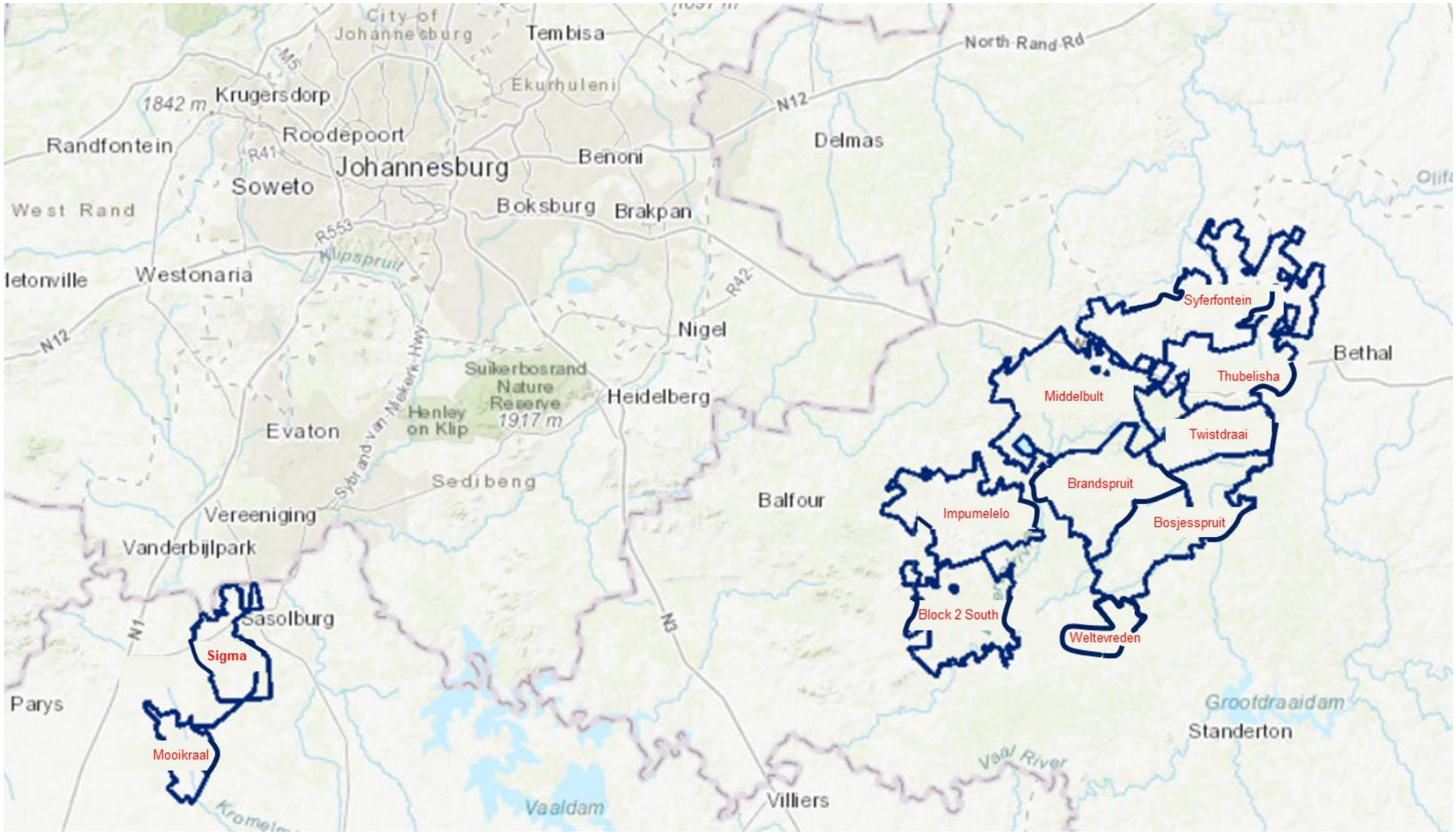
SASOL MINING ENTRY EXAMINATION

14 May 2021

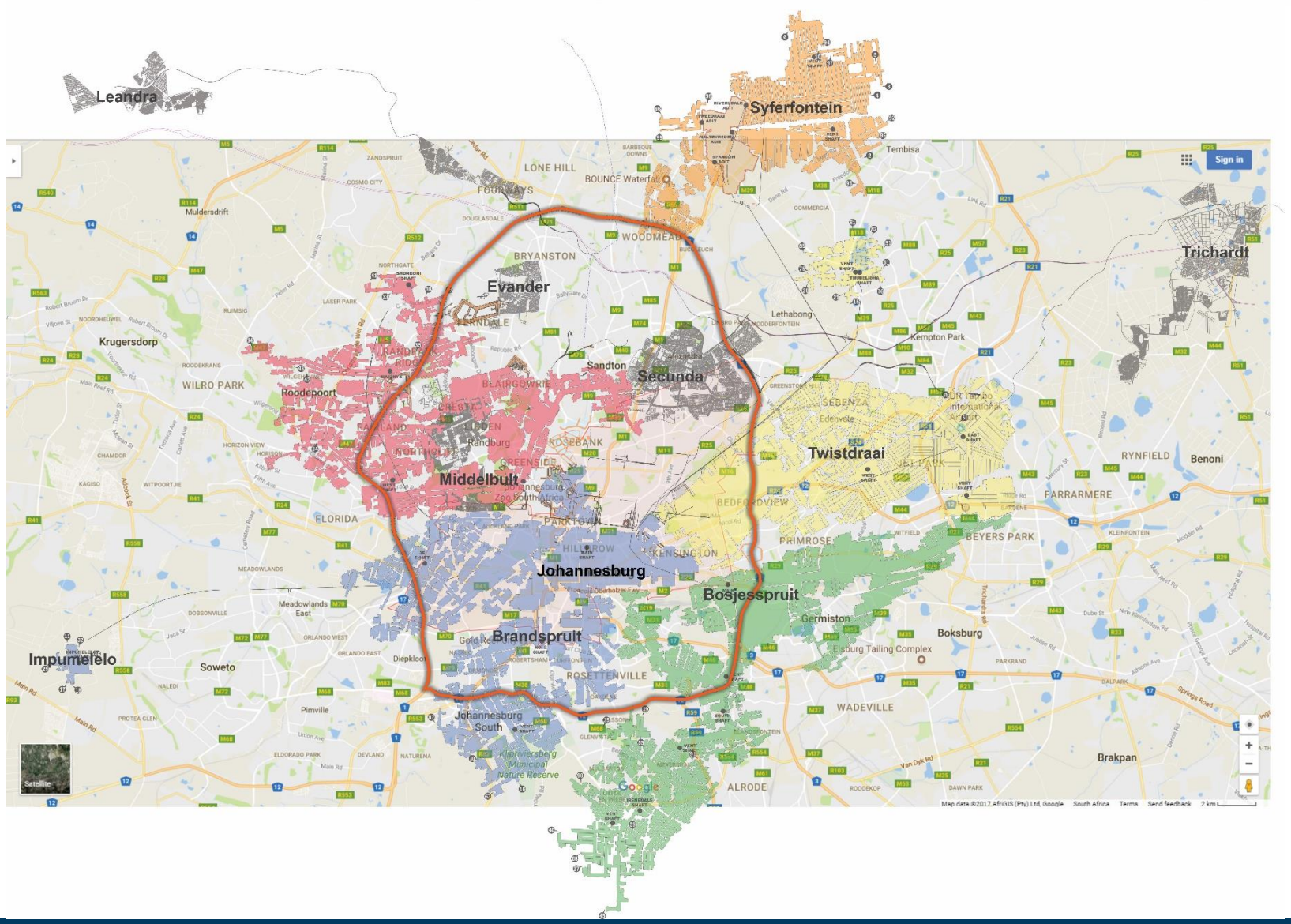
Locality

Secunda and Sasolburg Operations

Locality and Operation size



2018 Mined out scale vs the city of JHB



Underground Coal Mining Equipment

Continuous Miner (CM)

Shuttle cars

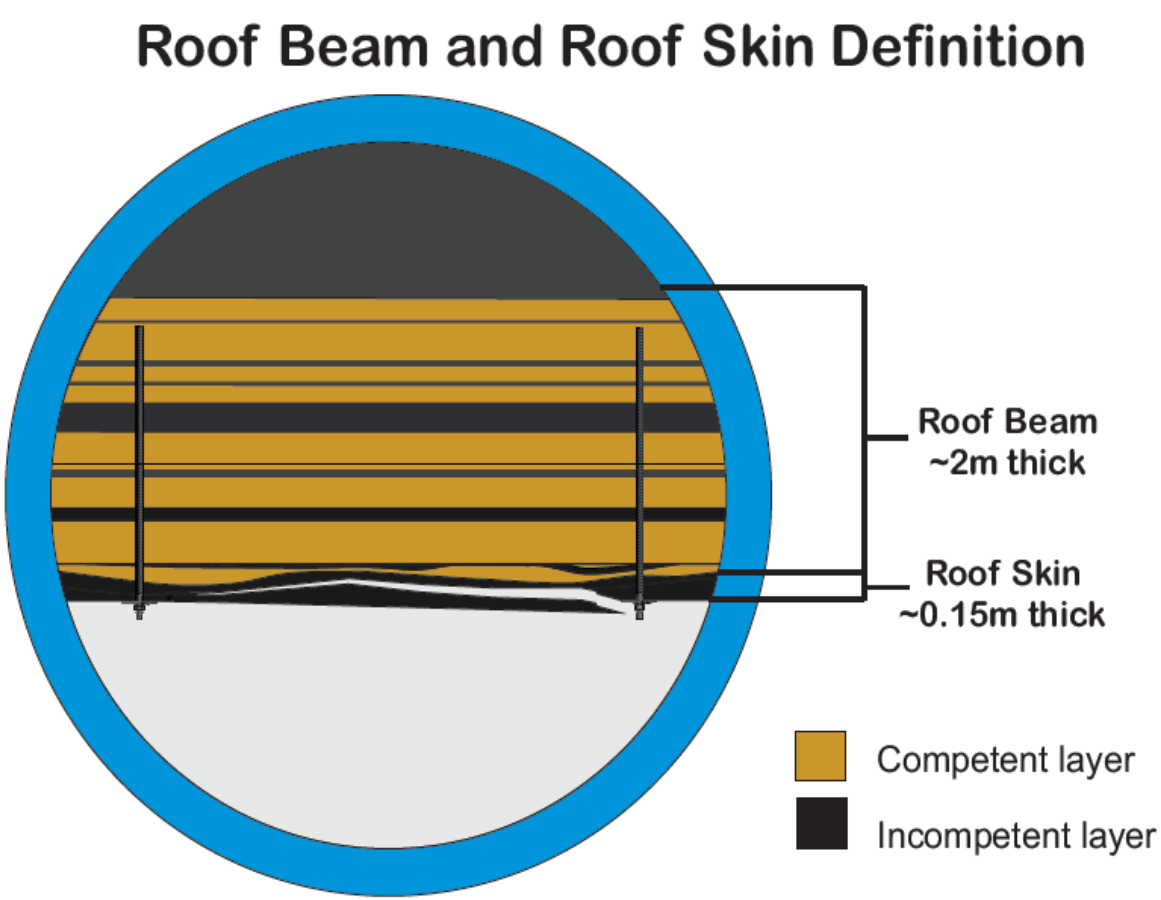
Twin boom bolter with TRS

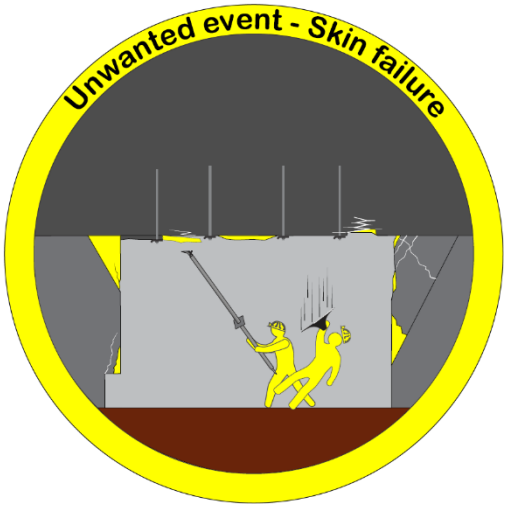
Load Haul Dumper (LHD)

Incident analyses

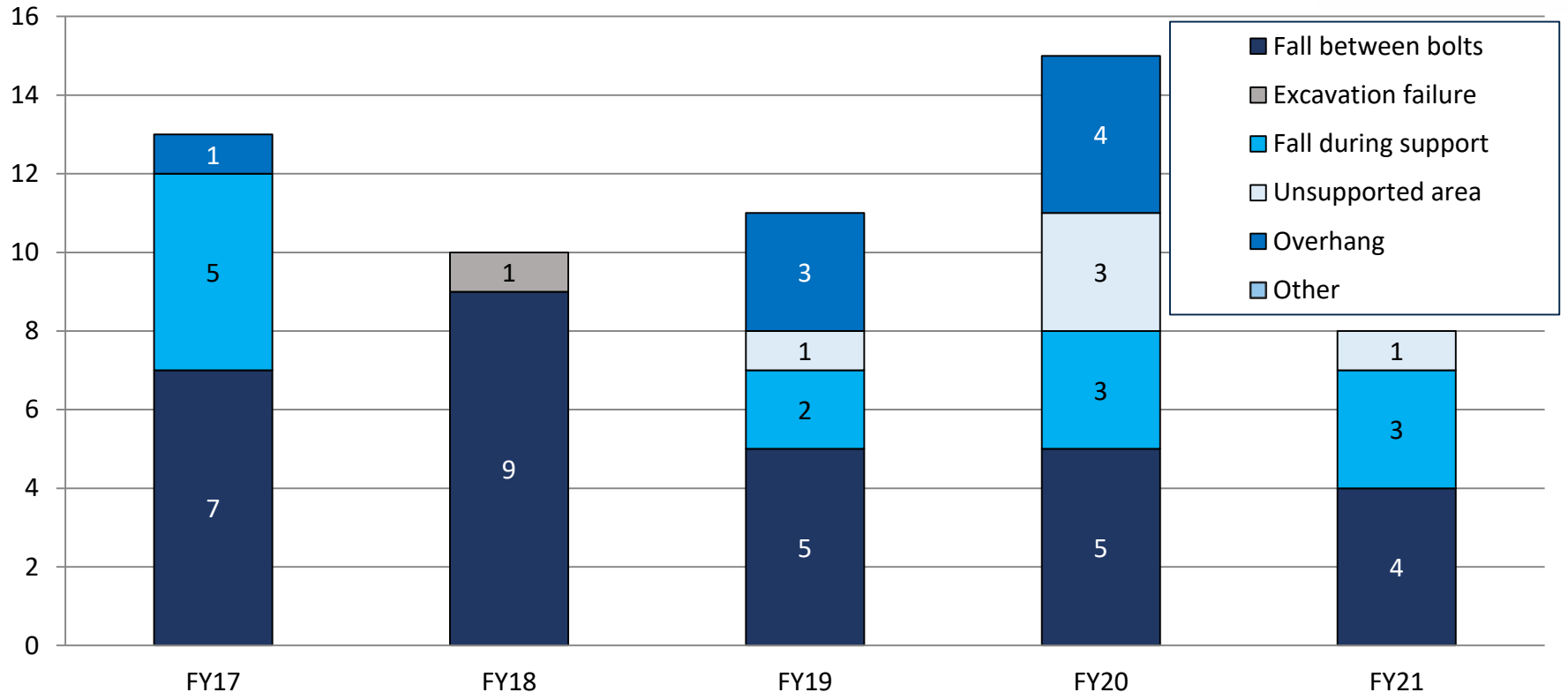
FY17 – FY21

FOG Key Unwanted Events





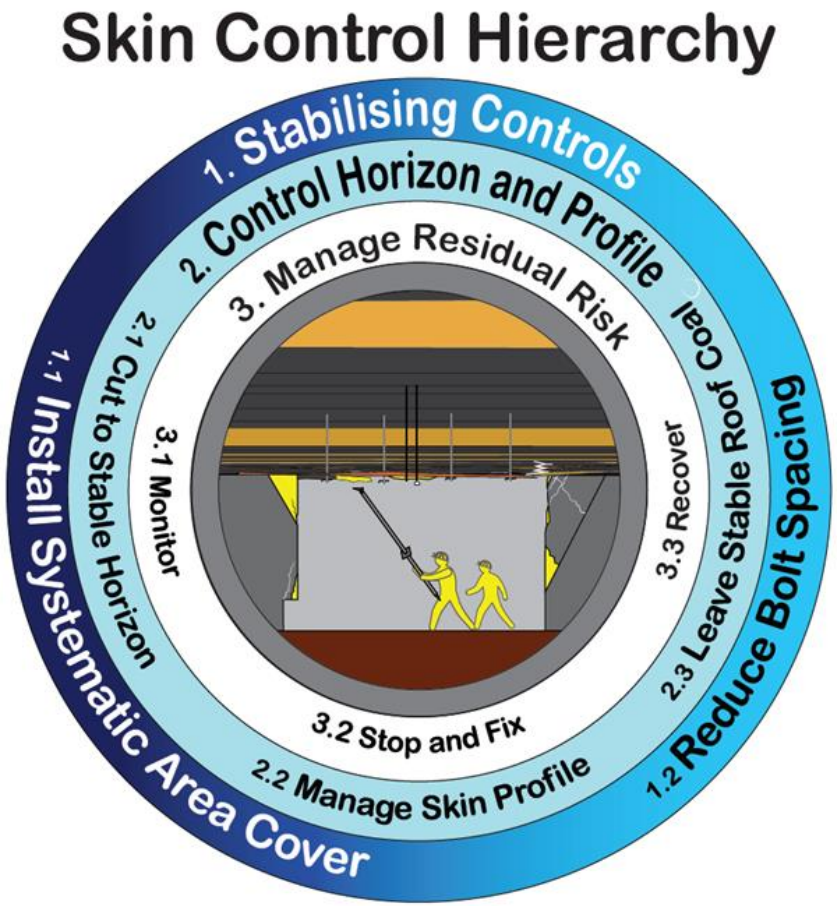
FOG failure mechanisms FY17 to FY21



- 51 FOG incidents since FY17
- Of which 89% was skin related failures not identified during Inspection and Safe making
  - 52% Falls between bolts
  - 23% Falls during support
  - 14% Unsupported overhang and Blasting faces

FOG Management System - Skin

Skin Controls



- Entry examination is dependent on Human-based controls and is not as reliable as engineering controls to manage residual risk

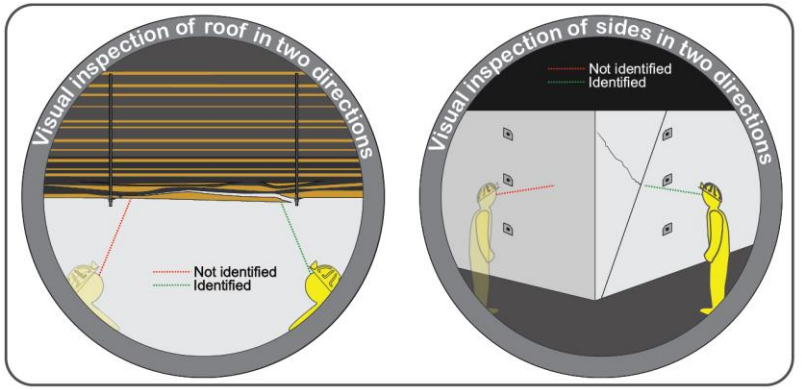
FOG SLAM control effectiveness verification

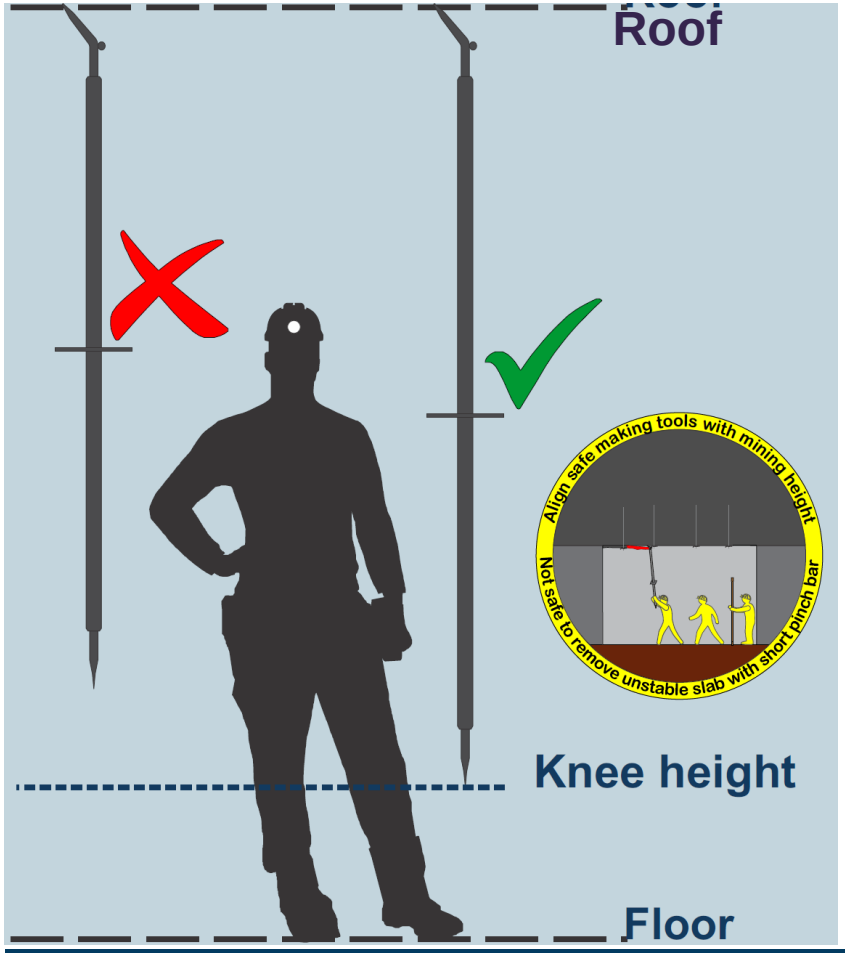
Fall of Ground SLAM		
Stop and Look for Triggers	☐ No red triggers ☐ Yellow triggers present ☐ Risk areas can be identified and made safe ☐ Gradual deterioration ☐ Extent of failures and conditions manageable ☐ Stable once made safe i.e. removed and/or supported ☐ No failure since previous inspection and safe making ☐ No MHSA Section 23 concerns raised	☐ Red triggers present ☐ Excessive yellow triggers and insufficient resources to manage risk ☐ Unsafe and/or difficult to inspect and make risk areas safe: ☐ Mining height, confined spaces - cannot make safe ☐ Damage prior to support, falls in unsupported area ☐ Progressive/Sudden failure ☐ Unexpected failures, support failing ☐ High failure rate – new failures since previous safe making ☐ Repeated failure in identifying triggers ☐ Difficult or impossible to identify triggers ☐ Multiple cycles of safe making or continuous stop and fix
Assess Controls	☐ Stop and Fix appropriate ☐ Required controls identified and can be implemented	☐ Stop and Fix not appropriate ☐ Uncertainty regarding required controls ☐ Required controls cannot be implemented
Assessment Outcome	☐ **Control Plan Effective** ☐ Uncontrolled excavation failure unlikely ☐ Uncontrolled skin failure unlikely ☐ Yellow triggers manageable **We can fix this**	☐ **Control Plan Deficient or uncertain** ☐ Uncontrolled excavation failure likely ☐ Uncontrolled skin failure likely ☐ Triggers cannot be managed ☐ Available controls do not reduce risk or potentially increase risk **We need assistance** • Immediately stop, withdraw personnel and equipment from risk area; and • Fence risk area.
Manage	**Continue with Control Plan:** • Implement stop and fix actions or fence risk area until made safe • Residual risk significantly reduced and acceptable • Miner or Competent A person declare area safe when all risk areas are made safe. Fence areas that cannot be made and declared safe • Verify controls are effective and give permission to proceed • Continuously monitor and make safe	**Follow the Management Plan Alignment process to manage change** ☐ **Revise Skin Control Plan** • Issue instructions • Ensure necessary resources are made available and enable implementation • Report to Mine Manager ☐ **Initiate Excavation Control Plan review** • Report to Mine Manager and Rock Engineer • Ensure necessary resources are made available • Align Management Plan with risk • Implement revised Management Plan

- Assessment used by operational personnel to assess their capability to manage residual risk

General Rules of Inspection and safe making

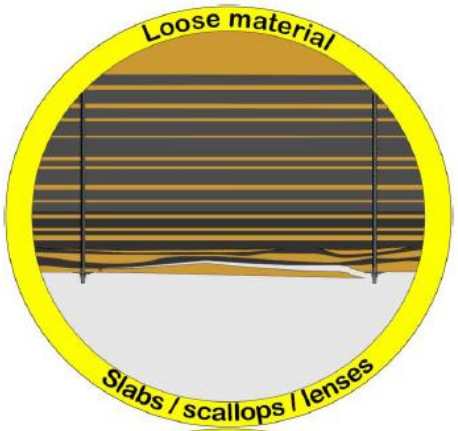
- Inspect roof and sidewalls in multiple directions

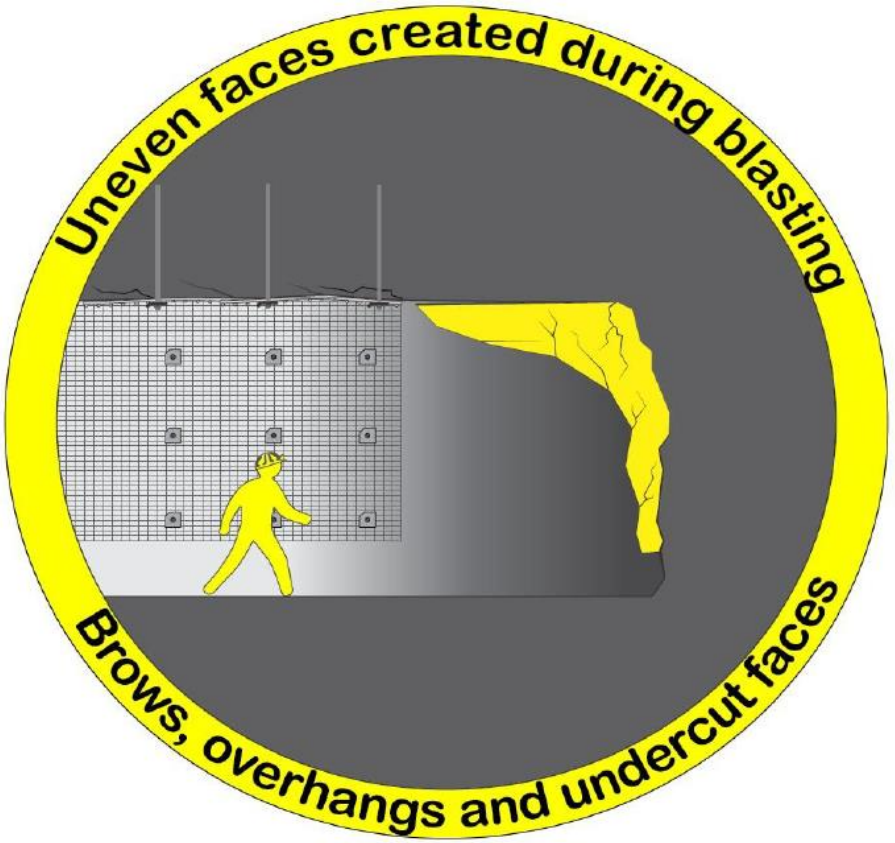




- Manual safe making tools (pinch bars and sounding sticks), to touch the roof and knee of person conducting safe making.
- Position person away from falling skin.

Trigger Response Action Plan (TRAP) - Skin





Innovation

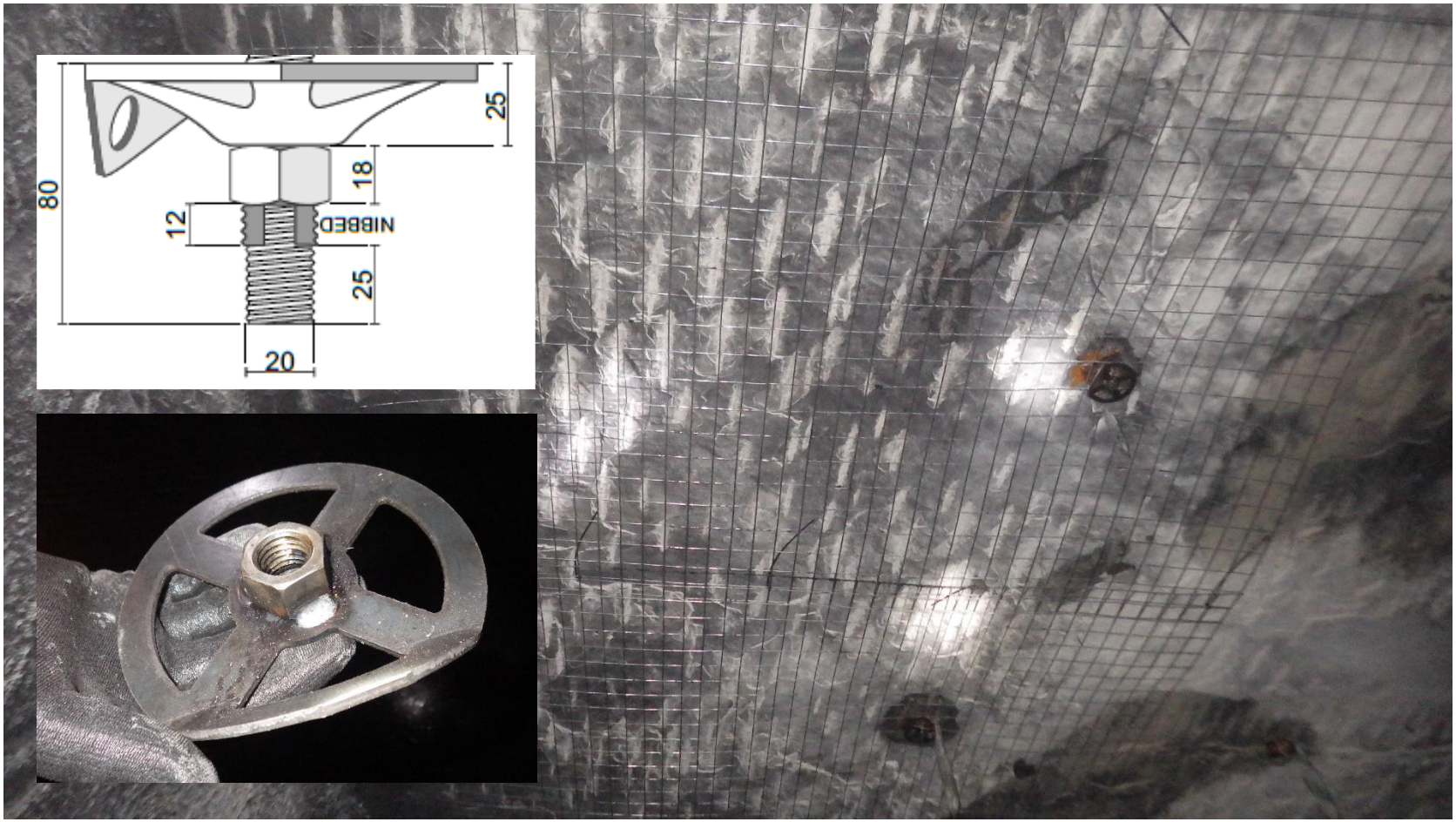
Bolter improvements

- Introduction of Temporary roof support (TRS) on RHAM bolters in (2002)
  - To prevent overrun of the unsupported area into area being supported
- Twin boom bolters with canopy protection on bolting platforms and tramming position (2004)
  - Protect operators against skin failures during tramming and bolting
  - Most incidents during bolting still occurred on the bolter walkway
- Introduction of bolter walkway canopies (2019)
- Narrow bolter able to support confined spaces in back areas (2018)

Mesh installation – Concurrent with Primary support

- Mesh handler implemented on bolters TRS's to improve concurrent installation
- Enable full systematic area cover where required

Mesh installation - Follow-on

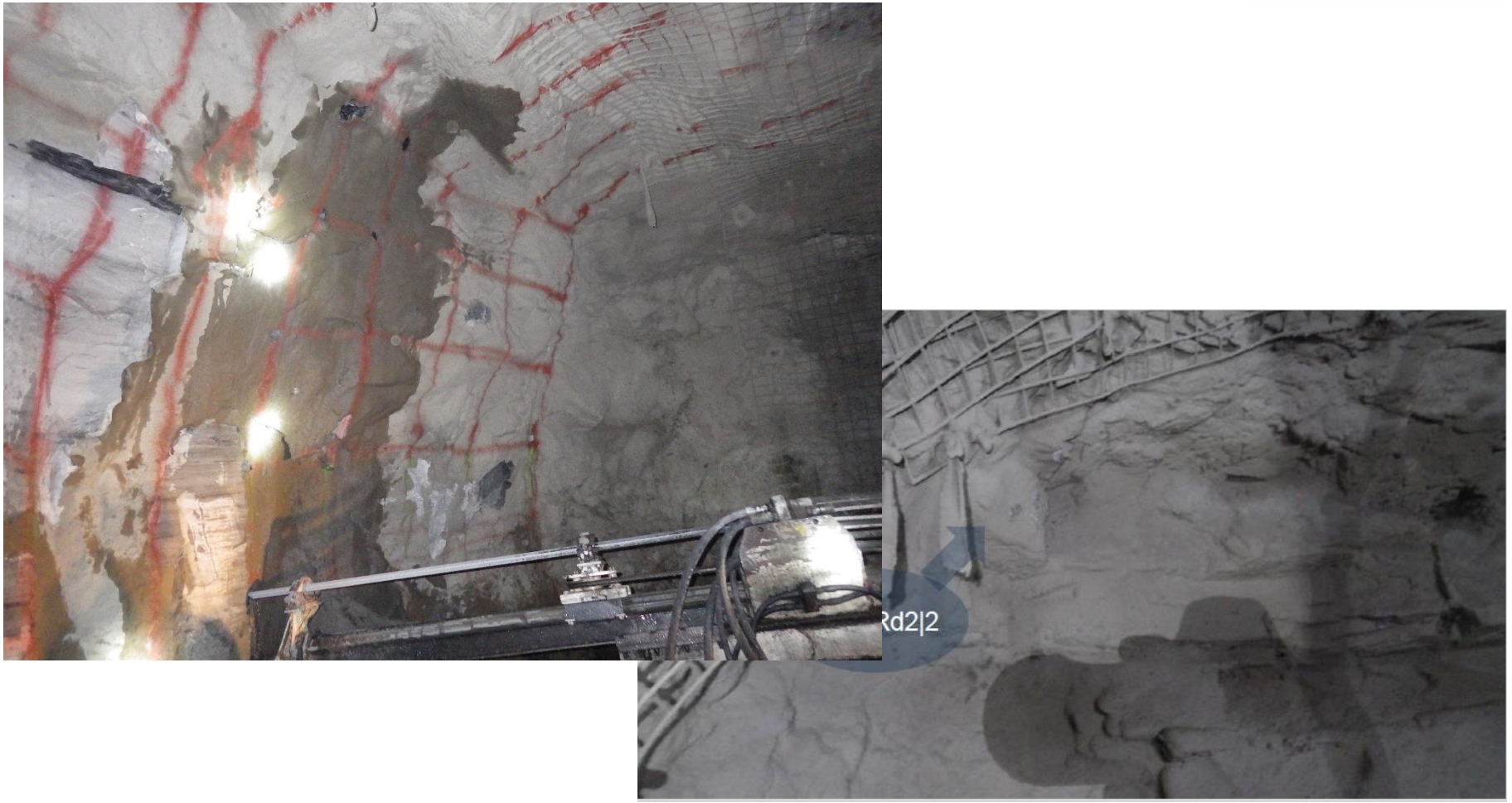


- Additional thread available below nib to allow for double-nut installation
- Double nut assembly used to install mesh in risk areas where bolting is not available

Blasting face protection - Charging cage

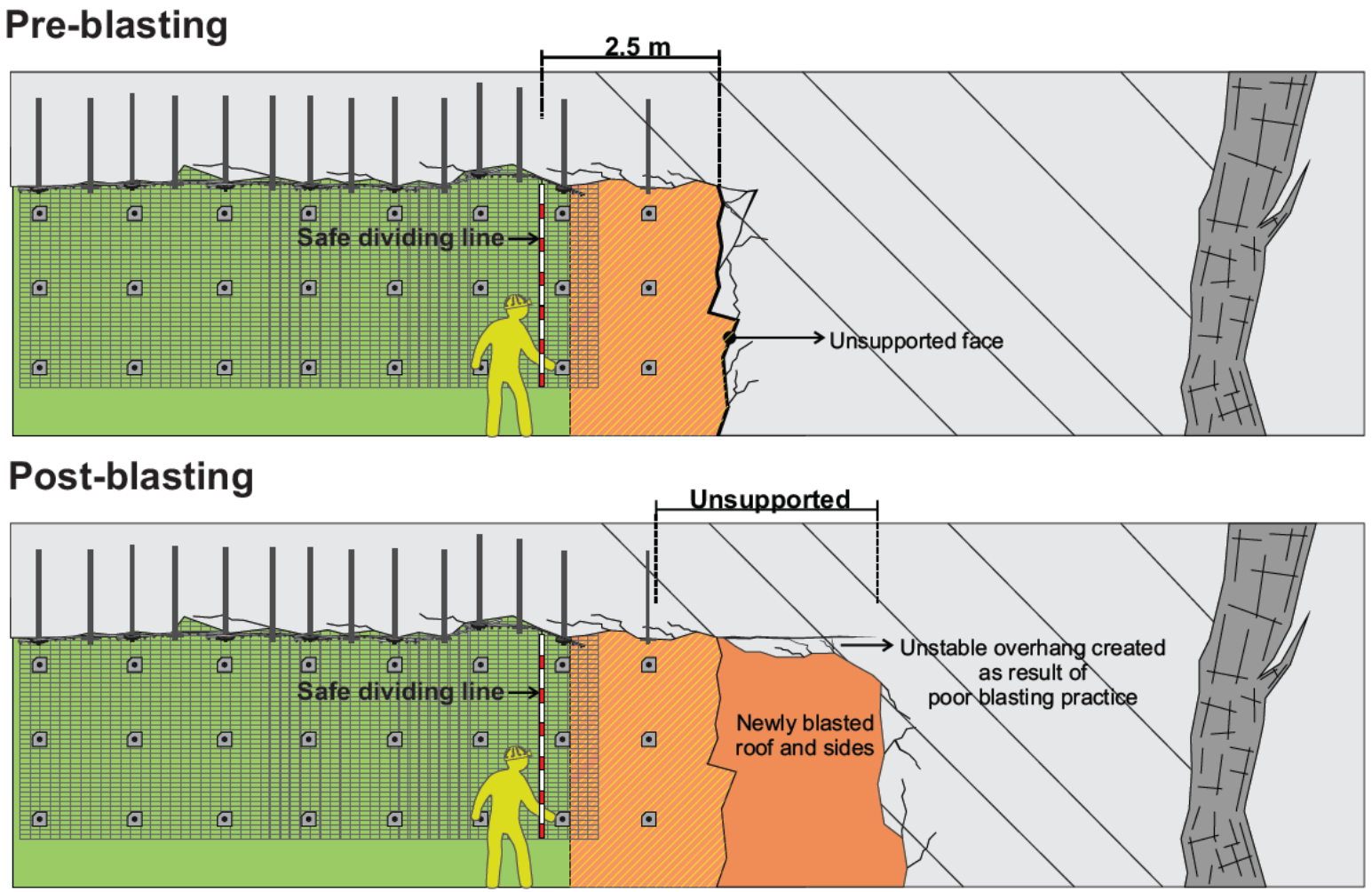
- Charging cage used to conduct face activities past last line of support
- Personnel protection against unsupported blasting faces

Alternative blasting face protection - Thin Skin Liner (TSL)



- TSL used in blasting faces to confine material
- Personnel protection against unsupported blasting face

Blasting face protection – Safe dividing line

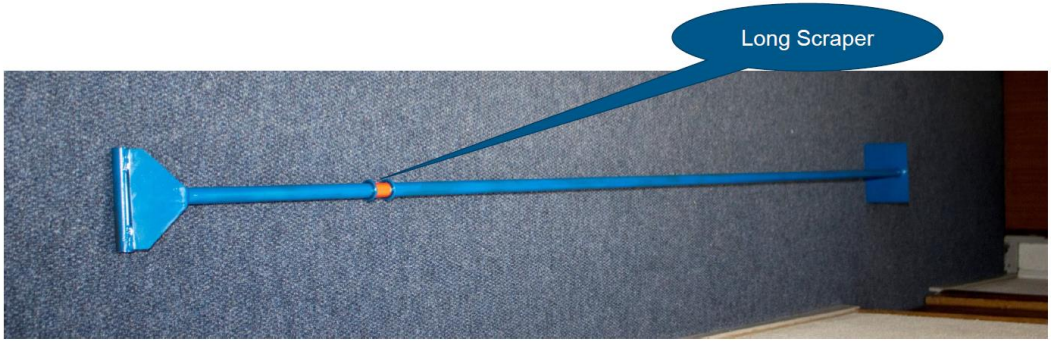


Support must be to standard prior to each blast.

No person on foot shall be allowed closer than 2.5 m from the working face or past the 2nd last line of support, which ever is furthest, without an approved barrier. Includes charge up cage / Bolter canopy

Blasting face protection – Enable remote activities

- Flexible and extendable charging sticks
- Spray paint extender and long distance spray nozzle
- Long scraper to allow cleaning of bottom holes



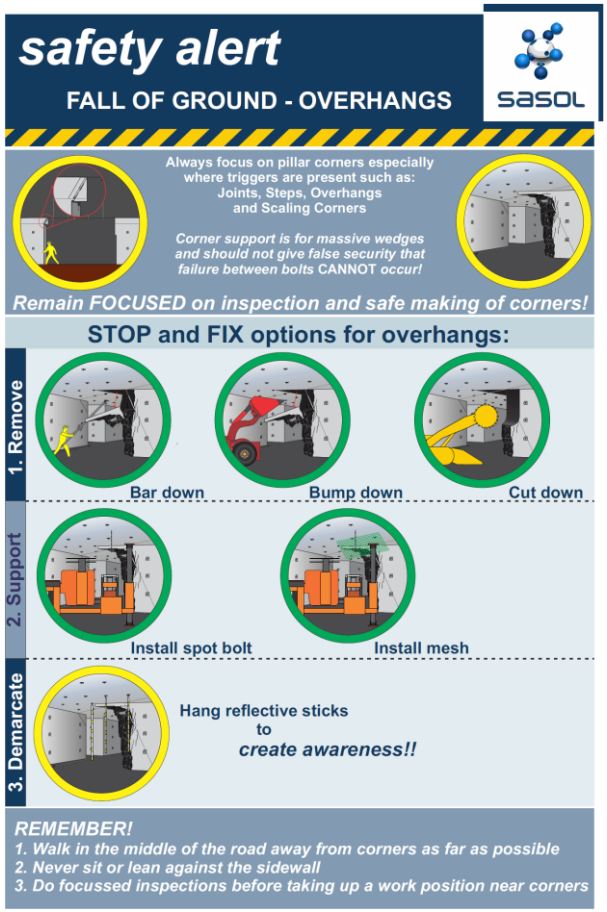
Thin Skin Liner (TSL) – For rehabilitation of back area

- Weathered and deteriorated roof skin in the belt road prior rehabilitation.
- Limited access for rehabilitation and re-support due to belt and props

- TSL applied as temporary barrier to create safe working area for re-supporting with handheld drills

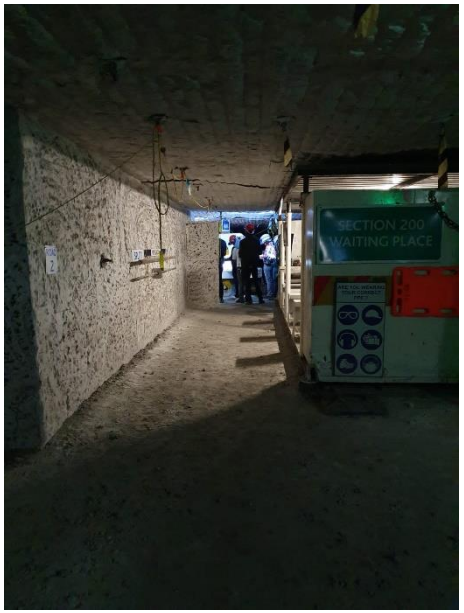
Training

Training Material – Typical posters communication



Mock Mine and Training facility



- Mine simulation built to train risk identification and facility explaining FOG management system

Training Material – Trigger animations

Training Material – 5 P’s to barring

Questions?