HARMONY™

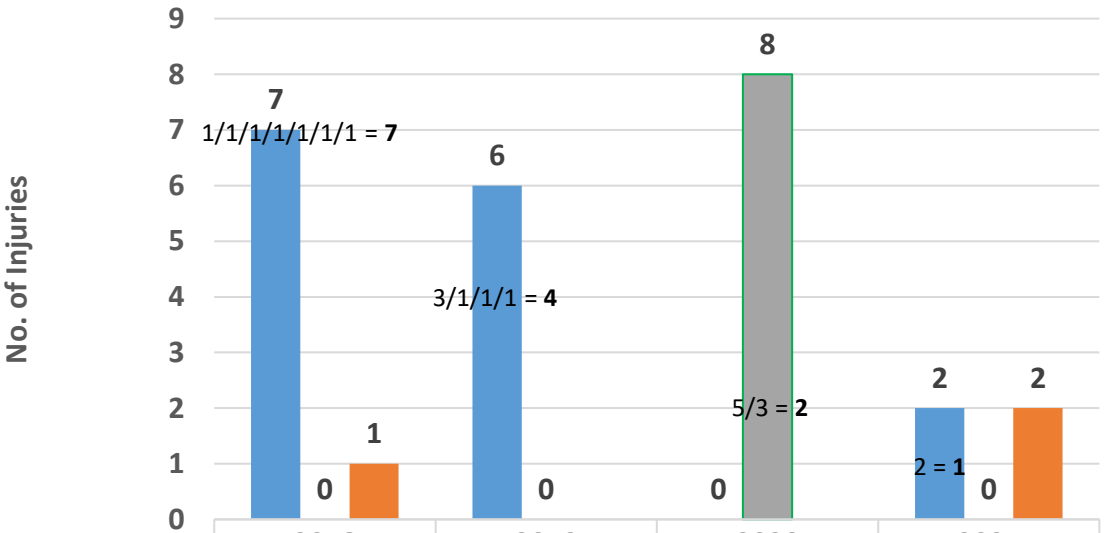
Bambanani Shaft -

Entry Examination and Making Safe

Date: 14th May 2021
Presented at: South African Mine Industry MOSH Day of Learning
Presented by: Willem Gouws

Introduction

Bambanani FOG Statistics - Shaft Rock Related Injuries:



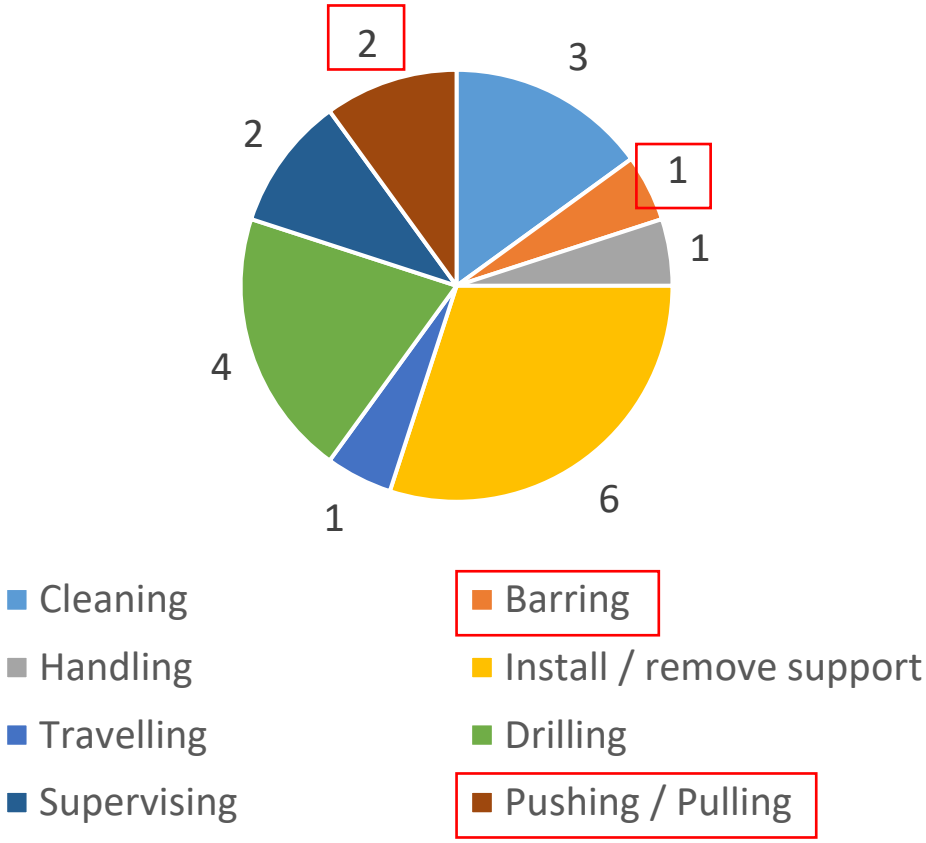
	2018	2019	2020	2021
FOG Gravity	7	6	0	2
FOG Seismic	0	0	8	0
Rolling Rock	1	0	0	2

Yearly reduction in FOG related accidents:
2018 – 7
2019 – 4
2020 – 2
2021 – 1

Concern is multiple injuries when accidents do occur.

Introduction

FOG Accident Activity/Task Breakdown 2018 – 2021:



Loss of life Accident

On the 13th January 2021, a gravity-induced fall of ground occurred in raise line 71-86 panel S7 and two employees, were reported trapped below the fall of ground.

At the time of the accident, they were pulling the face scraper rope in towards the panel face, when a gravity-induced fall of ground occurred ±7m from the face between the backfill gully pack and the backfill line.

Findings at the scene

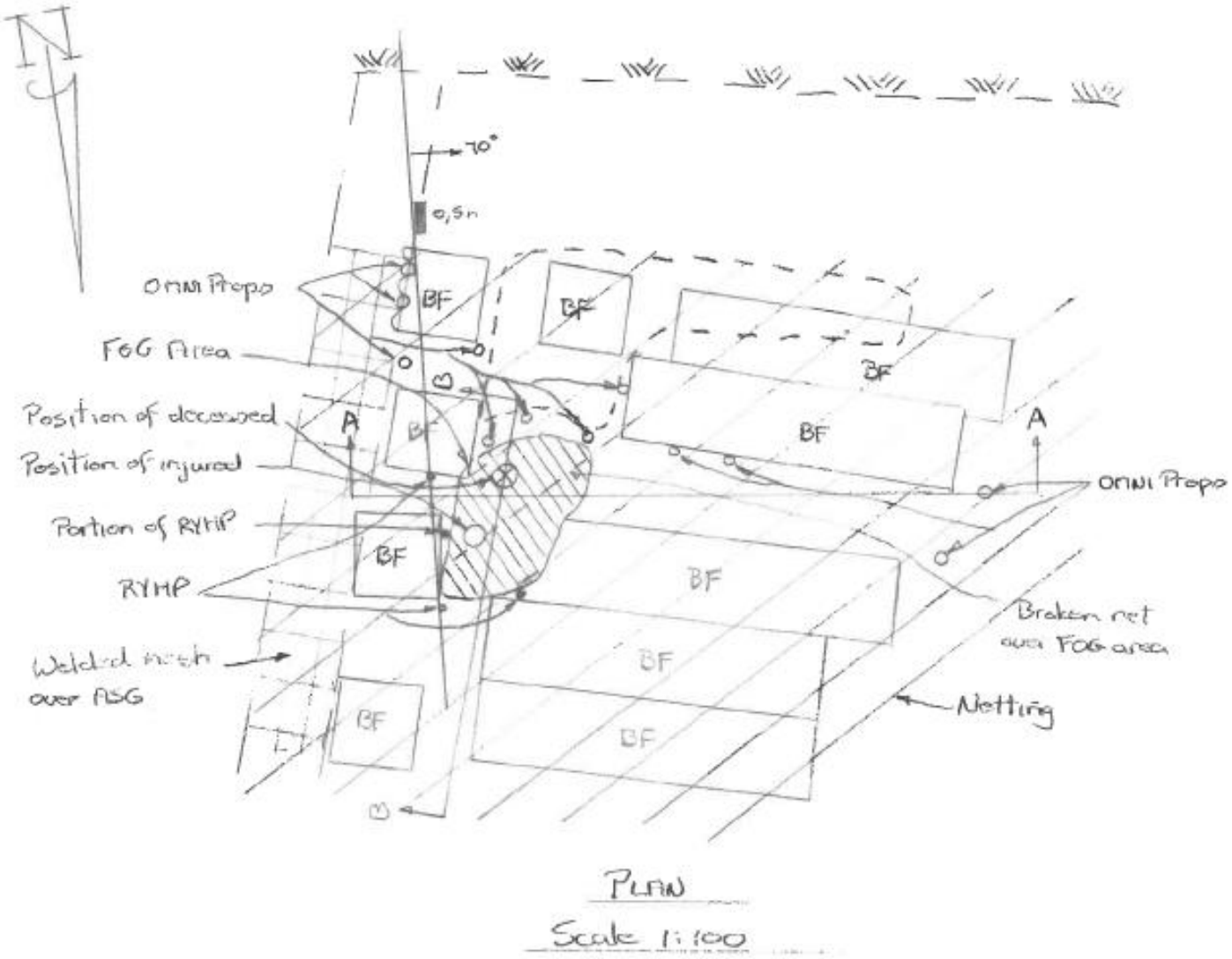
- Backfill measured 3,9m from the face with the standard of 5,5m
- Second dip travelling way spacing between the backfills measured 1,2m with the standard of 1,5m.
- First dip travelling way spacing measured 1,4m between the backfills with the standard of 1,5m
- Omni props/blast on props measured 1,3m from the backfill with the standard of 1,6m, in the face.
- Net not tightly held up to the hanging wall in the first dip travelling way at the top and next to accident scene.
- The accident occurred 7,0m from the face between the backfills in the first dip travelling way where the spacing was measured 1,4m apart with the standard of 1,5m.
- No seismic activity was recorded on seismology system.

Findings at the scene

- Spacing between the backfill and backfill pack on the gully shoulder measured 2,5m on the southern side of the accident scene with two additional Omni/blast on props installed in the vicinity with the standard of 1,0m on dip.
- Spacing between the backfill and backfill pack on the gully shoulder measured 2,2m on the northern side of the accident scene.
- Temperature at accident scene measured 30/32.5^{0}C with velocity of 0,75 m/s
- Temperature at top of first dip travelling way measured 30/32^{0}C with velocity of 1,1m/s.
- Netting in First dip travelling way net had broken strands next to area of accident.
- Area where the accident occurred was mined as undercut and exempted from installation of in – stope bolting from the Rock Engineering Department.
- Face length of 25m.

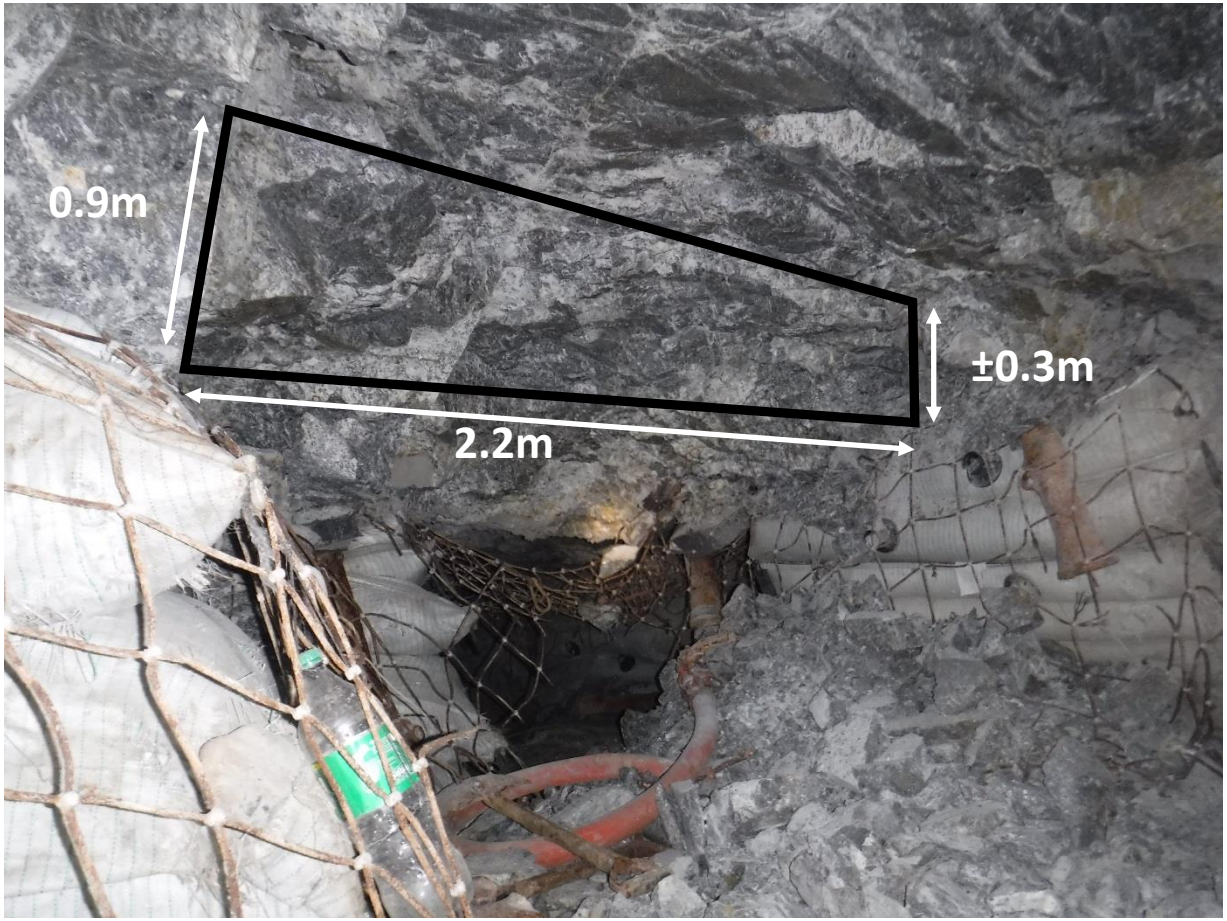
Photos Scene of Accident 71–86 S7

Loss of life Accident



Photos Scene of Accident 71-86 S7

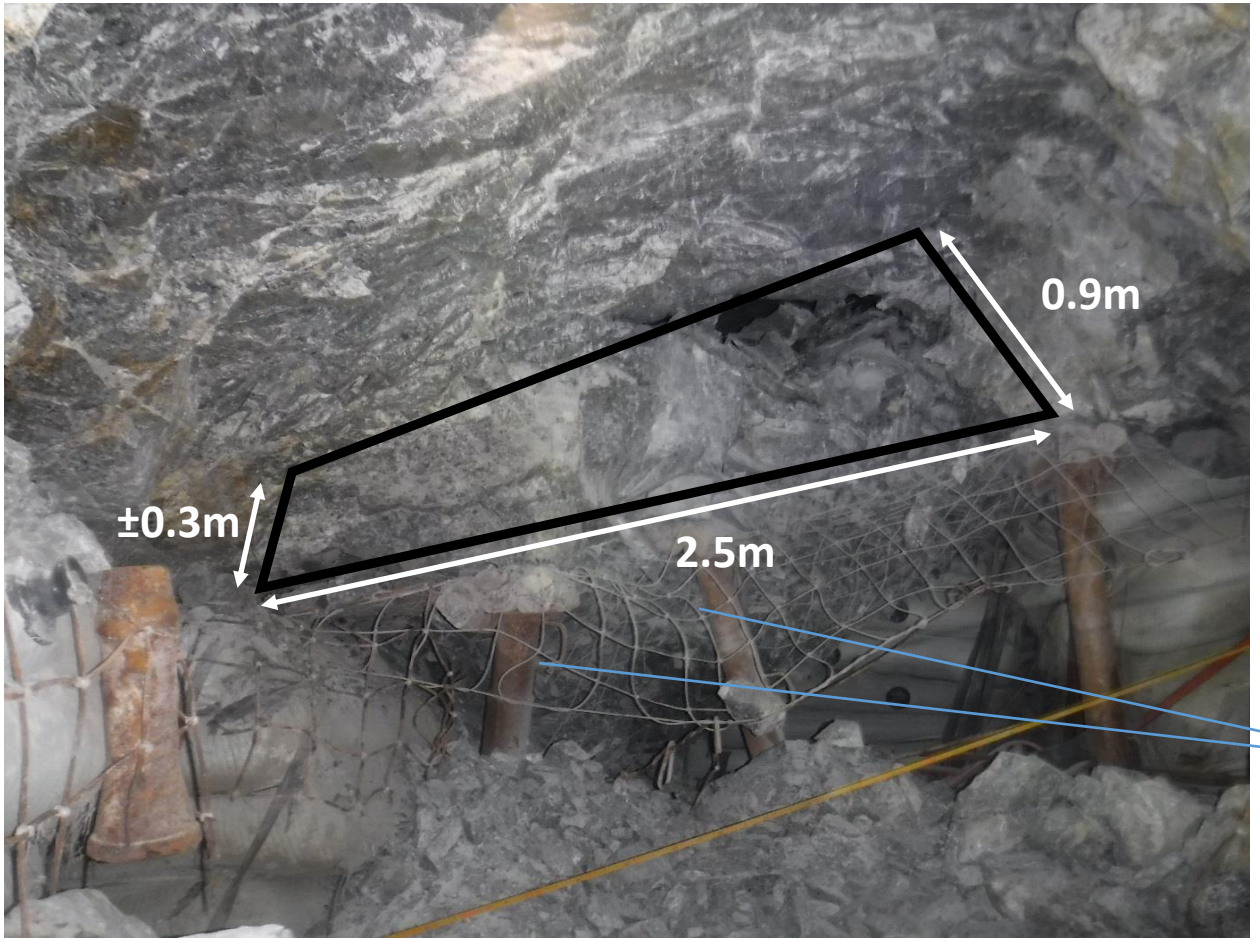
Photo taken in a northern direction, looking toward the winch



Jointing intersecting the panel on strike

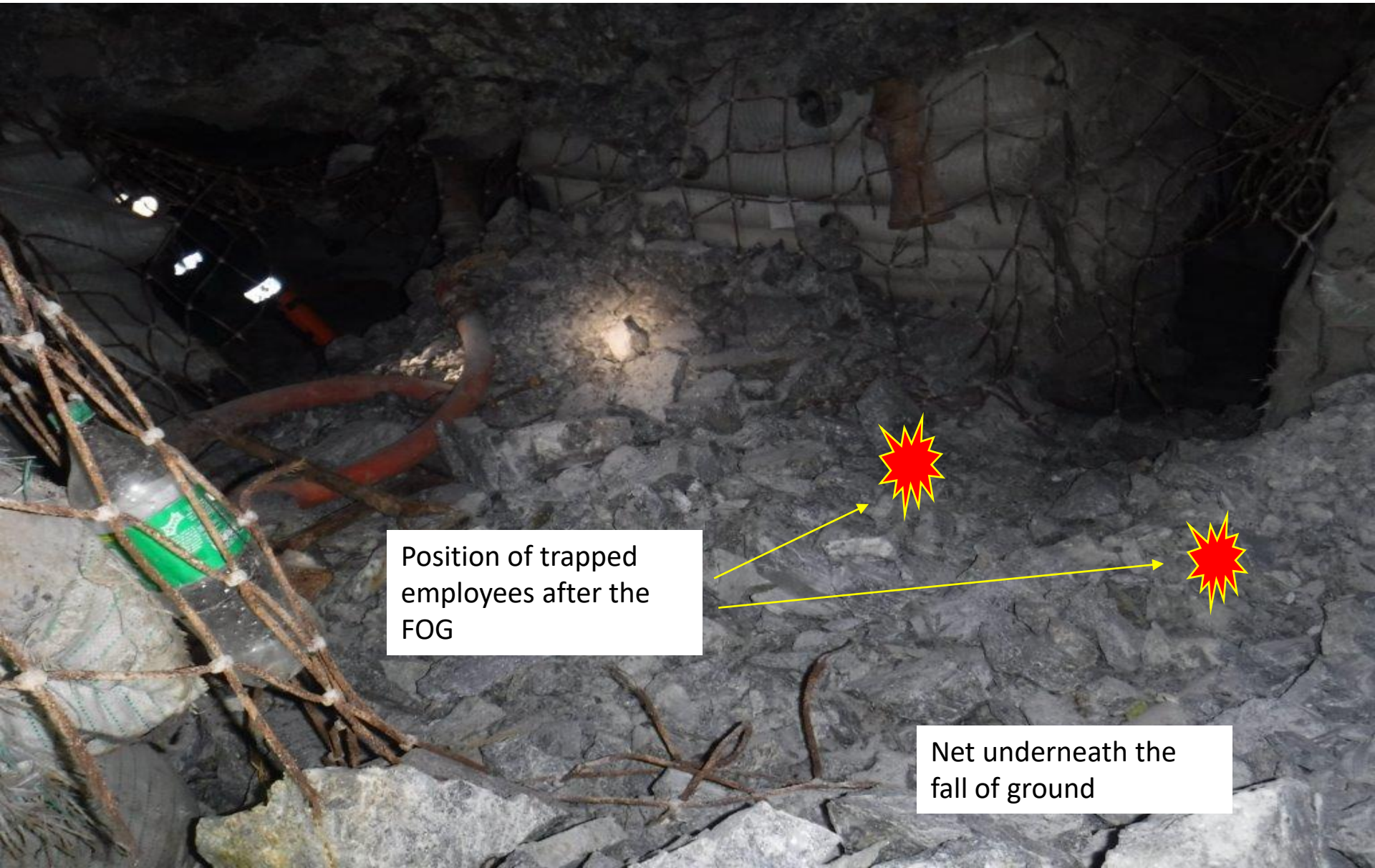
Photos Scene of Accident 71-86 S7

Photo taken in a southern direction, looking toward the face



Two props installed to break the span between the backfill

Photos Scene of Accident 71-86 S7



Preliminary investigation in terms of section 11(5) of the MHSA - Findings

Basic cause

- Fall of Ground (Gravity)

Job Factors

- Factors that lead to this accident not identified in that net not tightly held up to the hanging wall in the first dip travelling way at the top and next to accident scene and netting corroded

Personal Factors

- Inadequate supervision over task in that no PTO was conducted on the safety net installation.

Preliminary investigation in terms of section 11(5) of the MHSA – Findings (Continued)

Unsafe condition(s), which may have contributed to the accident / incident:

- Jointing was observed in the hanging wall and fractured hanging wall (stress and blast induced fracturing)
- Dip spacing between backfill and backfill pack across travelling way exceeded the mine standard measured 2.5m (3 props were installed on the Southern side to reduce the span; it was also indicated by the whole crew that 2 props were installed on northern side but was removed during rescue operations)

Preliminary investigation in terms of section 11(5) of the MHSA – Findings (Continued)

Unsafe act(s), which may have contributed to the accident / incident:

- Deviation from standard practice in that dip spacing between backfill and backfill pack across travelling way exceeded the mine standard measured 2.5m (3 props were installed on the Southern side to reduce the span; it was also indicated by the whole crew that 2 props were installed on Northern side but was removed during rescue operations)

Remedial Actions

NO.	REMEDIAL MEASURE	RESPONSIBLE PERSON	PLANNED COMPLETION DATE
1	Re-training on stoping standard for frontline supervisors	S vd Wath	26 Jan 2021
2	Audits conducted on all stoping panels and dip and strike travelling ways	J. Molelekoa	25 Jan 2021
3	Reviewed support standards to provide for additional support units to cater for the span between the placed gully pack and backfill bag support units.	S vd Wath	15 Jan 2021
4	Investigate netting alternatives to be corrosion resistant and net storage	S vd Wath	28 Feb 2021
5	IBRA to be conducted before re-starting the work in the panel with all relevant stakeholders	J VD Merwe	28 Jan 2021
6	SLAM to be conducted prior to performing any task (Entry examination).	J VD Merwe	29 Jan 2021
7	Corroded steel safety nets to be replaced	J VD Merwe	29 Jan 2021

Loss of life Accident - Learnings

- EEMS conducted workplace declared safe
- Area identified previously as a hazard – Excessive span
- TARP initiated
  - Shiftboss treated the area, additional support installed
  - Mine Overseer followed up and agreed with action taken
  - No service departments involved
- Corroded netting not identified as a hazard
- False sense of security created amongst team – Evident from discussions with team during 11-5 Investigation
- Management of Change – Backfill pack in place of Timber pack

EEMS - Overview

Bambanani Entry Examination and Making Safe:

- Safe Declaration Book is in a scanable format.
- Safe Declaration process done daily by the Competent Person / Miner and at end of shift this documentation is scanned in at the OCR scanner.
- Feedback is send electronically via OCR system to Management.

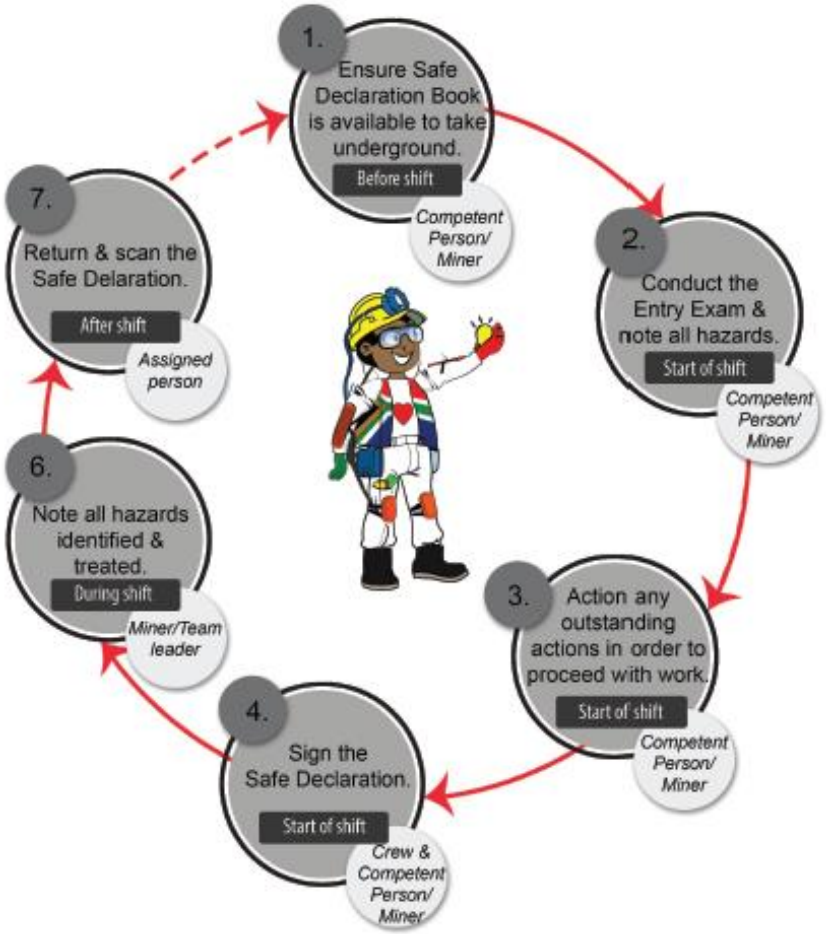
EEMS – Training

Employee Training:

- Initial and annual refresher training at Bambanani Training Centre on:
  - Safe Declaration
  - SLAM
  - TARP
- Employees trained on the e-learning system and records is kept of all training received.
- Underground assessments and PTO's by Supervisors
- Coaching through Visible Felt Leadership visits
- Recognition program

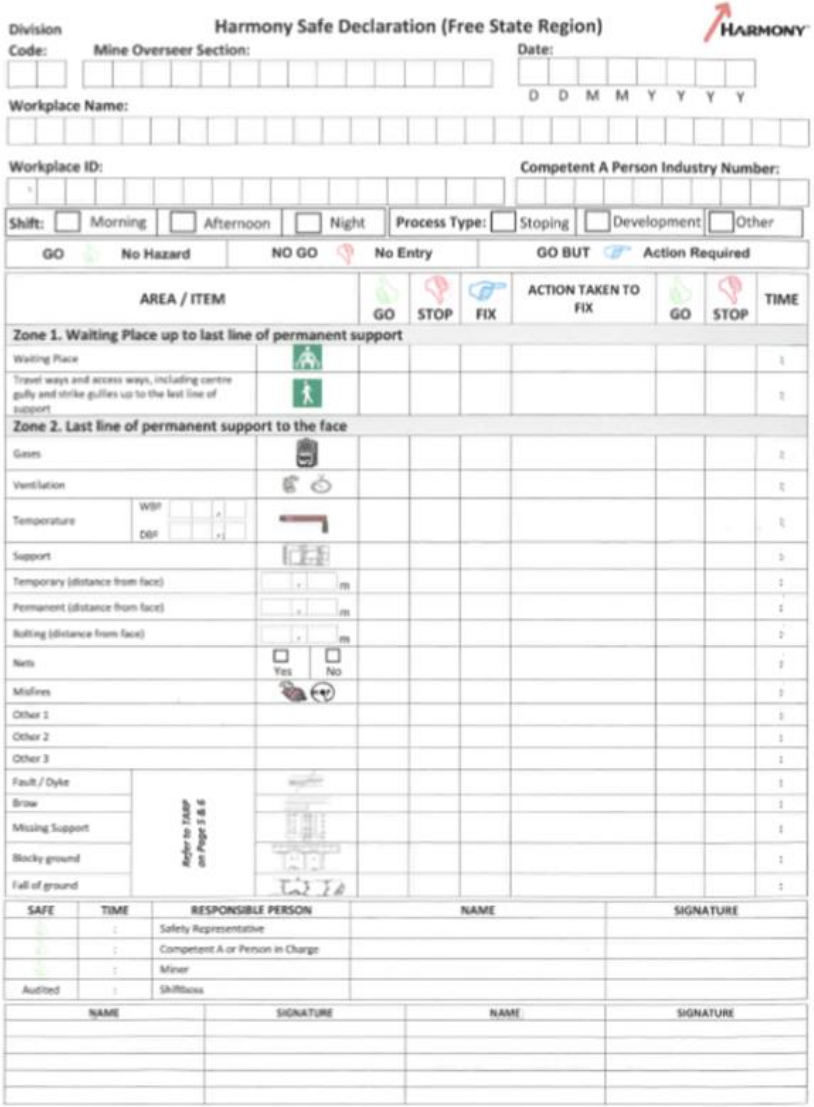
EEMS Process - General

Daily Safe Declaration Routine:



EEMS Process - General

Daily Safe Declaration Document:



Harmony Safe Declaration (Free State Region)

Division
Code:
Mine Overseer Section:
Date: D D M M Y Y Y Y
Workplace Name:
Workplace ID:
Competent A Person Industry Number:
Shift: Morning Afternoon Night
Process Type: Stoping Development Other
GO No Hazard
NO GO No Entry
GO BUT Action Required

AREA / ITEM	GO	STOP	FIX	ACTION TAKEN TO FIX	GO	STOP	TIME
Zone 1. Waiting Place up to last line of permanent support							
Waiting Place							
Travel ways and access ways, including centre gully and strike gullies up to the last line of support							
Zone 2. Last line of permanent support to the face							
Gases							
Ventilation							
Temperature WBT / DBT							
Support							
Temporary (distance from face) m							
Permanent (distance from face) m							
Bolting (distance from face) m							
Nets Yes No							
Misfires							
Other 1							
Other 2							
Other 3							
Fault / Dyke							
Brow							
Missing Support							
Blocky ground							
Fall of ground							

Refer to TARP on Page 5 & 6

SAFE	TIME	RESPONSIBLE PERSON	NAME	SIGNATURE
	:	Safety Representative		
	:	Competent A or Person in Charge		
	:	Miner		
Audited	:	Shiftboss		

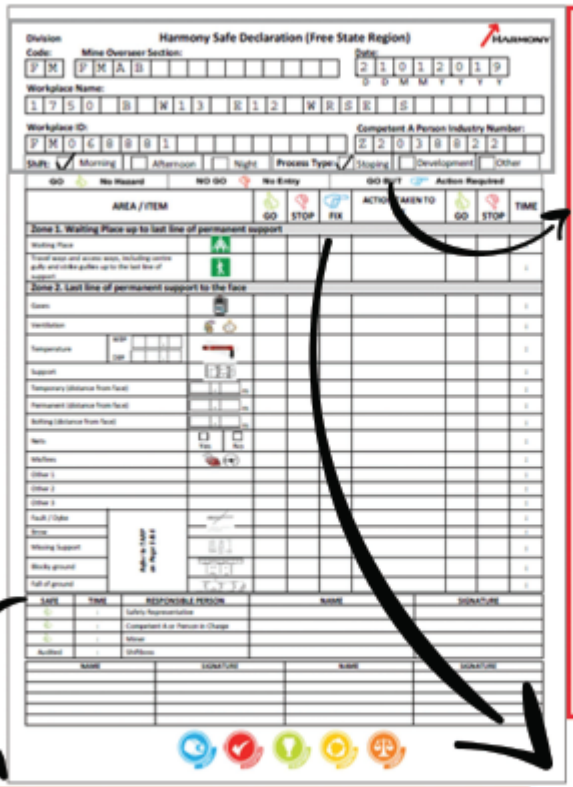
NAME	SIGNATURE	NAME	SIGNATURE

495801

EEMS Process - General

Daily Safe Declaration Checks:

What to check on the Safe Declaration



Miner/ Competent person Check that:

- ☐ Mine Overseer section.
- ☐ Division Code.
- ☐ Workplaces - Work Notes are available to assist to correctly complete the workplace names.
- ☐ Dates - correct on the day the inspection is done.
- ☐ Which shift the Safe Declaration is completed for.
- ☐ Which process is followed e.g. stoping, development or other.
- ☐ Note & sign off any hazards identified before or during the shift and sign eliminated.

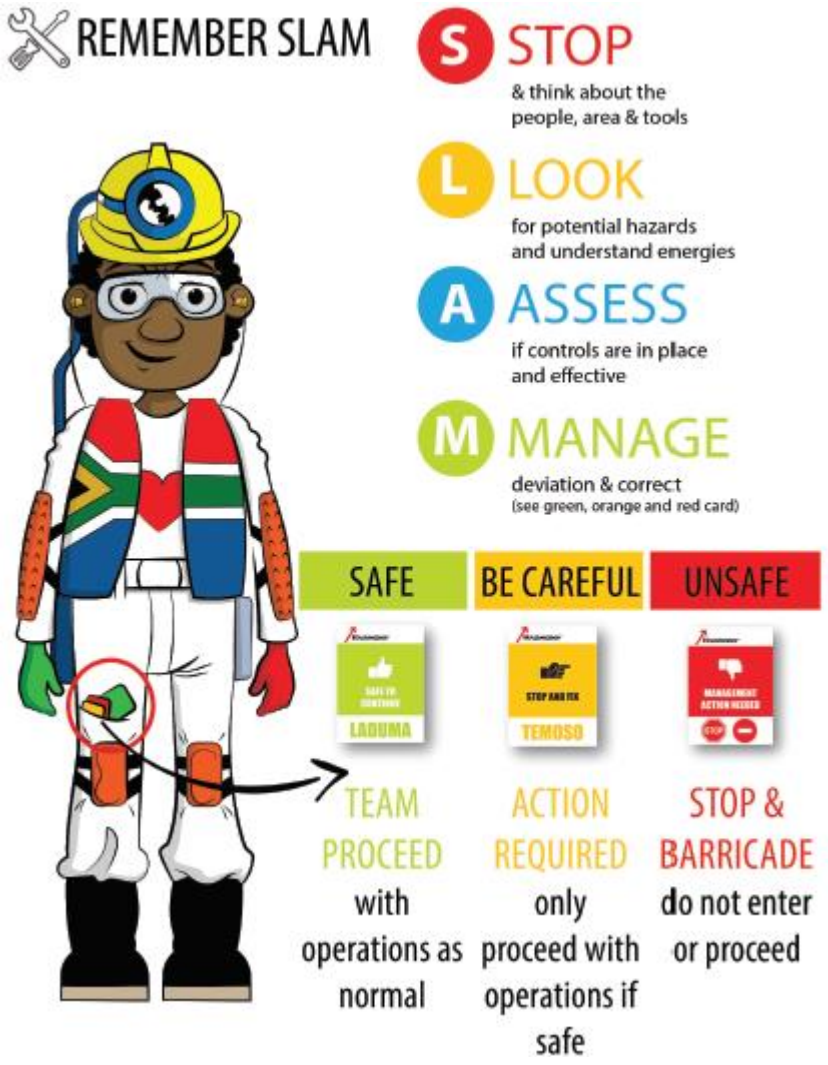
Shift Boss must check that:

- ☐ The Safe Declaration is complied with and completed.
- ☐ Ensure that the form is handed back at the end of a shift.

REMEMBER SLAM

EEMS Process - SLAM

SLAM:



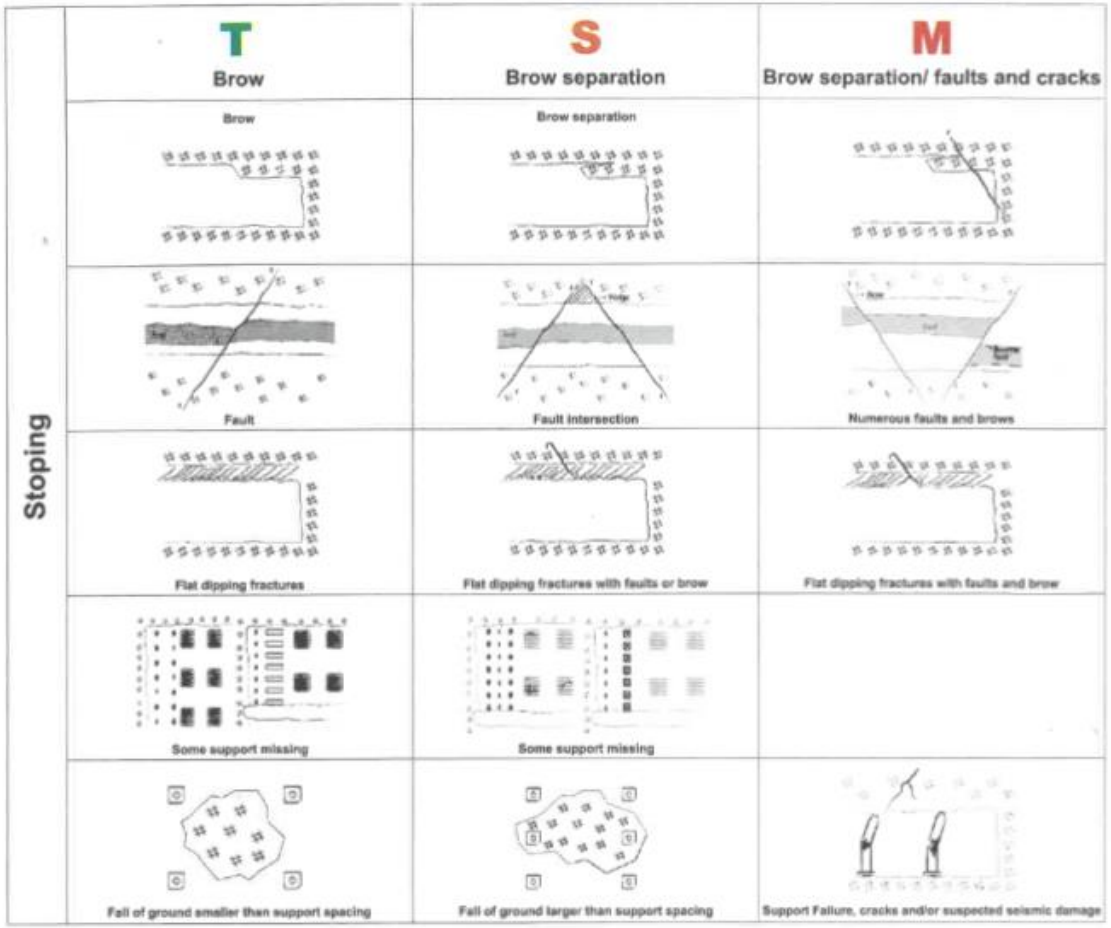
EEMS Process - TARP

Guide for Assessing Rock Related Hazards (TARP):

Actions	Action	Authority
TEAM	1. Stop and assess the situation. 2. Ensure crew members are aware of the hazard. 3. Establish an action plan. 4. Collect correct materials to make safe and support. 5. Make area safe and install support. 6. Declare area safe.	Miner - with assistance of: • Team Leader • Comp A • Safety representative
SUPERVISOR	1. Assess the situation 2. Establish action plan (team and experts) 3. Give concise instructions 4. Work can continue when corrective action is completed and signed off by shiftboss.	Shiftboss - with assistance of: • Strata Control Officer • Full time Safety representative • Safety Officer • Geologist
MINE OVERSEER	1. Assess the situation 2. Consult with experts 3. Establish action plan 4. Give concise instructions 5. Work can continue when corrective action is completed and signed off by Mine Overseer.	Mine Overseer - with assistance of: • Mining Manager • Strata Control Officer / Rock Engineer • Safety Officer / Chief Safety Officer • Geologist • Any other service

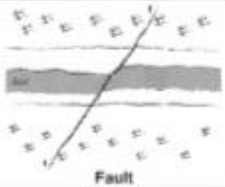
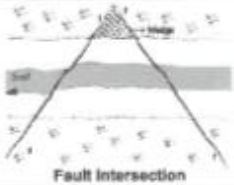
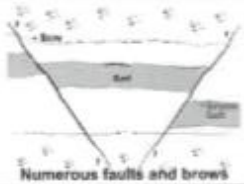
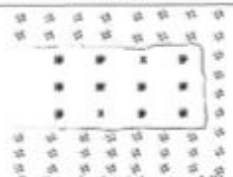
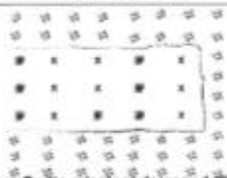
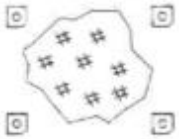
EEMS Process - TARP

Bambanani Mine Stoping TARP Triggers:



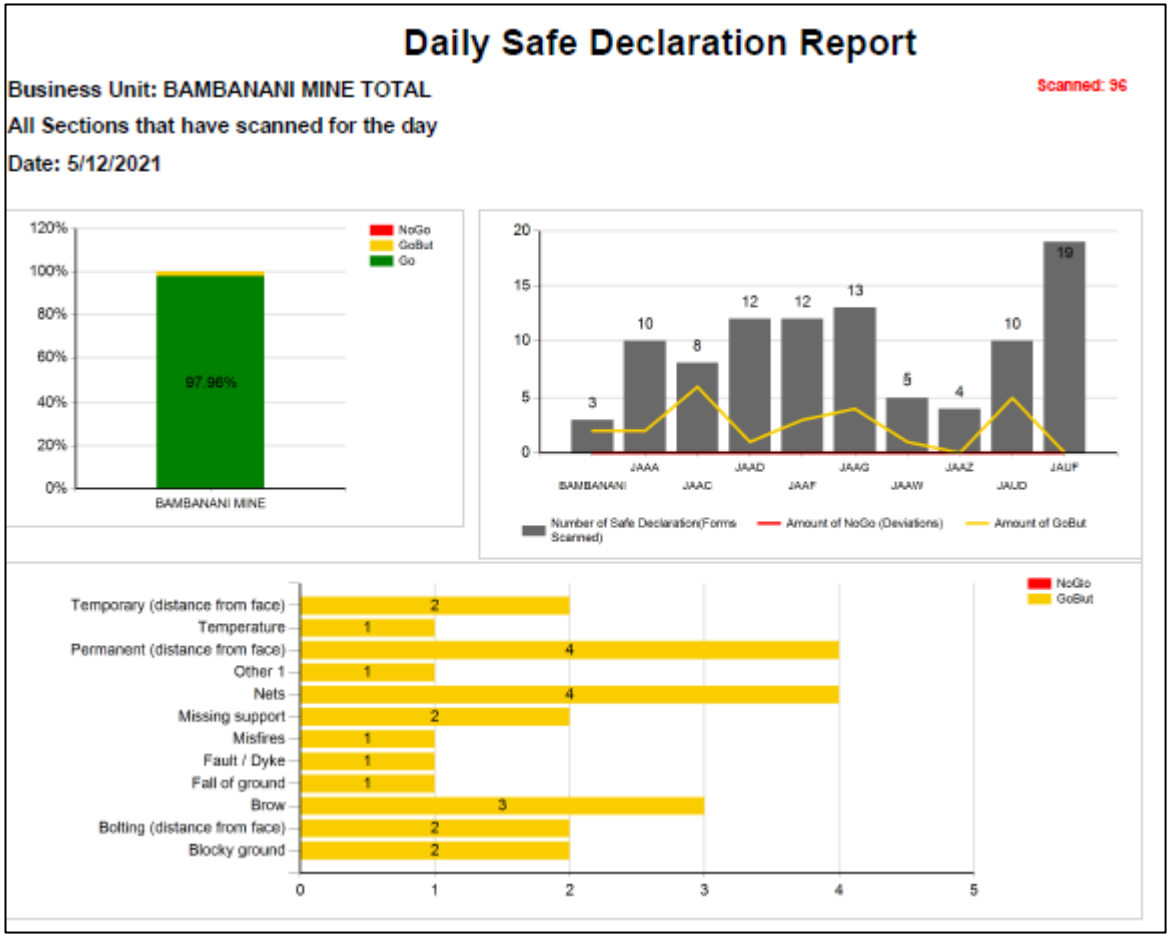
EEMS Process - TARP

Bambanani Mine Development TARP Triggers:

	T	S	M
	Brow	Brow separation	Brow separation/ faults and cracks
Development			
	 Fault	 Fault Intersection	 Numerous faults and brows
	 Some roofbolts missing/ damaged (X missing)	 Some roofbolts missing/ damaged (X missing)	
	 Fall of ground smaller than support spacing	 Fall of ground larger than support spacing	 Support Failure and/or suspected seismic damage

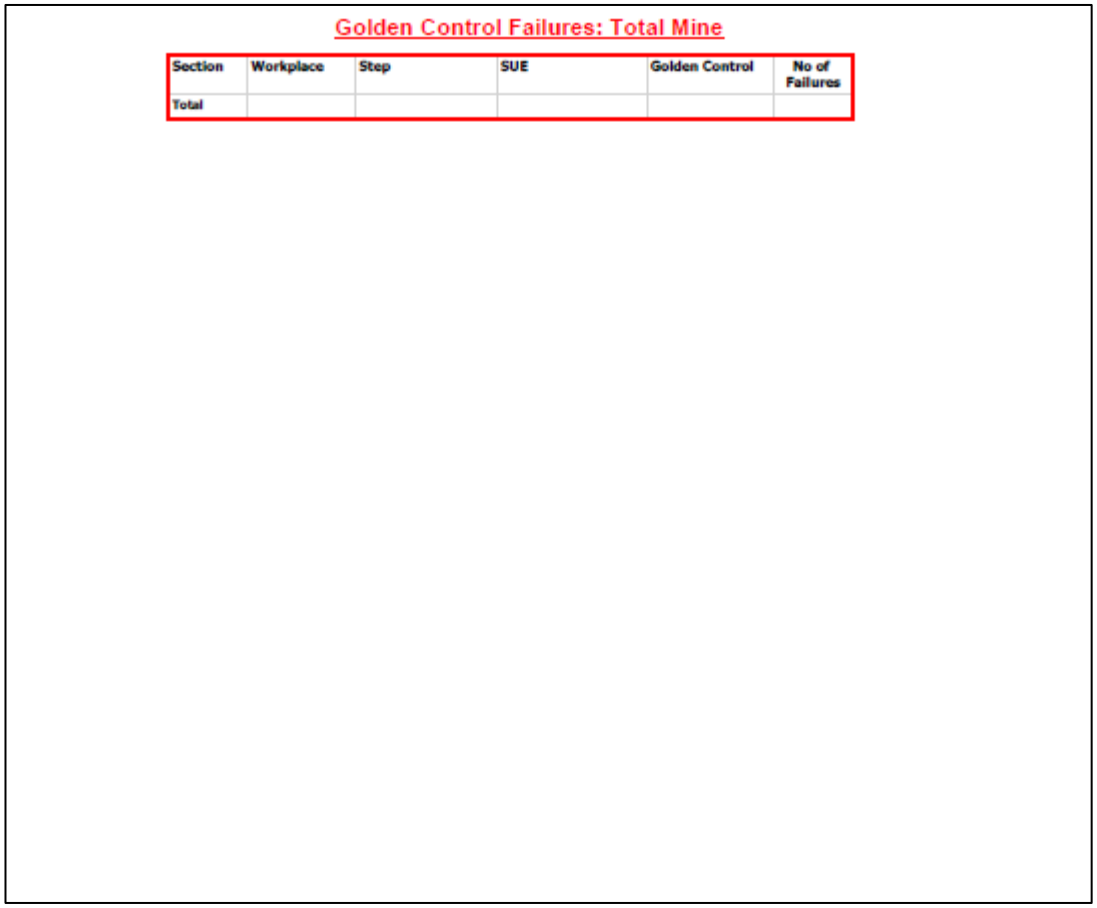
HRM Reporting

Bambanani Mine Safe Declaration **Daily** Report Summary:



HRM Reporting

Bambanani Mine Safe Declaration **Daily** Golden Control Failure Report:



HRM Reporting

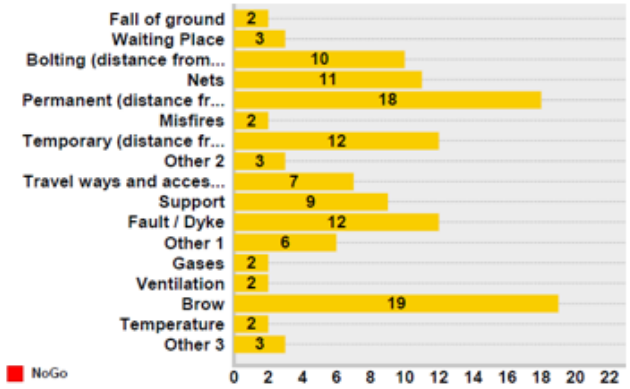
Bambanani Mine Safe Declaration **Daily** Working Place Report:

Section	Workplace	Process Type	Date	Shift	WB Temp	DB Temp	Permanent Support	Bolting	Temporary Support	Is Planned
BAMBANANI	4 N 2A	STOPING	2021/05/12	M	31.0	32.0	3.5	1.5	1.5	No
	69 80 X/CUT	OTHER	2021/05/12	M	30.0	31.0	No data	No data	1.0	No
	S3	STOPING	2021/05/12	M	30.5	31.5	4.5	No data	2.8	No
JAAA	69 80 S2 RS	OTHER	2021/05/12	M	30.0	31.0	No data	No data	No data	No
	69 80 S2 S3 MONO WINCH	OTHER	2021/05/12	M	28.5	32.5	No data	No data	No data	No
	69 80 S4 G1	OTHER	2021/05/12	M	No data	No data	No data	No data	No data	No
	69 80 S5 SLUSHER	STOPING	2021/05/12	M	31.0	33.0	No data	No data	No data	No
	69 80 S9	STOPING	2021/05/12	M	29.0	30.0	No data	No data	No data	No
	69 80 SLUSH S5	STOPING	2021/05/12	A	29.0	30.0	No data	No data	No data	No
	69/80 S5 MONO WINCH	OTHER	2021/05/12	M	28.0	30.0	No data	No data	No data	No
	69/80/S 1	STOPING	2021/05/12	M	29.0	30.0	3.5	No data	1.5	No
	71 80 S 5	STOPING	2021/05/12	M	28.0	29.0	3.6	No data	1.0	No
	71-80-S 7	STOPING	2021/05/12	M	30.0	31.0	2.3	No data	1.0	No
JAAC	69 86 N8 REEF STRIPPING	STOPING	2021/05/12	M	29.5	31.0	4.1	1.5	2.3	No
	71 36 SLUSH	OTHER	2021/05/12	A	29.0	32.0	No data	No data	No data	No
	71 86 N 2A WRSE 2	STOPING	2021/05/12	M	29.0	32.0	2.8	No data	0.6	Yes
	71 86 S 7	STOPING	2021/05/12	M	30.0	32.0	1.5	0.8	1.0	Yes
	71 86 S5/S6 MONO WINCH	OTHER	2021/05/12	M	27.0	29.0	No data	No data	No data	No
	71 86 S6	DEVELOPMENT	2021/05/12	M	28.0	30.0	2.0	No data	1.0	No
	71 86 S7 GULLY	OTHER	2021/05/12	A	29.0	32.0	No data	No data	No data	No
	71-86 S 4	STOPING	2021/05/12	M	28.0	29.0	2.5	No data	1.0	No
JAAD	66 86	OTHER	2021/05/12	M	29.5	30.6	1.0	1.0	No data	No
	66 86 S1	OTHER	2021/05/12	A	28.0	30.0	No data	No data	No data	No
	69 80	OTHER	2021/05/12	M	30.0	33.0	1.0	1.0	No data	No
	69 80 S5	OTHER	2021/05/12	M	30.0	33.0	1.8	No data	No data	No
	69 86 N2	OTHER	2021/05/12	M	29.0	31.0	1.0	No data	1.0	No
	69 86 N8 RS	STOPING	2021/05/12	M	29.0	31.0	4.1	0.5	0.9	No
	69 86 S3	OTHER	2021/05/12	A	30.0	31.0	No data	No data	No data	No
	69 86 S6	OTHER	2021/05/12	M	27.0	29.0	1.0	1.5	0.5	No
	71 86	OTHER	2021/05/12	M	28.0	30.0	No data	No data	No data	No
	71 86 N2A	OTHER	2021/05/12	A	30.5	31.5	No data	No data	No data	No
	7180 S7	OTHER	2021/05/12	A	30.0	32.0	No data	No data	No data	No
	73-80-S-4	OTHER	2021/05/12	M	29.0	30.0	No data	No data	No data	No
JAAF	71 80 S 5	STOPING	2021/05/12	M	30.0	32.0	4.3	1.2	1.9	Yes
	71 80 S 6	STOPING	2021/05/12	M	29.0	32.0	3.0	No data	0.5	Yes
	71 80 S 7	STOPING	2021/05/12	M	30.5	32.5	3.5	1.0	0.9	Yes

HRM Reporting

Bambanani Mine Safe Declaration **Weekly** Report Summary:

Bambanani Mine – Safe Declarations



Safe Declaration Outcome – focus points

Brow and permanent support prominent leading indicator – less findings week 7

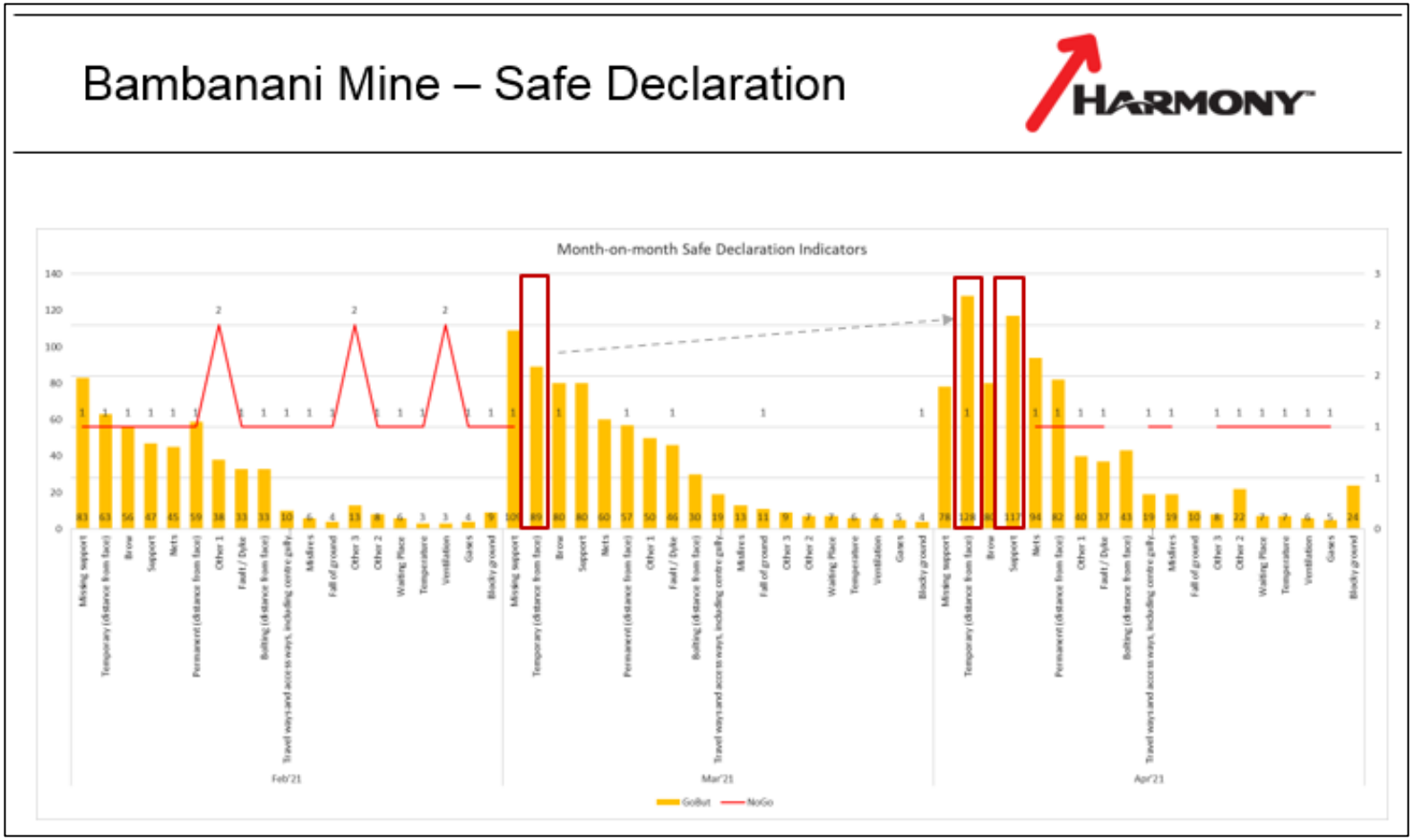
Focus areas requiring investigation (NoGo):

Nil

Leading indicators
- Permanent support
- Brow

HRM Reporting

Bambanani Mine Safe Declaration **Monthly** Report Summary:



HRM Reporting

Bambanani Mine Safe Declaration **Monthly** Report Summary:

Bambanani Mine – Safe Declaration

*Repetitive deficiencies – April 2021

Section	Workplace	Control Failed	Count
BAMBANANI	69 80 N1	Ventilation, continuous monitoring	2
JAAA	71 80 N7 R5	Support design	2

*Repetitive deficiencies are major **LEADING INDICATORS** indicating that the workplace is having continuous issues with the same control and requires intervention

Focus Points

- Training Coaching and Follow ups
- Culture of taking charge of safety
- Reaction to risks identified – Action Manager close out
- Permanent Netting, influence on EEMS
  - Neglect back area
  - False sense of security

Conclusion

The major improvement with the EEMS was the OCR scanning solution of safe declaration documents into the database, which allows for the Daily, Weekly and Monthly reports to be generated to focus on:

- Monitoring of Golden controls
- Leading indicators
- Repetitive deficiencies
- Problematic sections/supervisors/workplaces highlighted

Thank You Kindly for Your Attention