SA PGM Operations

Kwezi Shaft – Kroondal West

HPI: IOD Investigation

Date of injury:18 June 2020

Date of presentation:14 May 2021

SAMI Entry Examination and Making Safe Day of Learning

Our vision and values dictate our actions

PURPOSE

OUR MINING IMPROVES LIVES

VISION

SUPERIOR VALUE CREATION FOR ALL OUR STAKEHOLDERS through the responsible mining and beneficiation of our mineral resources

Underpinned by our
C.A.R.E.S. VALUES

Ensuring value creation for all stakeholders is a fundamental requirement for sustainability

Zero Harm Strategic Framework

OUR VALUES

Commitment

Accountability

Respect

Enabling

Safety

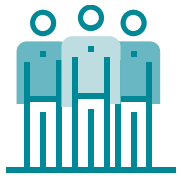
ENGAGED LEADERSHIP

OUR VALUES

ENABLING ENVIRONMENT

Reducing risk exposure by maintaining a safe working environment with equipment, tools and material that enable sustainably safe production

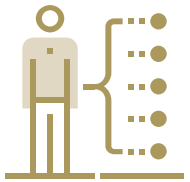
- Real risk reduction initiatives ongoing
  - Working place layout improvements
  - Ventilation and refrigeration
    - Occupational Hygiene, dust, noise, radiation, DPM
  - Infrastructure improvement
  - Shafts; Horisontal transportation, In stope ore removal, Fires
  - Surface water course safety
  - Focus on the 'elimination' of 'A' Hazards



EMPOWERED PEOPLE

Ensuring the required number of trained people to apply relevant standards and procedures to work safely

- Working and living with COVID-19
- Safe Production leadership and culture
  - Individual, team and organisation; Mirror sessions; Values-based decisions intervention
- Safety Summits
- High Impact training
  - Supervisory training
  - Language Policy
  - Risk management; Strata control, Incident investigations
- Section 23 withdrawals reinforcement
- Risk Management capacitation and qualifications



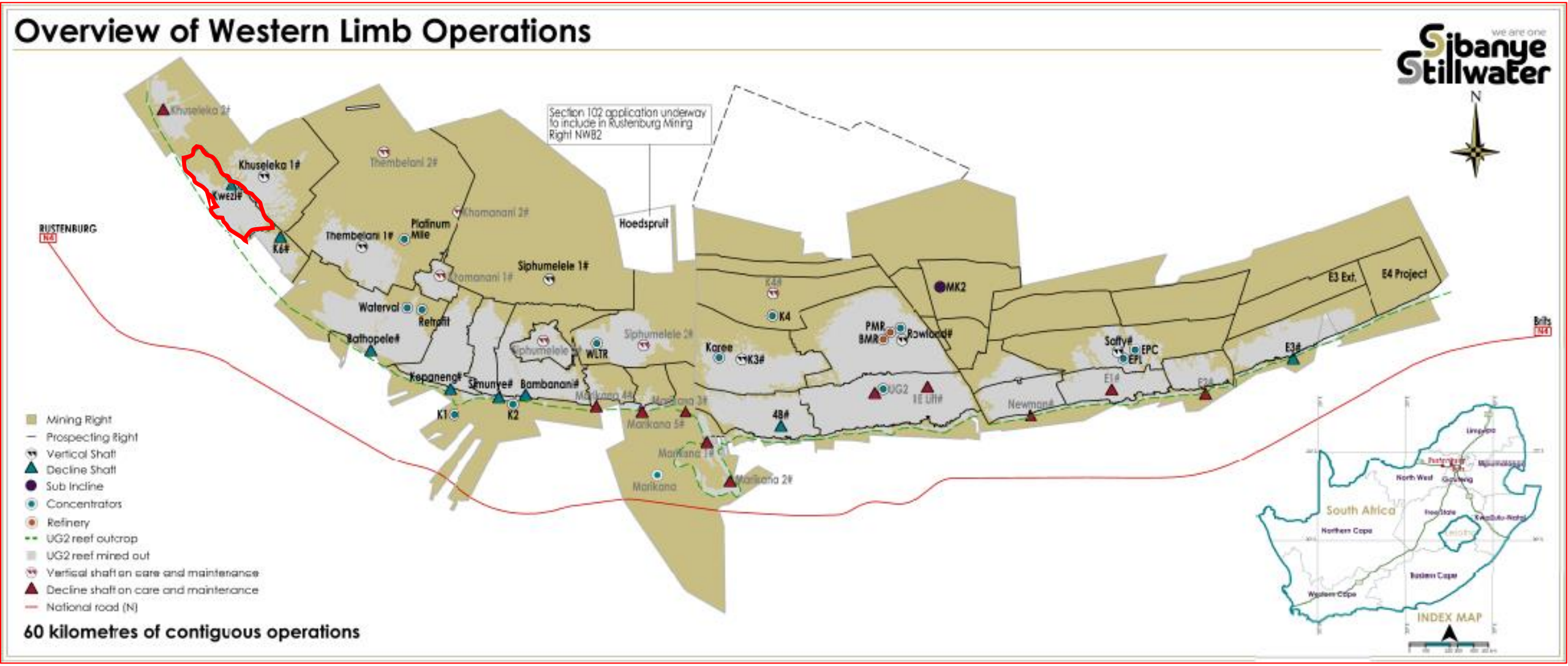
SYSTEMS

Subscribing to international best practice principles and integrated systems

- Mine Operating System enhancement
- Risk management
  - Integration with the Mine Operating System
  - Risk identification, prioritisation, reduction , follow up
  - Bow-tie risk management; critical controls
  - Root cause analysis
  - Real Risk Reduction Protocols
  - Life-saving rules
  - Trigger Action Response Plan (TARP)
- Safety and Health leading indicators
  - QlikView rollout
- TRIFR
  - Low energy incident focus
  - Incident reviews
  - Basic cause analysis
- Rock mass management
- Independent high potential incident reviews
  - Action plans per segment
- ICMM principles
  - Definitions
- ISO 45001 Occupational Health & Safety certification (2021)
- Safety maturity management (Bradley curve)
- Incentive Scheme alignment
  - Fatal penalty 2022
  - Leading indicators inclusion 2022
  - Health indicators 2023

Our Operations

Overview of Western Limb Operations



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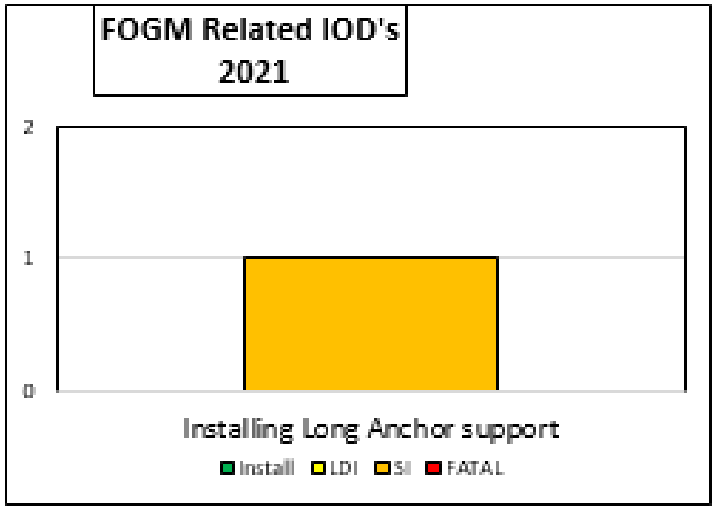
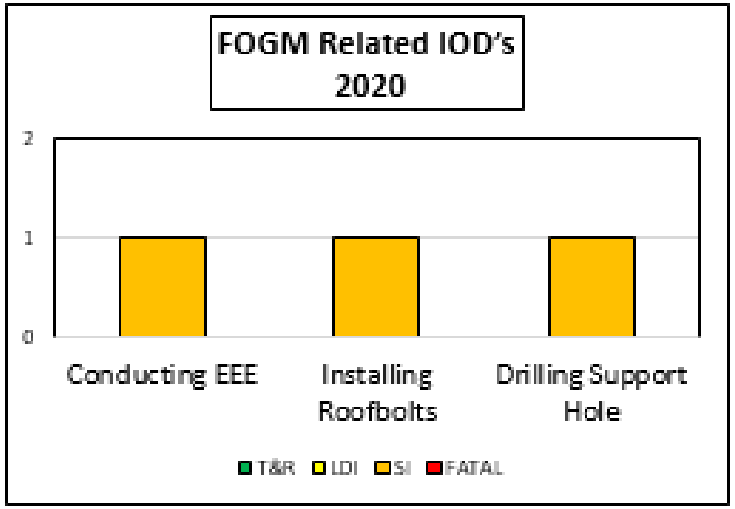
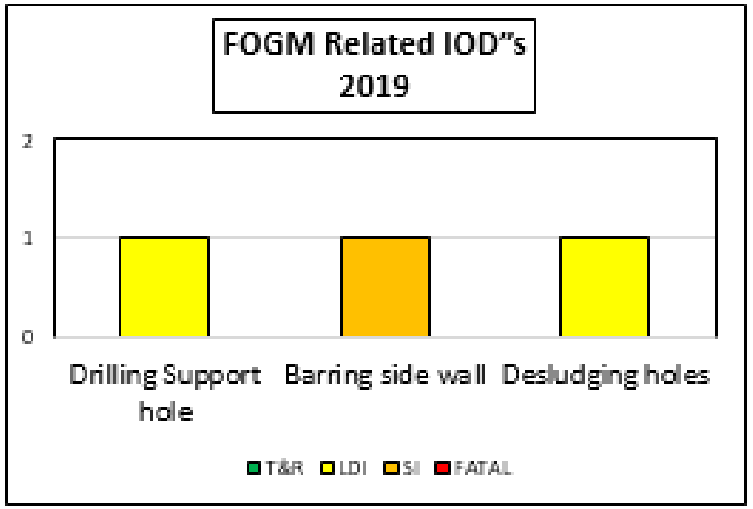
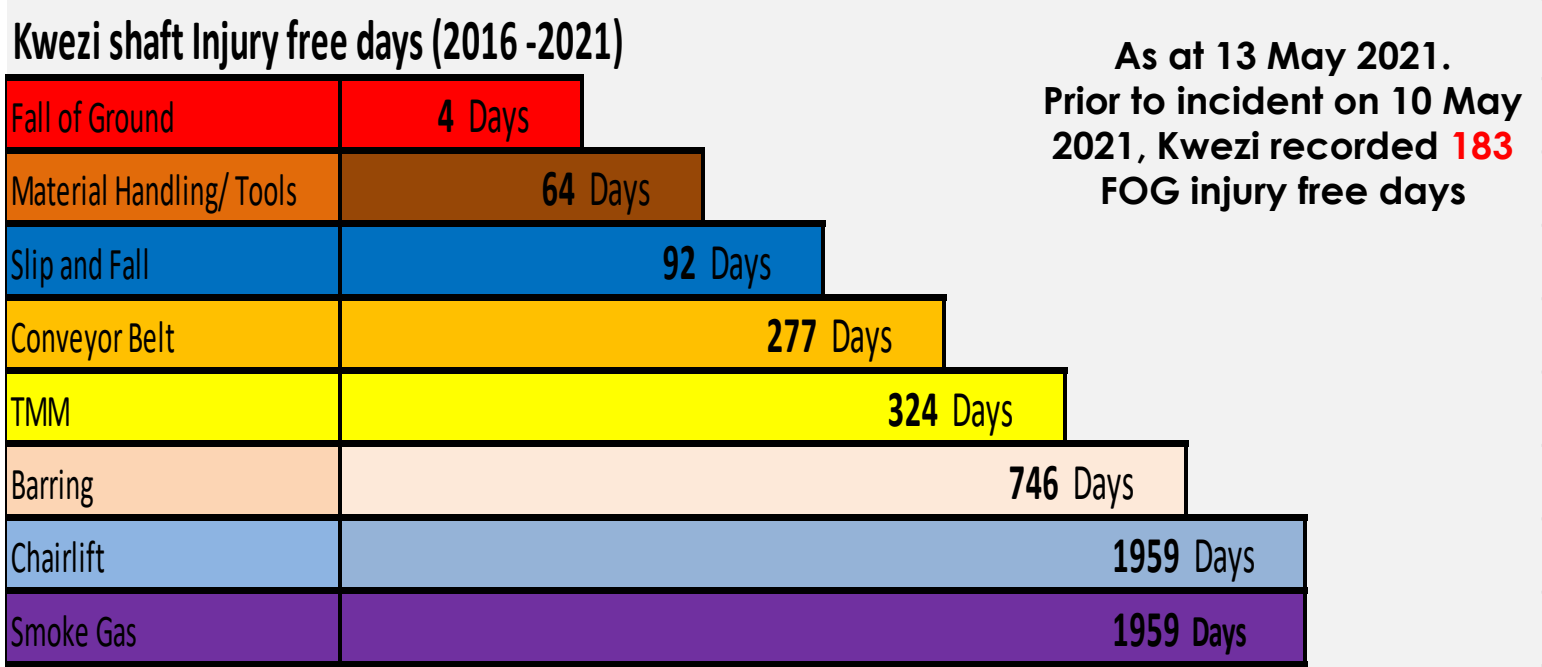
Kwezi Shaft Injury Statistics









Details of Injured

- Full names : Katiso Elias Mosoale
- Employer : Sibanye Stillwater
- Coy. No : Z0717526
- Age : 47 Years
- Passport no : RC657947
- Occupation : Team Leader Underground
- Total years service : 12 Years 5 Months
- Injury sustained : Multiple injuries: Upper limbs & Lower Limbs
- Location : KWE 10LS 01 PNL008 115W
- Time of Incident : 12:05
- Residing at : 16497 Sondela Village Boitekong
- Dependents : 02

After establishing the employee's family is in Lesotho, TEBA was contacted to convey the news. Confirmation was received on the 19th June 2020 that his wife and two daughters namely Nteboheleng Mosoale (21yrs) and Rorisang Mosoale (14yrs) was duly informed. Due to current lockdown restrictions, TEBA could not transport his wife to Milpark as per practice, but Dr Tjale took over to update his wife on progress of Mr. Mosoale. Unit Manager-HR contact details has been shared with his wife in order to have direct contact to the shaft and or if any clarity or assistance was required.

Description of Incident

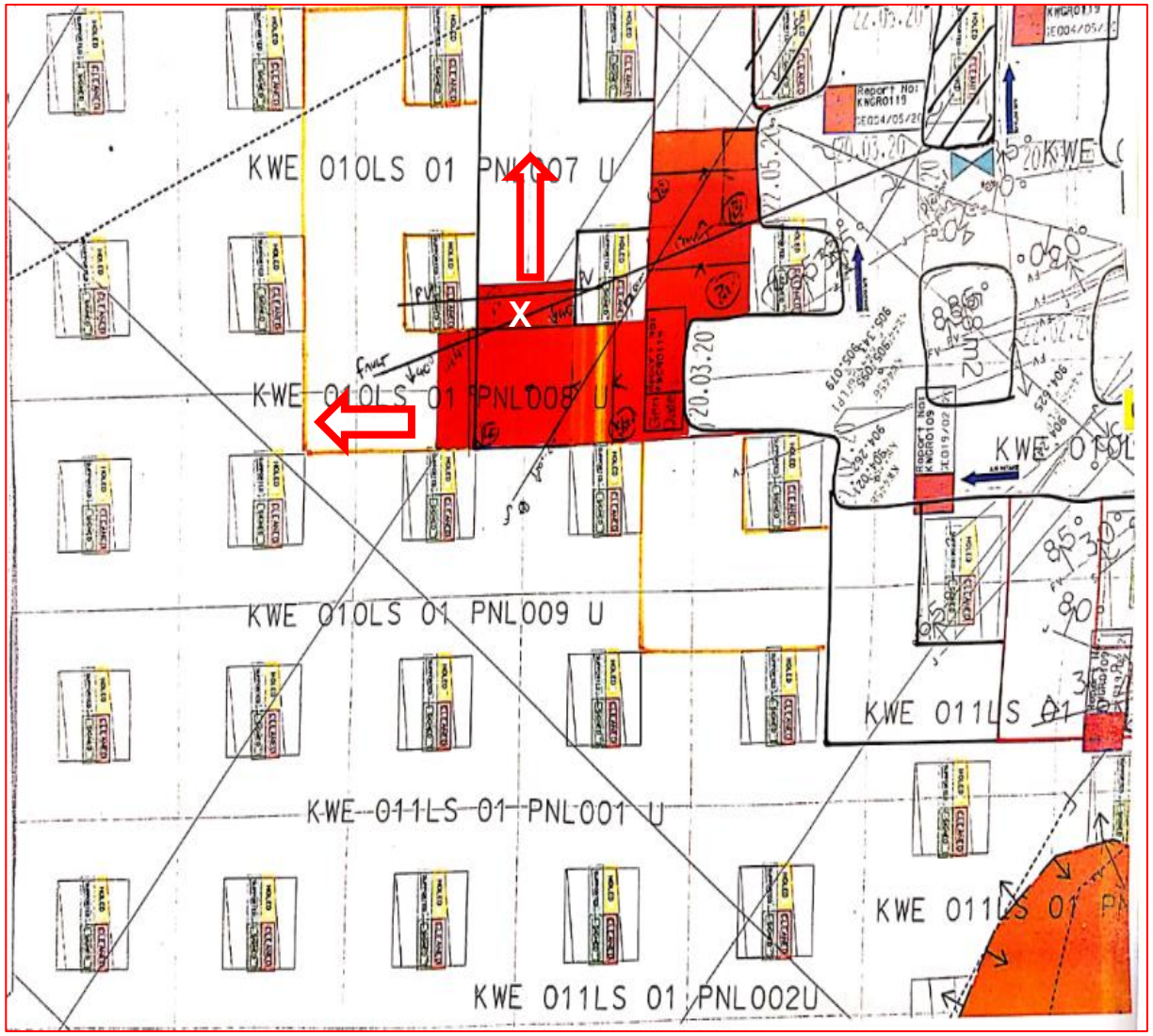
On 18 June 2020 at approximately 12:10, it was reported that a gravity induced fall of ground (FOG) occurred at 10 South Panel 8, at up-dip 115 West.

The crew was in the process of drilling 4,5m anchor support with a bolter when a FOG, measuring 1,72m x 0,85m x 0,3m, occurred from the side of the brow that was being supported (The up dip was mined from the strong side of the fault).

A brow of 1,18m was created at a flat dipping fault (40°) during the previous blast and the brow was in the process of being supported. The drilling vibrations from the bolter loosened the side of the newly created brow which resulted in the rock, weighing approximately 1403 kg, falling from the brow face. The rock struck the Team Leader, Mr Mosoale who was standing next to the bolter's boom, on his left side. He sustained multiple fractures to his left forearm and left lower leg.

He was airlifted to Milpark Hospital in a stable condition where he was under the care of a neuro surgeon. His left forearm has been amputated on the 20th of June 2020.

Plan of Incident Scene



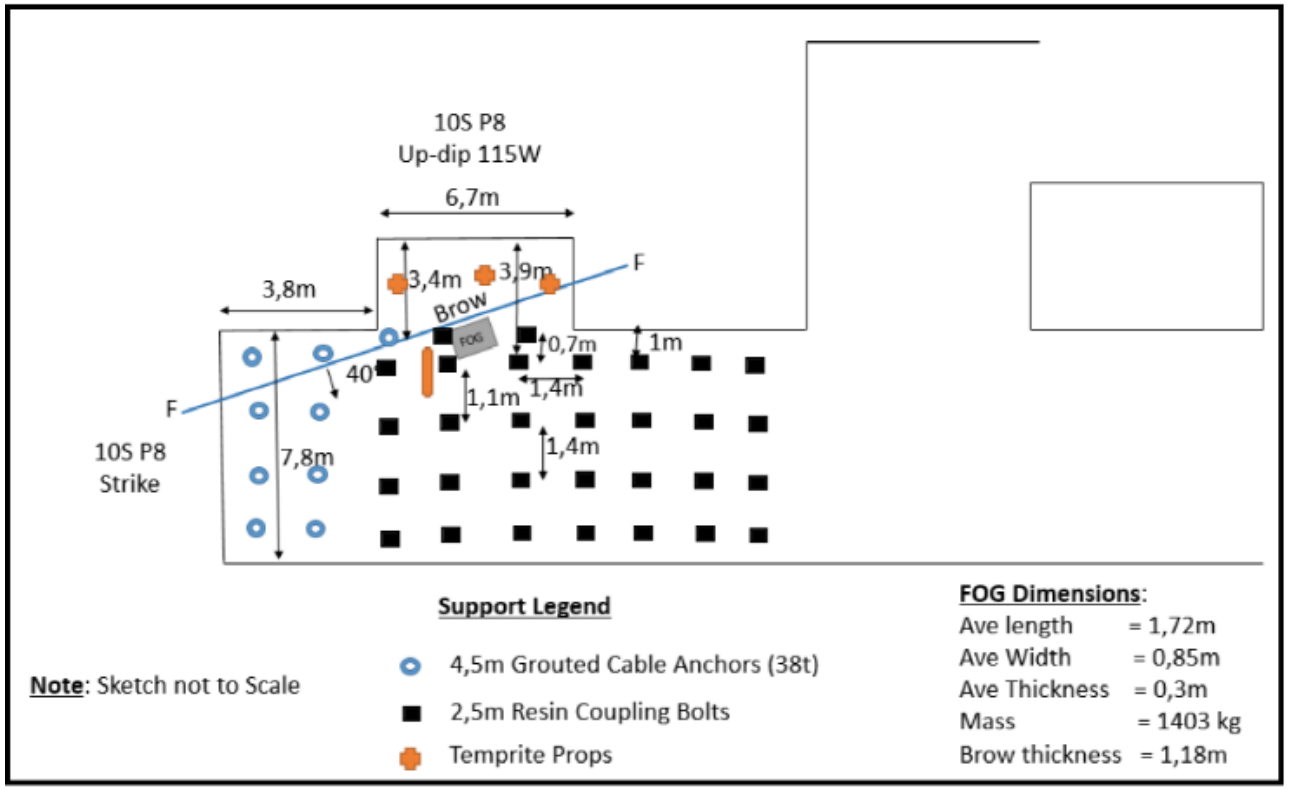
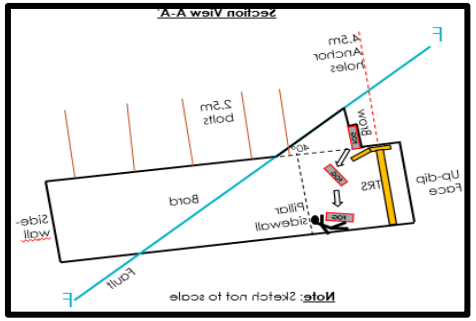


Figure 1 – Plan view of FOG accident, showing the geology and installed support



Photo's of Incident Scene

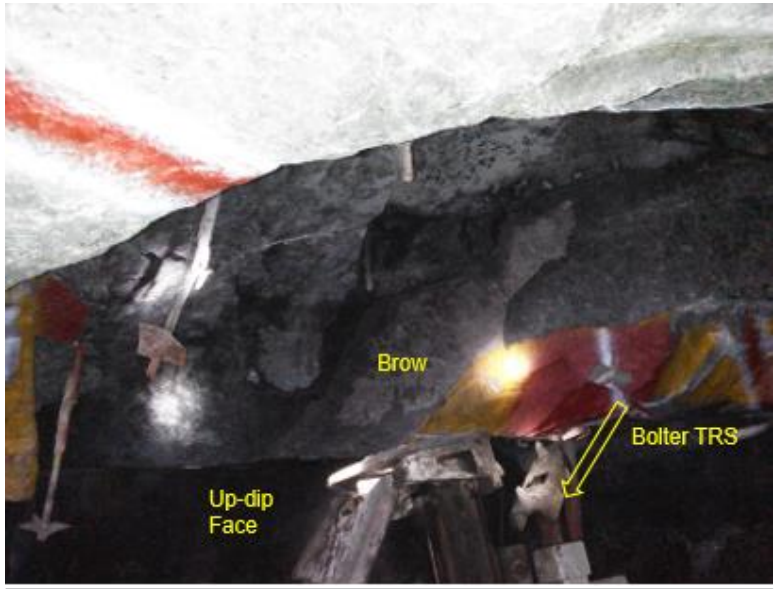


Photo taken from down-dip position looking up-dip towards the brow and up-dip panel face

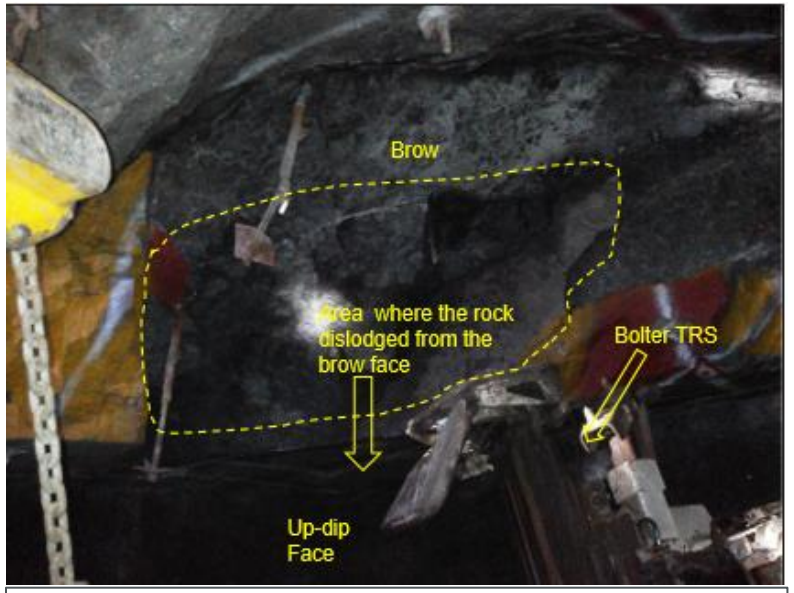


Photo taken from down-dip position showing where the rock dislodged from the brow face

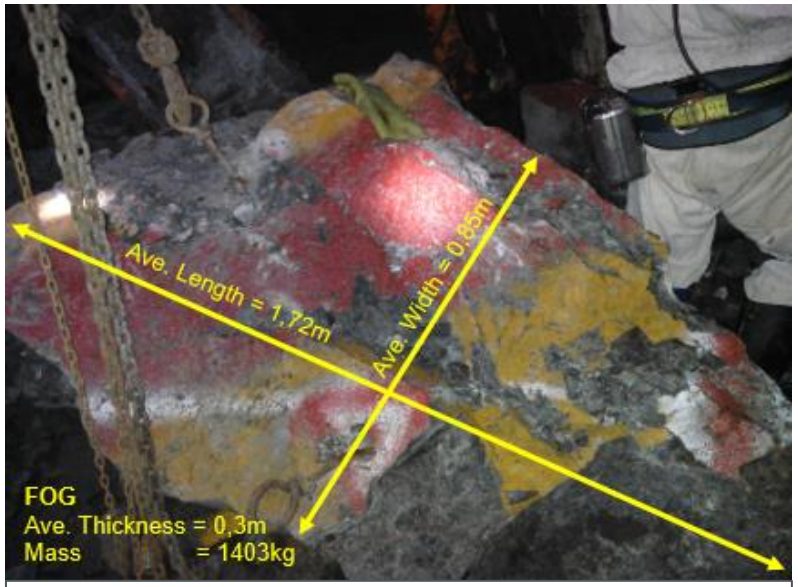
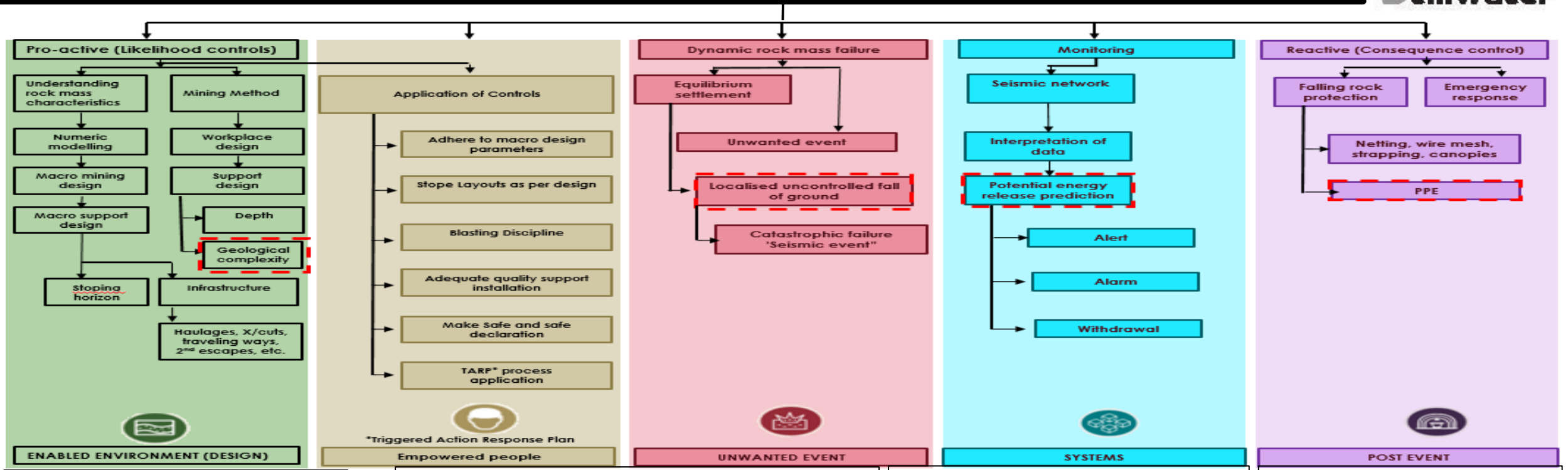


Photo taken of the FOG that struck Mr. Masoale

Photo taken of hanging wall & support immediately down-dip of the 40° flat dipping fault – TARP 2 conditions

Photo taken of installed support on strong side of 40° flat dipping fault. Spaced 1m x 1,4m and better than standard

Rock Mass Management



Enabled Environment - Geological complexity.

- Up-dip board 115W was blasted from the strike board and intersected the 40° flat dipping fault.
- This fault was approached from the strong side, but a 1,18m brow was formed due to fallout from the blast.
- TARP 3 support instructions were issued to support both the weak side of the flat dipping fault as well as the brow been formed.

Unwanted Event – Localised Uncontrolled FOG.

- The predominant mechanism of failure is a slab that fell under the action of gravity, from the brow face.
- The loss of load (5t), supplied by the TRS when the boom was lowered, resulted in the rock to become loose from the brow face where the support hole was drilled, and toppled over causing the FOG injury.
- The main components of this failure are:
  - Brow created on the weak side of the 40° fault
  - Structure: the 40° fault
  - Drilling vibration from bolter loosened the rock, lowering the boom resulted in the rock to dislodge from brow face (load loss from TRS)

Systems – Make Safe

- The Miner, wanting to sound test the suspect hanging wall, should have made sure that the people are removed as per step 6 of the 13 steps to safe barring.

Systems – Potential Energy Release Prediction

- Personnel in front of the bolter operator should have been removed before the boom and TRS was lowered below the brow where roof support holes were drilled.

Reactive Consequence Control

- Procedure for drilling and installing Grouted Cable Anchors as primary support using a bolter, reviewed.
- Drill – install – tension – grout – crop – then only move to the next hole.

Causes

Unsafe Acts

- Standing in the vicinity of the boom whilst lowering the TRS.

Unsafe Conditions

- Unsupported ground condition created when the boom was lowered, resulted in the rock to become loose from the brow face where the support hole was drilled, and toppled over causing the FOG injury.
- TARP 3 support instructions were issued to address the 40° flat dipping fault and brow. The faults was picked up in the adjacent boards of the up-dip where the FOG occurred.

Root causes

- Incorrect drilling and support installation sequence (the procedure at the time allowed for 1 row to be completely drilled before anchor installation took place).
- Position of people during boom operations.

System Control/Management Failure

- Unsafe support drilling and installation practice (row of six support holes drilled along the fault zone without installing support units).
- Support sequence of installation not provided / available at the time of the incident.

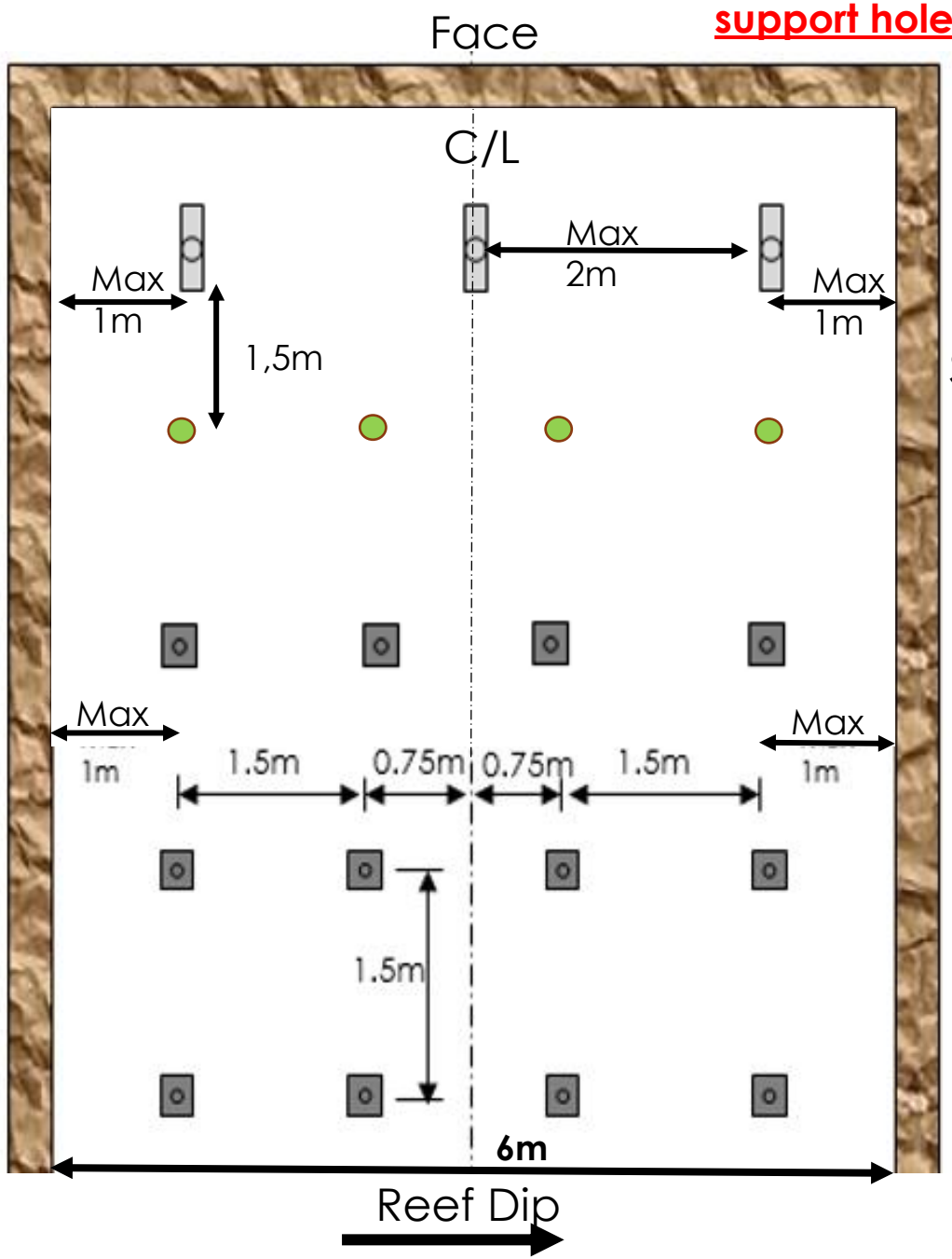
Final Actions

Basic cause	Action	Responsible person	Planned Date	Actual Date
Unsafe support drilling and installation practice (row of six support holes drilled along the fault zone and friable hanging wall without installing support units).	Revise the Procedure of installation of secondary support when drilling with a bolter.	Christo Haasbroek (Rock Engineer)	03 July 2020	03July 2020
Support layout and sequence of installation not provided.	Special Instruction – Installation of secondary support drilling with a bolter.	Lance Sapsford (Mine Manager)	22 June 2020	22 June 2020
Standing next to the boom whilst lowering the TRS. (Temporary Roof Support)	Conduct PTO'S on Support drilling with a Bolter	All Mine Overseers	22 June 2020	On Going

Lessons Learnt and Critical Controls

Similar to drilling and supporting primary support, a long anchor must be drilled and installed prior to moving to the next hole.

Procedure at 6m bords mining North, where cable anchor support holes are drilled, using an AARD / Sandvic Bolter



Step 1

Panel examined, barred and safe declaration done for entire face.

Support holes marked as per standard or TARP 3 support instructions.

Install 1 row of temp. support units at 1,5m ahead of marked row of cable anchor support holes.

Bolter operator prepare Bolter and drill steel for support hole drilling and support crew prepare material for cable anchor support installation.

Legend

- Cable anchors
- Temp. support
- New Support

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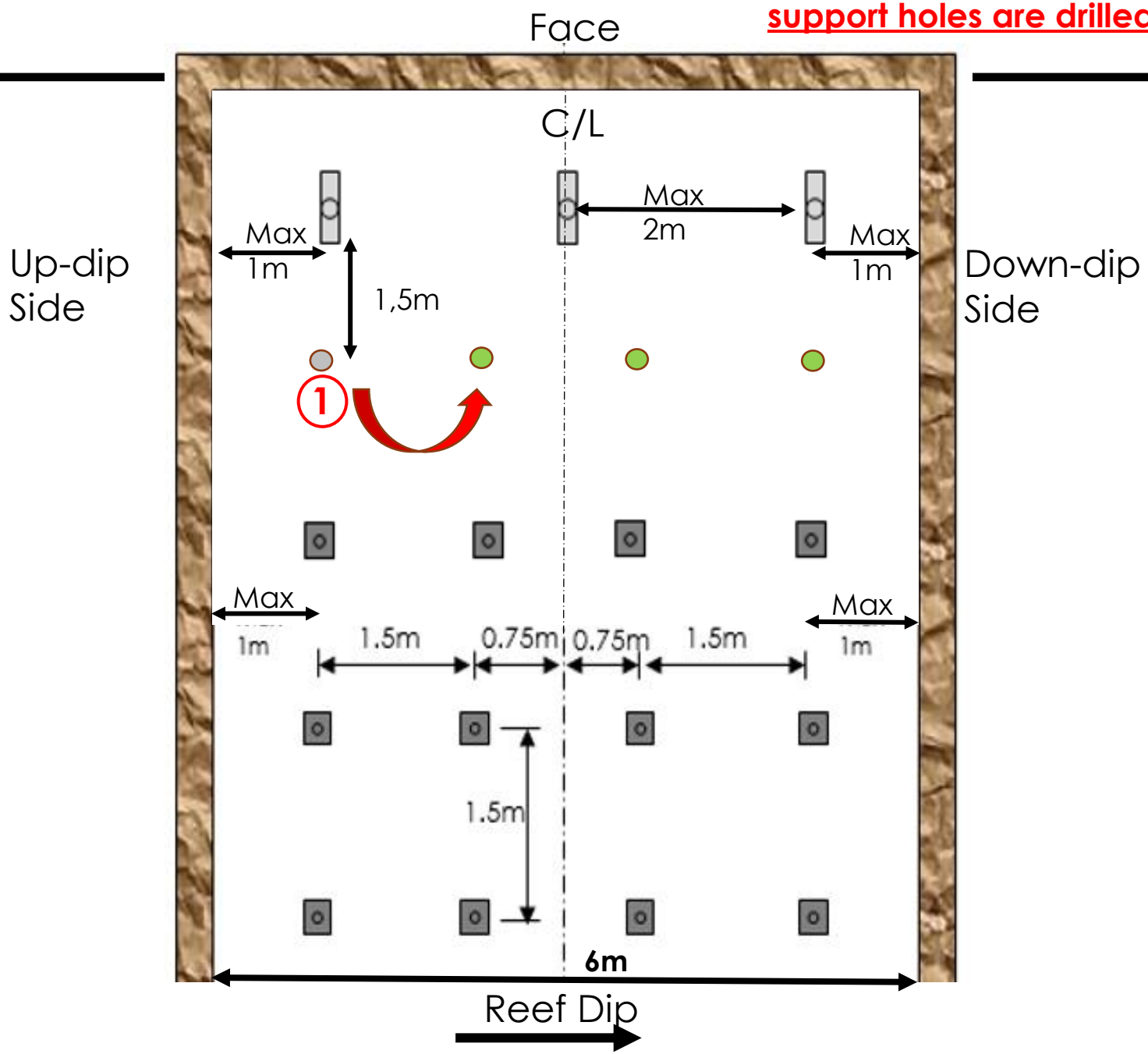


Step 2

Drill the 1st cable anchor support hole, starting on the **Up-dip** side of the panel.

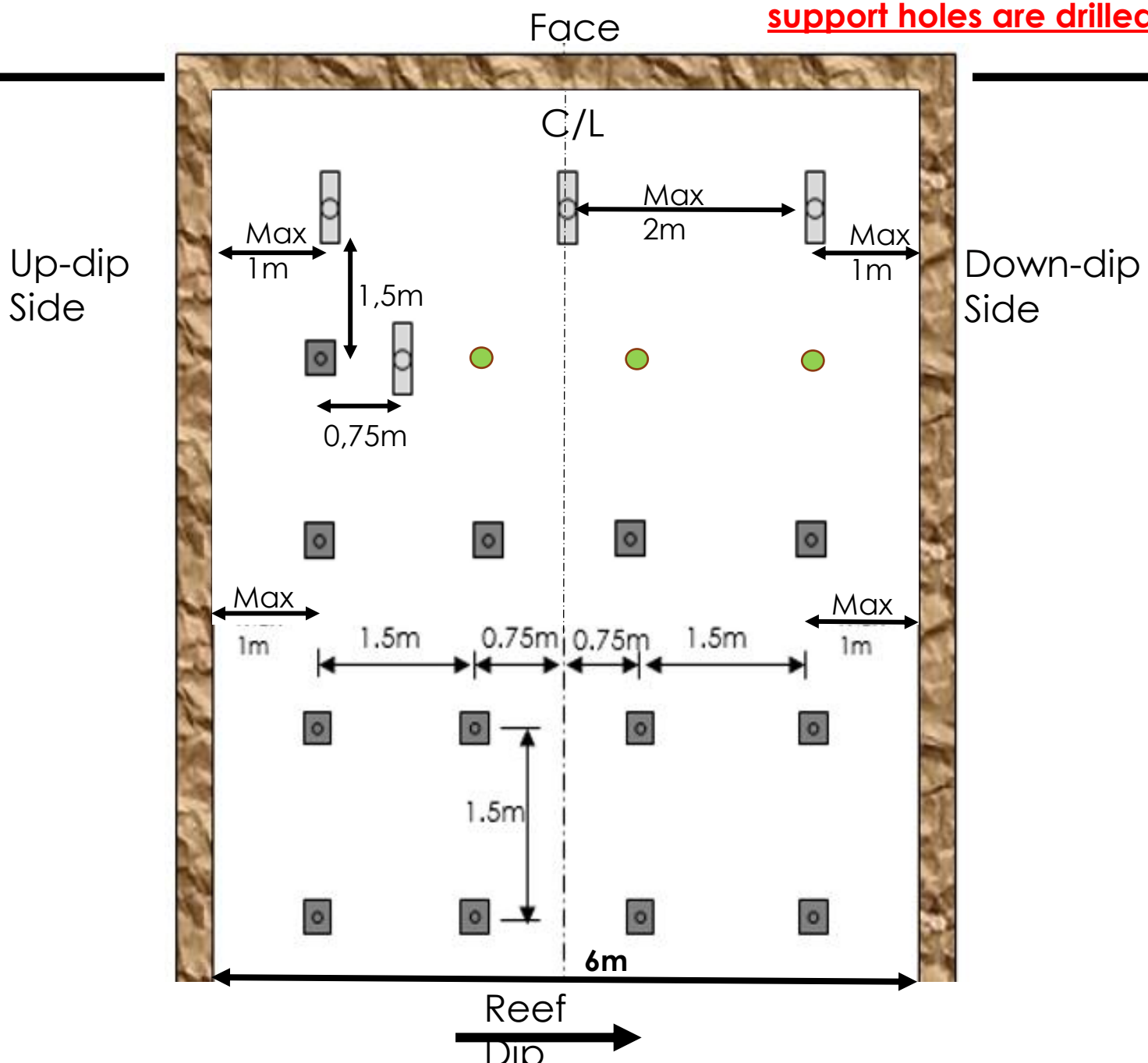
When the hole limit length is reached, stop drilling and move the boom to the next support hole position and activate the TRS and stab jack against hanging wall.

Do **not** start drilling the next hole yet.

Legend

- Cable anchors
- Temp. support
- New Support

Procedure at 6m bords mining North, where cable anchor support holes are drilled, using an AARD / Sandvic Bolter



Step 3

Support crew enters and examine and bar the hanging wall where the hole was drilled.

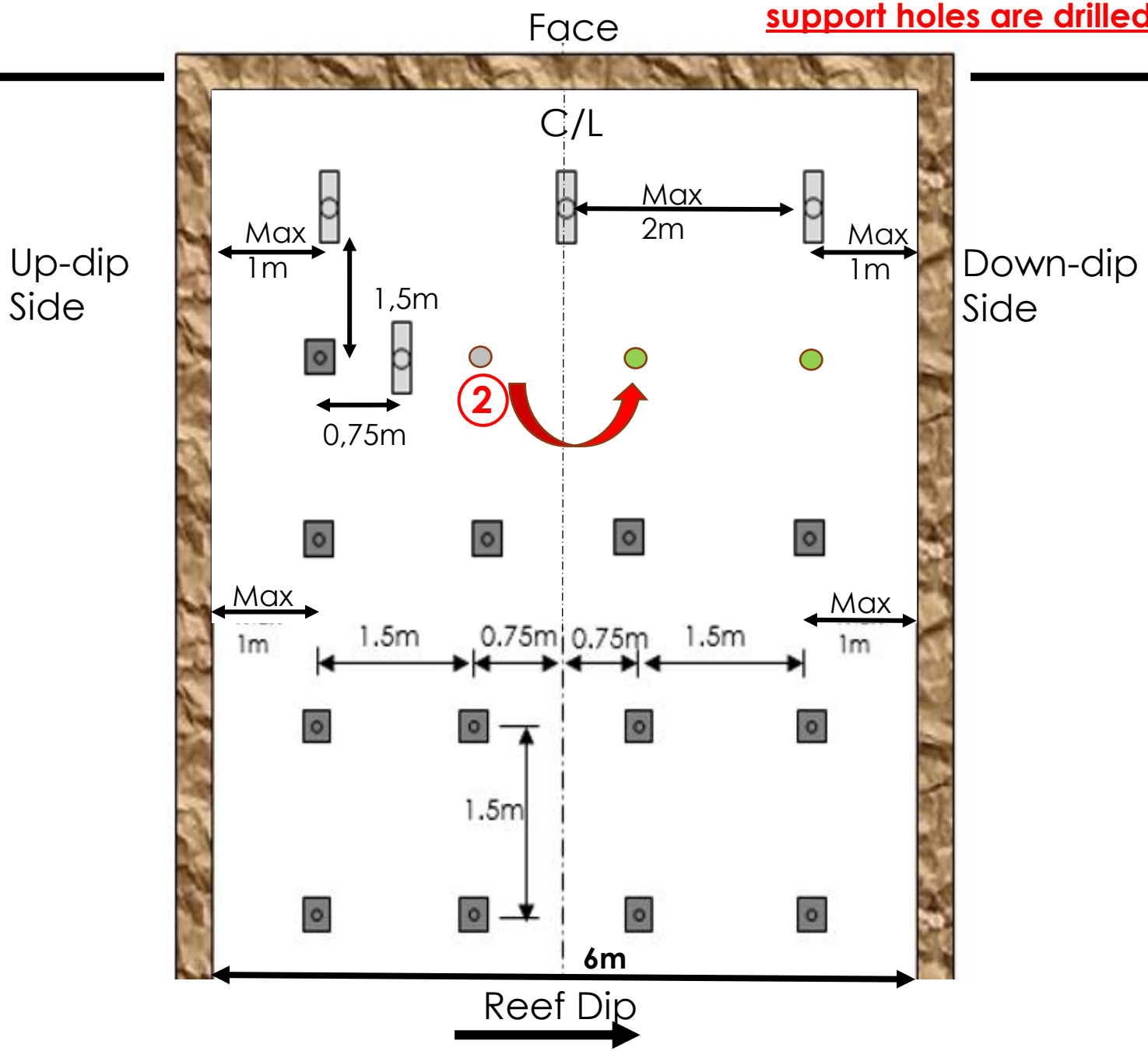
Install 1 x temp. support unit midway between the drilled support hole and next hole to be drilled, max. 0,75m from the support hole.

Install the 1st cable anchor at the 1st hole from the **Up-dip** side of panel and pre-tension the cable anchor, grout and crop the anchor (complete installation).

Support crew moves out of panel face area.

Legend
- Cable anchors
- Temp. support
- New Support

Procedure at 6m bords mining North, where cable anchor support holes are drilled, using an AARD / Sandvic Bolter



Step 4

Once the 1st cable anchor is installed, grouted, tensioned and cropped, start drilling the 2nd cable anchor support hole.

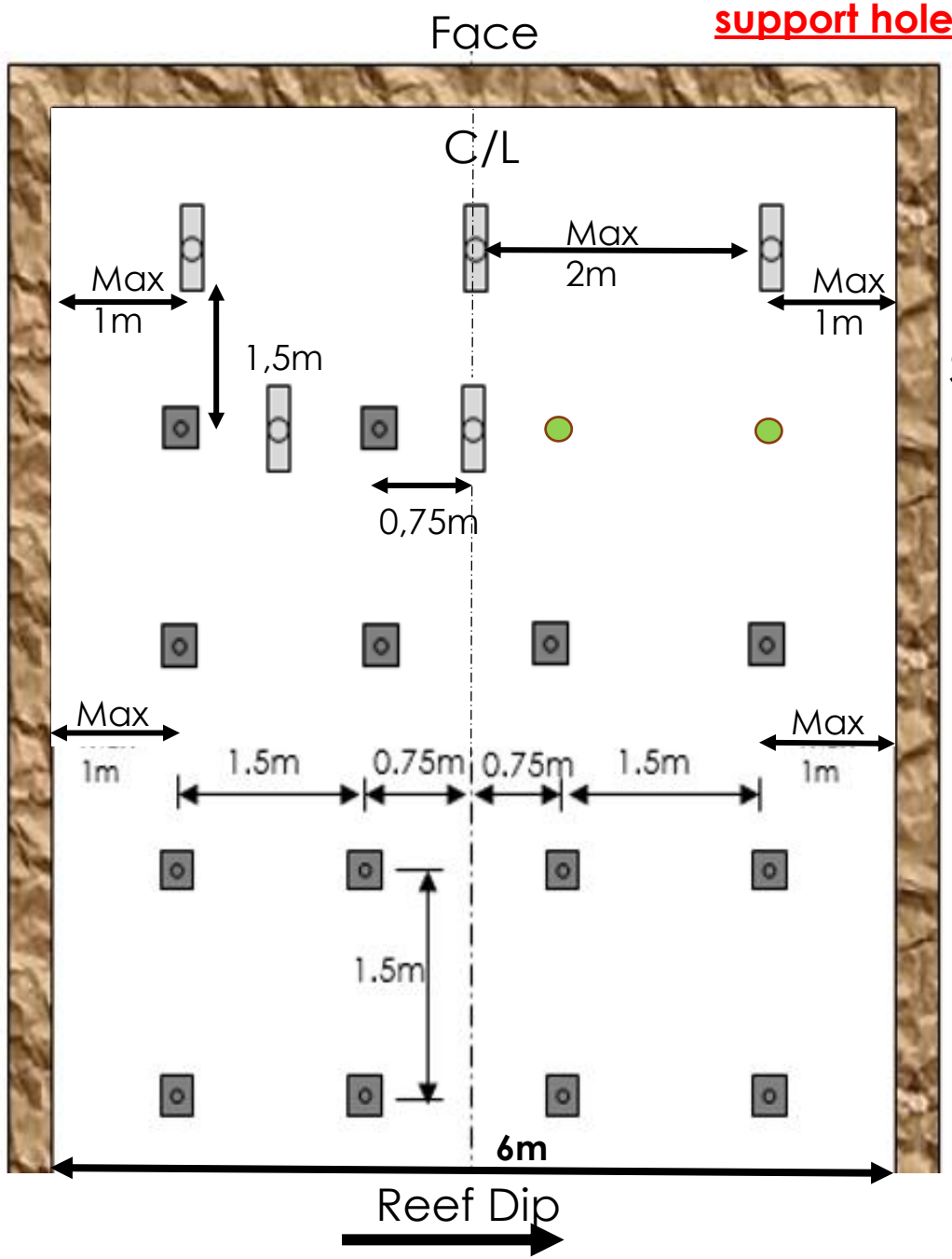
When the hole limit length is reached, stop drilling and move the boom to the next support hole position and activate the TRS and stab jack against hanging wall.

Do **not** start drilling the next hole yet.

Legend

- Cable anchors
- Temp. support
- New Support

Procedure at 6m bords mining North, where cable anchor support holes are drilled, using an AARD / Sandvic Bolter



Step 5

Support crew enters and examine and bar the hanging wall where the hole was drilled.

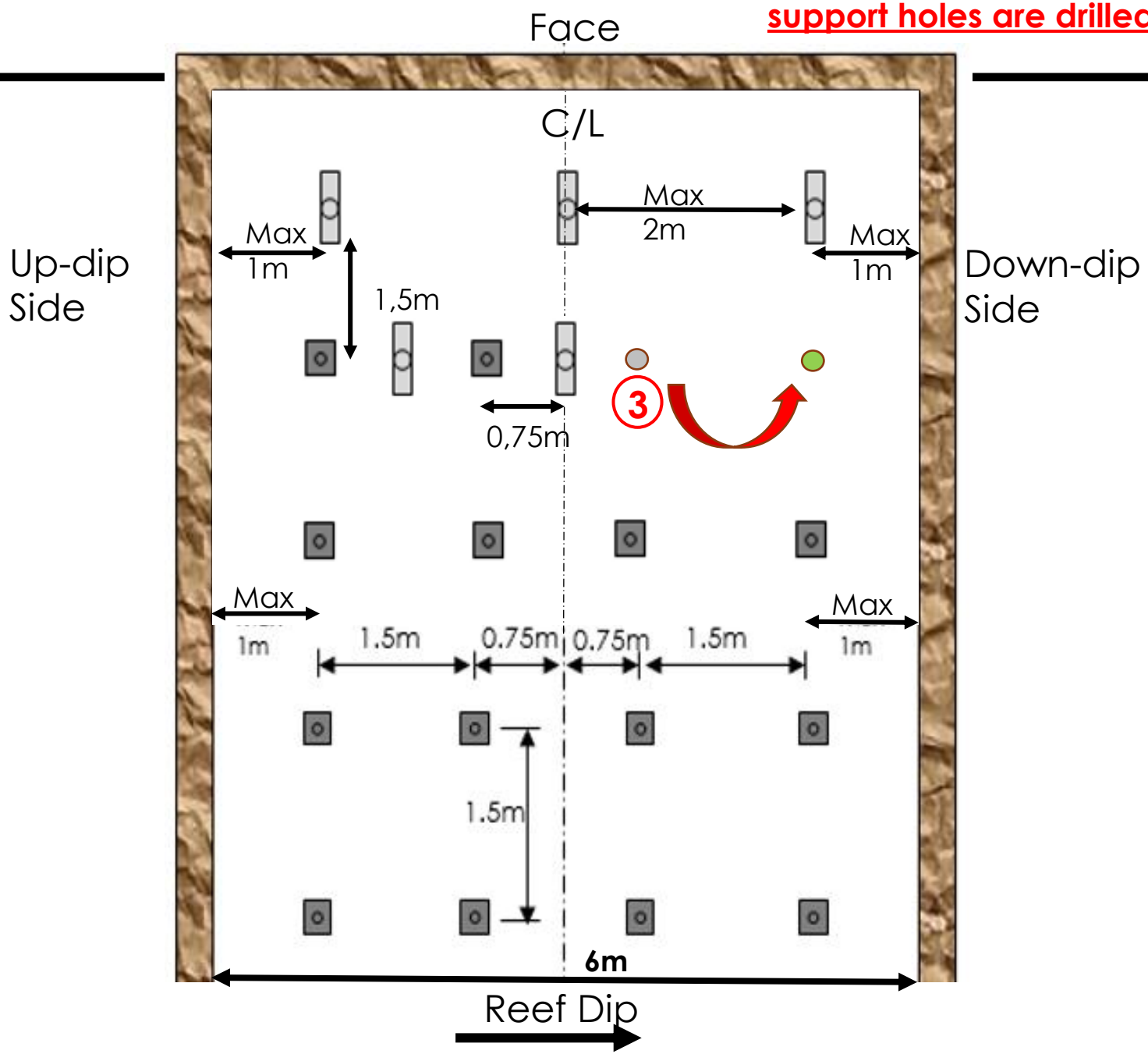
Install 1 x temp. support unit midway between the drilled support hole and next hole to be drilled, max. 0,75m from the support hole.

Install the 2nd cable anchor at the 2nd hole from the **Up-dip** side of panel and pre-tension the cable anchor, grout and crop the anchor (complete installation).

Support crew moves out of panel face area.

Legend
- Cable anchors
- Temp. support
- New Support

Procedure at 6m bords mining North, where cable anchor support holes are drilled, using an AARD / Sandvic Bolter



Step 6

Once the 2nd cable anchor is installed, grouted, tensioned and cropped, start drilling the 3rd cable anchor support hole.

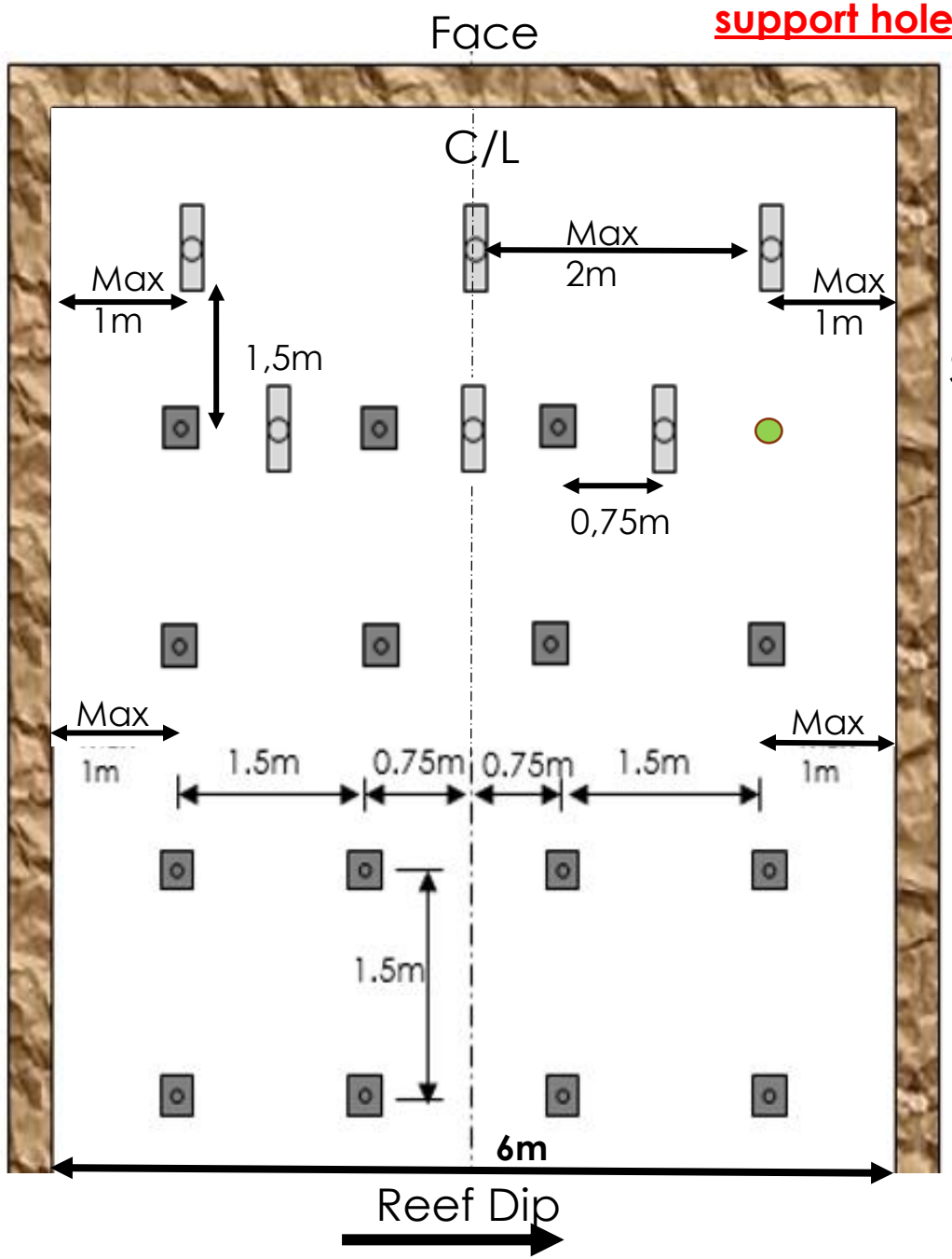
When the hole limit length is reached, stop drilling and move the boom to the next support hole position and activate the TRS and stab jack against hanging wall.

Do **not** start drilling the next hole yet.

Legend

- Cable anchors
- Temp. support
- New Support

Procedure at 6m bords mining North, where cable anchor support holes are drilled, using an AARD / Sandvic Bolter



Step 7

Support crew enters and examine and bar the hanging wall where the hole was drilled.

Install 1 x temp. support unit midway between the drilled support hole and next hole to be drilled, max. 0,75m from the support hole.

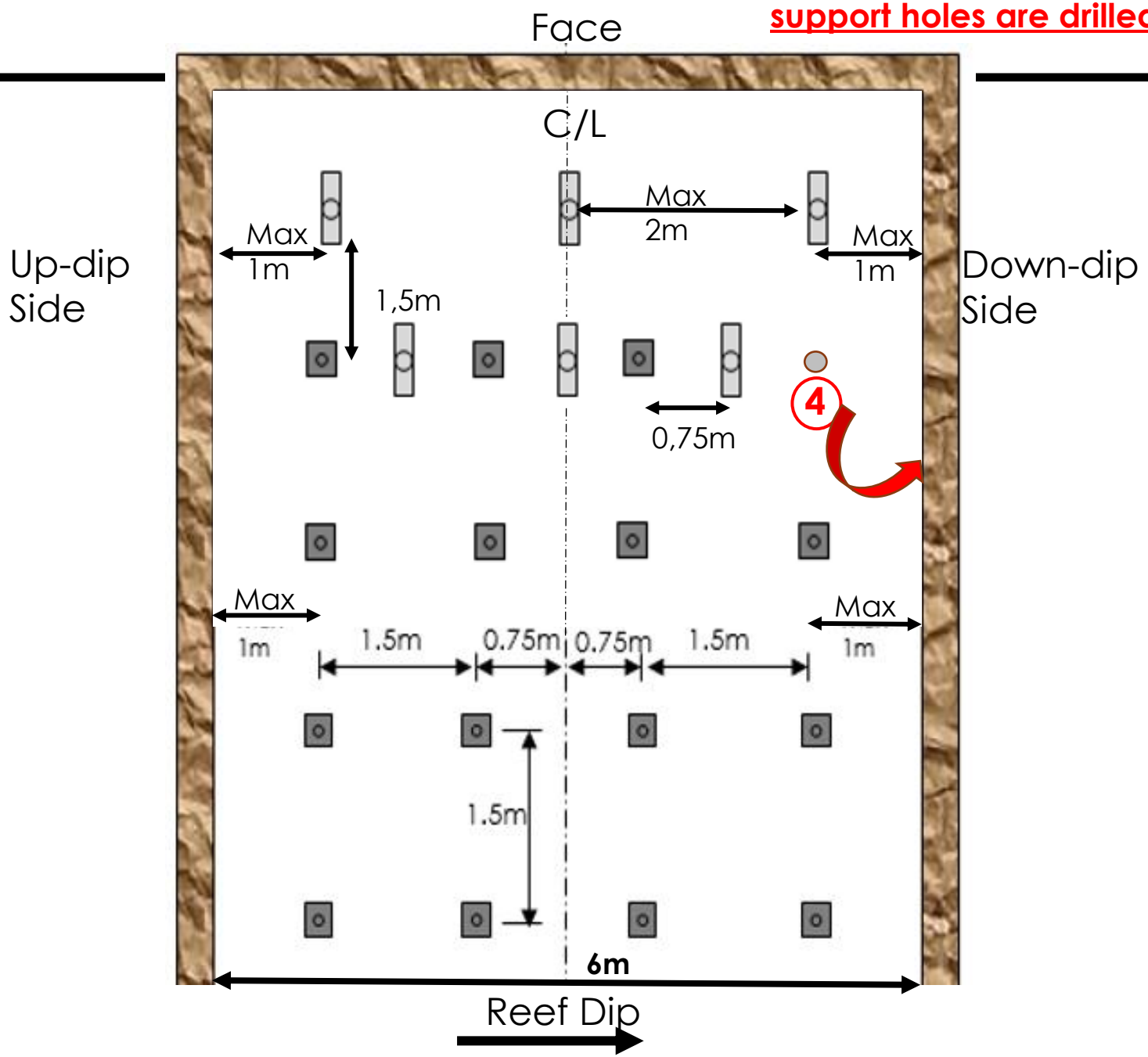
Install the 3rd cable anchor at the 3rd hole from the **Up-dip** side of panel and pre-tension the cable anchor, grout and crop the anchor (complete installation).

Support crew moves out of panel face area.

Legend

- Cable anchors
- Temp. support
- New Support

Procedure at 6m bords mining North, where cable anchor support holes are drilled, using an AARD / Sandvic Bolter



Step 8

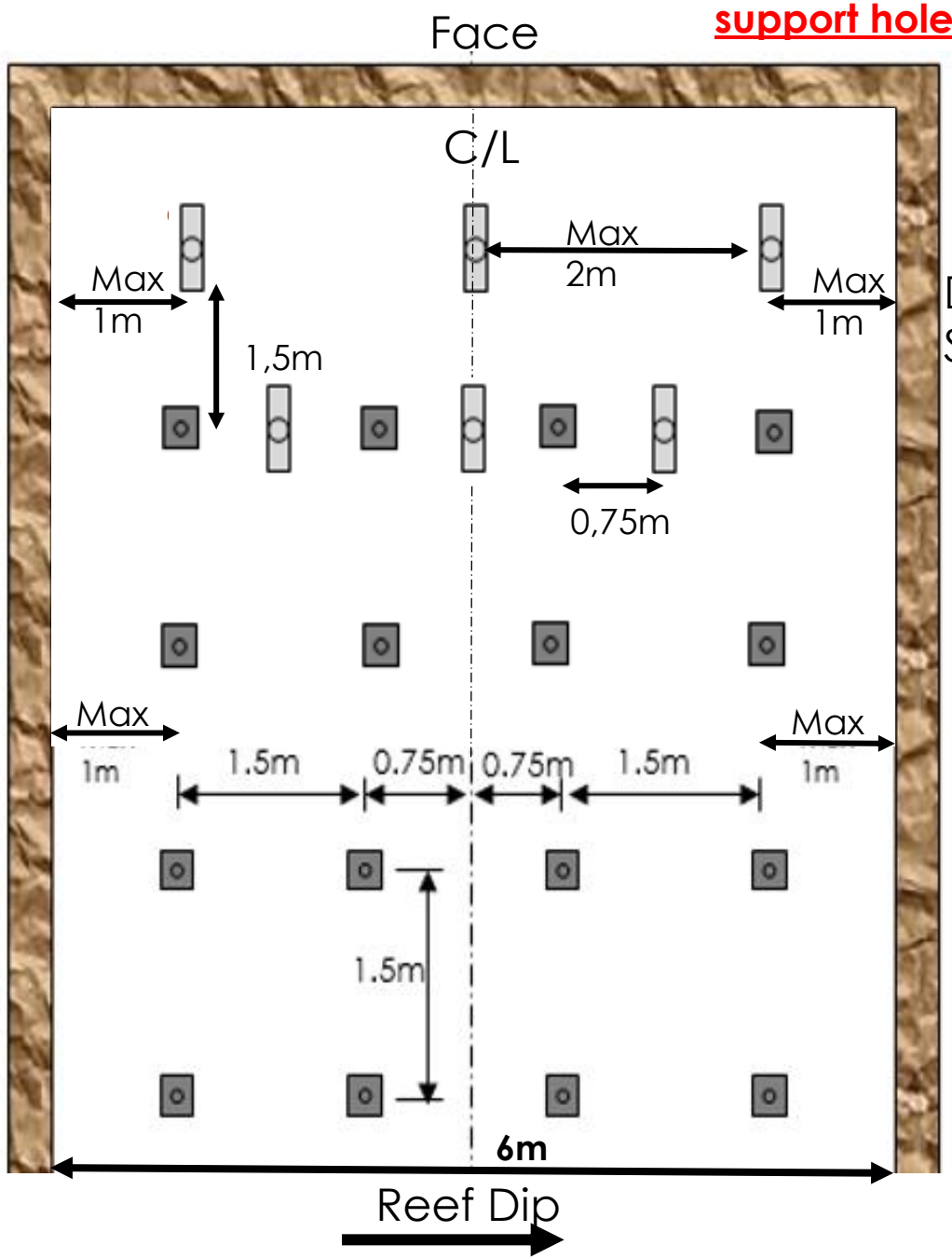
Once the 3rd cable anchor is installed, grouted, tensioned and cropped, start drilling the 4th cable anchor support hole.

When the hole limit length is reached, stop drilling and move the boom to the down-dip sidewall or move bolter back and wait for complete anchor installation before moving forward to the next row of support holes to be drilled.

Legend

- Cable anchors
- Temp. support
- New Support

Procedure at 6m bords mining North, where cable anchor support holes are drilled, using an AARD / Sandvic Bolter



Step 9

Support crew enters and examine and bar the hanging wall where the hole was drilled.

Install the 4th cable anchor at the 4th hole from the **Up-dip** side of panel and pre-tension the cable anchor, grout and crop the anchor (complete installation).

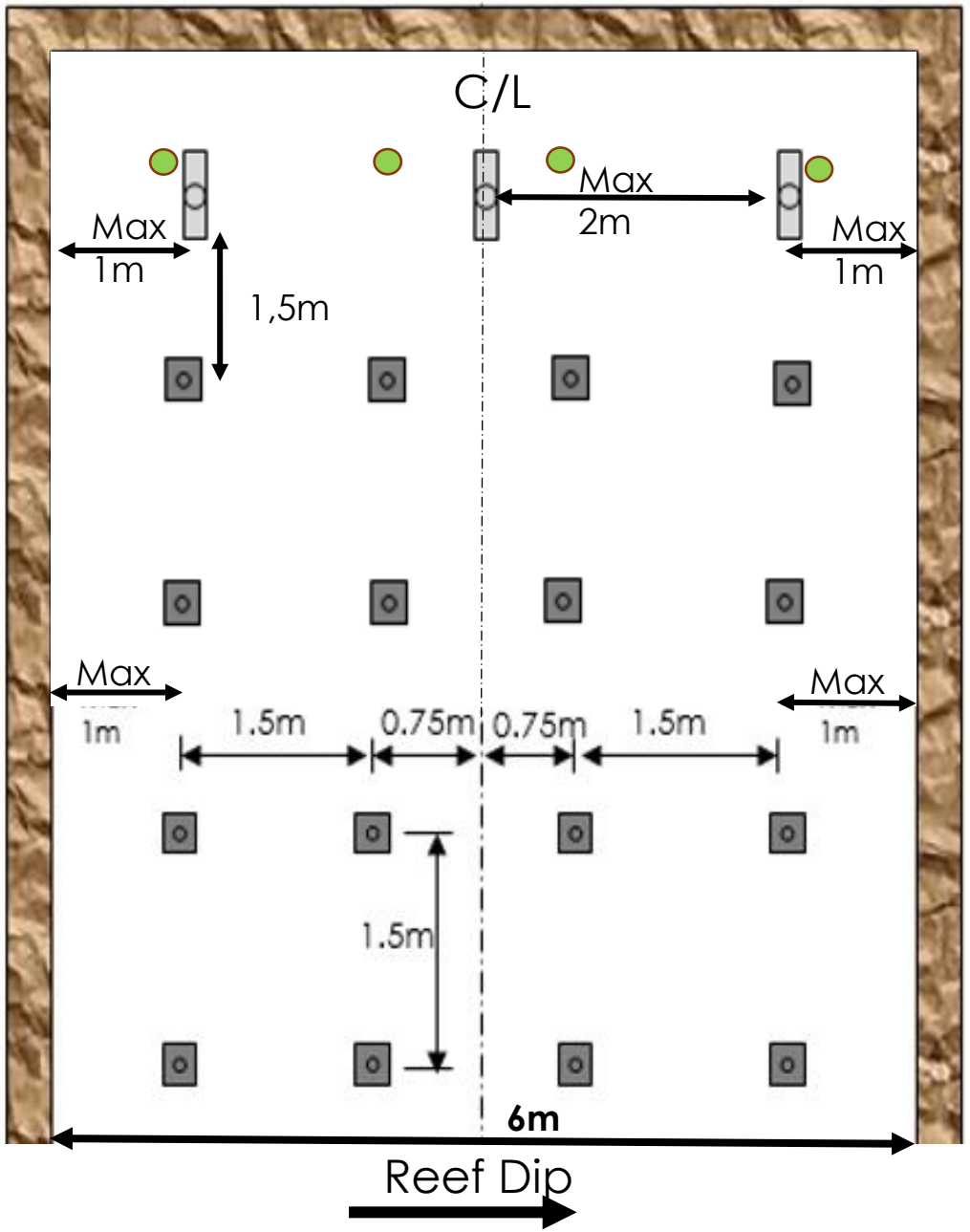
Once the complete row anchor support is installed grouted, tensioned and cropped, remove the row of temp. support units, using a remote release sling.

Support crew moves out of panel face area.

Legend
- Cable anchors
- Temp. support
- New Support

Procedure at 6m bords mining North, where cable anchor support holes are drilled, using an AARD / Sandvic Bolter

Face



Up-dip Side

Down-dip Side

Reef Dip

Step 10

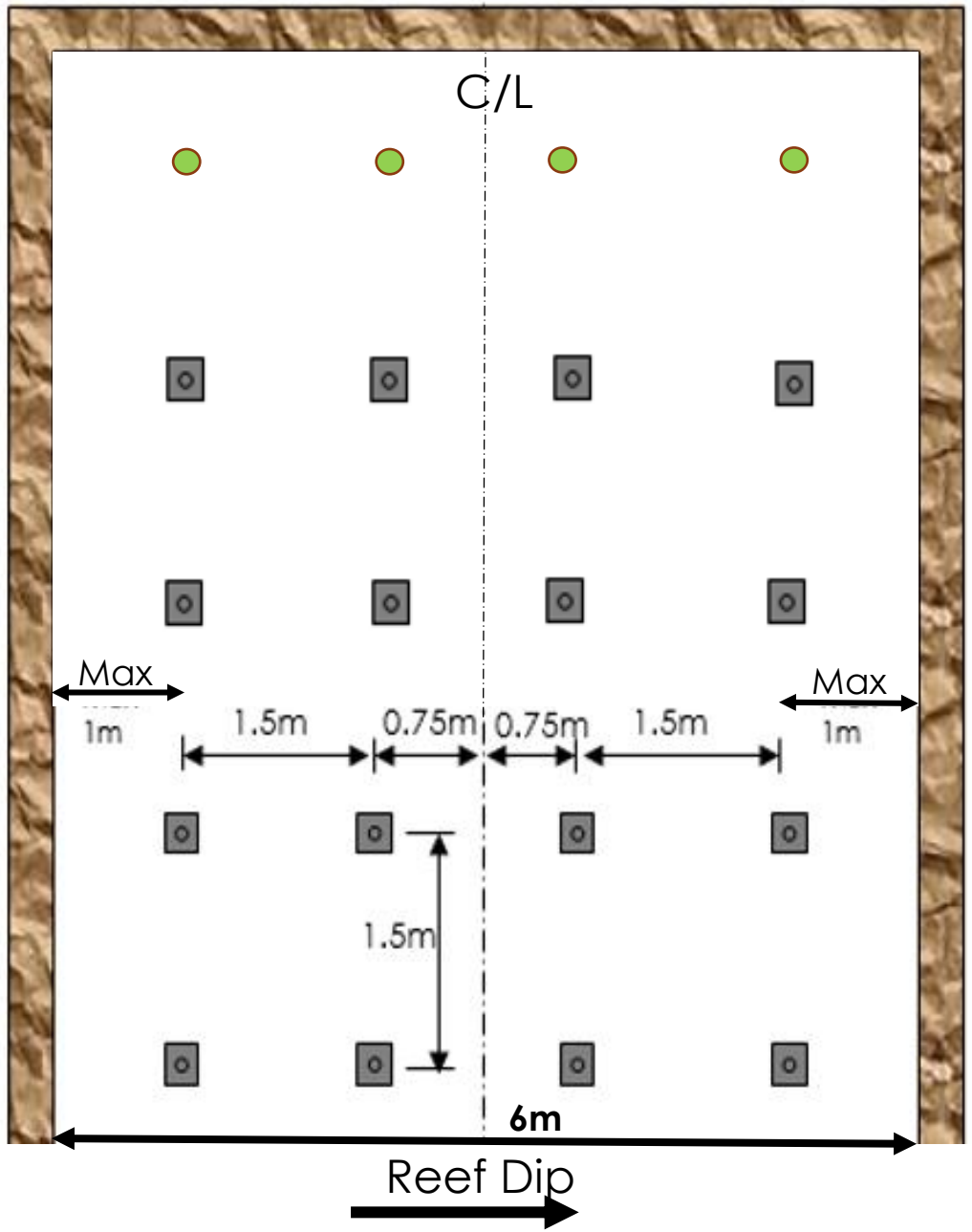
Mark the new row of cable anchor support as per standard or TARP 3 support instructions, with temp. support at the face still in place.

Legend

- Cable anchors
- Temp. support
- New Support

Procedure at 6m bords mining North, where cable anchor support holes are drilled, using an AARD / Sandvic Bolter

Face



Up-dip Side

Down-dip Side

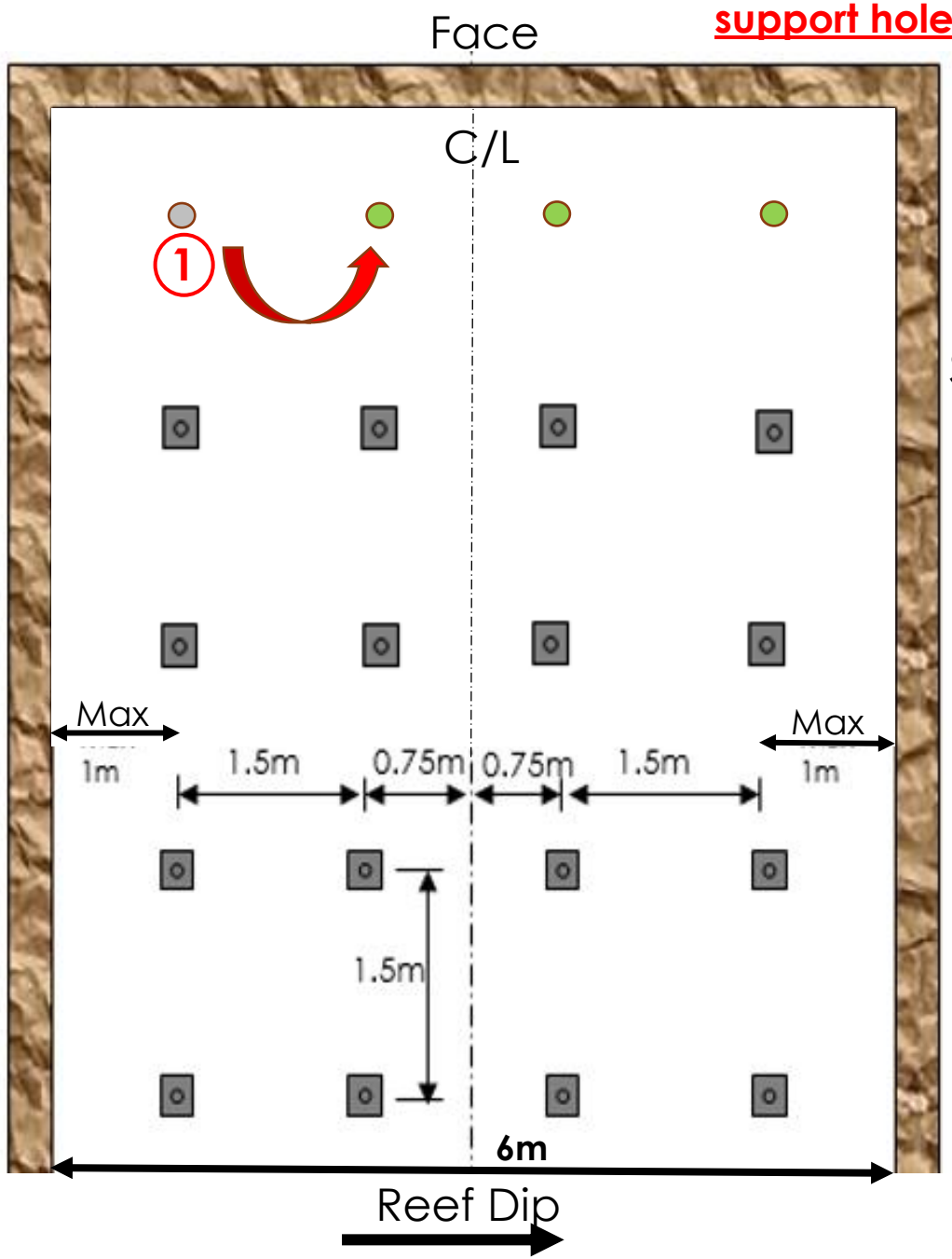
Step 11

Once the new row anchor support is marked remove the row of temp. support units, using a remote release sling.

Legend

- Cable anchors
- Temp. support
- New Support

Procedure at 6m bords mining North, where cable anchor support holes are drilled, using an AARD / Sandvic Bolter



Step 12

Drill the 1st cable anchor support hole, starting on the **up-dip** side of the panel.

When the hole limit length is reached, stop drilling and move the boom to the next support hole position and activate the TRS and stab jack against hanging wall.

Do **not** start drilling the next hole yet.

Repeat Steps 2 – 9 for completing the row of support.

Legend

- Cable anchors
- Temp. support
- New Support

Questions and comments