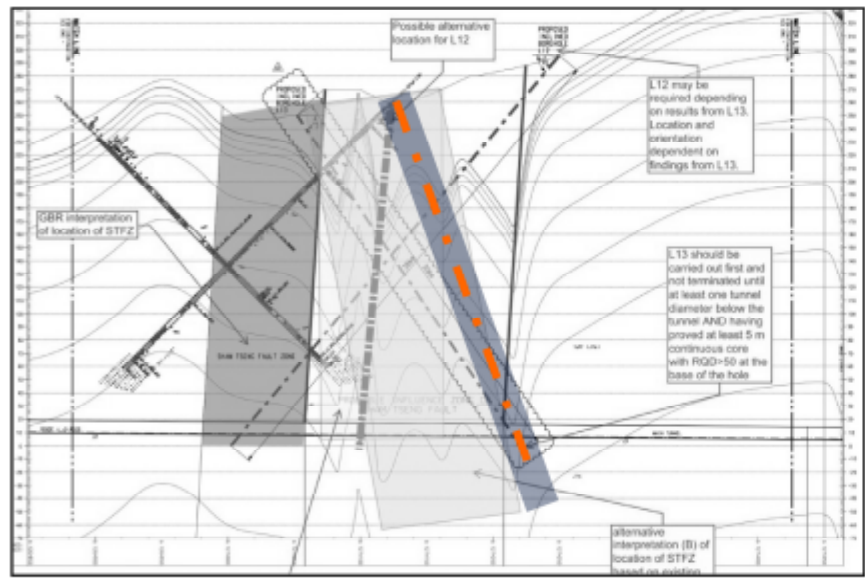
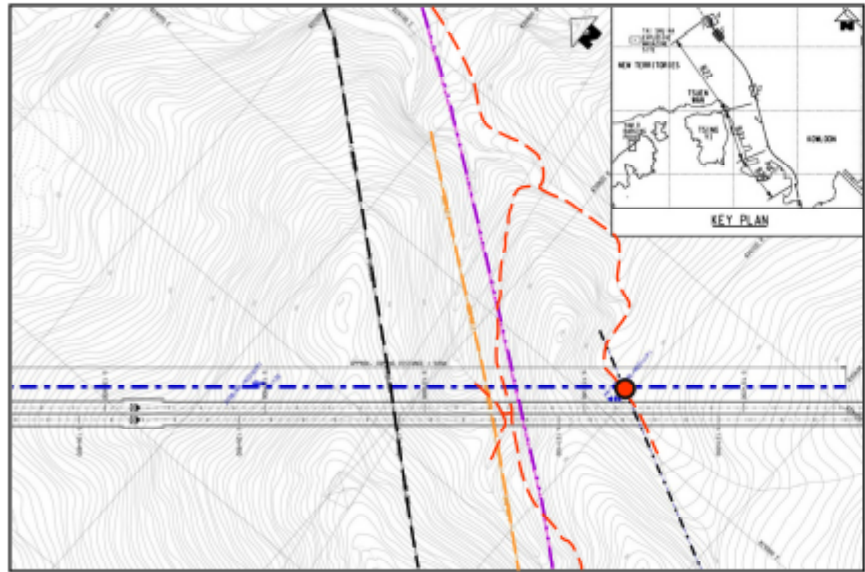
Possible solution for 1) & 2)



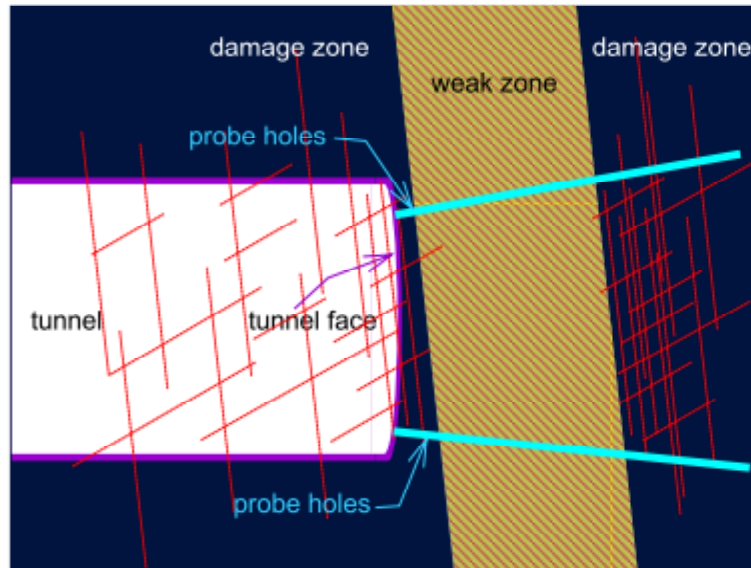
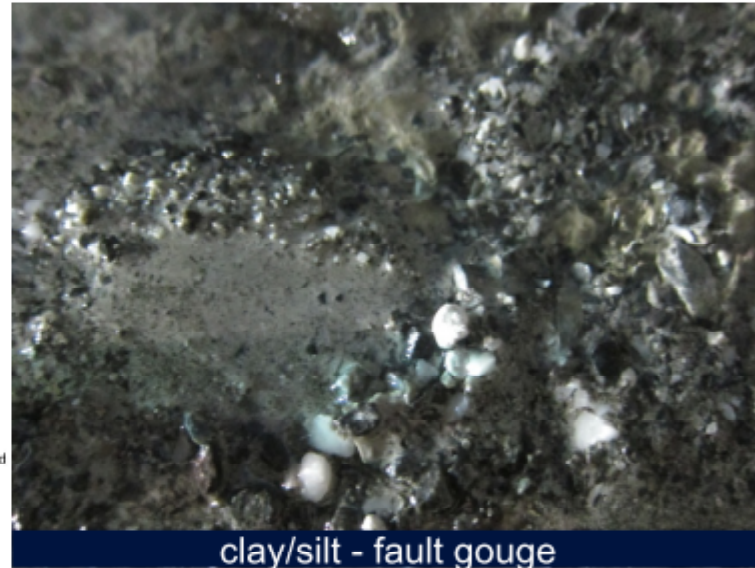
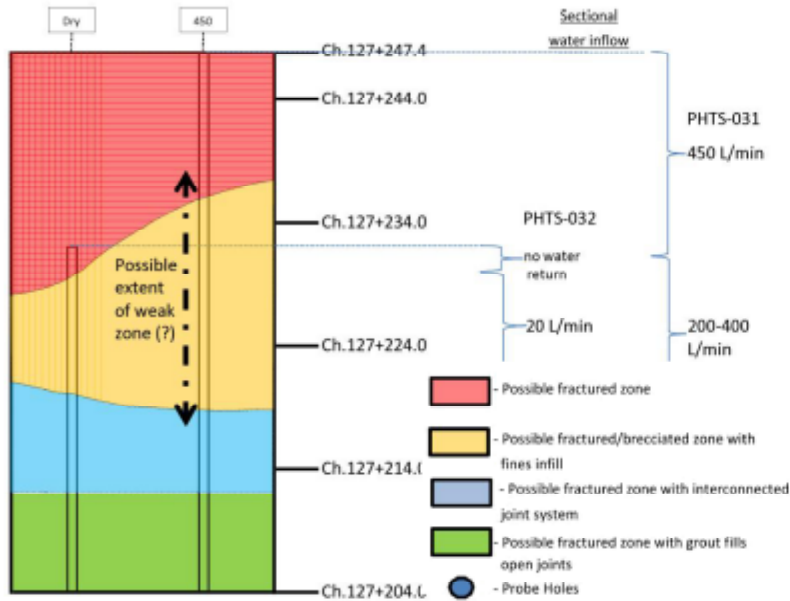
3) Fault



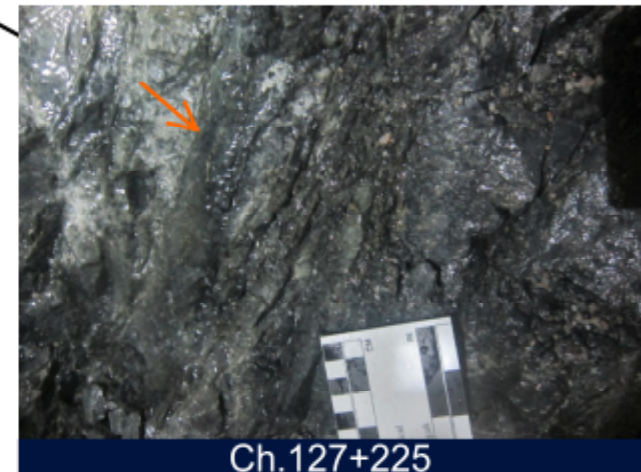
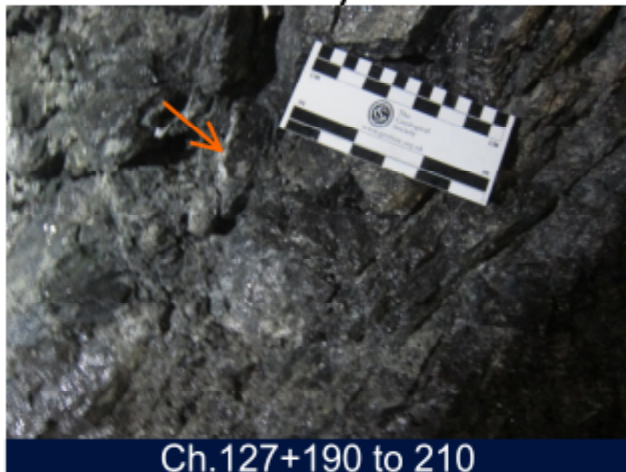
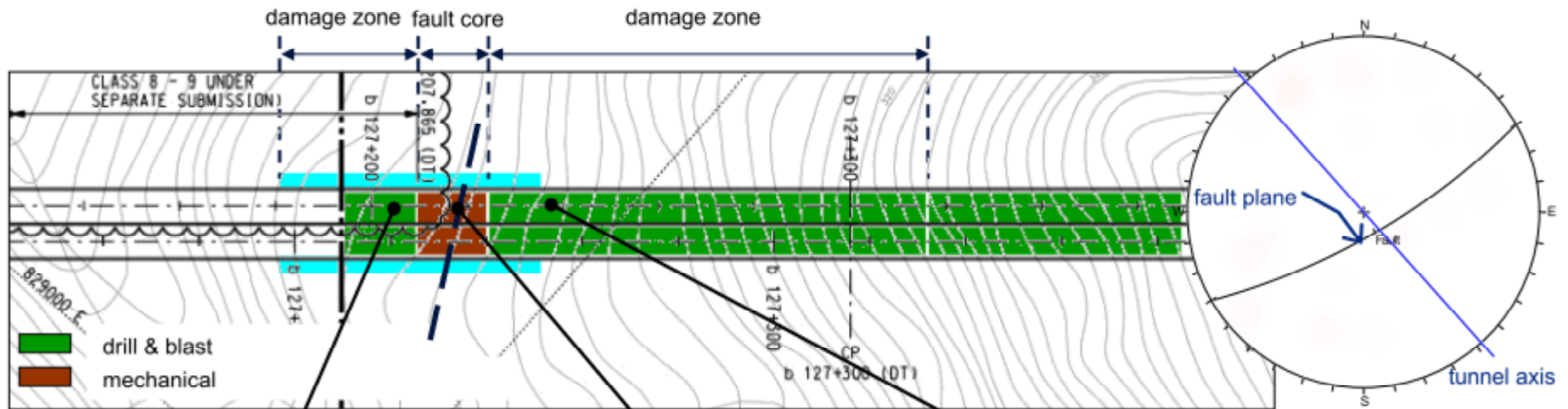
Desk study + Field mapping



Probing



Fault - ground conditions

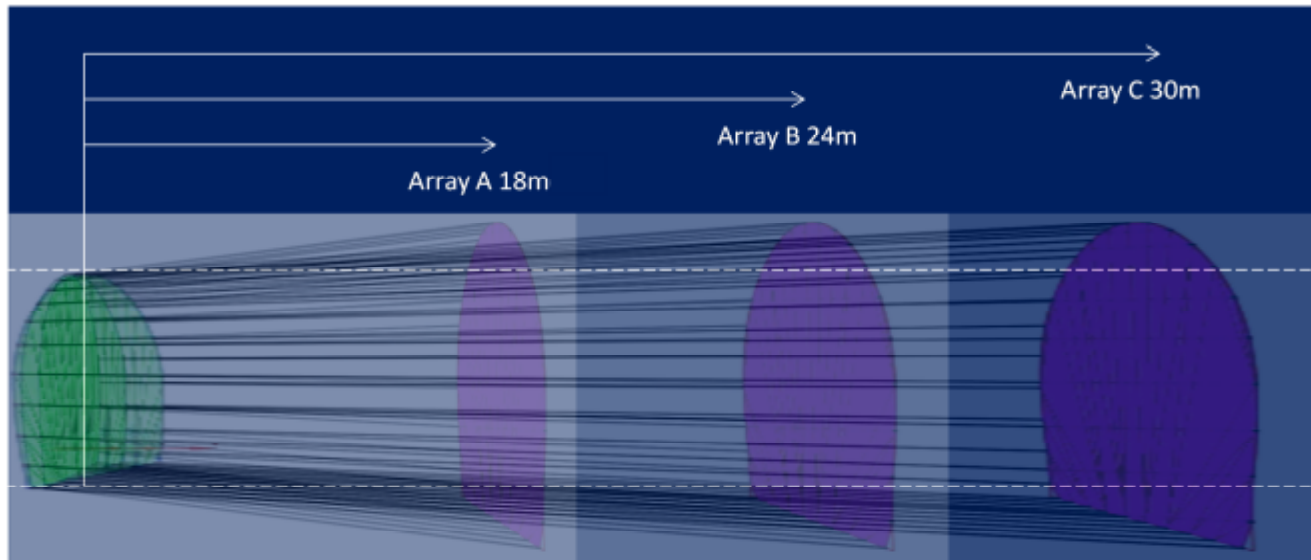
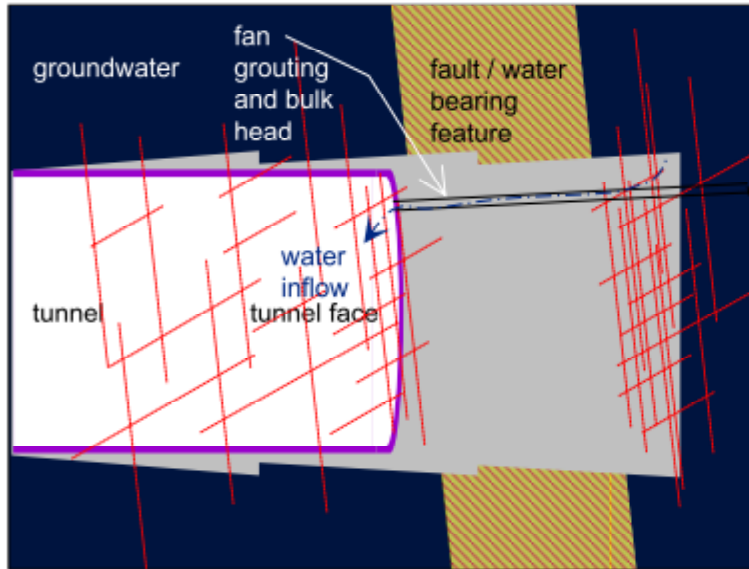


Excavation and Support

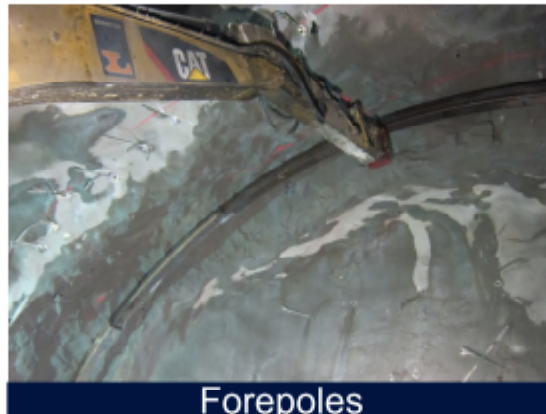
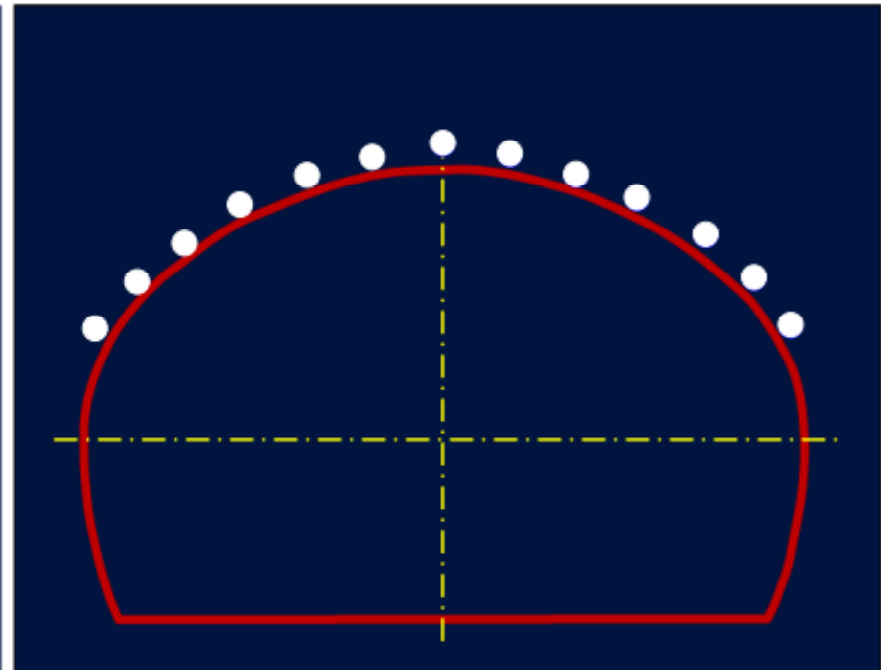
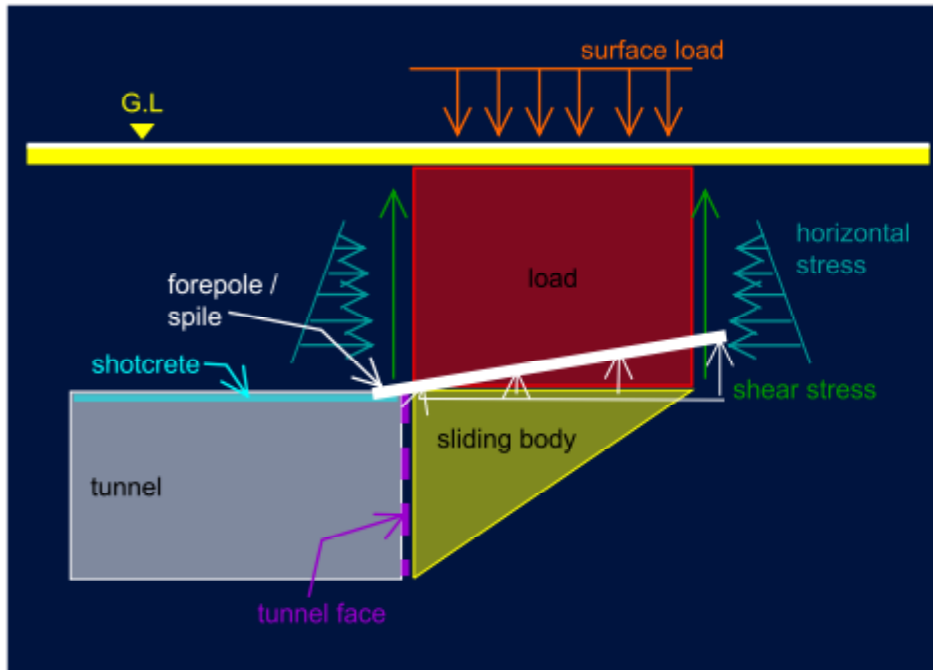
- pre-excavation grouting
- pre-support
- reinforcement
- steel ribs & fibre reinforced shotcrete



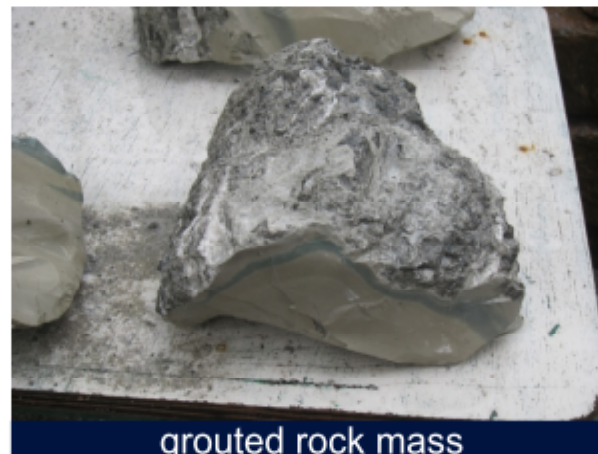
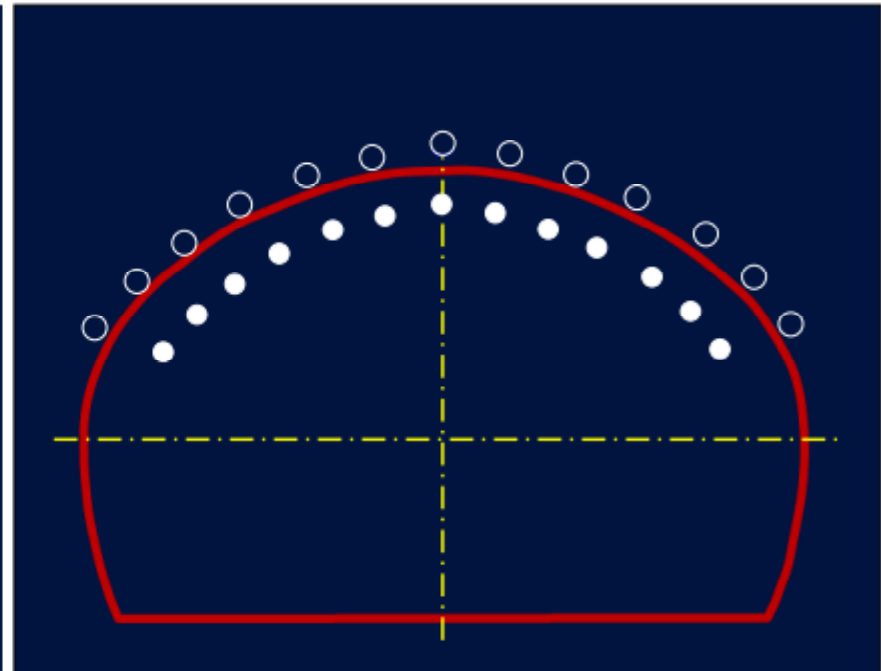
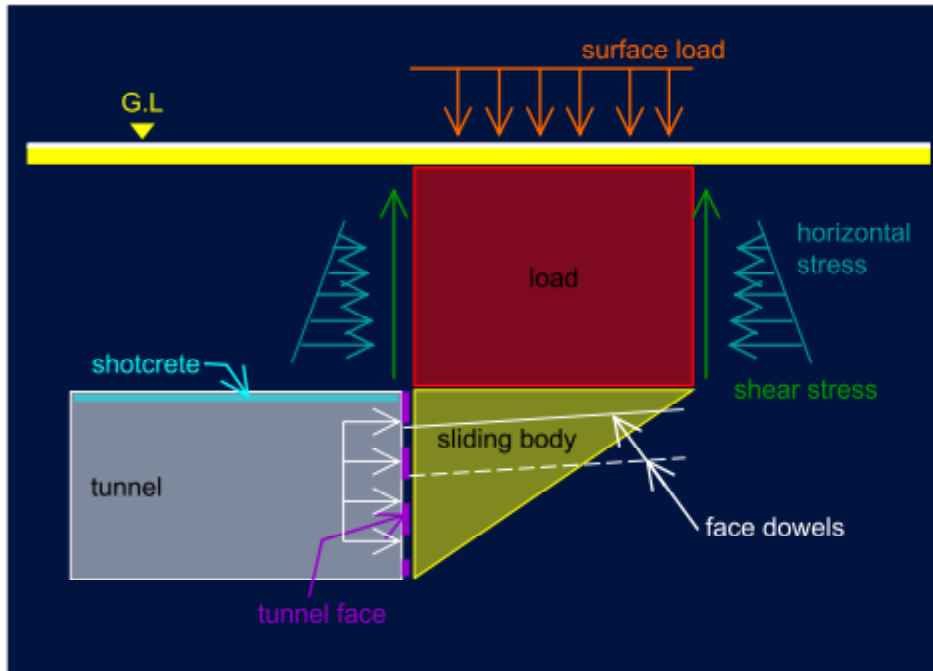
Drainage - pre-excitation grouting



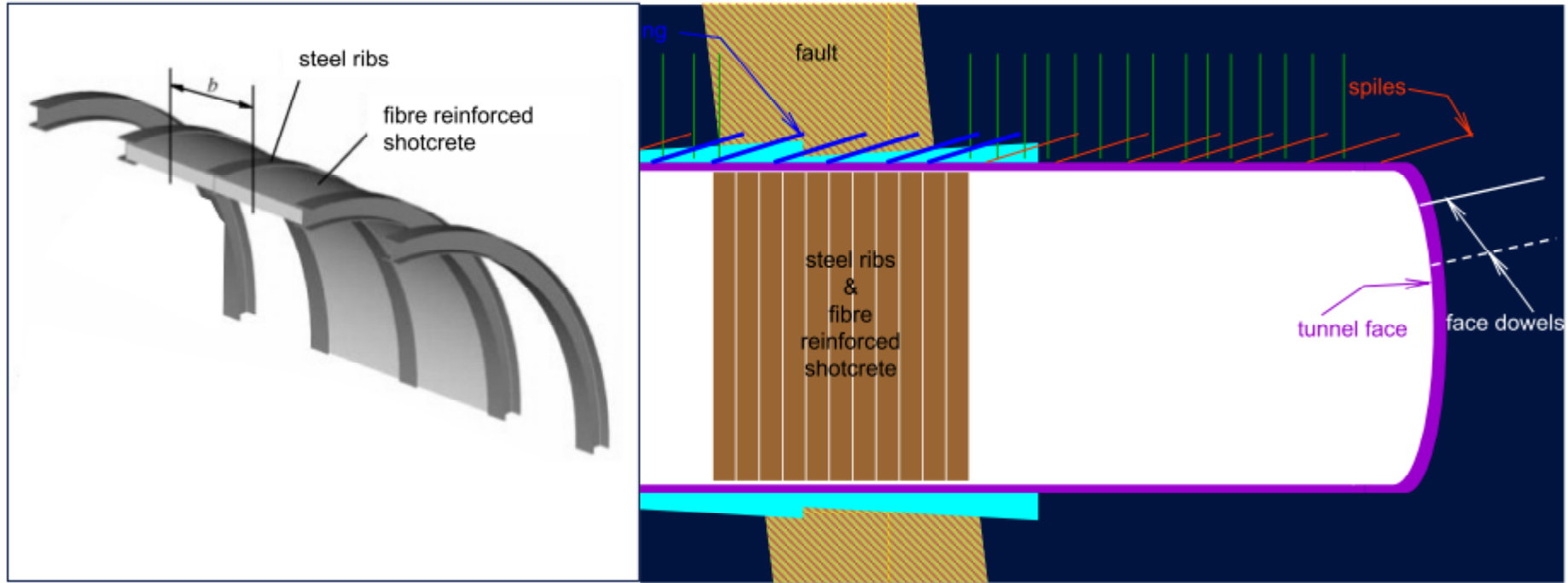
Pre-support - forepoles / spiles



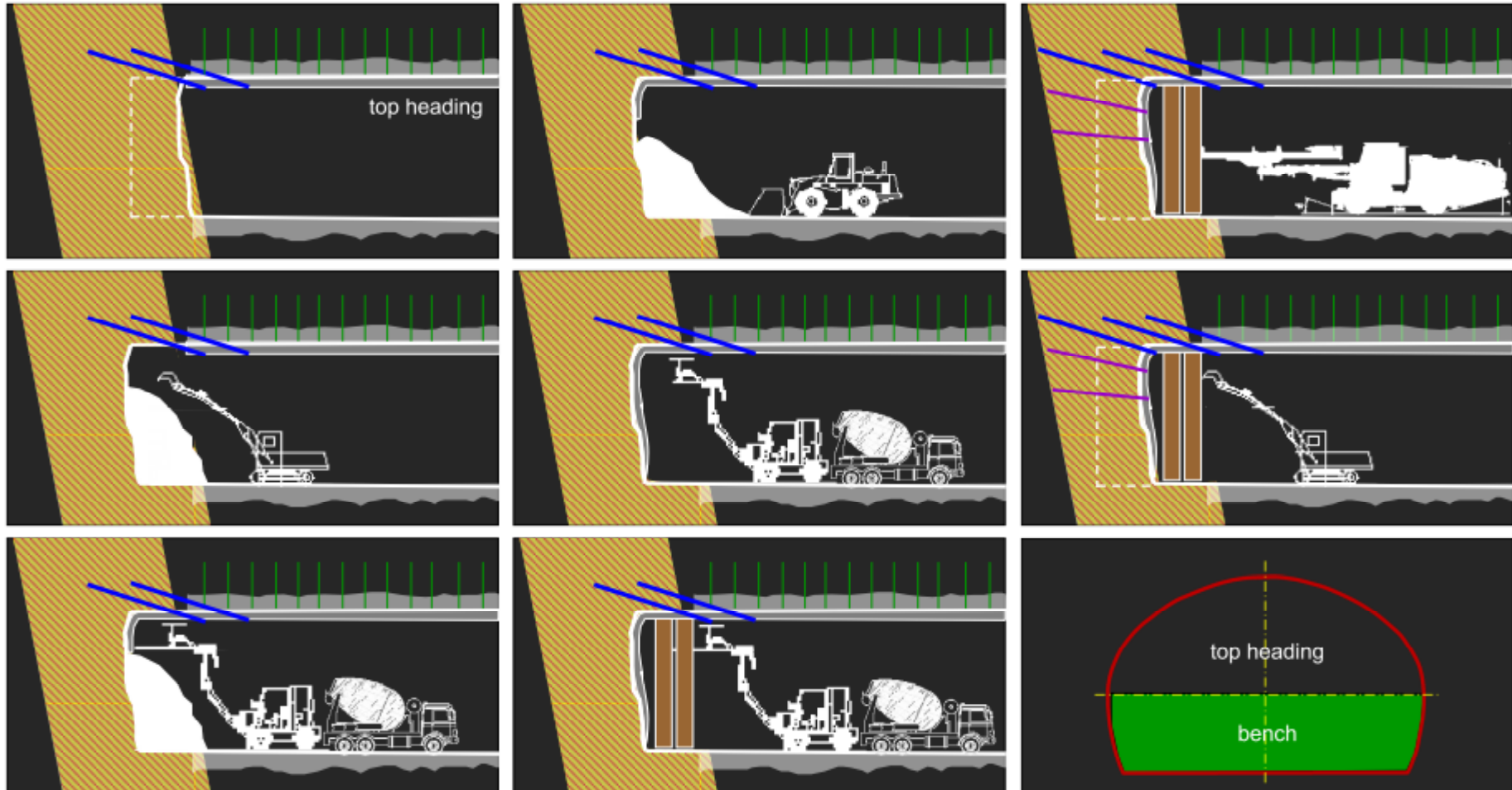
Reinforcement - rock dowels + grouting



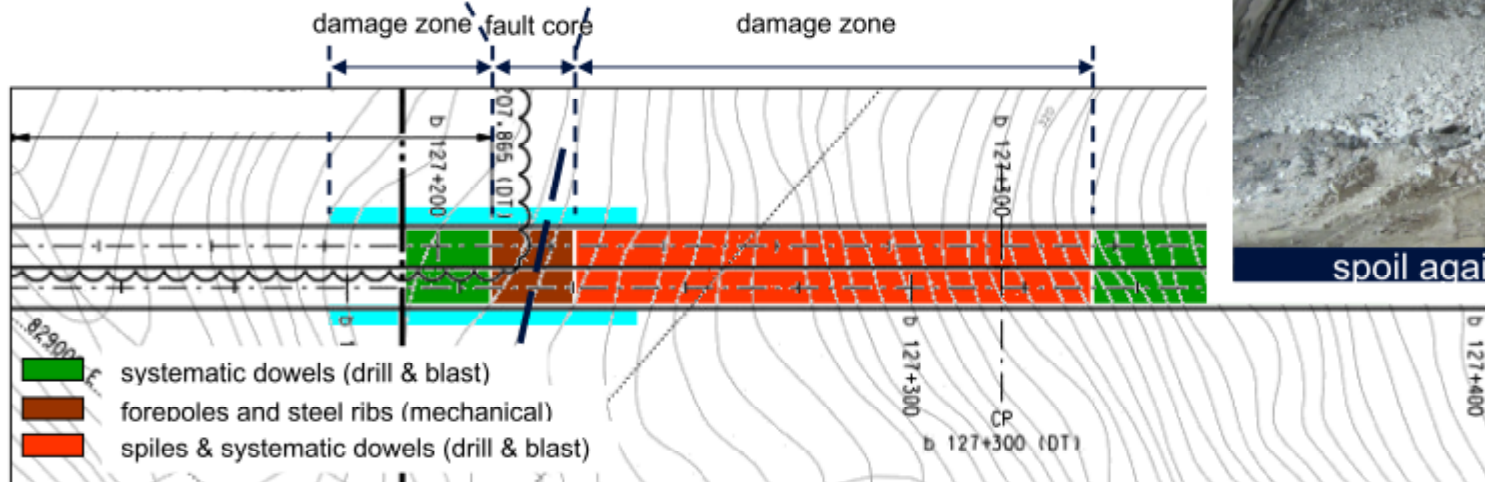
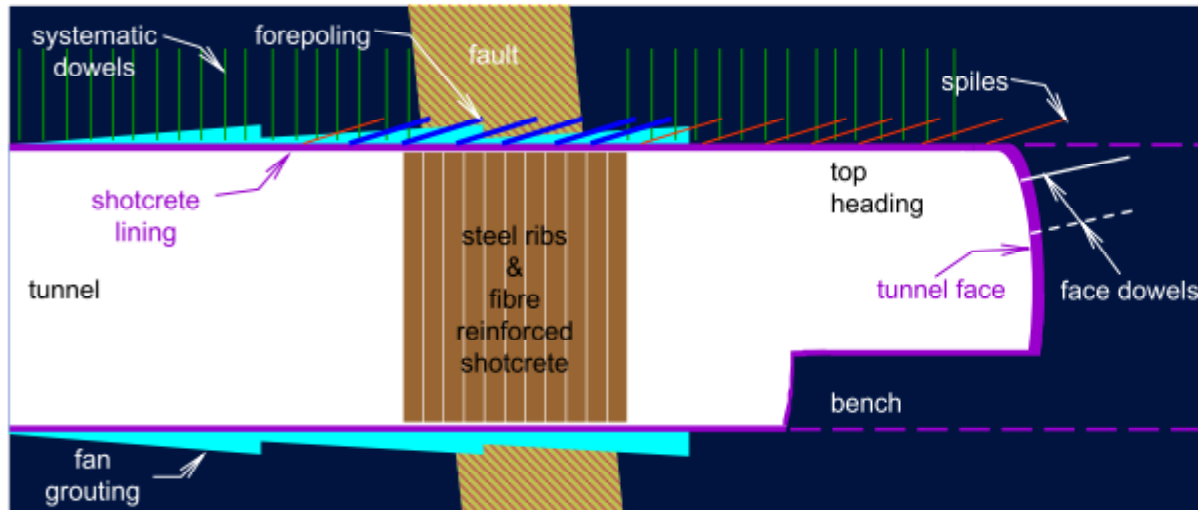
Steel ribs + Shotcrete (fibre)



Excavation sequence



Temporary support



Thank you

