SERITI Khutala

Khutala Colliery

Back-bye Management Strategy

5 June 2025

From Success to Significance

Agenda

1. Background
2. Historical Roof Support Strategies
3. Backbye Ground Conditions
4. Backbye Fog Incidents
5. Backbye Management Strategy

Background

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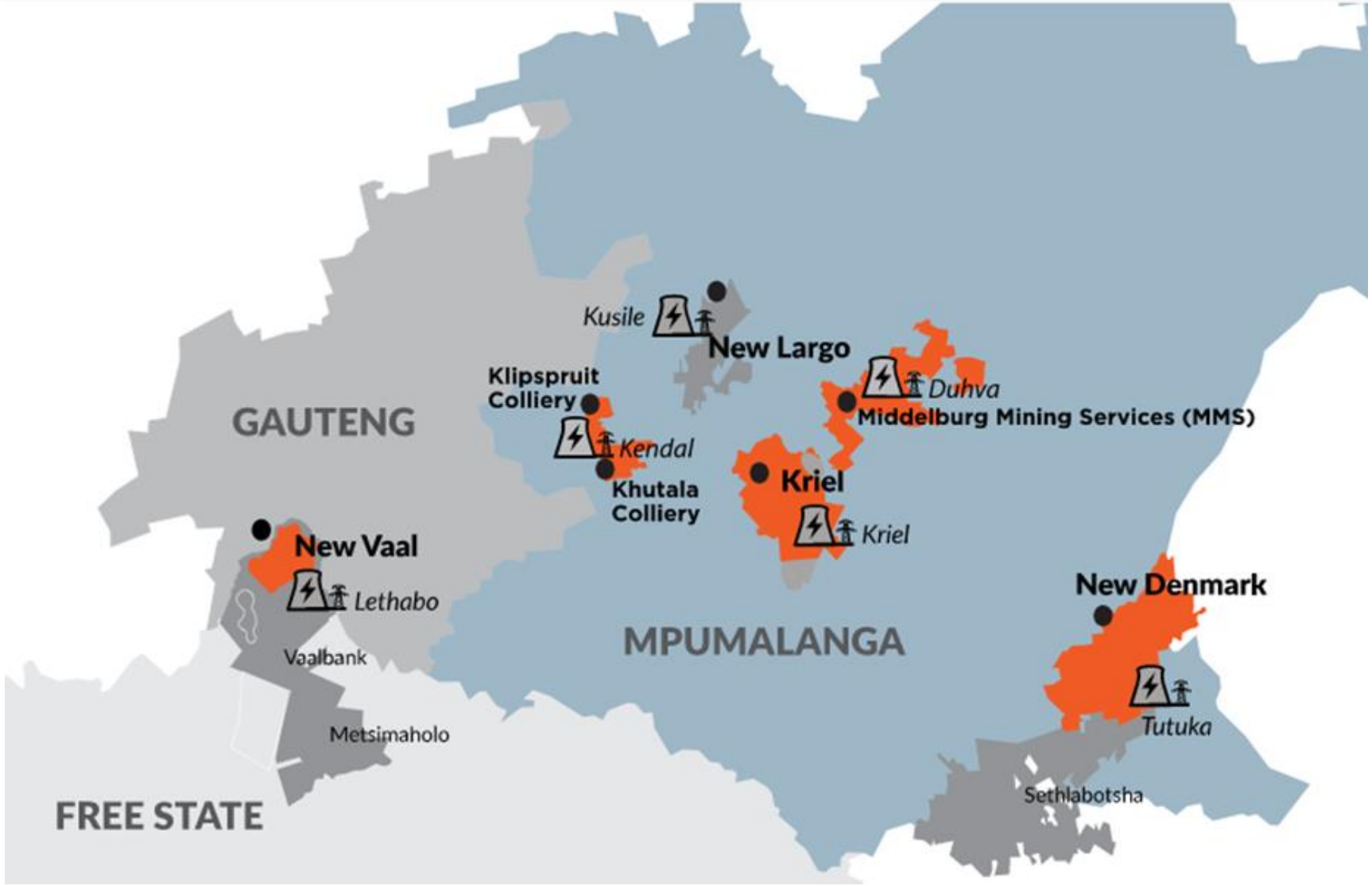
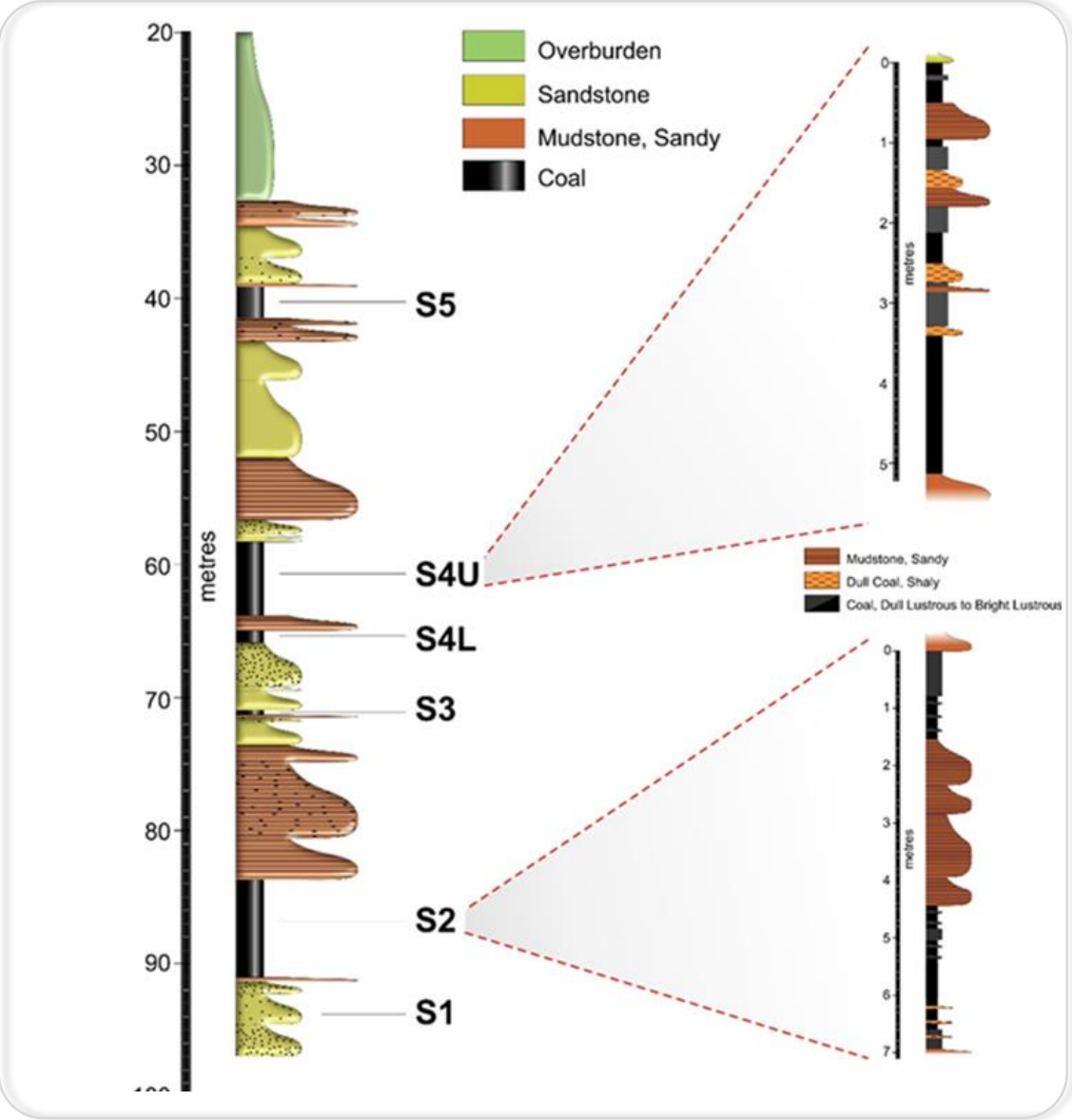
Khutala Colliery Locality



Location: Western side of the Witbank Coal Field (WCF), northern part of South Africa's Karoo Basin.

Generalized Stratigraphy For Khutala Colliery



Brief Description on Economical Deposits

#5 seam roof composition: silty/sandy mudstone roof

- Avg thickness ≈ 2.0m (approximate seam thickness range 1.5m – 2.5m)
- Avg depth ≈ 30m (approximate depth range 20m – 50m)

#4 seam roof composition: laminated sandstone overlain by mudstone/sandy mudstone

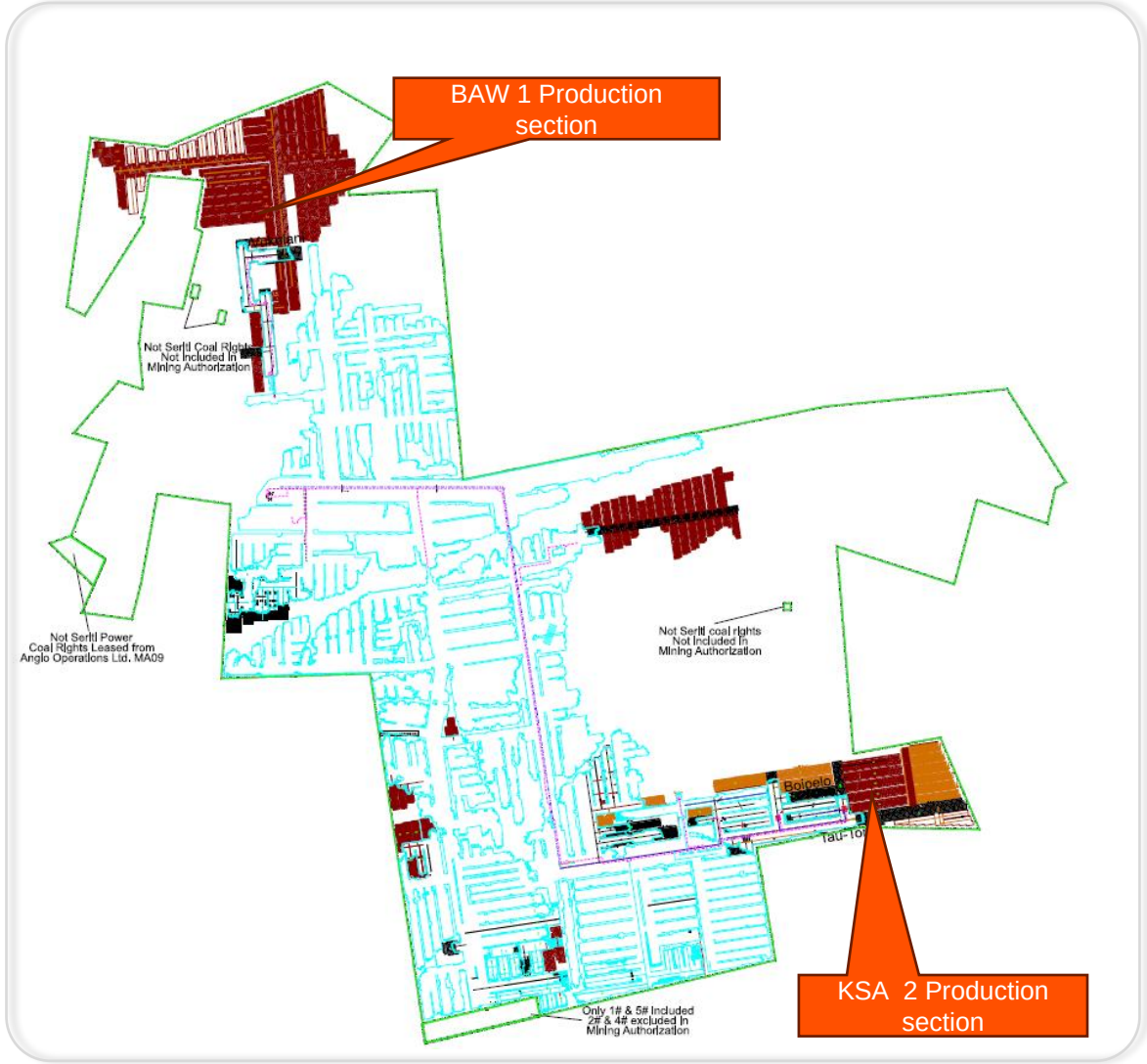
- Avg thickness ≈ 5.41m (approximate seam thickness range 0.24m – 8.51m)
- Avg depth ≈ 51.42m (approximate depth range 60m – 80m)

#2 seam roof comp: mudstone/sandy mudstone

- Avg thickness ≈ 5.71m (approximate seam thickness range 0.18m – 10.26m)
- Avg depth ≈ 75.28m (approximate depth range 80m – 100m)

Mined Areas And Remaining Underground Reserves

2 Seam Layout (Reserves and Mined Out)



4 Seam Layout (Reserves and Mined Out)

Historical Roof Support Strategies

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Khutala Historical Systematic Support Strategies

2x 1.5m x 16mm mechanical bolts support

Voest onboard support (staggered bolts)

3 x 1.8m x 18mm point anchor resin

4 x 1.8m x 20mm full column resin bolts

Support Type and Age

- **Year 1991**
  2 x 1.5m x 16mm mechanical bolts support installed

- **Year 1997**
  Voest onboard support (staggered bolts)

- **Year 1998**
  3 x 1.8m x 18mm point anchor resin

- **Year 2004**
  4 x 1.8m x 20mm full column resin bolts

Current Backbye Ground Conditions

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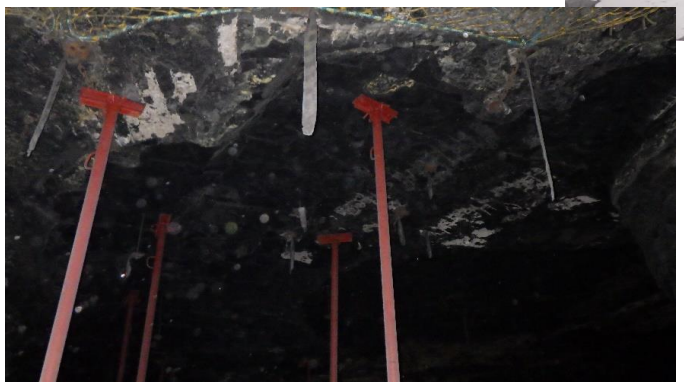
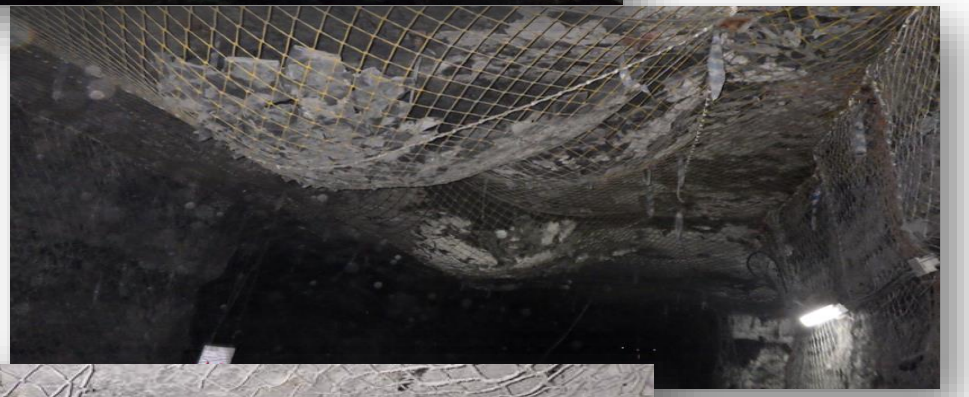
Backbye Conditions

Description of conditions	Images
Most areas has been previously supported with 2 × 1.5m × 16mm long mechanical anchor roof bolts at a row spacing +/-2m.	
Delaminated loose roof slabs have been identified within these areas thus; highlighting the risk of further roof slabbing.	
Roof slabbing occurs between and around the roof bolts, resulting in ineffective loose/un-tensioned hanging roof bolts.	

Backbye Conditions

Description of conditions	Images
Major geological structures (Faults and Dykes), not previously fully supported.	
Roof debris accumulation in the roof nets, which requires bleeding.	
Torn roof nets which require replacement	

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Backbye Fog Incidents

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Back-bye Fog Incidents

2 Seam Spine Belt (Sp.107-108)

Immediate roof slabbing consisting of a weak laminated coal stratum with an estimated thickness of 0.3 m, dislodged from an inadequately supported area resulting in “skin” failure of rock under its weight.

The area had been previously supported with 2 x 1.5m long x 16mm diameter mechanical anchor roof bolts per row, rows spaced at ≈3.0 m, hence the failure occurred between the roof bolts.

4 Seam Service Road (Backbye areas)

Immediate roof slabbing consisting of a weak laminated coal stratum with an estimated thickness of 0.2m, dislodged from an inadequately supported area, resulting in “skin” failure of the coal layer under its weight.

The roadway has been previously supported with 2 x 1.5m long x 16mm diameter mechanical anchor roof bolts per row, rows spaced at ≈2.0 m

Images

Images

Back-bye Fog Incidents

242 Belt Road

Roof slabbing of the laminated sandstone roof took place along 242 Belt Road between leg structures 85 and 86. A roof slab of approximately **1.5m (length) × 1.5m (width) × 0.03m (thickness)**, fell onto the belt structure. This resulted in a pull key wire being damaged by the failure.

The cause of the roof slabbing is due to the time dependent deterioration.

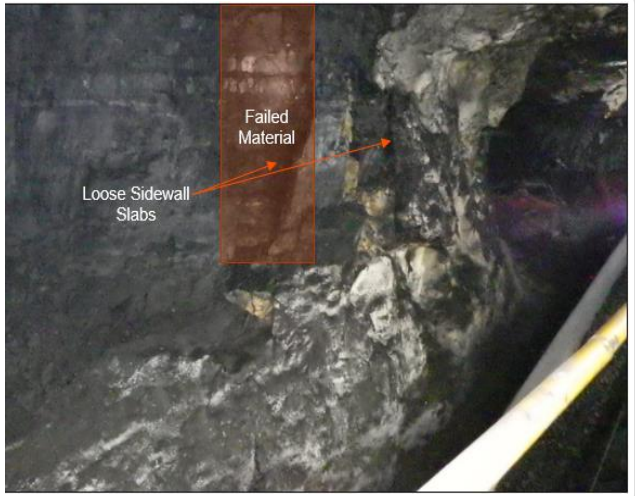
Images

4E2 Belt (Sp.8-9)

Pillar sidewall scaling consisting of a coal block with an estimated thickness of **0.3m**, length of **2.0m**, and width of **1.0m.** No areal support (sidewall netting/welded mesh support) was installed at the time of failure

Heavy rainfalls also contributed to the added weight of the overlying strata (increasing vertical load) and thus causing the pillars to scale as a response to the additional load.

Images



Back-bye Fog Incidents

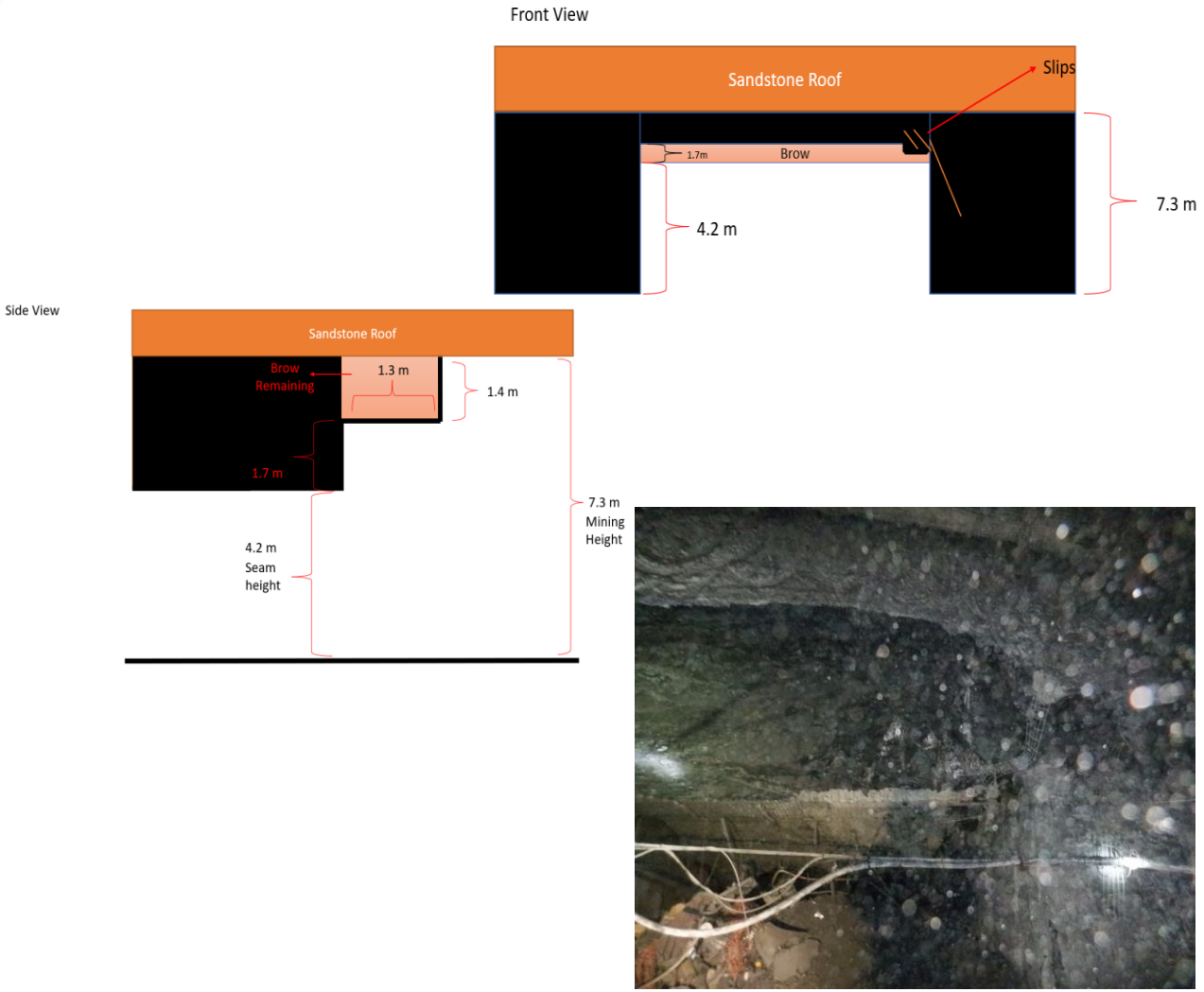
2E3 Traveling Road

Brow failure with estimated dimensions of **7.0m** wide x **1.3m** length x **1.7m** thick = **15.47m^3** dislodged from within the main brow with a thickness of **≈3.1m** and fell into 2E3 traveling road

The mining dimensions, bord width and mining height were measured as **7.0 m** and **4.2m** (under the brow) – **7.3 m** (to the sandstone roof) respectively.

The above mining parameters are a consequence of total seam mining to accommodate the construction of air-crossings at the time.

Images



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Backbye Management Strategy

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Back-bye Management Process Flow

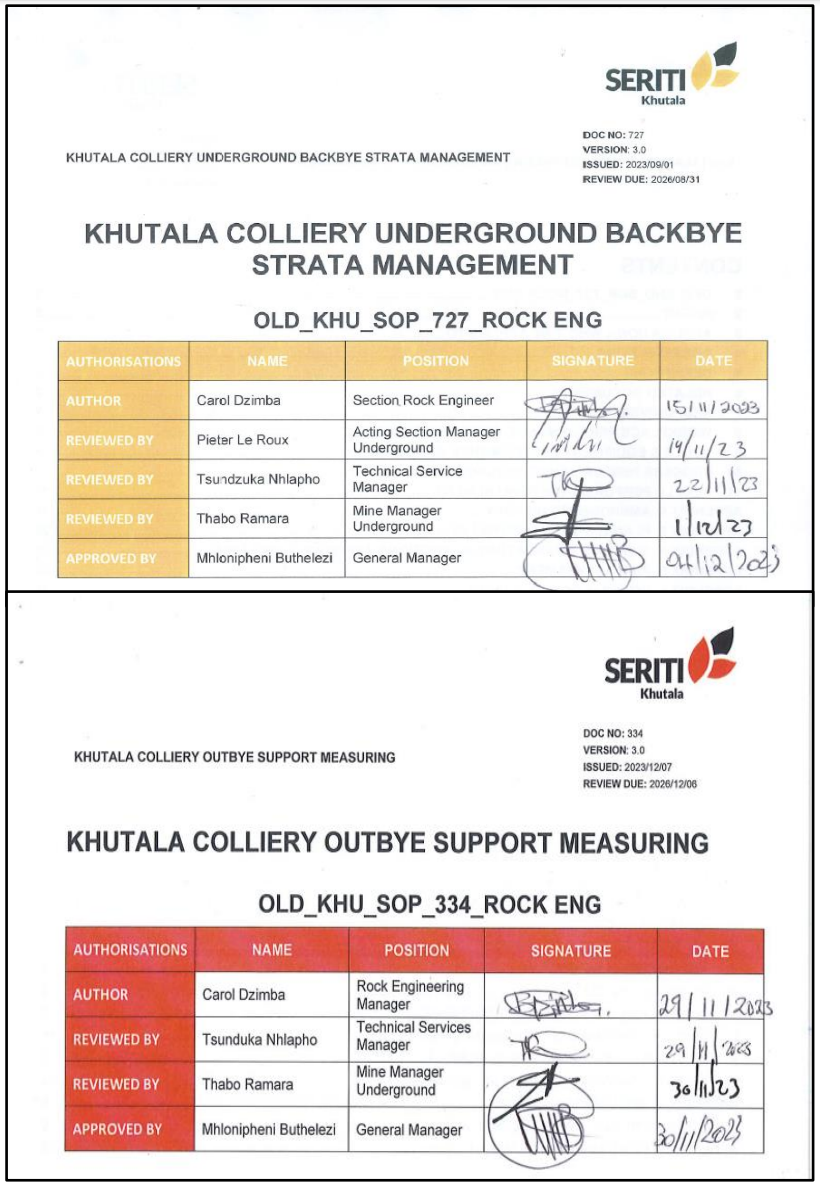
- Geotechnical inspection done by the RE department, risk rank conditions and issue recommendations

- Back-bye hazard plan and a heat map are updated as per the conditions observed by RE and made available on the cloud for execution team to track

- Back-bye execution team updates the heat map after the scope of work is executed

- Back-bye execution team executes the scope of work issued by the RE department

Back-bye Management Standard Operating Procedures



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KHUTALA COLLIERY UNDERGROUND BACKBYE STRATA MANAGEMENT

DOC NO: 727
VERSION: 3.0
ISSUED: 2023/09/01
REVIEW DUE: 2026/08/31

KHUTALA COLLIERY UNDERGROUND BACKBYE STRATA MANAGEMENT

OLD_KHU_SOP_727_ROCK ENG

AUTHORISATIONS	NAME	POSITION	SIGNATURE	DATE
AUTHOR	Carol Dzimba	Section Rock Engineer		15/11/2023
REVIEWED BY	Pieter Le Roux	Acting Section Manager Underground		14/11/23
REVIEWED BY	Tsundzuka Nhlapho	Technical Service Manager		22/11/23
REVIEWED BY	Thabo Ramara	Mine Manager Underground		1/12/23
APPROVED BY	Mhlonipheni Buthelezi	General Manager		04/12/2023

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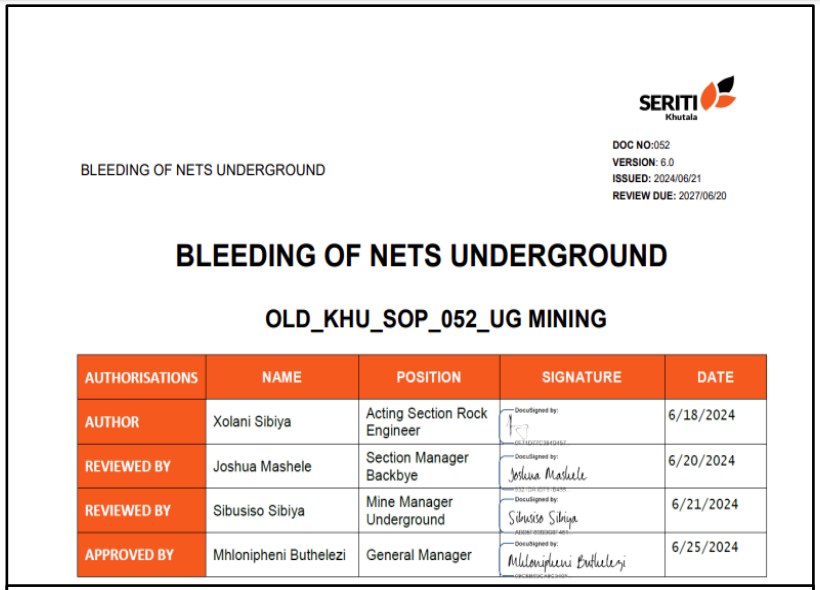
KHUTALA COLLIERY OUTBYE SUPPORT MEASURING

DOC NO: 334
VERSION: 3.0
ISSUED: 2023/12/07
REVIEW DUE: 2026/12/06

KHUTALA COLLIERY OUTBYE SUPPORT MEASURING

OLD_KHU_SOP_334_ROCK ENG

AUTHORISATIONS	NAME	POSITION	SIGNATURE	DATE
AUTHOR	Carol Dzimba	Rock Engineering Manager		29/11/2023
REVIEWED BY	Tsunduka Nhlapho	Technical Services Manager		29/11/2023
REVIEWED BY	Thabo Ramara	Mine Manager Underground		30/11/23
APPROVED BY	Mhlonipheni Buthelezi	General Manager		30/11/2023



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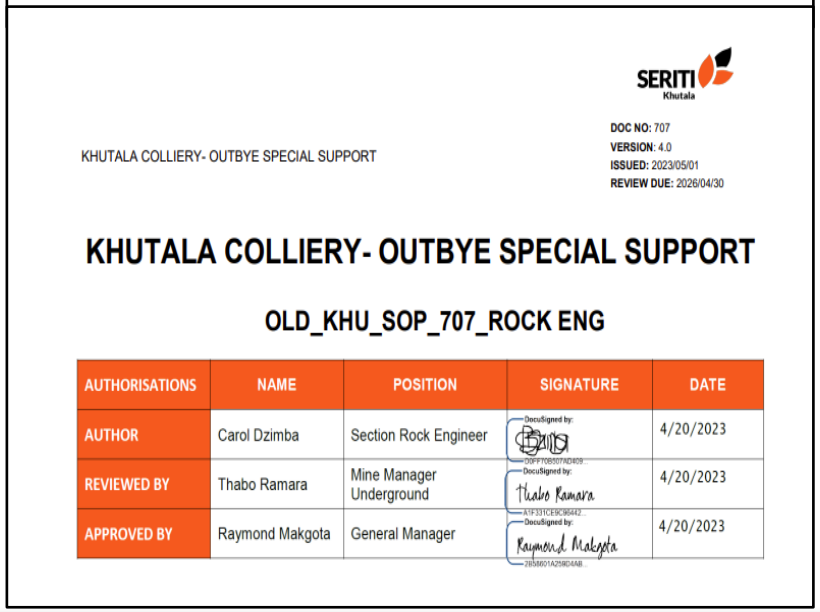
BLEEDING OF NETS UNDERGROUND

DOC NO:052
VERSION: 6.0
ISSUED: 2024/06/21
REVIEW DUE: 2027/06/20

BLEEDING OF NETS UNDERGROUND

OLD_KHU_SOP_052_UG MINING

AUTHORISATIONS	NAME	POSITION	SIGNATURE	DATE
AUTHOR	Xolani Sibiya	Acting Section Rock Engineer	DocuSigned by:	6/18/2024
REVIEWED BY	Joshua Mashele	Section Manager Backbye	DocuSigned by: Joshua Mashele	6/20/2024
REVIEWED BY	Sibusiso Sibiya	Mine Manager Underground	DocuSigned by: Sibusiso Sibiya	6/21/2024
APPROVED BY	Mhlonipheni Buthelezi	General Manager	DocuSigned by: Mhlonipheni Buthelezi	6/25/2024



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KHUTALA COLLIERY- OUTBYE SPECIAL SUPPORT

DOC NO: 707
VERSION: 4.0
ISSUED: 2023/05/01
REVIEW DUE: 2026/04/30

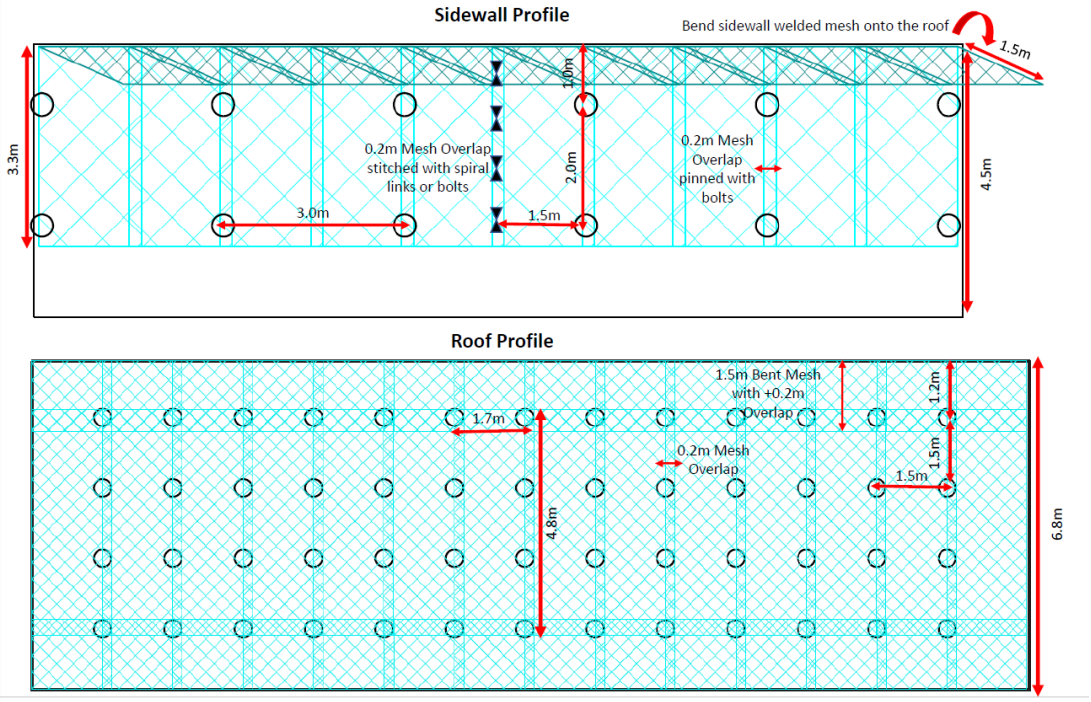
KHUTALA COLLIERY- OUTBYE SPECIAL SUPPORT

OLD_KHU_SOP_707_ROCK ENG

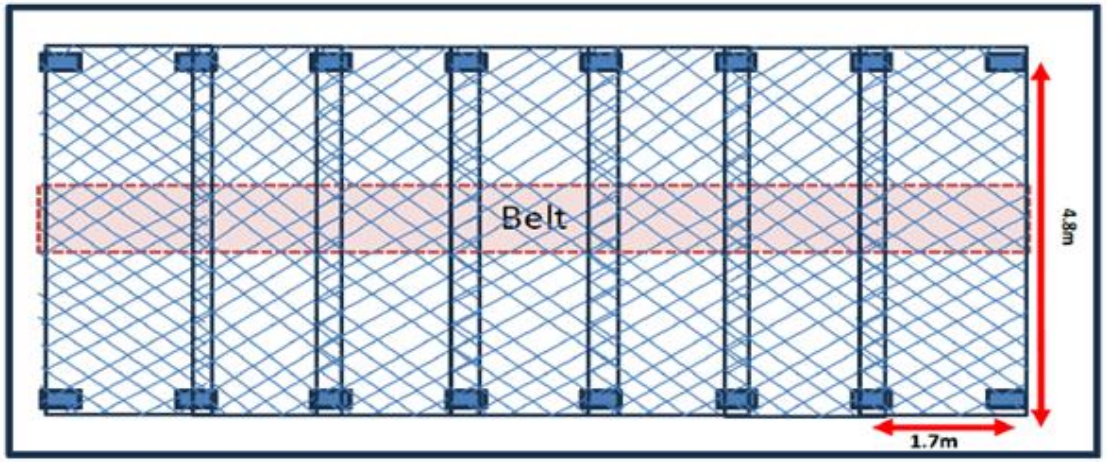
AUTHORISATIONS	NAME	POSITION	SIGNATURE	DATE
AUTHOR	Carol Dzimba	Section Rock Engineer	DocuSigned by:	4/20/2023
REVIEWED BY	Thabo Ramara	Mine Manager Underground	DocuSigned by: Thabo Ramara	4/20/2023
APPROVED BY	Raymond Makgota	General Manager	DocuSigned by: Raymond Makgota	4/20/2023

Back-bye Support Rule

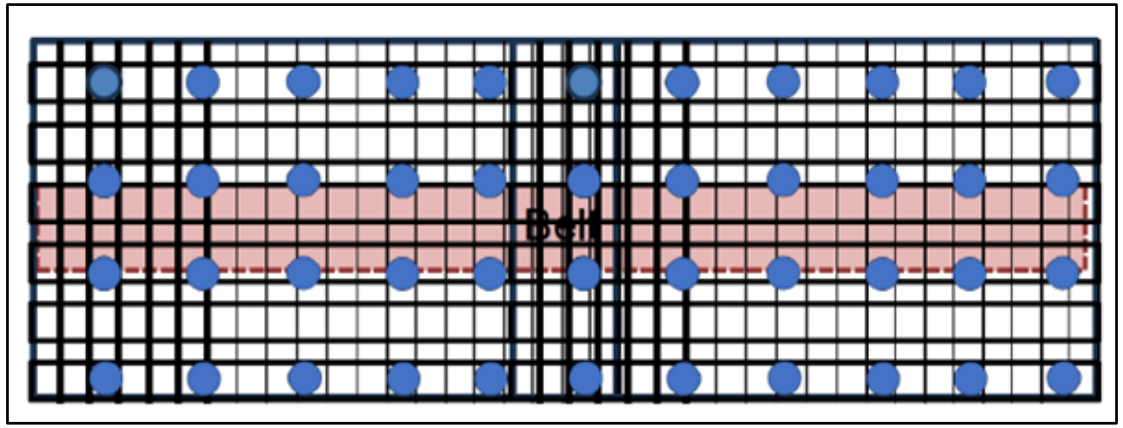
Systematic roof and sidewall welded mesh support pattern



Suspension of roof mesh with hydraulic/temporary support jacks



Systemic roof welded mesh support pattern using double nuts/Q-links

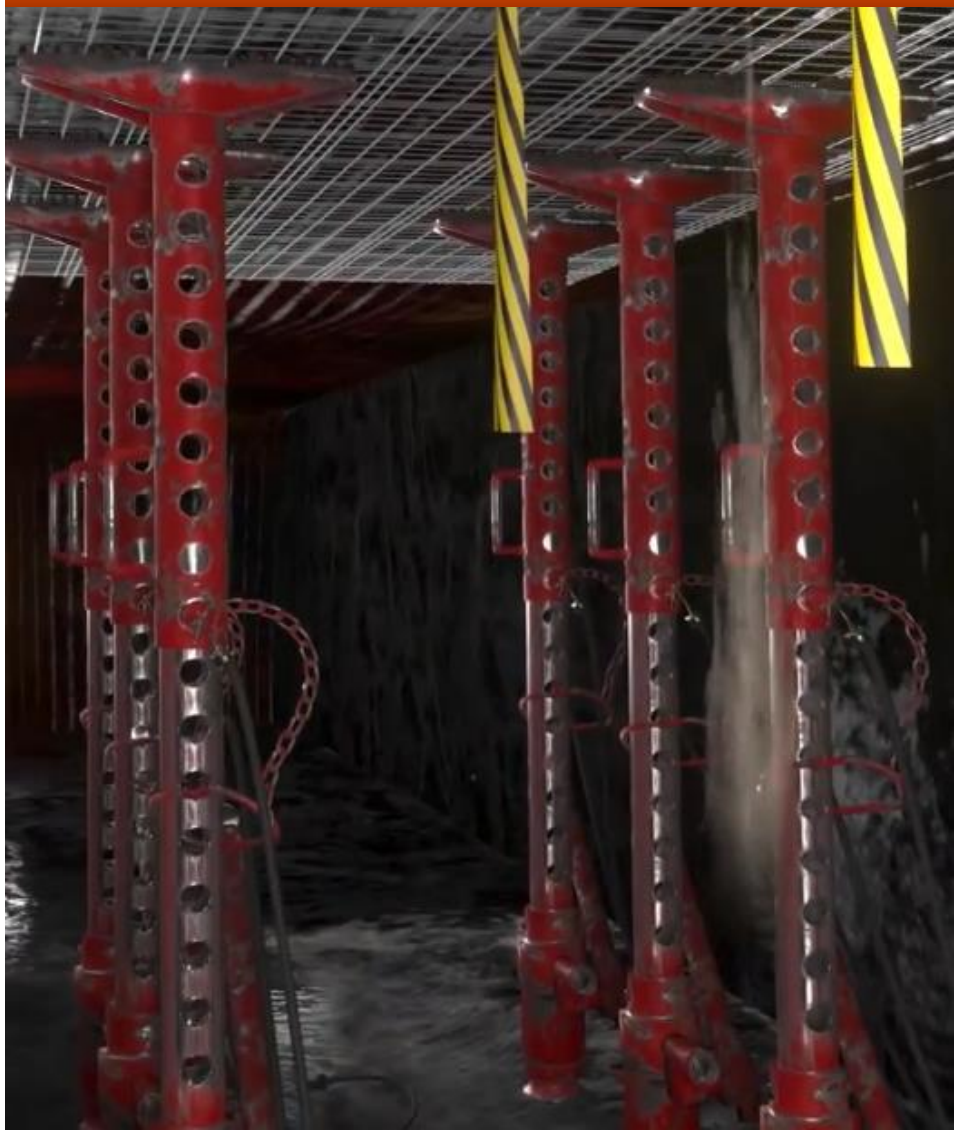


Back-bye Fog Incidents

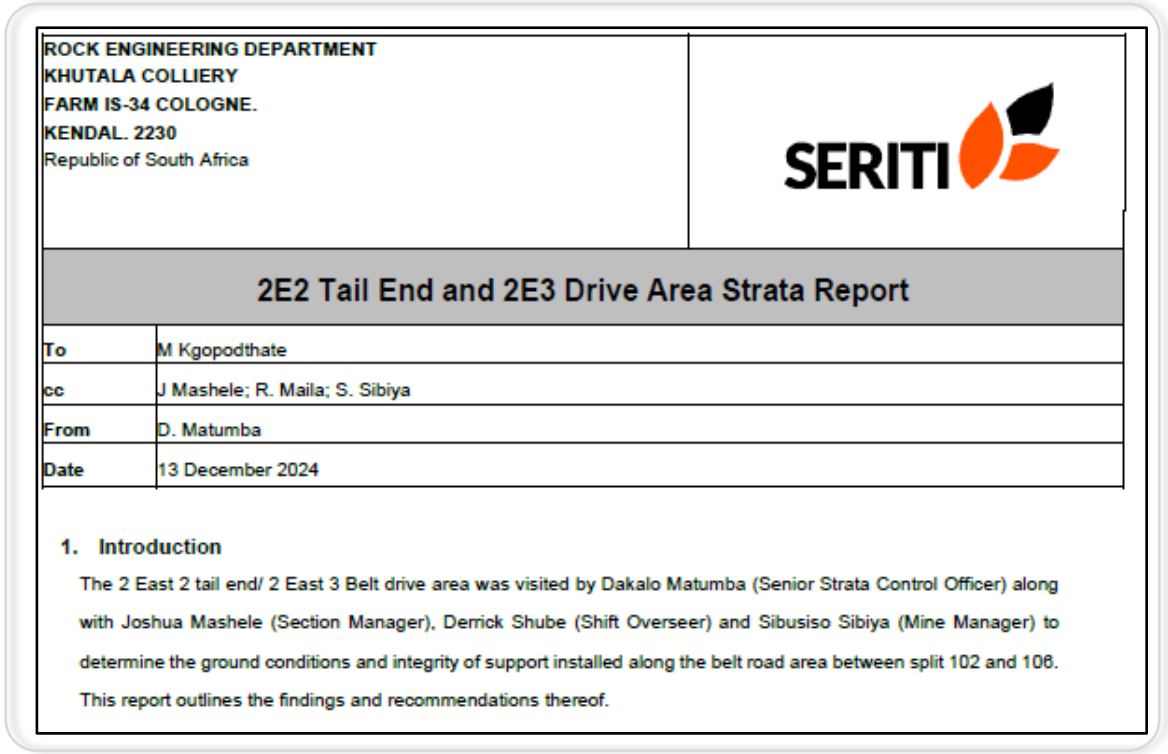
Systemic roof and sidewall welded mesh support pattern

Systemic roof welded mesh support pattern using double nuts/Q-links

Suspension of roof welded mesh with hydraulic/ temporary support jacks



Geotechnical Inspections



ROCK ENGINEERING DEPARTMENT
KHUTALA COLLIERY
FARM IS-34 COLOGNE.
KENDAL. 2230
Republic of South Africa

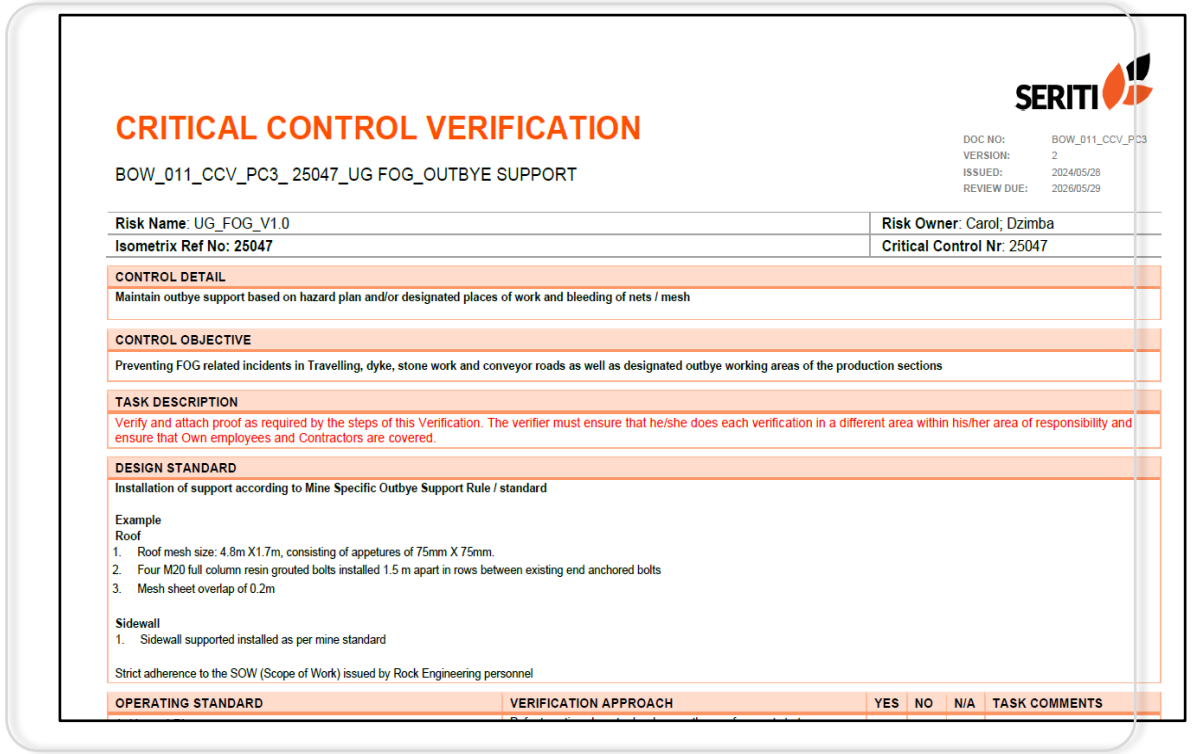
SERITI

2E2 Tail End and 2E3 Drive Area Strata Report

To	M Kgopodthate
cc	J Mashele; R. Maila; S. Sibiya
From	D. Matumba
Date	13 December 2024

1. Introduction

The 2 East 2 tail end/ 2 East 3 Belt drive area was visited by Dakalo Matumba (Senior Strata Control Officer) along with Joshua Mashele (Section Manager), Derrick Shube (Shift Overseer) and Sibusiso Sibiya (Mine Manager) to determine the ground conditions and integrity of support installed along the belt road area between split 102 and 106. This report outlines the findings and recommendations thereof.



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CRITICAL CONTROL VERIFICATION

DOC NO: BOW_011_CCV_PC3
VERSION: 2
ISSUED: 2024/05/28
REVIEW DUE: 2026/05/29

BOW_011_CCV_PC3_ 25047_UG FOG_OUTBYE SUPPORT

Risk Name: UG_FOG_V1.0	**Risk Owner**: Carol; Dzimba
Isometrix Ref No: 25047	**Critical Control Nr**: 25047

CONTROL DETAIL

Maintain outbye support based on hazard plan and/or designated places of work and bleeding of nets / mesh

CONTROL OBJECTIVE

Preventing FOG related incidents in Travelling, dyke, stone work and conveyor roads as well as designated outbye working areas of the production sections

TASK DESCRIPTION

Verify and attach proof as required by the steps of this Verification. The verifier must ensure that he/she does each verification in a different area within his/her area of responsibility and ensure that Own employees and Contractors are covered.

DESIGN STANDARD

Installation of support according to Mine Specific Outbye Support Rule / standard

Example
Roof
1. Roof mesh size: 4.8m X1.7m, consisting of appetures of 75mm X 75mm.
2. Four M20 full column resin grouted bolts installed 1.5 m apart in rows between existing end anchored bolts
3. Mesh sheet overlap of 0.2m

Sidewall
1. Sidewall supported installed as per mine standard

Strict adherence to the SOW (Scope of Work) issued by Rock Engineering personnel

OPERATING STANDARD	VERIFICATION APPROACH	YES	NO	N/A	TASK COMMENTS

Scopes of work are drafted following inspections done by rock engineering in conjunction with the back-bye mining team to address support issues that cannot be fully addressed by the mine standard support rule. These scopes of work give guidance and support designs suited for the inspected conditions.

Critical Control Verifications for back-bye support verifications are scheduled monthly and assigned to both execution and rock engineering personnel. They are designed to track overall back-bye conditions and support status (actions are raised on Isometrix where non-compliance is identified).

Backbye Management Strategy

Conditions Observed and Action Plan

Area Observed	Conditions Observed	Ground Condition Risk Ranking	Corrective action	Status (Rock Eng)	Execution Plan by Mining	Status (Mining)
2E3 Belt Drive	No areal cover has been installed along the 3.1m roof brow.	High Risk	The brow needs to be wrapped with areal cover.	Not Done		
	Pillar scaling has been observed around the area with no areal cover installed on the sidewalls	High Risk	Area cover should be installed on the roof and sidewalls around the 2E3 Belt Drive intersection.	Not Done		
Belt structure leg 59-60	Roof bolts were found missing and others sticking out, with the integrity of support being compromised	High Risk	The roof needs to be re-supported with roof bolts supplemented with areal cover.	Not Done		
Belt structure leg 107	A vertical brow with a tension crack, posing a risk of collapsing,	High Risk	Bar down the loose sidewall brow	Not Done		
Belt structure leg 233-236 & 257	Area cover was found not installed on the roof, with slabbing taking place between the roof bolts due to time-based roof deterioration.	High Risk	Areal cover needs to be installed on the roof and sidewalls.	Not Done		
Belt structure leg 64-70, 76, 114, 121, 162-168, 208, 223-226, 252-257, 274, 298-306	Roof debris accumulated within the norse netting installed on the roof due to slabbing	Medium Risk	Norse net with roof debris accumulation needs to be bled , and welded mesh be installed where the nets have been bled.	Not Done		
Length of the belt	No safe-making tools between splits	Low Risk	Sounding sticks and pinch bar should be placed every 10 splits along the splits between the BR and Travelling road	Not Done		
		Overall Belt Condtion Risk Rank (e.g HR/LR/MR)				

Comments

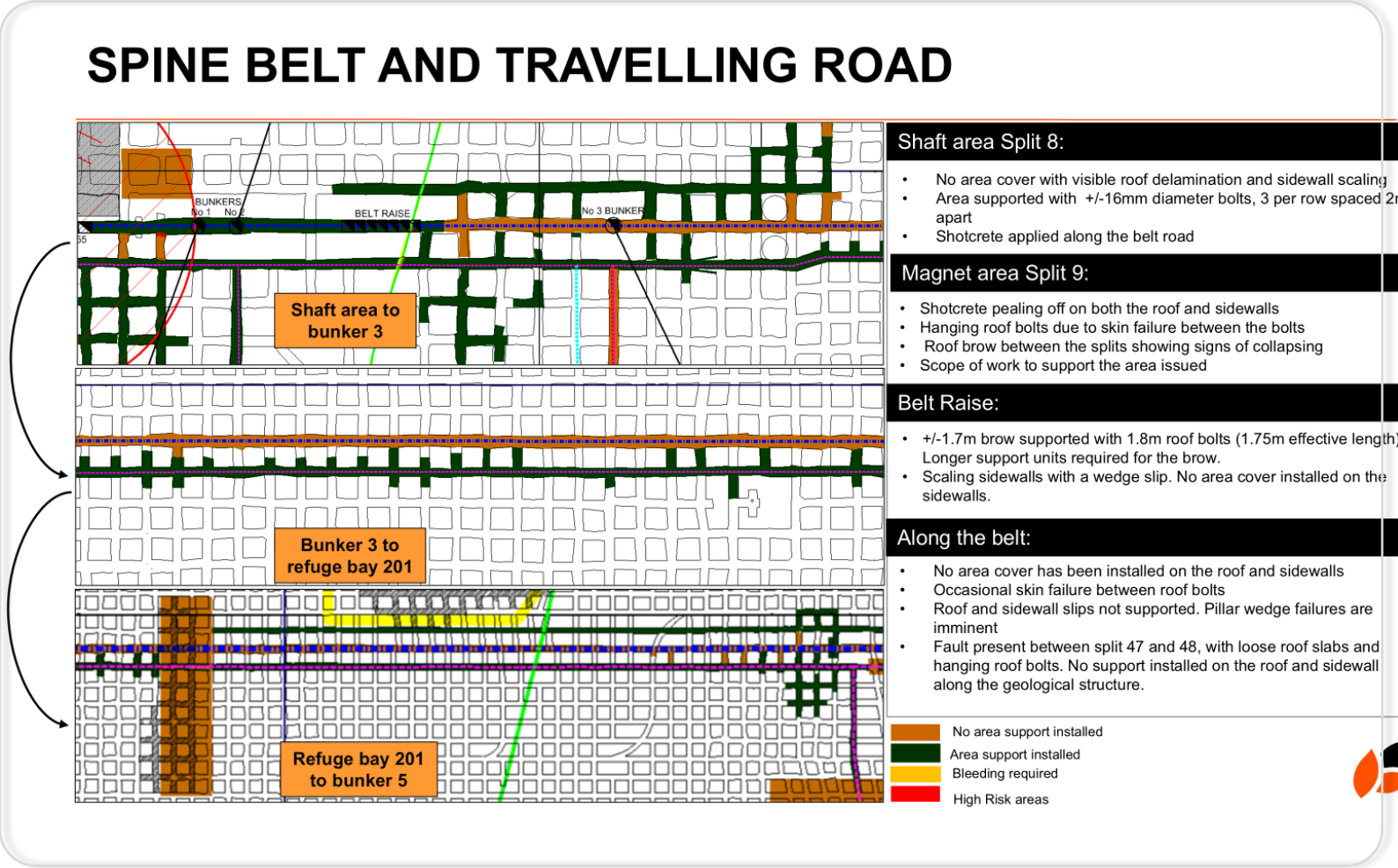
A live document updated by the Rock Engineering department on the cloud and accessed by the backbye management team.

Outlines the observations made by the RE department and recommendations on how to make the areas safe.

The execution team to update the live document upon implementation of the controls.

Feedback is provided to the Mine Manager weekly in the RE compliance meeting for alignment.

Backbye Management Strategy



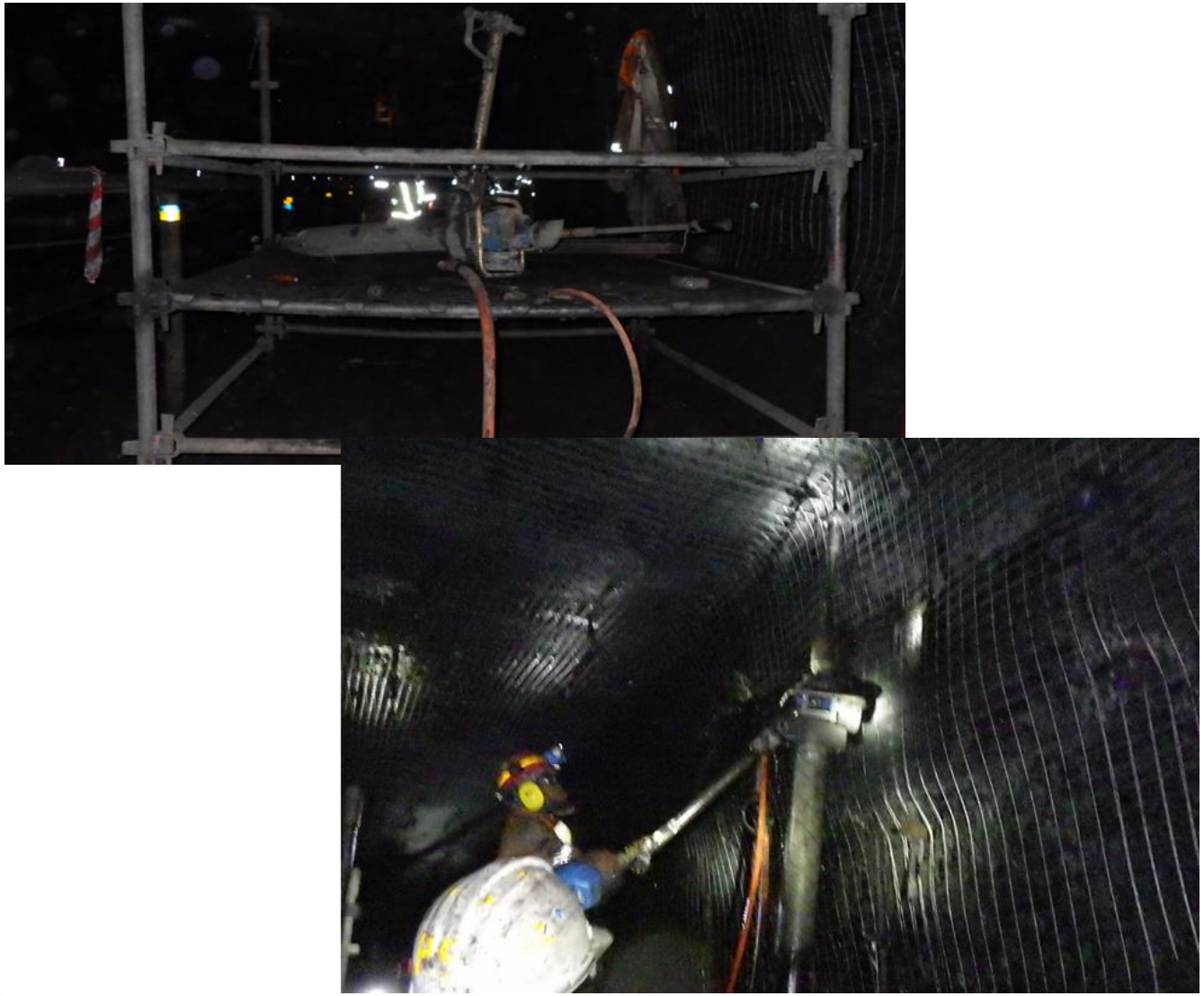
Backbye Hazard Plan

A hazard plan outlining the ground conditions along the belt and travelling areas.

The areas are ranked according to the conditions observed:

- No areal support installed
- Area support installed
- Bleeding of nets required
- High-risk area (no support installed/old support installed)

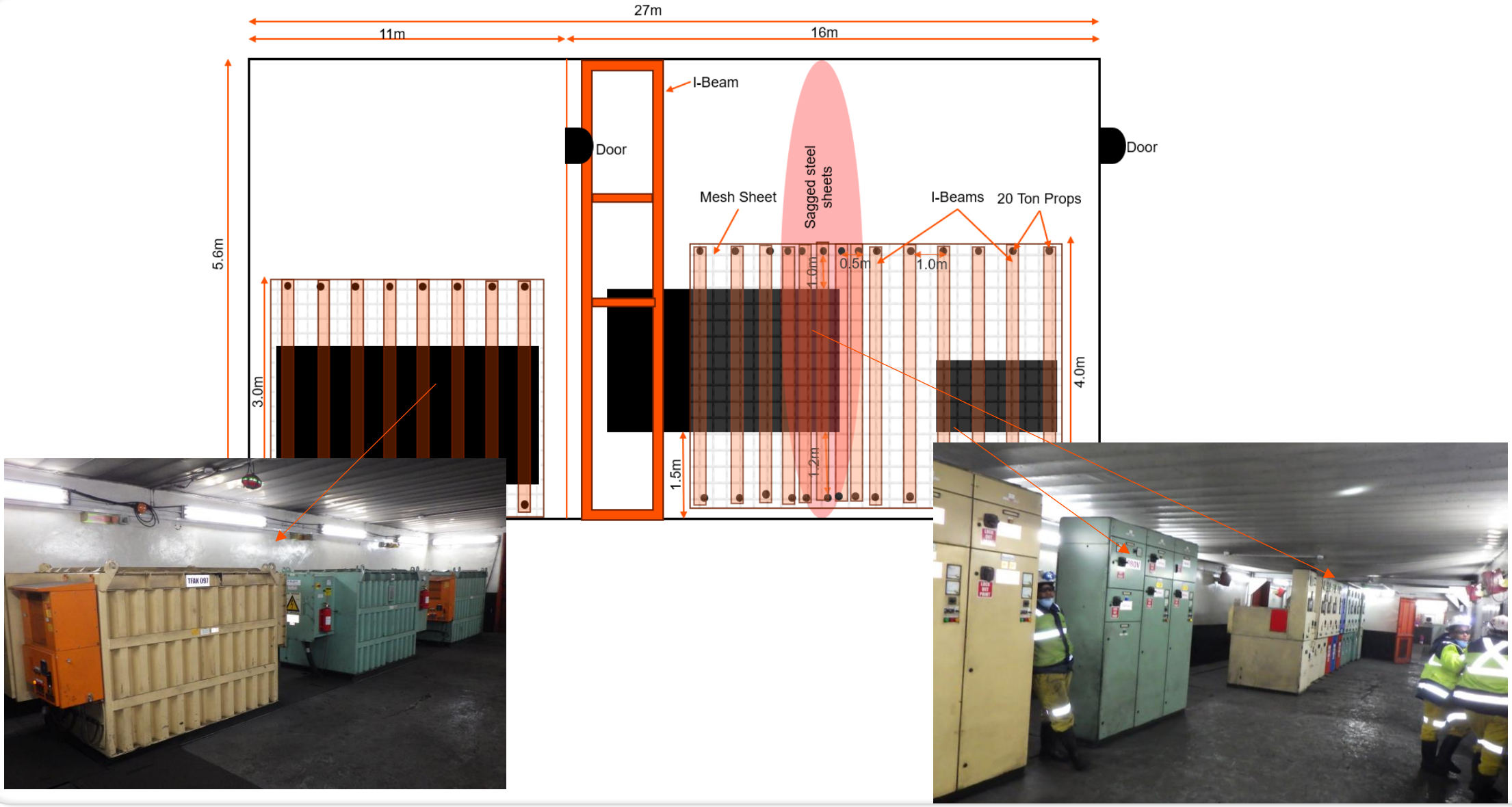
Backbye Management Strategy



Special Support Using Gophers and Scaffolding

This strategy is utilized by the inhouse mining teams to install roof support over the conveyor belt by making use of portable hand-held roof bolter machines (Gophers) and using scaffolding to enable working over the conveyor belt whilst it is operating.

Visuals And Support Design Sketch Of District Substation 1



Scope Of Work Execution

Specialized Support at MC

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Thank You

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