



II CONGRESO
INTERNACIONAL
DE MINERÍA

Managing safety and controlling the risk of rockfalls at development faces

Lima, 14 July 2019



Government of South Australia

SafeWork SA



Introduction

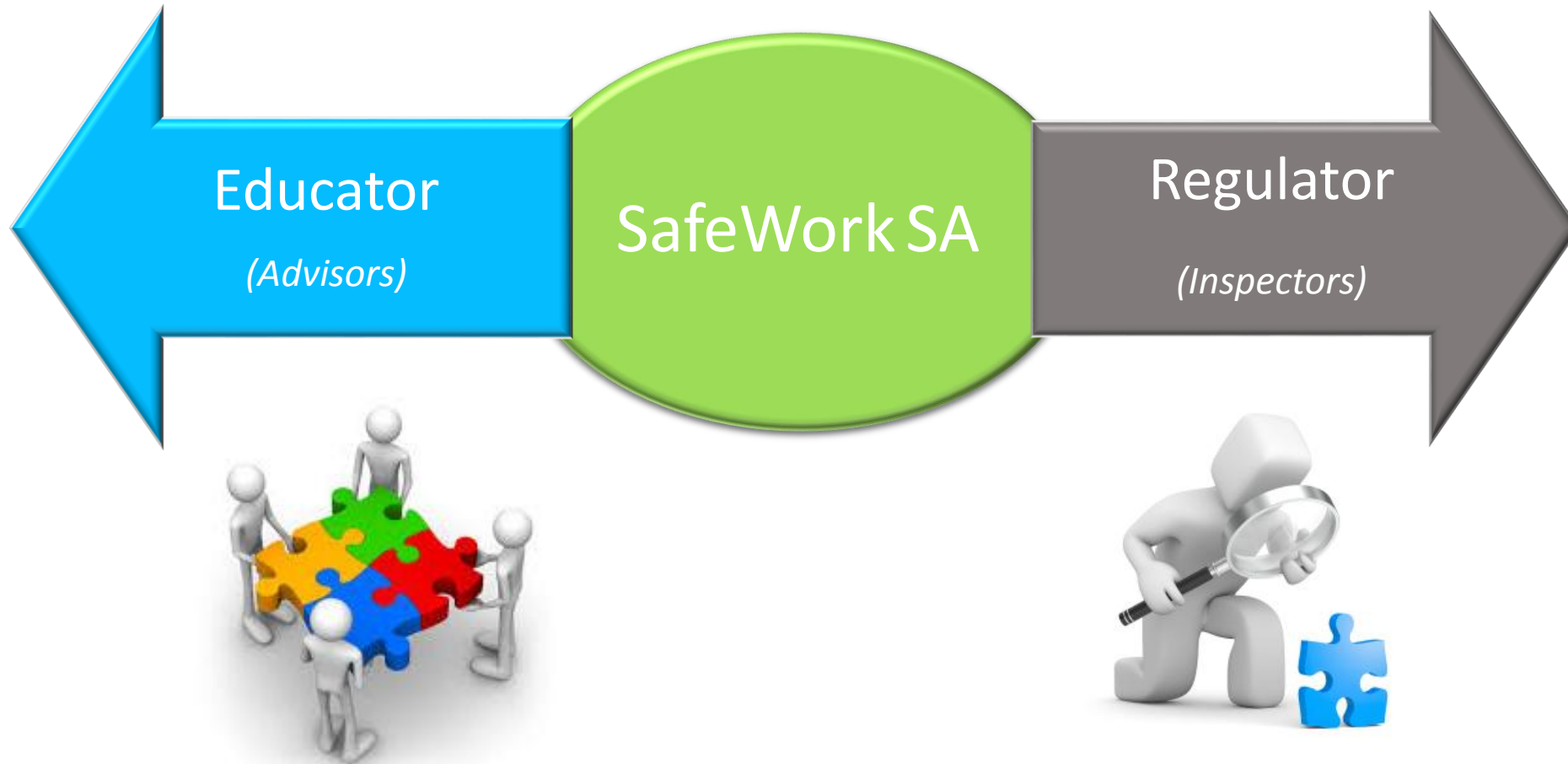
- Luke Brammy
- SafeWork South Australia (SA)
- Principal Mining Engineer
- Work Health and Safety (WHS) Inspector
- Inspector of Mines
- Inspector of Explosives

SafeWork SA

- Department of Treasury and Finance
- Work Health & Safety Regulator in South Australia
- 80 Inspectors – 3 in the Mining Unit

Primary role is to promote and encourage safe, fair, productive working lives in South Australia

SafeWork SA



Legislation



Regulator



Incident



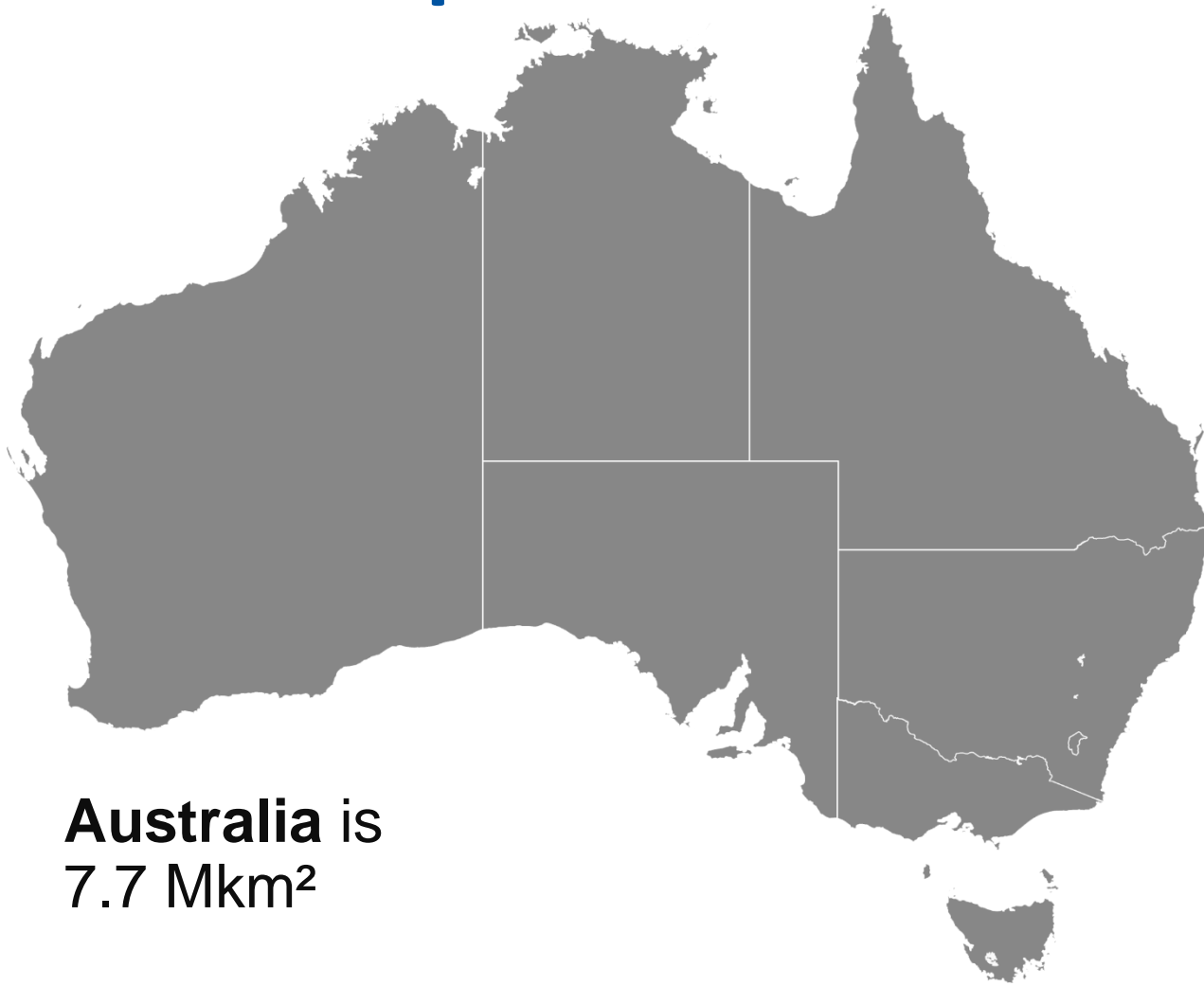
Powers of an inspector

- Enter and investigate any workplace at any time
- Conduct interviews and enquiries
- Take photographs, recordings and measurements, or samples
- Gather information, examine and copy documents
- Seize any documentation or exhibits
- Issue notices or directions

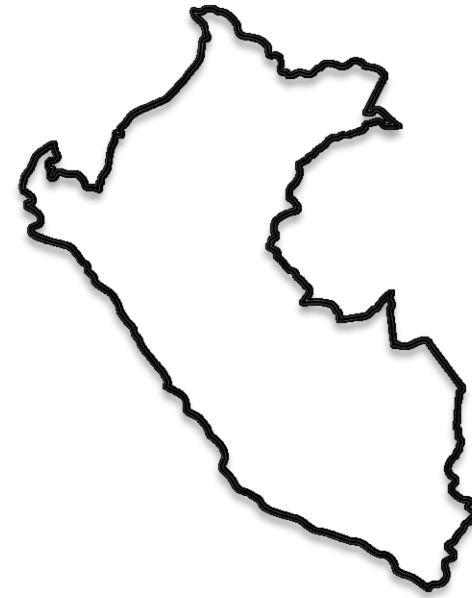
Australia



Size comparison

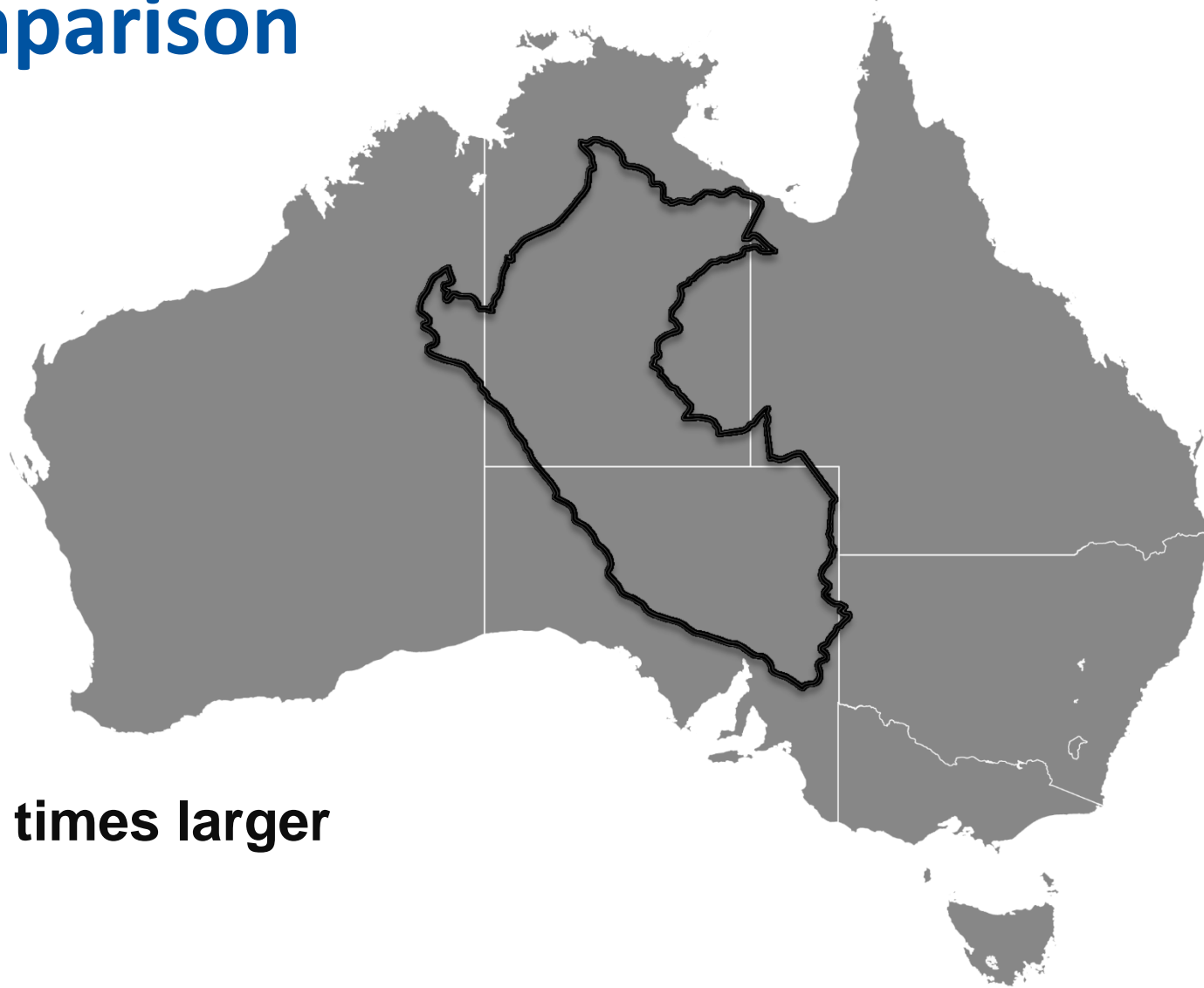


Australia is
7.7 Mkm²



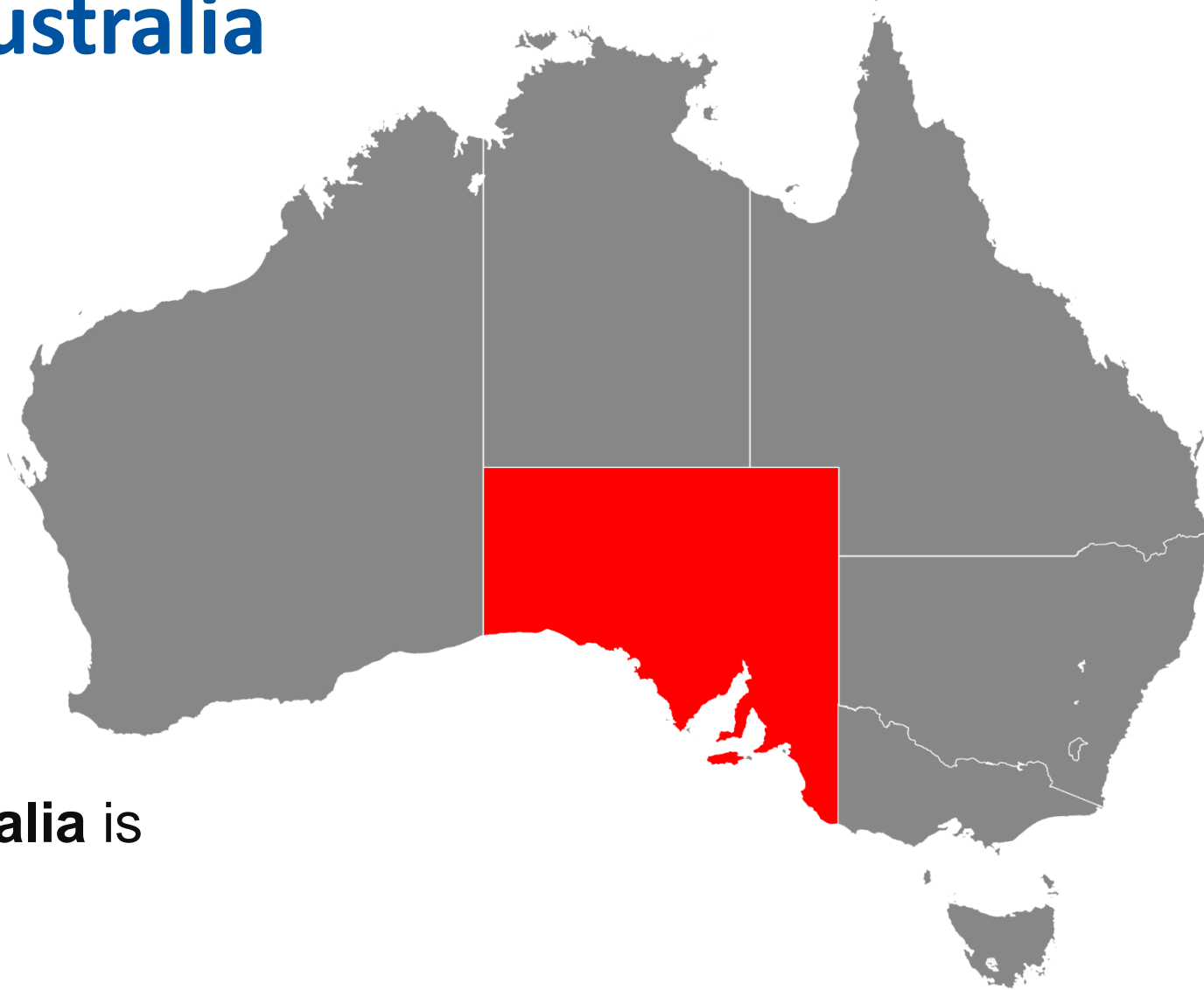
Peru is
1.3 Mkm²

Size comparison



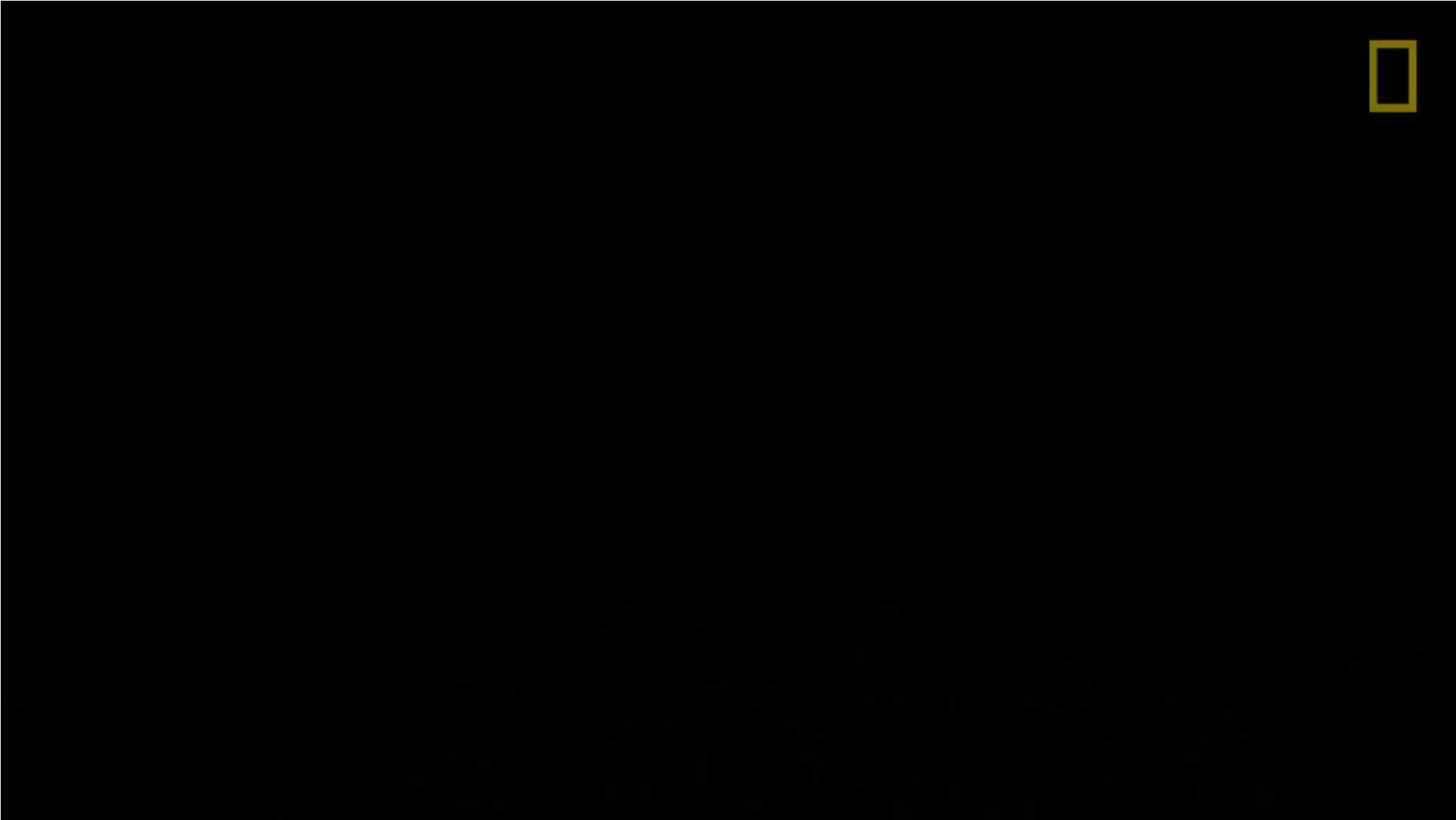
Australia is **6 times larger**
than Peru

South Australia

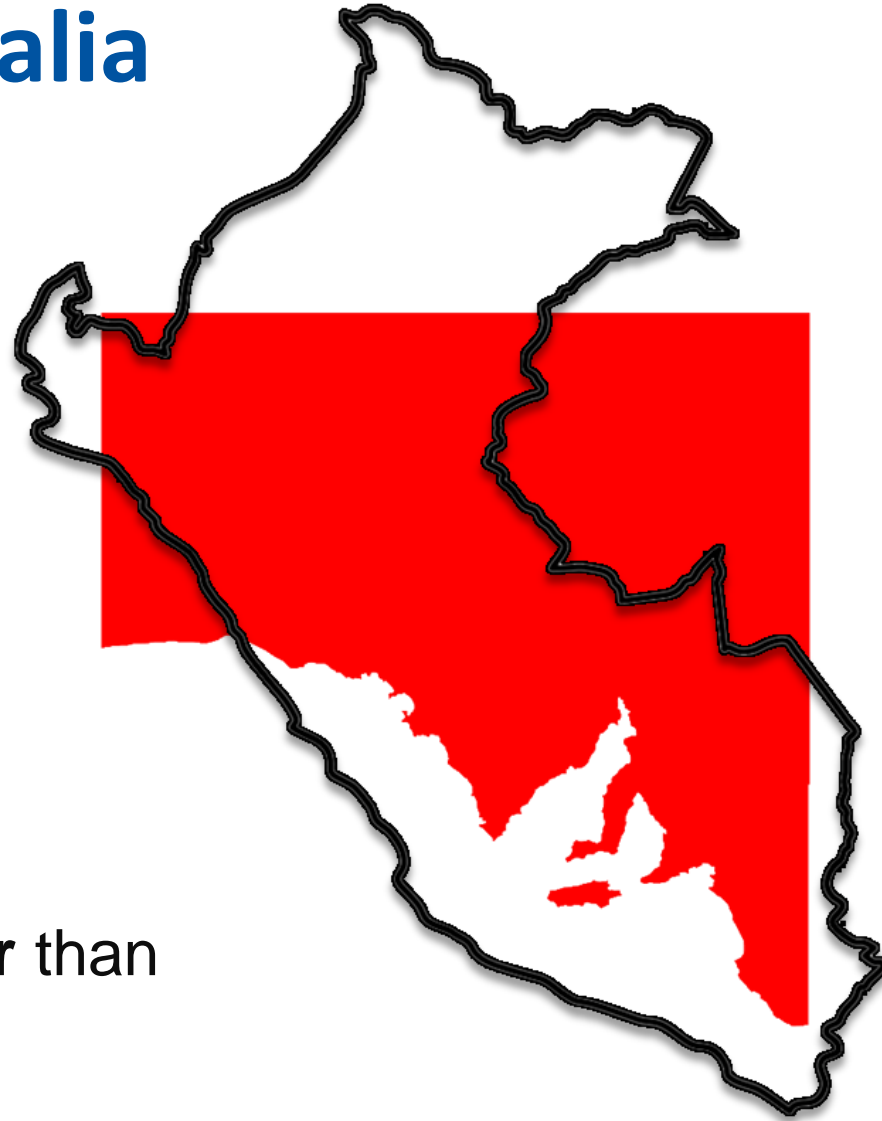


South Australia is
983,482 km²

South Australia



South Australia



Peru's population in **19** times
South Australia's

Peru is **23% larger** than
South Australia

Mining in South Australia

- 11,000 workers
- 16 major mines
- 3 UG mines
- 300+ quarries
- Opal Mining
- Mineral Exploration



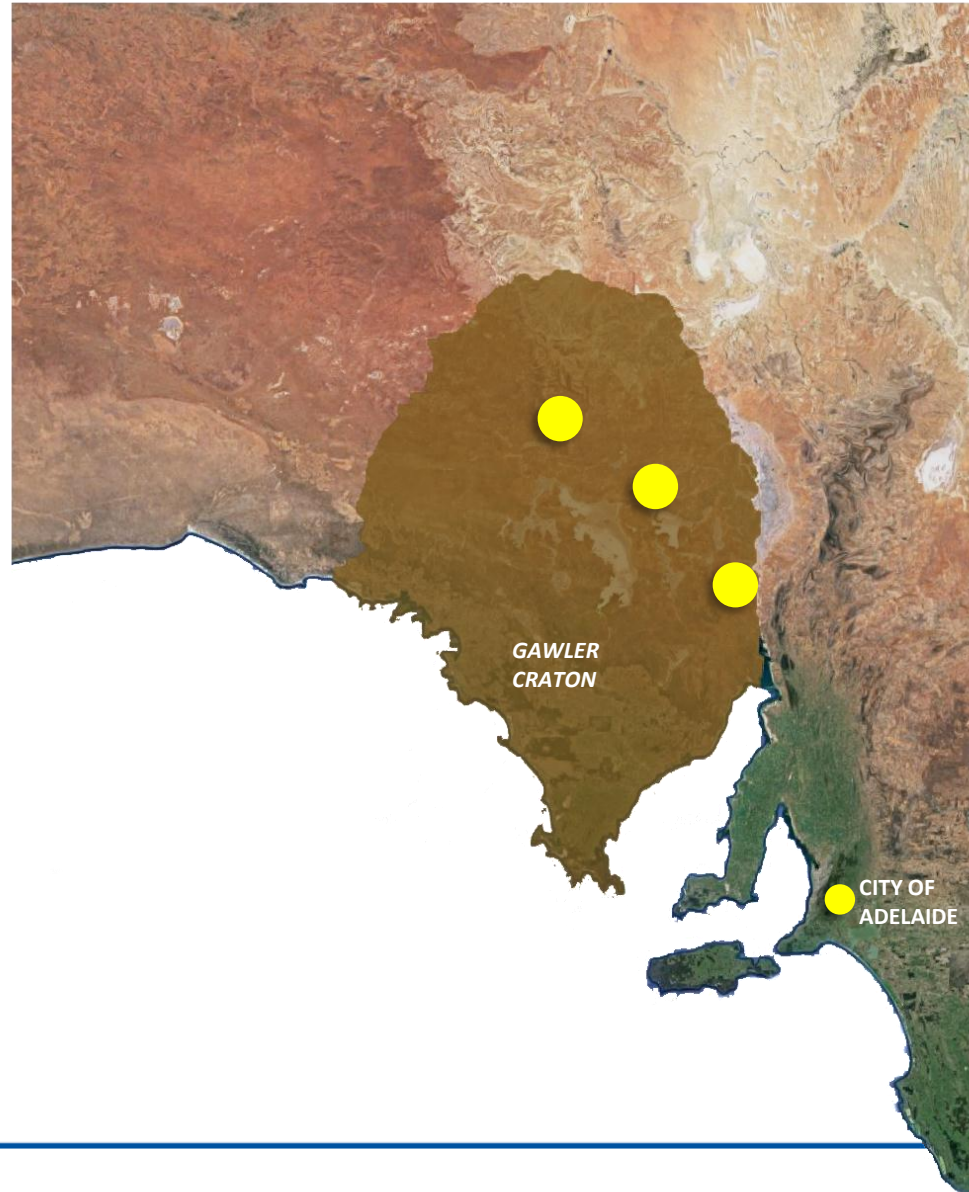
3 UG Mines

- Olympic Dam
- Prominent Hill
- Carrapateena



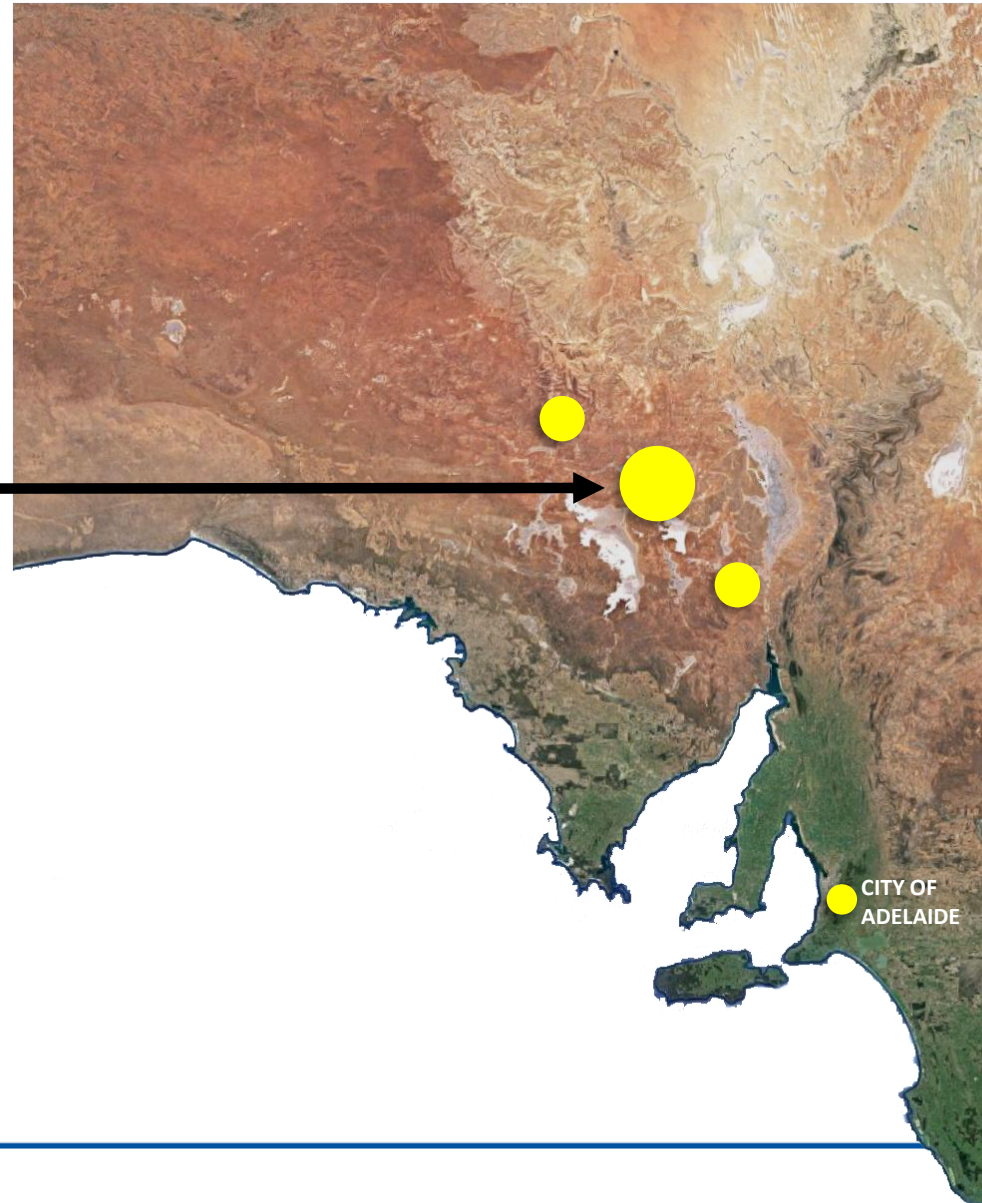
Gawler Craton

- Emerging copper belt
- SA focus on copper



Olympic Dam

- 1979
- Cu U₃O₈ Au Ag
- Cu metal, Yellow Cake
- SLOS
- CAF
- 35 kmpa
- 10 Mtpa – Hoist & Truck
- Residential & FIFO
- 3500 workers



Olympic Dam



Prominent Hill

- 2010
- Cu Au
- Concentrate
- SLOS
- Hydraulic & Paste
- 12 kmpa
- 4 Mtpa – Truck
- FIFO
- 900 workers

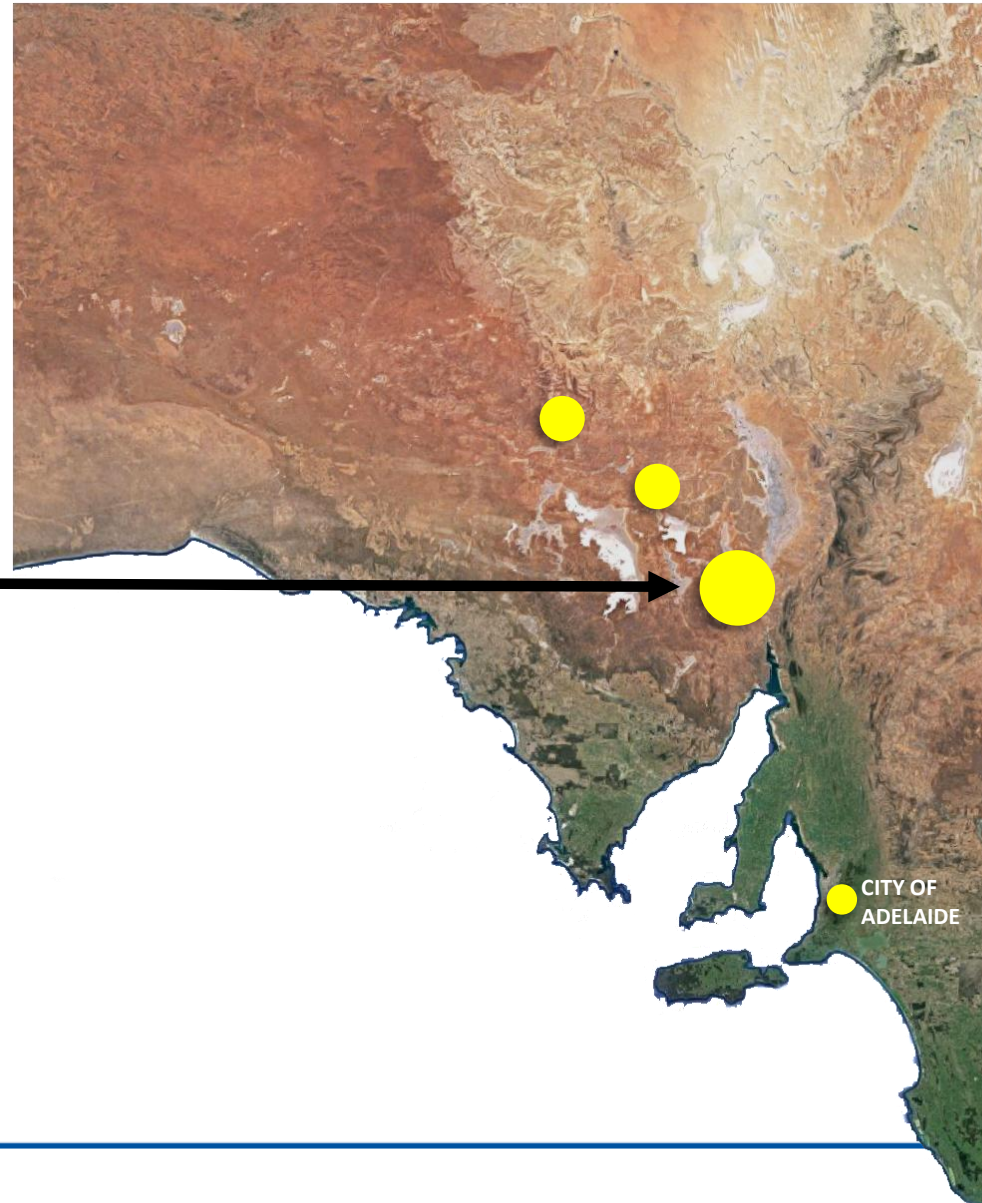


Prominent Hill Camp

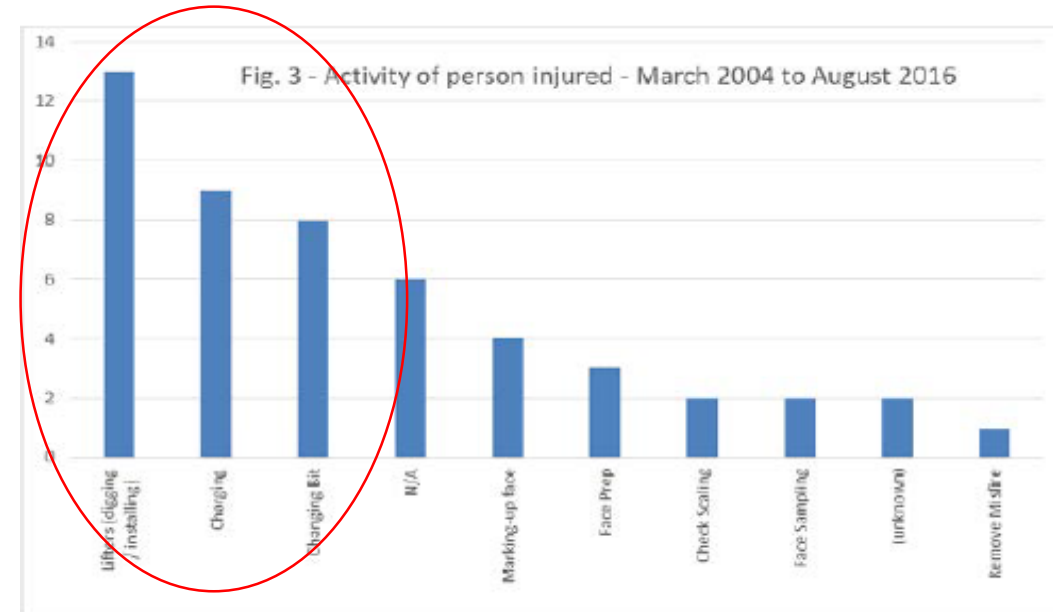
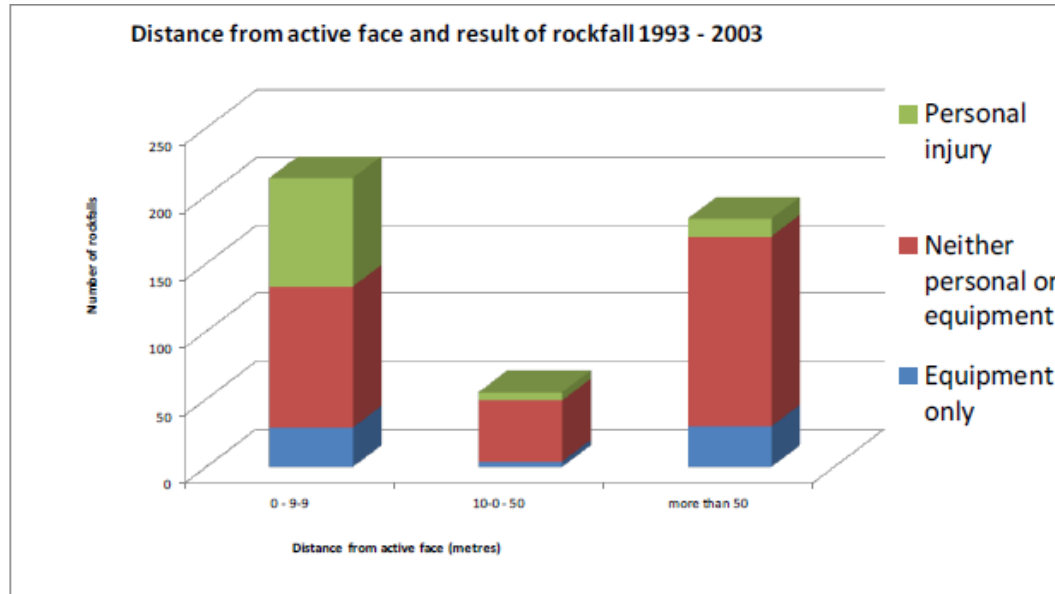


Carrapateena

- 2016 (construction)
- Cu Au
- Concentrate
- Sublevel cave
- 18 kmpa
- 4.25 Mtpa – conveyor
- FIFO
- 700 workers

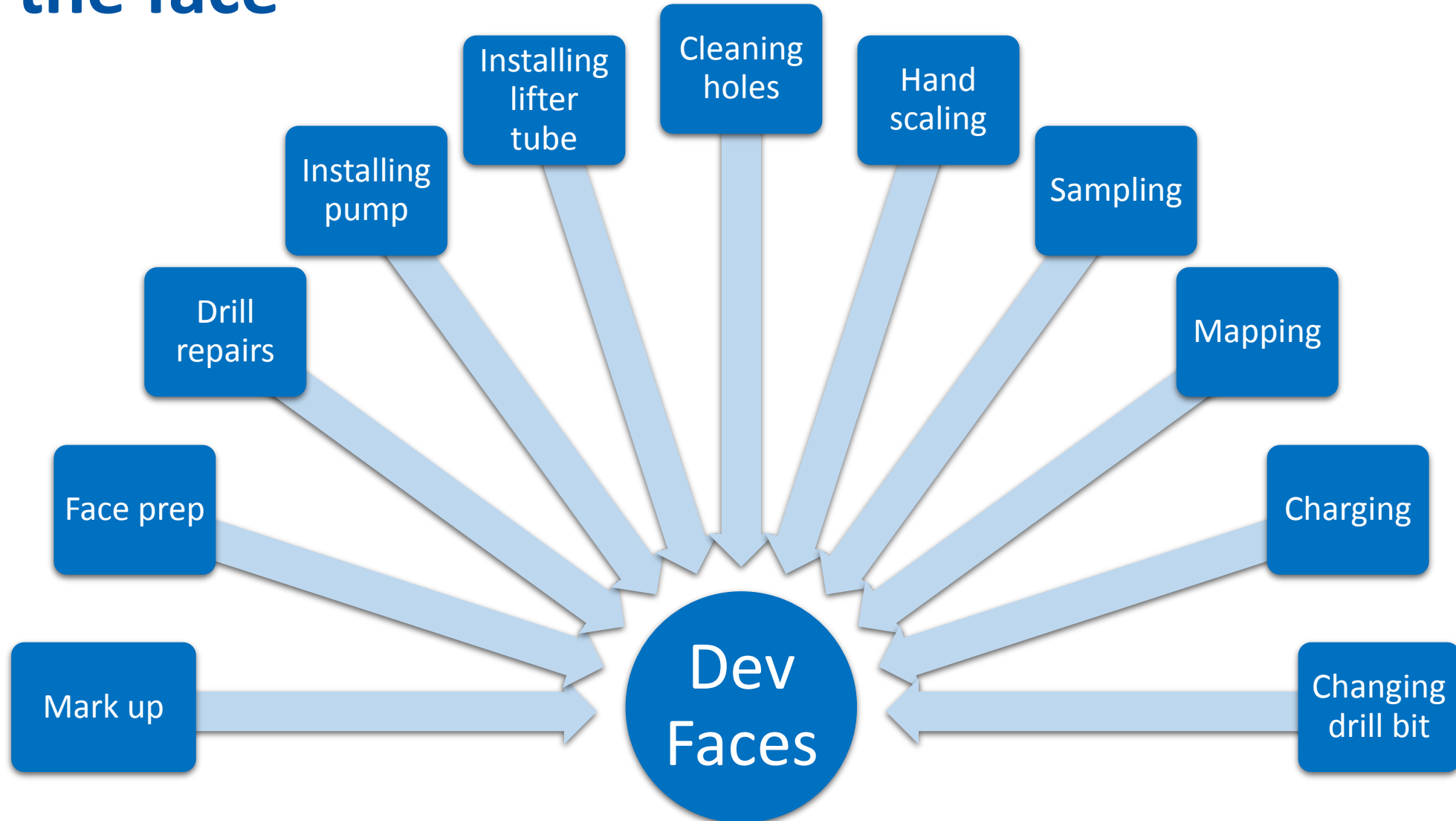


Working at Dev faces - The risk



- Rock fall incidents in Underground Mines predominantly occur at or very close to the development face
- Injury data (Queensland DNRME 2016) indicates activities are not limited to those immediately at the face

At the face



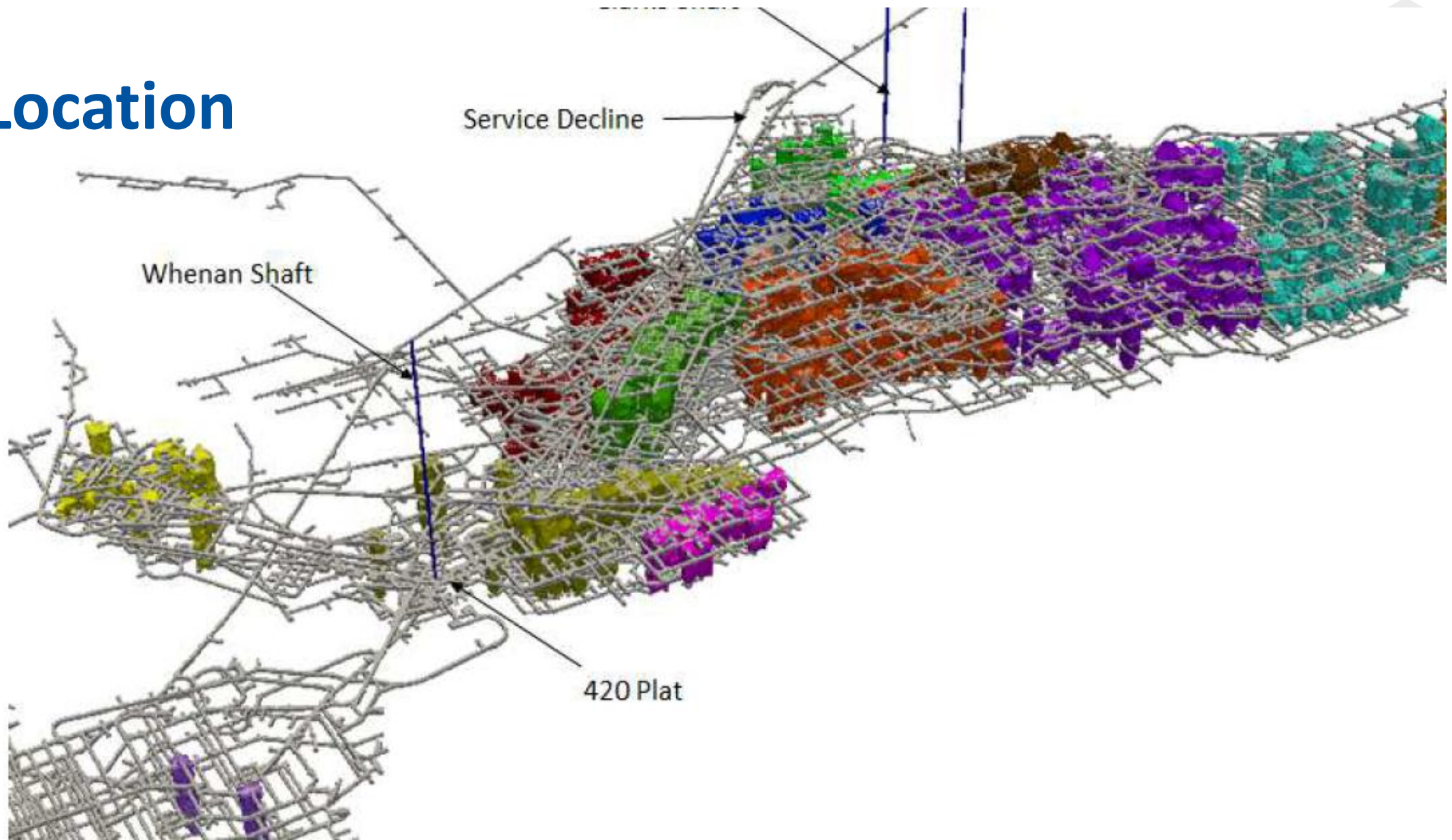
Historically

- Faces are not supported in cycle
- Walls & Backs are supported to a standard
- Judgement call to support a face or not by:
 - Driller
 - Supervisor
 - Geotechnical Engineer
- Regular rock fall incidents at faces
 - Resulting in injuries
 - Lost time
 - Rehabilitation of ground

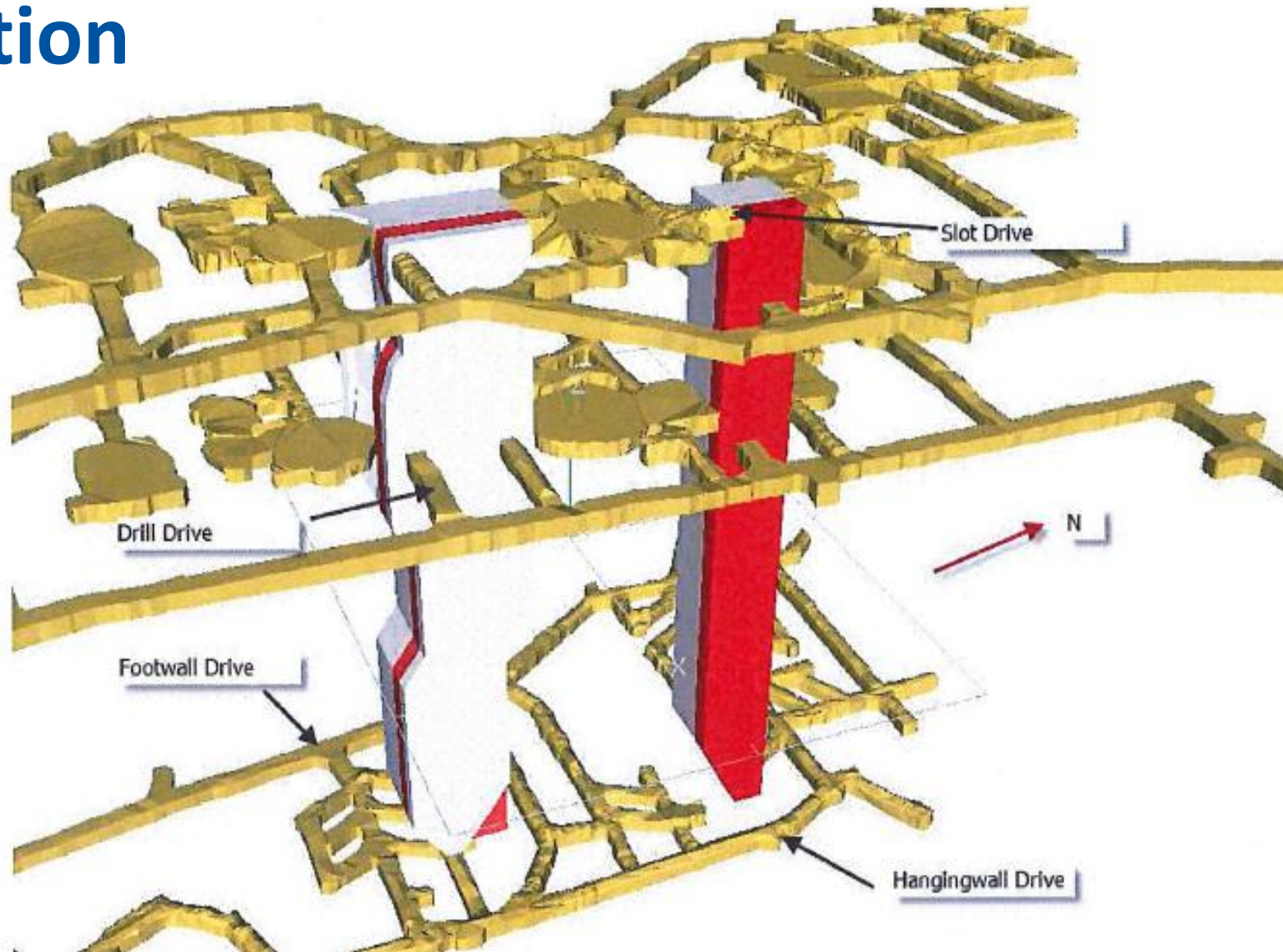
Case Study

- 10 February 2015 - Incident
- Olympic Dam Mine
- Jumbo Drill Operator
- Drilling out a development face, approx. 75% complete
- Changing drill bit
- Tragically killed when crushed by rocks that fell from the face
- Facts:
 - Face not supported
 - Changing a drill bit
 - Ground conditions - noise

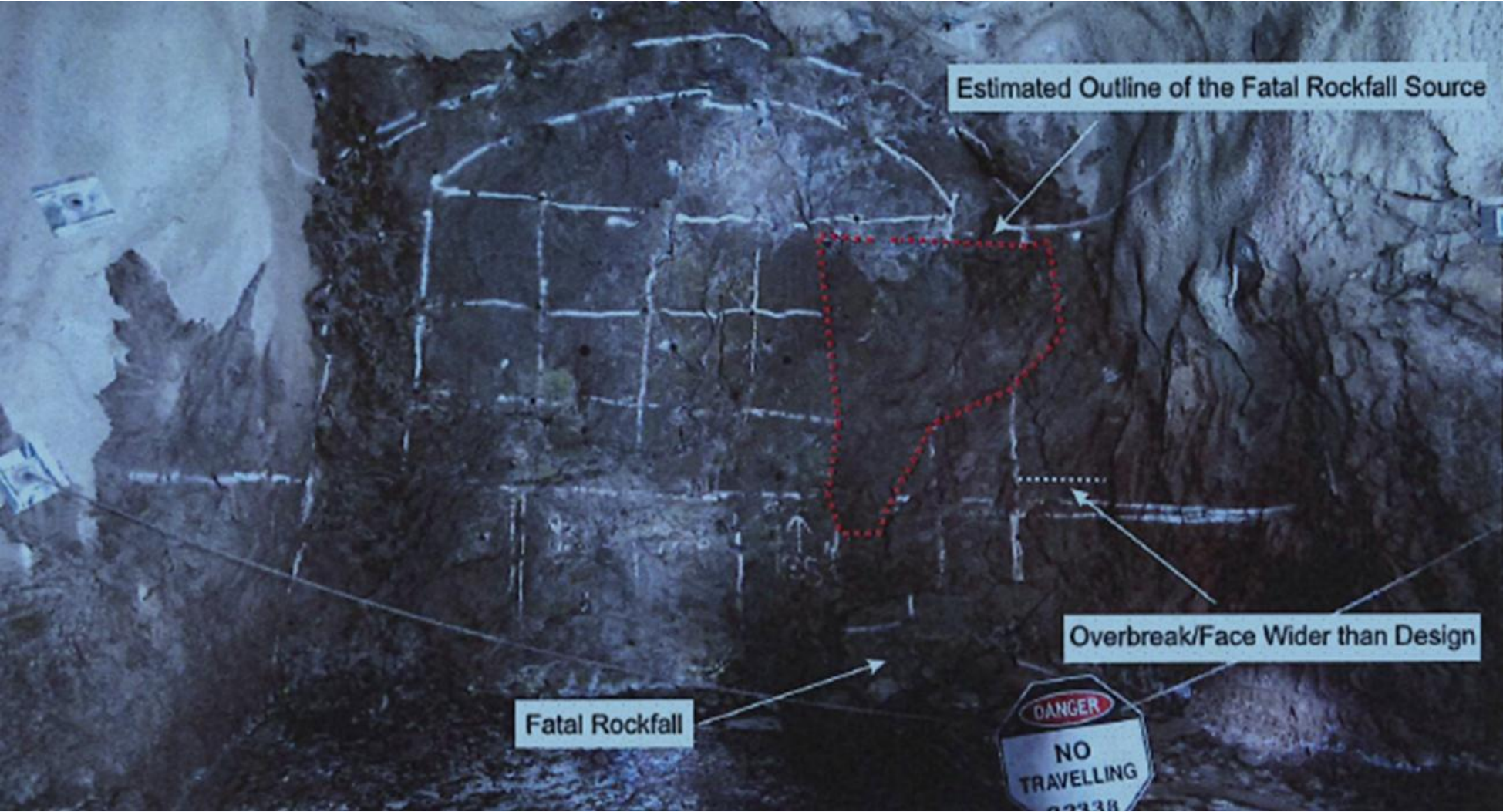
Location



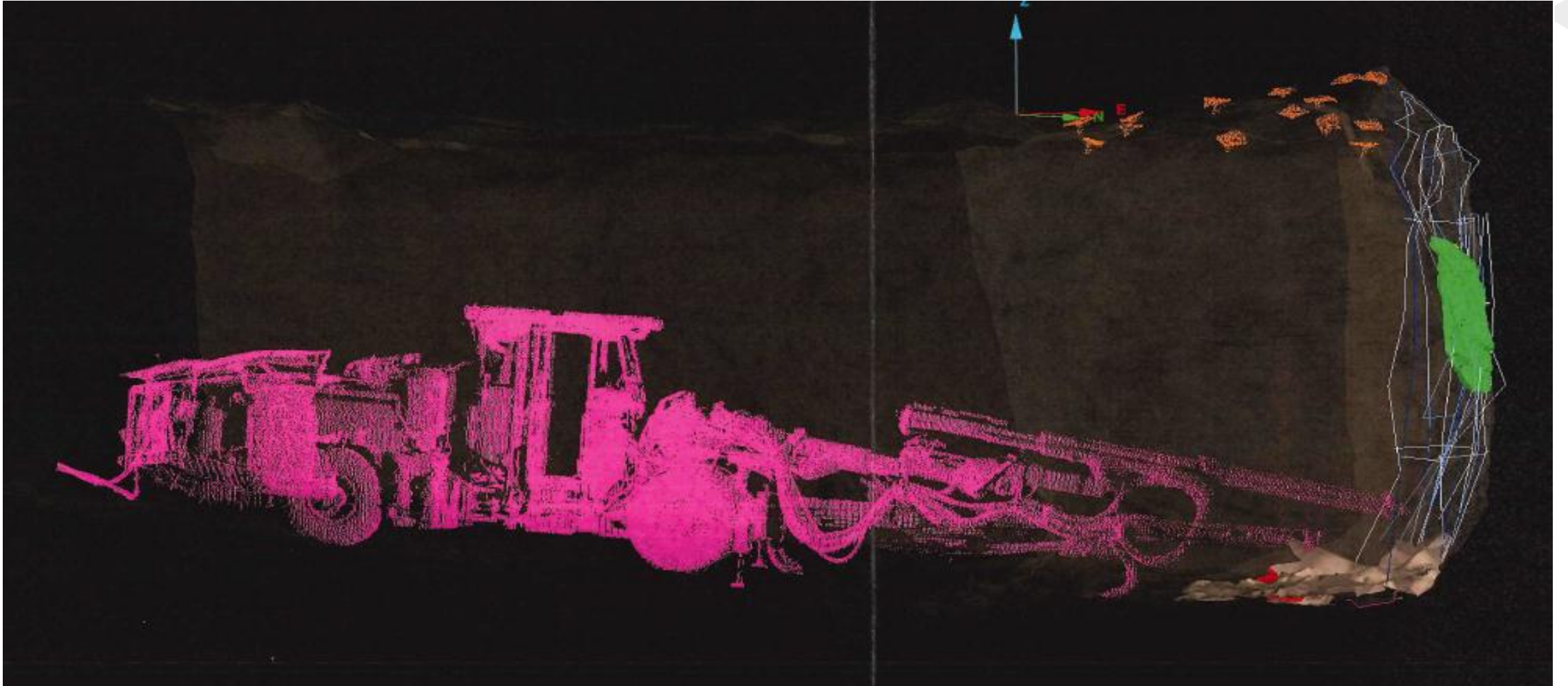
Location



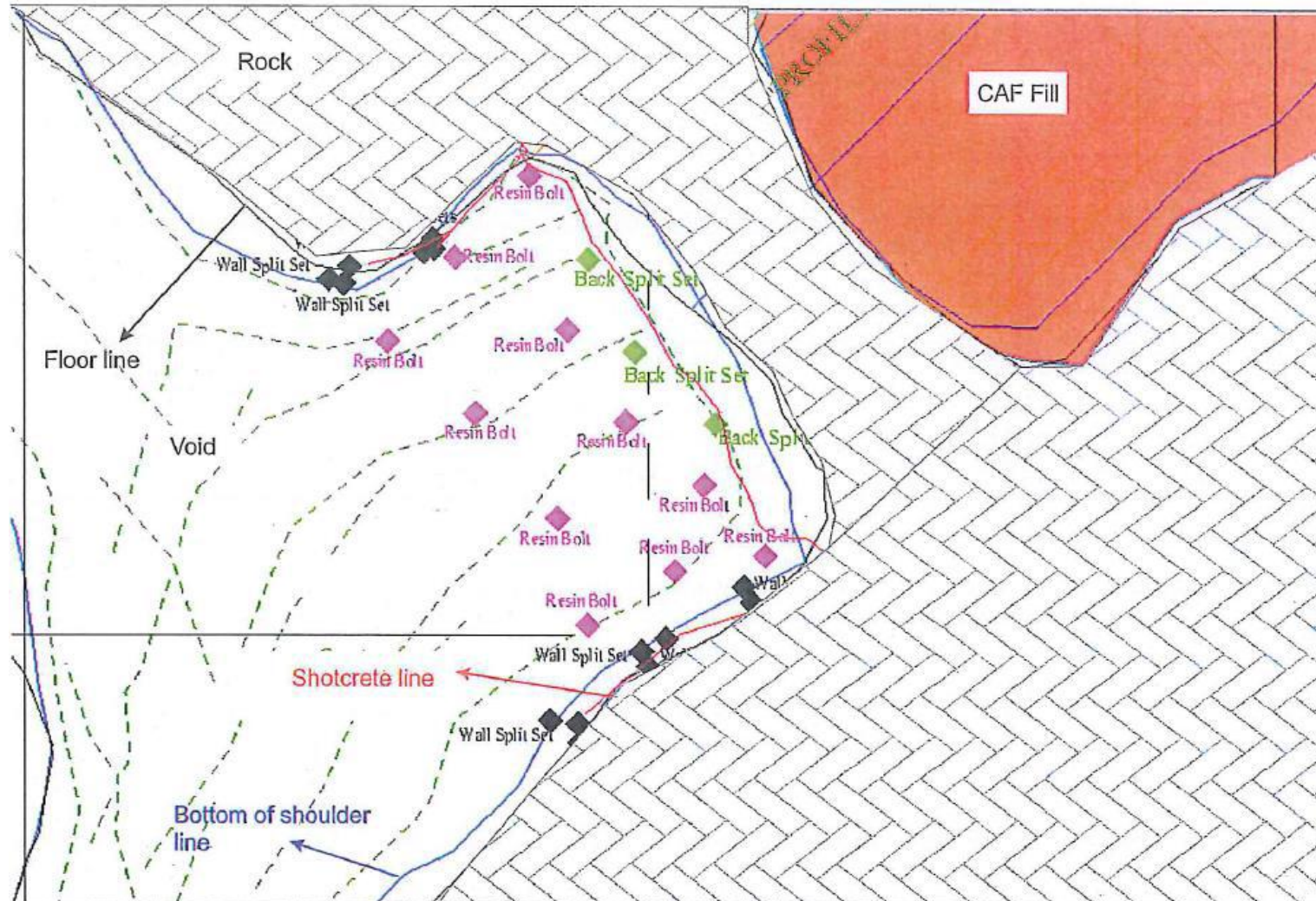
The Face



Laser survey



Laser survey



The rock fall failure

- Slot drive – over break
- Face slightly undercut
- Approx – 1200 kg slab toppled / popped off face
- The drilling (i.e. vibration / percussion) and the associated water disturbed the rock face
- The water from the drilling would have seeped in behind the slab causing minor hydraulic pressure behind the slab
- Likely that a mini strain burst occurred just before the rock dislodged

Geotechnical Findings

- Faces were not considered as unsupported ground
- Risks associated with mining development within close proximity to a CAF filled stope not covered
- Shortfalls - Ground Control Management Plan

Safe system of work findings

- Changing of drills bits and drill rig maintenance not covered
- Access to faces only restricted prior to charging – hand scaling
- No exclusion zones at faces once drilling has commenced

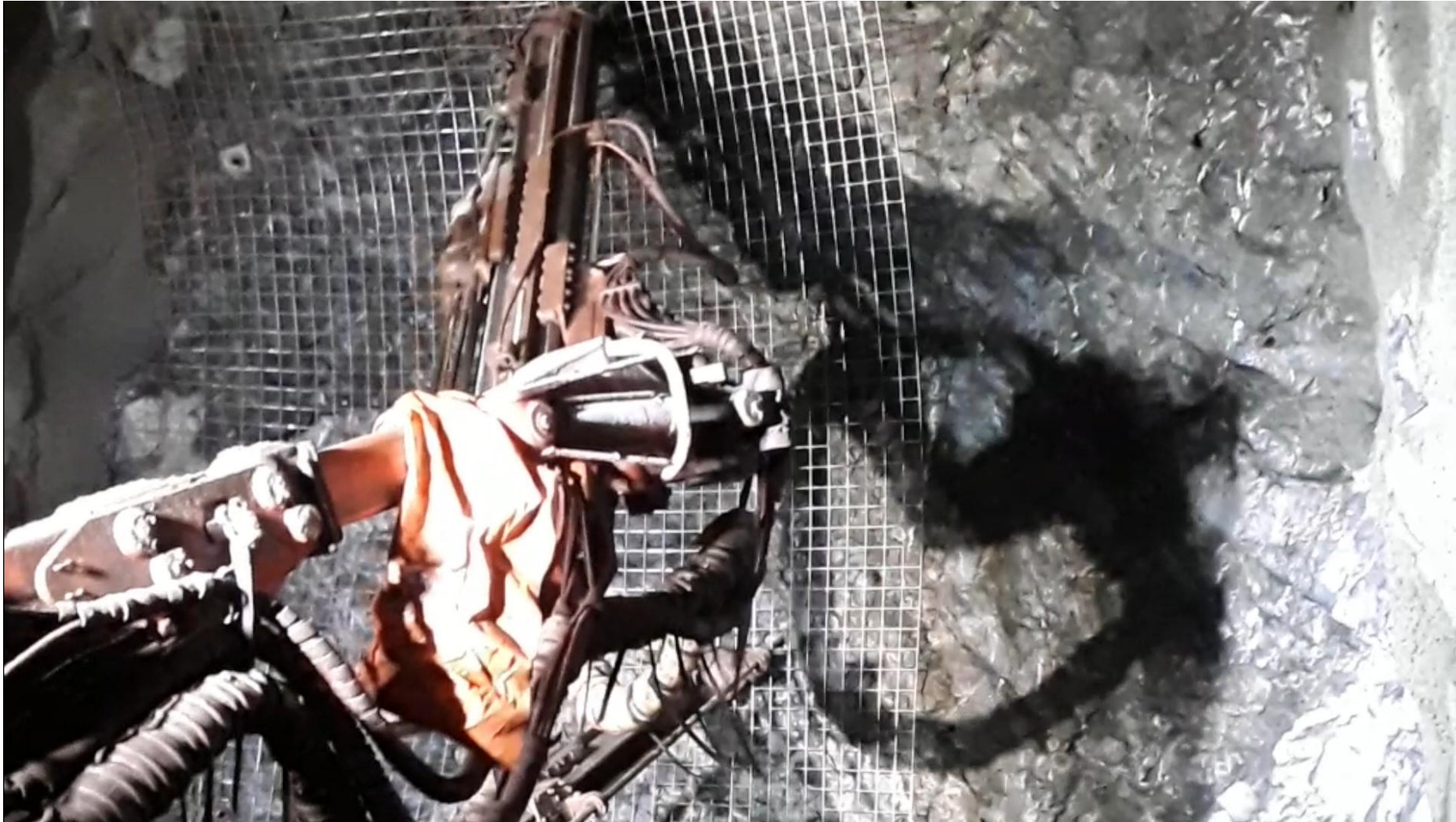
What did SafeWork SA enforce?

- Prohibition Notices
 - changing drill bits at faces
 - use of Jumbo (unknown possible damage)
- Improvement Notices (other SA underground mines)
 - Review systems of work regarding working at development faces

Outcomes

- South Australia
 - 2m exclusion zones at faces, after lifters installed
 - Engineering control - mesh and bolt faces, fibrecrete
 - Improved systems of work for persons in the vicinity of faces
 - All UG mines now install ground support on all faces
 - Greatly reduced the risk of rock falls from faces
 - No major impact on cost or cycle times
- Australia
 - Supporting faces in cycle now common practice

Meshing a face



Fibrecrete versus bolt & meshing

- Fibrecrete:
 - Not adequate on wet faces
 - Still may require bolts
 - Still may require had scaling prior to charging
 - covering butts, potential misfires
 - Illegal to drill into butts in SA
- Bolts & Mesh
 - Metal in the system
 - Bleeding of rocks
 - Minor hand lacerations when charging

Slew boom



Changing a bit



Meshed face



Investigation outcome

- Mine Operator entered plea of guilty to one count
- The particular alleged the defendant:
 - *failed to ensure, so far as reasonably practicable, the provision and maintenance of safe systems of work in that it failed to provide and maintain documented safe work procedure which required jumbo drill operators drilling development faces into which no ground support was installed to change any drill bits required to be changed not less than 2m from development faces”*

Conclusion

- Pros:
 - Supporting development faces is a significant improvement in reducing the risk of rockfalls
 - Hierarchy of controls - Engineering control
 - Safer workplace
 - Reduction in rock falls incidents
 - Removed the risk of decision making / judgement call
 - No major impact on cost
- Cons:
 - Increased bolts & mesh in the crushing circuit
 - Minor hand injuries – cuts
 - Fibrecrete – covering butts – admin control

Questions?

