

# Report: Level 1 emergency exercise

**Exercise location:** Anglo American Aquila Coal Mine

**QMRS-focused event exercise date:** Wednesday, 13 September 2023

**Mine-focused event exercise date:** Tuesday, 7 November 2023



Resources  
Safety & Health  
Queensland

# Contents

1.0	Abbreviations and glossary	2
2.0	Foreword	<b>Error! Bookmark not defined.</b>
3.0	Preface	8
4.0	Executive Summary	9
5.0	2023 Level 1 exercise format	10
6.0	Mine-focused event	10
7.0	QMRS-focused event	10
8.0	Aquila Coal Mine (AngloAmerican)	11
9.0	Underground mine description and operational status	12
10.0	Introduction	13
11.0	Objectives	14
12.0	QMRS-focused event	14
12.1	Exercise design	14
12.2	Scenario	16
13.0	Assessment of the scenario	17
13.1	What worked well (QMRS at Mine Site)	31
13.2	Areas for improvement (QMRS at Mine Site)	31
13.3	Recommendations	33
14.0	Whole of Mine (WOM) focused event	38
14.1	Scenario	40
14.2	Assessment of the scenario	41
14.3	Underground assessments	42
14.4	Scenario response in each area of the mine	45
14.5	Observations at the mine portal	53
15.0	Surface assessments	56
	Aquila Coal Mine emergency response framework	57
15.1	57	
15.2	Surface assessment locations	57
15.3	Control room, debriefing rooms and tag board	58
15.4	What worked well	59
15.5	Areas for improvement	59
15.6	Incident Management Process	60
16.0	Conclusions	63
17.0	Key findings and recommendations	64
17.1	Recommendations for Queensland Mines Rescue service	64
	Recommendations for Aquila U/G Coal Mine and industry	64
17.2	64	
18.0	References	66

# 1.0 Abbreviations and glossary

Term	Definition
Approved standard	A standard made for safety and health under the repealed <i>Coal Mining Safety and Health Act 1925</i> stating ways to achieve an acceptable level of risk to people arising out of coal mining operations
CABA	Compressed air breathing apparatus
CPR	Cardiopulmonary resuscitation
CH <sub>4</sub>	Methane
CITECT	Brand name of SCADA system
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
CMW	Coal mine worker
Continuous miner (CM)	Coal cutting machine used to develop new roadways in a mine
Crib room	The location where mineworkers eat and a meeting station for the ERZ controllers
CRO	Control room operator
Cut-through (ct)	A passage cut through the coal, connecting two parallel headings
DAC	Direct audio communications Underground intercom system
Deputy	A safety supervisor who makes statutory inspections is referred to as an ERZ controller in Queensland regulation
Drift runner	Brand name for a flameproof diesel-powered man-riding vehicle carrying up to 12 personnel. They sometimes interchanged with PJB, which is a different brand

Term	Definition
Downcast	A shaft or borehole where air enters the mine - it is sometimes referred to as an intake shaft
Eimco	Brand name of a flameproof diesel-powered mechanical loader. They can be referred to as a load haul dump (LHD) machine
ERZ	Explosion risk zone
ERZC	A coal mine worker responsible for safety inspections is traditionally referred to as a Deputy
Face	The exposed surface of a coal deposit in the working place where mining is proceeding
Fresh air base (FAB)	A continuously monitored station for dispatch or return of rescue teams in close proximity to irrespirable zones
Gas chromatograph (GC)	A laboratory instrument used to analyse the composition of gas samples
Go line	An assembly area on the surface where the mobile plant is left after servicing and when available for use
HMP	Hazard management plan
IAP	Incident action plan—developed by the IMT and signed off so each of the teams, logistics, operations and planning have a clear direction
IC	Incident Controller – the most senior person in the IMT
IMT	Incident Management Team (the term is interchangeable with ICT)
Inbye	Mining is a term for going into an underground mine (away from the surface) from the point of reference
Industry Safety and Health Representative (ISHR)	A person appointed under section 109(1)5 of the <i>Coal Mining Safety and Health Act 1999</i> to represent coal mine workers on safety and health matters and who performs the functions and exercises the powers of an industry safety and health representative mentioned in part 8, division 2

<b>Term</b>	<b>Definition</b>
Intake (roadway)	A name or fresh air as defined in the coal mine regulations
Loader	Diesel powered mechanical loader. They can be referred to as a load haul dump (LHD) machine
Level 1 mine emergency exercise	It is a mine emergency exercise at a state level. The Moura disaster enquiry recommended exercises designed to test the mine's emergency response system, test the ability of external services to administer assistance and provide a focal point for emergency preparedness in the state.
Longwall	A method of mining flat-bedded coal deposits in which the working face is retreated over a considerable width at one time
MAG	Mutual Assistance Group
Mines Inspector	Official employed to make examinations of, and to report upon, mines and surface plants for compliance with mining laws, rules and regulations, safety methods
Mines Inspectorate	The organisation that controls the mines inspectors
MEMS	Mine Event Management System
MRAS	Mine Re-entry Assessment System
Mole	Name used to refer to the mine site representative on the organising committee for the level 1 mine emergency exercise
Non-verbal communication	Method of communicating using beeps on a telephone or DAC similar to Morse code
O <sub>2</sub>	Oxygen
OCN	Oaky Creek North Coal Mine
Outbye	Mining is a term for out of the underground mine (towards the surface) from the point of reference

Term	Definition
Panel	The working of coal seams in separate panels or districts, e.g. single unit panel—a longwall face is sometimes referred to as a panel
Personal emergency device (PED)	The ultra-low frequency through-the-earth communication system used for paging was initially developed to provide a fast and reliable method of informing underground miners of emergencies.  Other methods, such as underground WiFi networks, are also used to deliver emergency messages, such as the case at the Aquila Mine Site.
Portal	The surface entrance to an underground mine
ppm	Parts per million
QMRS	Queensland Mines Rescue Service
Recognised standard	A standard made for safety and health under the <i>Coal Mining Safety and Health Act 1999</i> stating ways to achieve an acceptable level of risk to people arising out of coal mining operations
Return (Roadway)	Name for air that has ventilated a working face often contaminated with heat, dust and gases
Rib	The solid coal on the side of a gallery or longwall face, a pillar or barrier of coal left for support
Safegas	Brand name of a mine gas monitoring system (developed by Simtars)
Self-contained self-rescuer (SCSR)	A respiratory device used by miners for escape during mine fires and explosions—it provides the wearer with a closed-circuit supply of oxygen for periods, usually less than 1 hour
Simtars	Safety in Mines Testing and Research Station
Stopping	A ventilation control device that stops ventilation flow through a roadway
Turbex™ (Foam Generator)	A water powered firefighting device (dimensions 902Wx927Hx495D Nett wt.55kg) designed to produce large capacities of high expansion foam, up to 200 cubic metres per minute

Term	Definition
Tag board	Peg board where underground personnel place a token to indicate their presence in a section of the mine
Undermanager	Coal Mine Worker in charge of the mine on a shift basis (i.e. shift supervisor)
Upcast	A shaft or borehole where the air leaves the mine. Sometimes referred to as a return shaft
Ventsim™	Ventilation modelling software
VCD	Ventilation control device—an air door, stopping, seal or brattice
VO	Ventilation Officer—coal mine worker responsible for the coordination of all ventilation related activities at the mine, including running a ventilation modelling system

## 2.0 Host mine's comments

Anglo American and Aquila Mine had the privilege of being host to the 2023 Level 1 emergency exercise. Level 1 exercises serve as a valuable opportunity to test the emergency preparedness of our systems both at a local mine, organisational and industry level in a practical and tangible manner. These events yield learnings, not only for the subject site, but for the broader industry and the services groups that are designed to support operations in such emergencies.

These exercises are made effective through significant collective efforts from the event organisers, assessor teams, Resources Safety and Health Queensland, Simtars, Queensland Mines Rescue Service, industry safety and health representatives, site personnel and supporting operations. The energy and time committed to ensuring the Level 1 exercise is a robust test is immense and for that effort I thank those contributors for their efforts.

As with all Level 1 exercises, it is hoped that the learnings presented from the 2023 Level 1 exercise are used to help improve the collective emergency response systems of all sites for the benefit of the health and safety of coal mine workers.

**Braedon Smith**  
Site Senior Executive and General Manager  
Aquila Mine



## 3.0 Committee's acknowledgment

This report has been compiled by the State Emergency Exercise Executive Management Committee under the guidelines in *Recognised Standard 8, Conduct of Mine Emergency Exercises*. Assessors have provided an account of their part of the exercise for this report.

The committee wants to thank all assessors for their input and acknowledge the co-operation and assistance of all those involved in the 2023 Level 1 Mine Emergency Exercises. The committee would also like to thank Aquila Coal Mine for participating in the exercises and providing self-contained self-rescuers (SCSRs) and compressed air breathing apparatus (CABA) for use during the exercise, adding to the reality of the experience of evacuating coal mine workers.

# 4.0 Executive Summary

This report covers the 2023 Level 1 Mine Emergency Exercise at Aquila Underground Coal Mine.

Aquila is an underground longwall operation located 31km southwest of Middlemount in the heart of the Bowen Basin (see Figure 1).

Thirty-two assessors participated in the exercise, with representatives from Glencore Oaky North Coal Mine, Anglo Aquila, Anglo Moranbah North, BMA Broadmeadow, Kestrel Coal Resources, Sungela Ensham, Mastermyne, Fitzroy Mining Carborough Downs, Simtars, University of Queensland, Resources Safety and Health Queensland (RSHQ), Queensland Mines Rescue Service (QMRS) and an industry safety and health representative (ISHR) from the Mining and Energy Union<sup>1</sup>. This report contains several writing styles, and each input has been reviewed and edited to provide a consistent theme.

In 2022 the Level 1 exercise conducted at Carborough Downs Coal Mine was split into 2 separate events. For 2023 the same arrangement was kept in place, with 2 separate events being arranged at Aquila U/G Coal Mine. The QMRS focussed event exercise was conducted on 13<sup>th</sup> September 2023 and the mine-focussed event exercise was conducted on 7<sup>th</sup> November 2023.

This report describes each exercise scenario and comments from assessors, including their observations of what went well and areas for improvement in multiple areas of each emergency response exercise. The report references Aquila Mine's approach to reducing the 'casualty rate' as repeatedly observed during the past 25 years' Level 1 exercises. Aquila introduced innovative solutions to enable SCSR changeover to CABA in a safe environment. Other enhancements are tailored for their low seam and small pillar environment, some of which are in the implementation process. Aquila Mine took this approach when it introduced the CABA system and embarked on a long-term upgrade of its Emergency Response System, including enhancements for deploying QMRS. One of the critical reasons for the Level 1 exercise to be conducted is for the industry to learn from each other and increase its capability.

Further, recommendations are provided for the Queensland Mines Rescue Service and all Queensland underground coal mines to consider when reviewing their respective Safety and Health Management Systems.

**Ron Wilkinson**  
Chair 2023 State Emergency Exercise Executive Committee

---

<sup>1</sup> At the time of the exercise, the Mining and Energy Union was known as the Construction Forestry Maritime and Mining Union—Mining and Energy Division Queensland District Branch.

## 5.0 2023 Level 1 exercise format

In previous Level 1 exercises, assessors identified significant logistical challenges in combining testing both the host mine's, and Queensland Mine Rescue Service's (QMRS), safety and health management systems (SHMS) in one exercise, due to its time and scale.

Of particular concern was how information and data are analysed in the risk-management process and how that informs the Incident Management Team (IMT) decision-making and deployment of mines rescue teams.

To ensure future Level 1 exercises effectively test emergency response systems and enhance learning opportunities for industry, the committee decided to continue with the format used in 2022 for the 2023 exercise. The 2023 exercise was conducted as two distinctly separate events – to improve the opportunity for both the host mine and QMRS to test their emergency response systems and to enhance learning.

## 6.0 Mine-focused event

The mine-focused event was held on the 7 November 2023 and was aimed for the mine to thoroughly test its site emergency response system and the application of risk management processes. External emergency services (Ambulance and Police) were not activated in this exercise.

The exercise included:

- An emergency scenario initiated on the mine site required the mine to apply its emergency response system practically.
- Mobilisation of QMRS - if/as required.

Where QMRS was required to be mobilised for the scenario, only the permanent QMRS employees responded i.e.:

- QMRS Operations Managers applied the QMRS Mine Event Management System in consultation with the mine Incident Management Team.
- Mines rescue volunteer team members were not mobilised for this mine-focused exercise event.

## 7.0 QMRS-focused event

The QMRS-focused event was held on 13 September 2023 and was aimed to thoroughly test the QMRS emergency response and mutual assistance systems for an underground emergency scenario.

The exercise included:

- An emergency scenario in an area of the mine that did not affect the mine's production activities.
- Underground mines are expected to provide mines rescue team members as required by QMRS, per their mines rescue agreement obligations.

*\* The host mine was not required to initiate its site emergency response system.*

The Anglo American Aquila Coal Mine underground operation hosted both events.

## 8.0 Aquila Coal Mine (Anglo American)

Aquila is an underground longwall mining operation located 32km southwest of Middlemount in the Bowen Basin. The mine extracts coal from the Aquila Seams, which ranges between 1.8 metres to 2.2 metres in thickness and produces metallurgical coal sold to meet the growing needs of international steel demand.

The mine features two longwalls, allowing operations to continue without downtime usually required for longwall moves. The mine commenced production in 2019 and is a proud contributor to the local and regional economies. It employs approximately 650 people; the remaining mine life is extended to 2028.

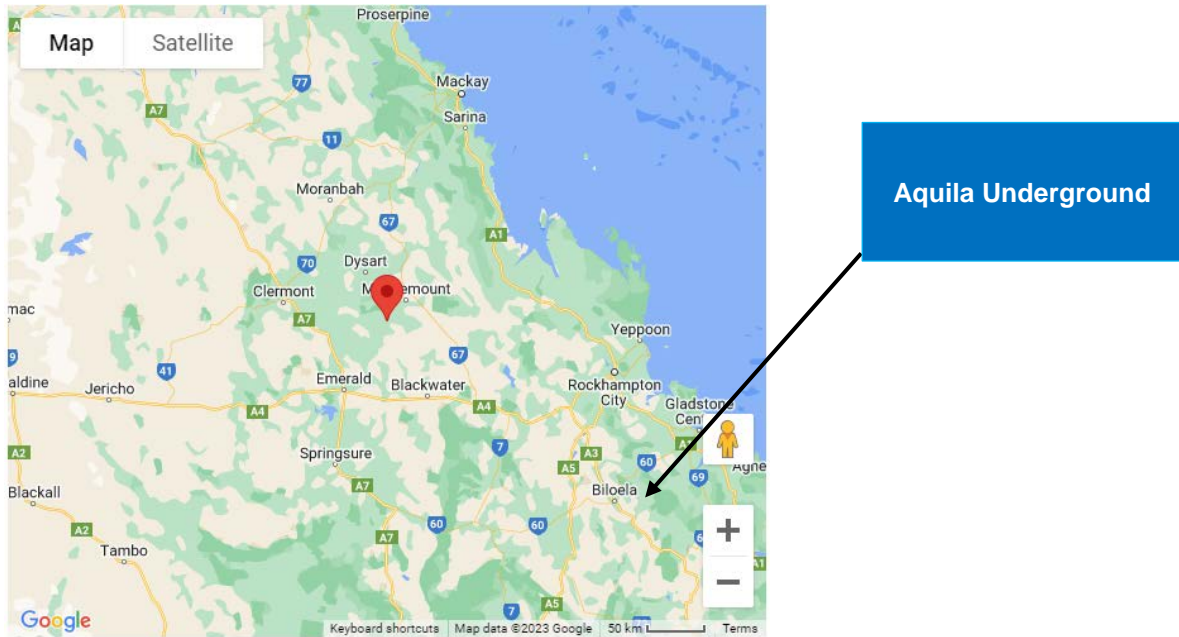


Figure 1: Location map for Aquila Coal Mine

# 9.0 Underground mine description and operational status

Aquila underground operations include longwall and gate road development. Development mining for future longwall blocks is continuing at the mine.

The underground mine workings at the time of the exercise consisted of LW902 production, gate road development panels: MG903, MG802 and North East Mains Development.

The mine's main ventilation is provided by three ventilation fan installations comprising upcast ventilation shaft Number 2 at 64ct North East Mains and upcast ventilation shaft at 94ct F to E hdg North East Mains. Intake air is drawn from the box cut portals, North East Mains shaft 3 at 63a ct, Shaft 6 at 94 ct C-D hdg and the South East Mains 103ct downcast shaft.

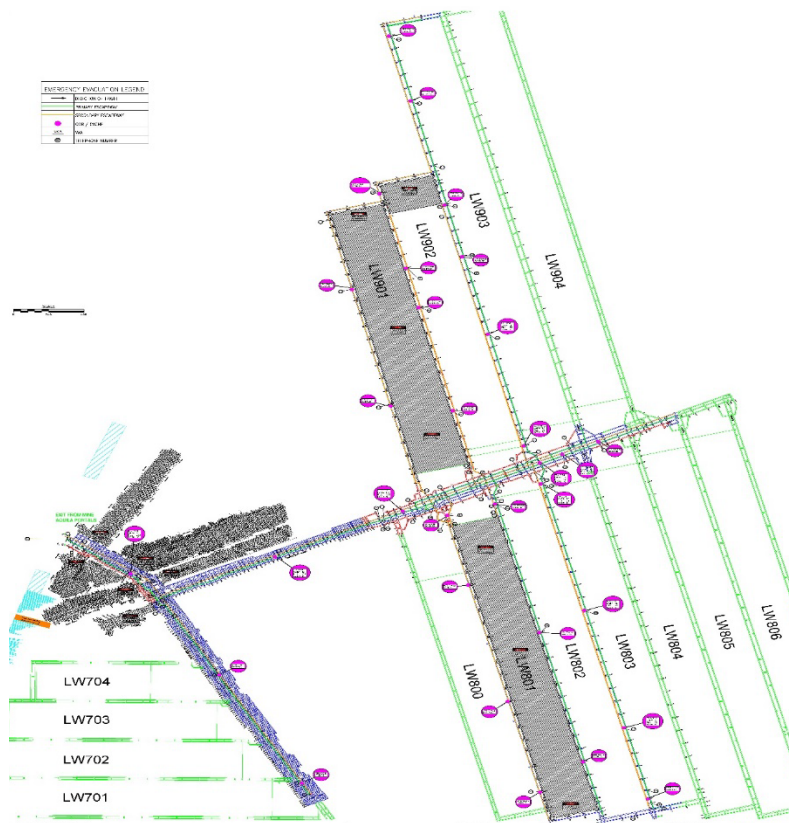


Figure 2: Aquila Mine Plan

## 10.0 Introduction

This report covers the 2023 Level 1 emergency exercises held at Aquila Coal Mine on Wednesday, 13 September 2023 (QMRS-focused event) and Tuesday, 7 November 2023 (mine-focused event).

The Queensland Mining Warden’s inquiry into the explosion at the Moura No. 2 mine in August 1994 recommended that “emergency procedures should be exercised at each mine on a systematic basis, the minimum requirement being on an annual basis for each mine” (Windridge et al. 1996).

In December 1996, the *Approved Standard for the Conduct of Emergency Procedures Exercises* was published. The approved standard was updated and issued as *Recognised Standard 8 Conduct of Mine Emergency Exercises* (RS8) in June 2009. It provides guidelines for conducting mine site emergency exercises, including the requirement to test statewide emergency responses by holding an annual exercise at an underground mine.

It is 29 years since the Moura No. 2 disaster and 13 years since the Pike River disaster in New Zealand. The Pike River Royal Commission outcomes led New Zealand to adopt similar legislation regarding emergency exercises.

Since 1998, 26 Level 1 emergency exercises have been held at coal mines in Queensland.

## 11.0 Objectives

The objectives of the exercise were set using the requirements of Recognised Standard 08 and by reviewing previous exercise reports. The objectives were to test:

- the ability of coal mine workers (CMWs) to self-escape
- mine site incident response
- the ability for triage of injured CMW
- donning of self-contained self-rescuers (SCSR) and the changeover to compressed air breathing apparatus (CABA)
- interaction with industry safety and health representative (ISHR) and Resources Safety and Health Queensland (RSHQ)
- Mobilisation of QMRS, risk assessment process for the mine re-entry, establishing a fresh air base (FAB) and location a missing CMW.

The exercise is the focal point for emergency preparedness in the state.

## 12.0 QMRS-focused event

### 12.1 Exercise design

The QMRS-focused event was conducted on Wednesday, 13 September 2023.

The objective of the QMRS-focused exercise was to provide an improved opportunity to test and evaluate the QMRS emergency response system from emergency initiation through deployment and operational activities of mines rescue teams and equipment.

For the underground element of the exercise, QMRS operational documents, including Captains Task Sheets, Authority to Enter, mine plans etc., were pre-prepared by the assessment team for QMRS Operations Managers to implement with mines rescue teams.

The operational area for mines rescue teams was selected to have minimal impact on mining operations but still provide a realistic environment to apply procedures and protocols.

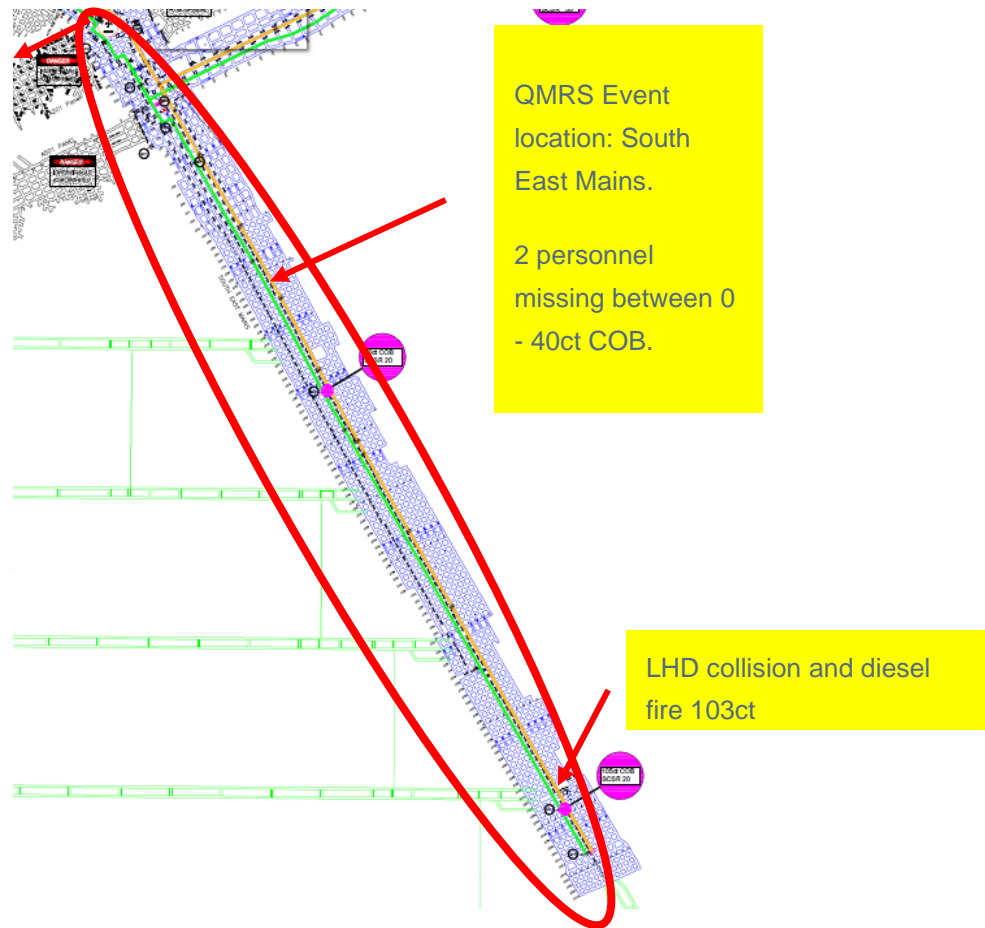


Figure 3: Mines rescue team's operational area



## 12.2 Scenario

The scenario comprised the following events initiating triggers for a response within the mines and QMRS SHMS.

1. At 0200hrs, a collision between an LHD and Drift runner (personnel transport) occurs at South East Mains 103ct A – B adjacent to the downcast shaft. The collision initiates a fire in the Drifrunner engine.
2. The ERZC (driver of the drift runner), standing immediately behind the drift runner, removing equipment for VCD repairs, is affected, causing a serious injury (fractured arm). He walks from the incident scene to the other side of the shaft.
3. The driver of LHD receives a head injury (shock), exits LHD, abandons the incident scene and commences walking outbye via E Hdg. Unaware of injured ERZC.
4. Fire evolves and involves LHD peaking to large fire until fuel is consumed and fire intensity reduces. However, coal ribs commence combustion, producing CO and other contaminants.
5. The ERZC is in fresh air at the base of the downcast shaft and can walk to self-escape. Conscious, able to communicate, but sustained a fractured arm. The ERZ Controller phones the CRO and advises the CRO of the fire, his injury, and his intention to self-escape on foot via B Hdg. He commences to walk out after getting spare self-rescuers from 105ct COB, only 40 m from his present position. The ERZ Controller phones again at the 40ct COB and continues to walk outbye in B Hdg with a fresh self-rescuer.
6. The LHD driver contacts the surface while travelling outbye via the travel road (E Hdg), not realising the smoke will catch up to him quickly. At 40ct D-E COB, he informs CRO, continuing to walk out via E heading. Encounters smoke walking outbye—no further contact with the surface after the phone call.

It was anticipated that QMRS would target at least three mines rescue teams (15 – 18 team members) in addition to technical support (Fresh Air Base (FAB)) members. Ultimately six teams were deployed to the site. However, only three were deployed underground.

The primary objectives for the two mines rescue teams were.

- FAB set up – correct, control of area, comms to surface, comms to team.
- Two area search and patient carry for return to FAB – Effective and safe search pattern, patient care, stretcher care, and does Standby Team activate to assist.
- Effective inspection – does the captain/team search all headings and stubs, map barricaded areas, correct mapping of the search pattern/drawings.
- Comms to FAB.

## 13.0 Assessment of the scenario

QMRS Event Assessors		
Name	Location	Organisation
Chris Gately	QMRS Head Office Dysart	Anglo American
Jason O'Connor	FAB	Anglo American
Tony Armstrong / Ben Snow	FAB and search area	Glencore
Graham Fuller	Surface	Anglo Moranbah North
Tim Jackson	Surface	QMRS
Martin Watkinson	Surface	SIMTARS
Ben Elliott	FAB and Search area	Anglo American
Ron Wilkinson	Surface	RSHQ

Figure 4: Assessors QMRS event

### Exercise initiation

An assessor called the QMRS emergency number 1800 QMRS20 at 04:05 am. The QMRS Duty Officer answered the call. After receiving the information, the QMRS Duty Officer informed us that their expected arrival time would be within one hour.

The QMRS Duty Officer would also initiate a team member's response to the mine via the 'ALERTS' call-out system and contact mutual assistant mine sites to deploy available mines rescue team members.

The critical operational response areas for assessment included:

- QMRS Dysart head office logistics support functions.
- QMRS's response to the Aquila mine site includes equipment and team member response, team formation and deployment process and how the newly designed staging area, integrated with the QMRS substation, including enhanced operational facilities, for QMRS planning and IMT integration functioned.
- QMRS operational activities underground executing defined tasks.

Key findings for each operational response area are outlined below.

## QMRS head office activities

At 0405 hrs, a telephone call from Aquila U/G Coal Mine to QMRS was made to activate personnel to respond to a Level 1 emergency at the mine. By 0505hrs, the QMRS Operations Manager arrived at Aquila U/G Coal Mine and was briefed by the On-Scene Controller.

At 0421 hrs, the QMRS ALERTS call-out system was initiated to personal mobile phones received by designated QMRS team members advising of emergency exercise activation to Aquila U/G Coal Mine.

During the emergency exercise, these positions and roles were performed at QMRS Dysart Head Office and the mine site (Aquila).

- Duty Card No 1: Duty Officer and Assistant (Dysart)
- Duty Card No 2: Emergency Vehicle / Transport Driver (Dysart and Aquila)
- Duty Card No 3: Mines Rescue Operations Manager (at the mine site)
- Duty Card No 4: Fresh Air Base Controller (at the mine site)
- Duty Card No 5: Rescue Substation Coordinator (at the mine site)
- Duty Card No 6: Head Office / Chief Executive Officer (Dysart)
- Duty Card No 7: Assistant (Dysart)
- Duty Card No 7.1: Assistant 2 (Dysart)



Figure 5: QMRS Head office staff completing Duty Cards at QMRS Head office Dysart

## What worked well?

- QMRS staff demonstrated professional response and committed to providing mines rescue response to the Aquila Mine. All staff observed acted with controlled, calm urgency.
- Unity of command was effectively implemented by the QMRS GM at Dysart HQ and using the QMRS Duty Card system provided structure to manage the response. QMRS staff were observed following and reviewing duty cards throughout the exercise.
- Commitment from individual QMRS volunteer Mines Rescue Team members and Southern MAG (Mutual Assistance Group) Mines response and support to the exercise is to be commended. To have enough attend the mine site to form six teams and have a commitment by others to remain on standby to provide a prolonged response is a demonstration of dedication and commitment by

individuals and supporting mines within the MAG to enable an effective mines rescue response to an emergency.

- The internal QMRS MEMS event management for this exercise provided valuable updates throughout the event to maintain a common operating picture for both QMRS Operations Managers at the site and HQ teams to be informed to ensure an effective response.

Note – no tasks were raised in MEMS during this exercise by QMRS.

- Access to electronic copies of the mine plans supported remote situational awareness and a common operating picture from Dysart HO.
- A succession plan was developed early and communicated to ensure continuity of response capability for the mines rescue team members and QMRS Staff.
- The t-Card system used to oversee team member deployment worked effectively.

## Improvement Opportunities

### QMRS

- Review QMRS Response Trailers usage and the associated risk assessment, as the hazardous deterioration and constant changing road conditions observed by this assessor travelling over three days from Moranbah to Dysart and Dysart to Middlemount and return to Moranbah, with increased coal haulage and vehicle movements is a potential risk to the safety of QMRS staff pulling laden response trailers with SUVs on the roads in the current conditions. It may also extend QMRS response times and potential damage to emergency response equipment, trailers and SUVs. The risk assessment controls may need to be reviewed to ensure acceptable risk. Consider if response trailers are fit for purpose, given these road conditions. Consider if previously mapped response times are achievable. Consider if QMRS vehicles should be fitted with emergency light bars for use when responding to an actual emergency deployment (may require Mains Road and Emergency Service Minister approval)
- Proposal for Deployment and Confidentiality Deed will be part of the yearly SSE agreement sign-off process with QMRS. To remove distraction during an actual emergency.
- Add Objectives to the final QMRS MEMS Questions paperwork signed off between the Mine UMM and QMRS Operations Manager on site before QMRS deployment.
- Review QMRS Operations Manager Duty Card to capture requirements to periodically obtain and review mine environmental monitoring data and analysis results. At the same time, MRTs are deployed underground to ensure oversight is documented.
- During the T-Card review, consider the need to consider the QGN16 Guidance Note for Fatigue Risk Management to ensure that the fatigue of mines rescue team members is managed.
- Ensure mines have periodically updated Pre-Incident MEMS Questions as part of QMRS service agreement requirement and report lack/out-of-date information to SSE.
- QMRS to fully use its MEMS system to include task allocation capture and completion tracking.
- Continue to resolve Bodyguard and UG Radio Communication System certification and maintenance compliance requirements as soon as possible.
- Continue to resolve SRS1200 (Shaft Rescue System) operational and certification requirements as a matter of urgency. AngloAmerican invested heavily in this system and has the infrastructure on the surface and underground. Unfortunately, the system could not be used for the Level 1. However,

when writing this final report, QMRS has resolved the certification issues, and Aquila Mine has the infrastructure to support training for this critical system for the industry.



**Figure 6: Initial trials were held at Aquila Mine and risk management controls were in place**

## Industry

- Maintain and provide MEMS Pre-Incident Questions to QMRS, and as a part of change management, ensure that valid data is available to support the requirements for QMRS deployment.

## Exercise Planning Committee

- The 2023 Level 1 emergency exercise was run as two separate emergency response exercises. The committee recommends that the emergency exercise should return to a single exercise for the 2024 Level 1 exercise. The practical application of the two separate exercises resulted in:
  - some inability to truly test the interactions that should occur under the mine SHMS: the QMRS service and an activated mine Incident Management Team
  - duplication of the mines, assessor and planning committee time, and increased travel and accommodation costs.

## Additional Comments:

Note of appreciation to Anglo American Steelmaking Coal, Aquila Mine SLT, EEM, Wade Kathage and mine workers for successfully facilitating the Level 1 emergency exercise.

Applaud all individual QMRS volunteer Mines Rescue Team members who responded and the Southern MAG Mines who support the exercise. They are to be commended for their dedication and commitment to emergency response.



Figure 7: Mines rescue surface staging area, including sub station, readiness room, plus more

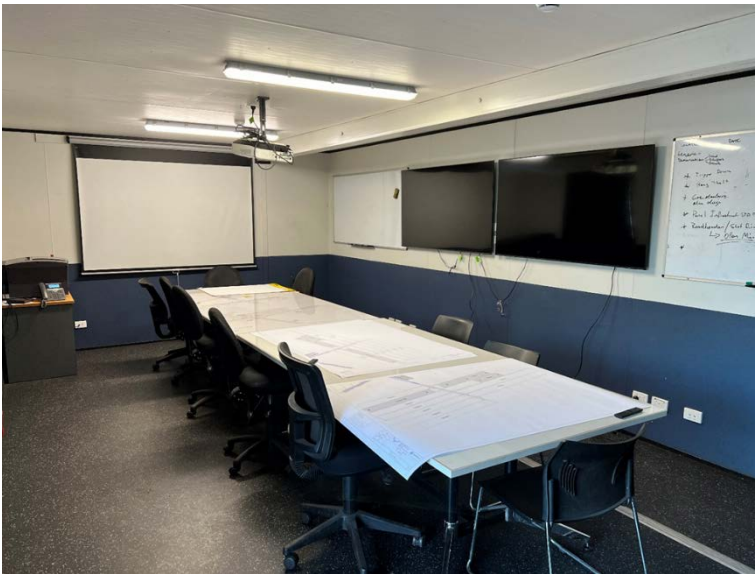


Figure 7: QMRS readiness/meeting room

*(Part of Substation – This room has access to Mine Site Systems such as monitoring, IMT teams and communications.)*

Aquila Mine Site had ensured that QMRS had access to dedicated infrastructure to maximise their ability to deploy quickly, plan and execute effectively.



Figure 8: Mines Rescue Team equipment being unloaded at Aquila Mines Rescue Substation

## QMRS Mine Site Surface activities

The principal elements reviewed by assessors during surface and deployment activities at Aquila included:

- adequacy of response by QMRS employees and volunteer team (response times and numbers)
- adequacy of team member equipment e.g. quantity, condition, and deployment efficiency
- effectiveness of team formation and deployment
- application of the QMRS emergency response system e.g. Duty Cards and the MEM software system.

A timeline of key events up to the deployment of Mines Rescue Teams underground and the establishment of the FAB is outlined below.



Time	Location	Action / Activity	Key decisions / Comments
04:00	Surface Sub-Station	Arrived on site/signed in	No QMRS response personnel on site yet.
04:30		Sub-Station Coordinator role filled. Chris Jackson (CJ) Sub-Station Resource Board established.	Chris assumed this role as the first QMRS team member on-site responding to the incident. A QMRS operations manager did not appoint him as he was there before anyone else. He continued to fill this role throughout the entire exercise.  A resource board was initially established outside the entrance to the sub-station building and all personnel involved in the incident reported to him.
04:45		Sub-Station Coordinator Duty Card being completed.	They started completing duty cards and maintaining the event log. They established a second QMRS member at the entry gate to the site (with radio comms) to direct any QMRS members/personnel involved in the incident response towards the rescue substation from the mine access road. This process worked well; both personnel were in continuous radio contact and well-informed of personnel arrivals/movements.
05:00		QMRS Operations Manager onsite. Garret Thompson (GT) was the first QMRS external offsite responder to the incident.  GT seemed calm and relaxed, even when briefed on a 'lives at risk emergency'.	GT reported to the sub-station coordinator. They checked adherence to the process (duty card compliance, resource board status and audited the number of QMRS team members on-site, where they were and what they were doing). He didn't identify/introduce himself as a QMRS Operations Manager and the sub-station coordinator was unaware he was a QMRS Operations Manager.  Suggest a form of Formal identification for QMRS Operations Managers (Shirts with Name and Title or a Fluoro/Reflective Vest with Title)
05:06		GT is being briefed by Incident Controller Ron Wilkinson (RW).  The incident timeline up to this point was provided to GT, which is the most recent status of missing	GT was checking for comms locations throughout the panel, taking photos to document the timeline/mine plan, and asking questions regarding suitable location for FAB, Ventilation and gas data, and frequency of heading demarcation.  *A copy of the current Level 1 incident assessor briefing document is left on the table, with arrows pointing to the location of missing casualties left demarcated on my plan in the planning room. Evidence was documented by GT but treated with discretion

Time	Location	Action / Activity	Key decisions / Comments
		CMWs. GT populating mine plan, asking questions regarding contact with missing CMWs, gas readings, formulating timeline.	and not used to influence team planning decisions.
05:12	Sub-station	Clive Hanrahan (CH) Brent Stewart (BS) Clint Battese (CB) QMRS Operations Managers on-site – arrived at sub-station.	CB was the only QMRS Operations Manager to introduce himself to the sub-station coordinator as an Ops Manager and ask for a formal sitrep of the resource management board. The sub-station coordinator was unaware that CH and BS were Op's managers. GT briefed all Ops Managers. Gas monitoring data are given to Operations Managers.
05:29		The sub-station coordinator is completing resource cards for drift runners/PJBs.	The resource management board was relocated inside (cold outside). T-cards are being completed and managed to an excellent standard—sub-station coordinator following duty card.
05:36		GT sit rep with sub-station coordinator.	It is good to see the ops manager checking in to see change in member numbers available on-site for planning purposes.
05:40		Luke Ludlow (LL), QMRS Operations Manager on site, reported this to the sub-station coordinator.	Five QMRS Ops Managers on site. No formal ID of the role is evident to members/site personnel. Was there a succession plan for a protracted incident .
05:43		CH cleaned out the sub-station. All assessors not directly involved in assessing sub-stations asked to relocate. All equipment bags were moved, and	It's great to see this leadership and control taken of the situation and improve the sub-station coordinator's task focus by removing distractions.

Time	Location	Action / Activity	Key decisions / Comments
		<p>the sub-station was set up to accommodate arriving QMRS team members and equipment ready for deployment.</p> <p>They have established office areas for team members to store gear bags and get changed into overalls.</p>	
05:47		LL sitrep – checking resource board status	LL requested CJ to organise team members into Aquila/Non-Aquila team member groups for planning purposes to help form rescue teams.
05:51	Sub-station meeting room	<p>CH requested the Ops Manager brief. They cleared out the meeting room. They discussed the requirement for a search plan. – I delegated this to two operations managers, LL and GT. The requirement for Authority to Enter and Captains Task sheet documents was also delegated to BS, which populated the MEMS information.</p>	CH took a leadership role within the group of ops managers.
05:55	Sub-station car park	QMRS Trailer arrived with BG4s and Minimum Equipment.	*Gas monitors were left on the trailer and were not checked by teams with minimum equipment. Additional and more frequent training required getting equipment off trailers + setting up.

Time	Location	Action / Activity	Key decisions / Comments
		The sub-station coordinator instructed team members to begin unloading and testing equipment.	
06:05	Sub-station meeting room	BS confirmed with Martin Watkinson (MW) that there is an ignition source. BS was populating MEMS.  GT + LL was formulating search plans for two teams.	They prioritised CMW based on available information. Inexperienced CMW, not wearing an SCSR, disorientation/head injury. This was a sound process. GT and LL complemented each other and worked well together.
06:16		BS/LL/GT are all collaborating well together. They discussed options for two teams: a standby team with a suitable FAB controller GT & LL briefing CB on search areas. They addressed the requirement for Captains Task Sheets and Authority To Enter. BS was completing the re-entry questions for MEMS. A gas data time delay of two hours was communicated to BS.  Captain selection and	QMRS Operations Managers did not discuss team size despite a planned search in an area with gases indicating a low visibility atmosphere. Teams of five were gathered and deployed.

Time	Location	Action / Activity	Key decisions / Comments
		appointment were discussed. LL appointed team captains. Team 1: Peter Liston, Team 2: Neil Dagan. The FAB Controller was appointed by CH Darren Prince (DP). CH was very decisive and direct.	
06:23		GT briefed the team captains on the situation and their planned tasks.	
06:26		BS was populating and generating Captains Task sheets and an Authority to Enter.	
06:30		GT briefed the FAB Controller and FAB assistant.	
06:44	Igloo/go line	Team members tested the MCOM radio system (FAB Controller)	Team members and the FAB controller were unaware that the MCOM radio system was UPEE and to follow the associated protocols.
06:44		BG4s were being set up for captain's checks along with minimum equipment.	
06:52		Team 1 Captain checks completed.	
06:55	Sub-station	BS finalised the Captain Task sheets +	No questions raised by anyone regarding the time delay for gas data (two hours from the

Time	Location	Action / Activity	Key decisions / Comments
	meeting room	Authority to Enter. Reviewed by BS, LL, GT and then signed by BS and RW (the incident controller)	fire to receiving monitoring data on the surface)  Team numbers are ordered in priority, + task sheets are developed/allocated accordingly. BS/LL/GT Ops Managers
07:05	Igloo/Go Line	Team 1 is finalising the surface captain's checks.	
07:10		Team 2 captains surface checks.	
07:18		FAB loaded into drift runner to head underground.	
07:20		GT briefed all team members together on the incident.	Team 1 captain clarifying priority. Is anyone fighting the fire? Is this a priority?
07:35		Team 1 is loading into the drift runner and is ready to deploy.	*Multiple delays with UPEE for BG4's. Completing new forms and entering equipment details into the kiosk. These delays added >100 minutes to the rescue team's deployment times.
07:50		Team 3 captains surface checks.	
08:10	Sub-station meeting room	BS sit rep. FAB established and set up. 20.9% oxygen, 16/18-degree Celsius WB/DB temperature. Fresh air.	
08:25	Sub-station	Resource board current status: four rescue teams allocated and	CJ is thoroughly in control of the resource board. T cards were completed to an excellent standard.

Time	Location	Action / Activity	Key decisions / Comments
		formed. Sufficient QMRS personnel on-site to form four five-person rescue teams, man the sub-station and FAB.	
08:40	Igloo/Go Line	Team 1 and Team 2 deployed from the surface.	After an extended delay due to UPEE
08:55		MEMS software briefing with BS	BS had a thorough understanding of the incident and how to populate MEMS.
09:00		Team 3 departed the surface.	

**Table 1: Timeline of key events**

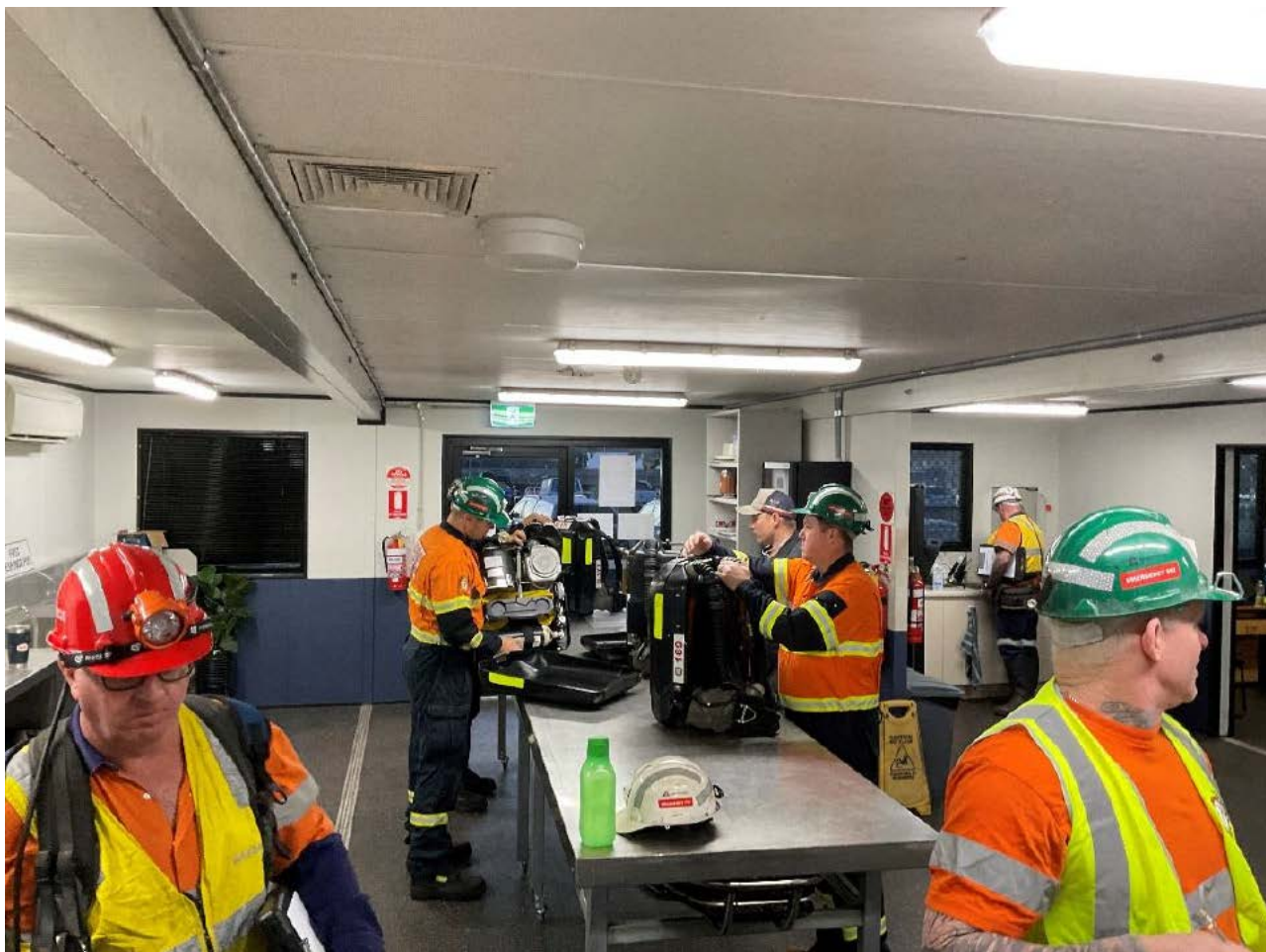


Figure 9: Testing of Draeger BG4 Breathing Apparatus before deployment.

## 13.1 What worked well (QMRS at Mine Site)

The number of QMRS members from all over the Mutual Assistance Group who attended the incident was excellent. Coal mine operators have also supported the event by releasing their people to attend.

The sub-station coordinator and sub-station coordinator management process (duty card and resource management board) worked well. The sub-station coordinator who adopted and maintained the role for the exercise had never done this before. He followed the steps on the duty card and used his rescue experience to perform the role competently and efficiently, which should be commended.

The QMRS Operations Managers worked well together as a team. Their different skill sets, experience and personalities meshed well to provide an effective outcome at the end of the exercise.

## 13.2 Areas for improvement (QMRS at Mine Site)

Additional training in removing equipment from response trailers and testing before operational use e.g. MCOM radios, gas monitors, minimum equipment, BG4s, etc.



## Matters relating to the certification and serviceability of some items of Mines Rescue equipment

Leading up to the Level 1 exercise at Aquila, some issues were identified with QMRS equipment that required rectification. Broadly, QMRS take their equipment containing electrical components underground, into a NERZ Zone. This means their equipment goes through the Introduction to Site Process at Aquila and includes breathing apparatus, radios and gas detectors.

The process requires QMRS to present the actual plant items for inspection including providing the current 'Manufacturers Declarations of Conformity' for the plant items. Some equipment from QMRS was lacking the current required 'in-date Certification' and 'Declaration of Conformity'.

### 1. Correct certification of BG4 suits, radios and gas detectors

- Correct certification of the BG4 suits: QMRS presented the out-of-date Certificate of Conformity and no overhaul history for the previous years. Incorrect batteries are used in the Bodyguard mechanism in suits. It was concerning an uncertified battery was being used.
- Serviceability of the Mcomm radios: The Ingress Protection (IP) rating of the first batch of radios presented was identified as needing attention. Alternate radios were sourced but still had to go onto the UPEE register - out-of-date Certificate of Conformity and no overhaul history for the previous years. Approval was given to use in NERZ only and under UPEE conditions.
- Correct certification of the XAM8000s gas detectors: no issues noted.

QMRS has addressed these matters.

### 2. Serviceability/reliability of the Shaft Recovery System (SRS) Truck

- In the weeks leading to the Level 1 exercise in September 2023, it became clear there were serviceability issues with the SRS truck Shaft Recovery System platform pneumatics/hydraulics and the interface between these systems and the control systems. The diagnosis and rectification of the issues were problematic. The truck has been sent back to the supplier for rectification under warranty. Ultimately, the QMRS-focused Level 1 exercise conducted in September 2023 was amended to remove the use of the SRS truck from the scenario.



Figure 10: Two views of the IGLOO marshalling area

## 13.3 Recommendations

### Aquila Mine

**Consider:** The marshalling area for teams heading underground (Igloo) should have a defined pathway from the Rescue Substation to stop brigade personnel walking through the substation readiness meeting/planning room.

**Consider** purchasing additional wheeled stretchers for rescue operations. Carrying a casualty in the low seam height for extended distances can injure rescue team members.

**Consider:** The sub-station readiness meeting/planning room had a conference call speaker phone system to enable calls from FAB to be broadcast to everyone in the room. This system could have been used. In addition, consider multiple whiteboards with the ability to hang plans under plastic to be installed around the room (two large whiteboards, plus additional room for plans on two other walls, yet no attempt to use them?).

**Consider:** Activation of the large monitors/televisions for a live MEMS feed of IMT and other critical information from the mine (Safegas/Citect etc.). WiFi is available, access via Teams was available, access to EMQnet or if QMRS wanted to access MEMs, access to all the mine electronic systems was available due to the availability of laptops, specifically for Emergency Response, availability of additional office space, also available for QMRS use. Site Emergency Response personnel and equipment are also centrally located in this area. Secure access to the rest of the IMT rooms, both physically and electronically.

### QMRS

**Consider:** A formalised system/structure (Hierarchy) for QMRS Operations Managers is established when they attend an incident. Multiple QMRS Operations Managers were briefing team captains, sub-station coordinators, and FAB controllers. This led to confusion amongst some Team Captains and Team Members and allowed the potential for information handover to be missed.

**Consider:** QMRS Operations Managers should be identifiable by a high visibility shirt/vest that states their name and role.

**Consider:** When QMRS conducts day release training at mine sites, bring their training equipment to the site on a response trailer. This allows the member's training run to include locating equipment on the trailer, unloading it into the sub-station and testing it before deployment. This more closely replicates the scenario of an actual response by QMRS to a mine site and how members would have to collect and test their equipment.

**Consider:** Only one wheeled stretcher was brought to the mine site on the response trailers. Have every response trailer kitted out with a wheeled stretcher for each team.

**Consider:** Train in low visibility environments using link lines to link team members together to familiarise themselves with this process.

**Consider:** Review Duty Card #3 - Operations Manager and Duty Card #5 – Substation Coordinator and add a check/step to the cards to consider the number of team members in teams for the planned tasks.

**Consider:** Review Appendix 1 in the QMRS guidelines (Assessment of explosibility: QMRS Guidelines requirement) to include a prompt under section 6. The data currency is used to account for the time it takes for a gas sample to travel from the known location of a fire to a monitoring point, which is added to the sample lag time.

**Consider:** Remind team members at day release training to wear appropriate PPE (Overalls or long sleeves/trousers) when preparing to deploy to protect themselves from the potential injury from fire.



Figure 11: Level 1 QMRS focused exercise Assessors deploying underground



Figure 12: FAB briefing of rescue team



Figure 13: Captain checks being conducted



Figure 14: Team advancing in South East Mains

## Industry

Facilitate rescue training at mine sites in bord and pillar panels, especially for searching operations. Where possible, reduce the visibility in the environment (using stone dusters), to familiarise team members with these searching conditions.

## Exercise team

Maintain information security/discretion. A copy of the current Level 1 incident assessor briefing document was left on the main table in the sub-station meeting room with arrows pointing to missing CMW left demarcated on a mine plan. This evidence was documented by a QMRS Operations manager, yet to their credit, it was treated with discretion and not used to influence team planning decisions.

Acquire gas data for a coal fire. This requires the products of combustion released concerning the physical size of the fire (e.g. how much CO and CO<sub>2</sub> is released from a fire of 5m<sup>2</sup> vs a fire of 10m<sup>2</sup> etc.) and the escalation of products of combustion/distillation of gases in the fire ladder over time and concentrations of gases produced (e.g. when CH<sub>4</sub> is produced by the burning coal, at what stage does the CH<sub>4</sub> become a hazard because the fire is generating its own potentially explosive atmosphere, which impacts re-entry decision making and affects the re-entry matrix TARP level.

## Additional comments

The compliance issues relating to the BG4 bodyguard and MCOM radio certification have been documented. These issues were identified while the equipment was put through the Aquila Introduction to Site Process. The Introduction to Site Process aims to identify equipment not in compliance. The system worked and the issues with the equipment were resolved.

Queensland Mines Rescue Service		Action	Ready	Issued
Captains Task Sheet		1	Trainer	
		2	Captain	
		3	File	

Colliery: Aquila	Date: 13/09/2023	Time:	Task Sheet # 1
Team Captain: Peter Liston	QMRS Senior Official: Brent Stewart		
Incident Controller: Ron Wilkinson	IMT Briefing Official: Ron Wilkinson		
<b>Current Situation:</b> Vehicle interaction occurred at 103CT South East Mains causing a fire. 2 CMW's exiting from the area at different locations. 1 CMW injured with potential broken arm (ERZC) and exiting via A Hdg. 2 <sup>nd</sup> CMW inexperienced (13 months) and walking out E Hdg and may not be using SCSR properly. Communication was last made with both CMW's at 40 CT at approximately 0500.			
<b>Mission (Objective):</b> Find 2 missing CMW's in South East Mains			
<b>Execution (Strategies &amp; Tasks):</b> Search E, F, G & H hdg for missing CMW			
Missing Persons? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, list missing persons			
Name	Lamp/SCSR#	Last Known Location	
Harvey Harold	15	40CT E Hdg	
Sunny Hammond	50	40 CT E Hdg, but travelling in A Hdg	

QPS-1283, Captains Task Sheet - Version 10, August 2023 Page 1 of 2

Queensland Mines Rescue Service		Captains Task Sheet	
Colliery: Aquila		Date: 13/09/2023	Task Sheet # 2
Team Captain: Neil Dagan		QMRS Senior Official: Brent Stewart	
Incident Controller: Ron Wilkinson		IMT Briefing Official: Ron Wilkinson	
<b>Current Situation:</b> Vehicle interaction occurred at 103CT South East Mains causing a fire. 2 CMW's exiting from the area at different locations. 1 CMW injured with potential broken arm (ERZC) and exiting via A Hdg. 2 <sup>nd</sup> CMW inexperienced (13 months) and walking out E Hdg and may not be using SCSR properly. Communication was last made with both CMW's at 40 CT at approximately 0500.			
<b>Mission (Objective):</b> Find 2 missing CMW's in South East Mains			
<b>Execution (Strategies &amp; Tasks):</b> Search A, B and C hdgs from 1 CT the 40 CT for missing CMW. (ERZC). Starting in A Hdg  3375 IMT			
Missing Persons? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If Yes, list missing persons			
Name	Lamp/SCSR#	Last Known Location	
Harvey Harold	15	40CT E Hdg	
Sunny Hammond	50	40 CT E Hdg, but travelling in A Hdg	
OPS-1283, Captains Task Sheet - Version 10, August 2023 <span style="float: right;">Page 1 of 2</span>			

Figure 15: Samples of the Captain's Task Sheets issued to each Captain

## What worked well (observations by assessors of the rescue teams)

- The direction was good by the team captain and vice-captain and communications were good and improved as they went e.g. by calling out cut-thru numbers.
- Good search pattern for C and B Headings; however, when the team came across A hdg flooded, they didn't do the leapfrog pattern as the captain wanted. They should have stopped and reconfirmed before setting off.
- The team recognised a spare wheeled stretcher at the Fresh Air Base (FAB). They decided to swap it with their carry-type stretcher.
- The urgency exhibited by the teams was excellent. The teams were fast paced during the search; however, there may have been an imagined belief that such a pace could be achieved. In reality, this pace could not be maintained.
- The Vice Captain took over the search to allow the captain to focus on map marking and team safety.
- Good communication by the captain with the team and informing them of what's going on and actions; however, when you are a new team that doesn't know each other, you must confirm what you told them.

- Fresh air base operators were conversant with mines rescue guidelines about FAB setup and equipment.
- It appears the training for team members is first class. The teams were efficient and highly knowledgeable about their duties and the mines rescue guidelines.
- The attendance of team members to fill five teams was excellent.
- The FAB controller utilised Team 3 to conduct ventilation velocity readings at FAB, allowing them more time to focus on the other FAB duties.
- Enough transport vehicles are available to transport teams.
- No suit failures were noted at FAB – preoperational checks were completed correctly.
- Teams are aware of the requirement for the location of a standby team in lives at-risk situations.
- Site security was handled well, the ability to control incoming traffic to normal Aquila Mine operations while ensuring security was maintained, measures to ensure people did not think an actual event was occurring went well and controlling who was QMRS personnel and directing them through a separate security checkpoint, went seamlessly and professionally and stayed within Aquila Mines, SHMS and Emergency Response Management Plan.

## Areas for improvement

- Size of the mine plan for the captains to use. The search area was on an A3 plan, which included a larger plan for the mine area, so marking the plan while on the move is hard when it's smaller. Consider larger scale plans for deployment of teams.
- Briefing and debriefing for team members on their arrival at site and on their return to the surface prior to departure from the mine could have been better managed. Review the documentation on how this can be improved.

There was no group debrief for all people who attended on the scenario, issues faced and a couple of key learnings. People were waiting around and asking what had happened and what we were doing now. It did not help when many of the team members were not aware of why UPEE protocols had to be used, which gave the impression that the organisation was poor when the reaction time and being ready to deploy was rapid. Still, the UPEE protocols, which included serial number checks, getting items put on the register, etc., were time-consuming and to some frustrating, but required due to the previously mentioned certification issues—resulting in some efficiencies gained by having a dedicated staging point that considered security, logistics, and QMRS's needs.

# 14.0 Mine-focused event

The mine-focused emergency exercise was conducted on Tuesday, 7 November 2023, commencing at 11:30 am.

## Mine operational status

Tuesday, 7 November 2023, was a scheduled production shift. The Thursday to Wednesday 'A' Crew and the day shift bull gang 'F' Crew were in the second last shift for their tour. Tuesday was also a rostered training day. Approximately 30 personnel were on the surface for scheduled training.

Underground activities when the exercise commenced:

- LW902 were producing
- LW801 take off face crew were on the face
- MG802 were producing
- MG904 were conducting bull gang tasks outbye
- Northeast Mains, stonework/roadheader crew were operating
- A project crew was installing conveyor structure and various outbye CMWs were conducting multiple tasks.

No crew members were excluded from the Level 1 exercise with the exception of an ERZ Controller from LW902 in order to maintain statutory compliance during the exercise.

Change-over Bays (COBs) are provided underground at 1300m intervals. In an emergency requiring CMWs to use their belt worn SCSR, a second SCSR is collected from the crib room caches in the working areas. The crew members then drive or walk to the COB closest to their work area. A differential pressure inside the COB, created by the difference in velocity pressure between the roadway ventilation and the air in the COB, provides a safe environment for the change over from SCSR to CABA. A regulated air-curtain at the entrance to the COB reduce the risk of contamination from polluted air outside the COB. These air showers are manually adjustable to ensure minimum usage of compressed air, including preventing any discharge when not used in an emergency or to reduce noise for communication purposes. A further planned enhancement is the use of a central diffuser to eradicate the noise issue.

The layout of the COB, particularly the COBs designed primarily for topping up CABA units, to have an ordered process flow of CMWs with an entry point and a separate exit point to promote the orderly and efficient flow of CMWs through the COB as they top up their CABA units. Each COB has a quick fill station to ensure CABA cylinders are filled before moving to the next COB. This design of the escape process provides an atmosphere with a much lower risk of toxic contamination, thus reducing the risk of CMWs being overcome from a highly toxic atmosphere during the changeover process from self-rescuer to CABA, which was found as an issue in previous Level 1 exercises.

Introducing wheeled stretchers started with the deployment of Emergency/Inseam Response pods placed at crib rooms to address CMWs without transportation. It can increase their ability to take an injured team member with them instead of leaving them behind next to a refill station while not creating a situation where the team runs out of breathable air with their breathing apparatus. Aquila conducted several trials to test the range and capabilities of such controls, such as having a spare self-rescuer with them and having the ability to use a wheeled stretcher if necessary to take an injured coal mine worker with them. The wheeled stretchers were first introduced at the face areas to extend and stand them throughout the mine. The Emergency/Inseam Response pods concept was introduced to include the equipment required to handle the first response.

Further enhancements planned include equipping these strategically placed pods for in-seam response and providing I.S. radios and command and control CABA units to enable CMW leadership to give direction to the rest of the CMWs for self-escape to the primary COBs. At each primary COB, glow sticks are stored, and once the CMW has changed over to a CABA, they clip one of these on the front of their



harness to increase their visibility. They worked well when they were first trailed and the plan is to attach a glow stick to the CABA harnesses as a default.

Aquila Mine also recognised the need to manage an enormous volume of information and deployed various technology methods such as integrated team's software, to create a controlled communication and information exchange connection between IMT team rooms. This aims to reduce the time the coordinators are away from their teams and increase the information flow between teams. Aquila has introduced EMQNet as the dedicated emergency response information system that can upload various tools such as MRAS. Another non-industry standard is introducing a 'Critical Information Coordinator' duty card and additional specialised debriefing rooms to test as proof of concept.

## 14.1 Scenario

### Initiation

The scenario comprised these events that initiated triggers for response within the mine SHMS.

- At 11:30 am, an LHD caught fire at Aquila Mains G Hdg 27ct to 28ct, adjacent to the non-seam connected ventilation shaft. The Load Haul Dump (LHD) operator has phoned the Control Room Operator (CRO). His attempts at extinguishing the fire with the suppression system and then a handheld extinguisher was unsuccessful. The LHD Operator has suffered burns to his face and hands and is having some difficulty breathing. He informs the CRO he will start walking out by and is now assumed to be missing. The LHD diesel fuel continues to burn, and thick smoke works its way inbye.
- Longwall 902 production face: the Longwall ERZ Controller inspects the tailgate and cannot be contacted. It has been an hour since he was last seen. Smoke is entering the panel. Leaving the production longwall crew without statutory leadership, they must make withdrawal and emergency response decisions.
- LW801 take-off face: When smoke enters the panel, all CMWs don self-rescuer, retreat, change to CABA, and evacuate in transport.
- Development Panel MG904: When smoke enters the panel, all CMW don self-rescuer, retreat, and change over to CABA (command and control CABA is kept in these pods to allow leadership within the crew to guide the rest of the crew to the changeover base, this unit has new type air shower design, that does not draw in atmosphere contaminants and provides protection from the contamination such as smoke and carbon monoxide, while the rest of the teams CMWs changes from self-rescuer to CABA at the new Emergency and Inseam response pod and evacuate in transport.
- Development Panel 802: When smoke enters the panel, an operator races for the crib room, trips and falls and badly sprains their ankle—stretcher case.
- Development Panel NE Mains Stoneworks: When smoke enters the panel, an operator suffers a medical episode and cannot walk, which is believed to be a heart condition and becomes a stretcher case. All CMW don self-rescuer, retreat, change over to CABA, and evacuate in transport.
- It is expected an orderly withdrawal will commence as per GAS MANAGEMENT TARP s149 (b).

## 14.2 Assessment of the scenario

See the two tables for underground and surface assessors.

Name	Location (Underground)	Organisation
Wade Kathage	COB Diversion NE Mains 26 ct	Anglo Aquila
Scott Fraser	COB Diversion NE Mains 26ct	Anglo Moranbah North
Mark Sanim	North East Mains	BMA Broadmeadow
Brendan Iddles	MG904	Kestrel Coal Resources
Nathan Kidman	MG904	Kestrel Coal Resources
Tony Caffery	MG802	Kestrel Coal Resources
Simon Georgieff	MG802	Sungela Ensham
Andrew Freeman	Longwall 902	Mastermyne
Shannon Doherty	Longwall 902	Fitzroy Mining Carborough Downs
Tanya Miller	Longwall 801 take off face	Anglo Aquila
John Toms	Longwall 801 take off face	Sungela Ensham
Richard Todd	Outbye COB Aquila Mains 23ct	Glencore Oaky North
Justin Hochart	Outbye COB Aquila Mains 23ct	Glencore Oaky North

**Table 2: List of U/G assessors for mine-focused exercise**

Name	Location (Surface)	Organisation
Shaun Dando	IMT	Anglo Grosvenor
Jason Fairweather	IMT	Glencore Oaky North
Mark Lydon	IMT	RSHQ
Nikki LaBranche	IMT / Tag Board / Debriefing Room	University of Queensland
Andrew Adamson	Control Room	BHP Broadmeadow
Graham Fuller	Control Room	Anglo Moranbah North
Joshua Whatman	IMT Planning	BMA Broadmeadow
Stephen Woods	IMT Planning	ISHR
Jason OConnor	IMT Operations	Anglo Moranbah North Mine
Ben Snow	IMT Operations	BMA Broadmeadow
Chris Gately	IMT Logistics	Anglo
Ron Wilkinson	Exercise Coordinator	RSHQ

Name	Location (Surface)	Organisation
Martin Watkinson	Exercise Coordinator / Ventsim	SIMTARS
Michael Smythe	Ventsim / Technical Support	SIMTARS

**Table 3: List of surface assessors for mine-focused exercise**

## 14.3 Underground assessments

Incident site: Aquila Mains G Hdg 27-28ct Load Haul Dump loader (LHD) fire.

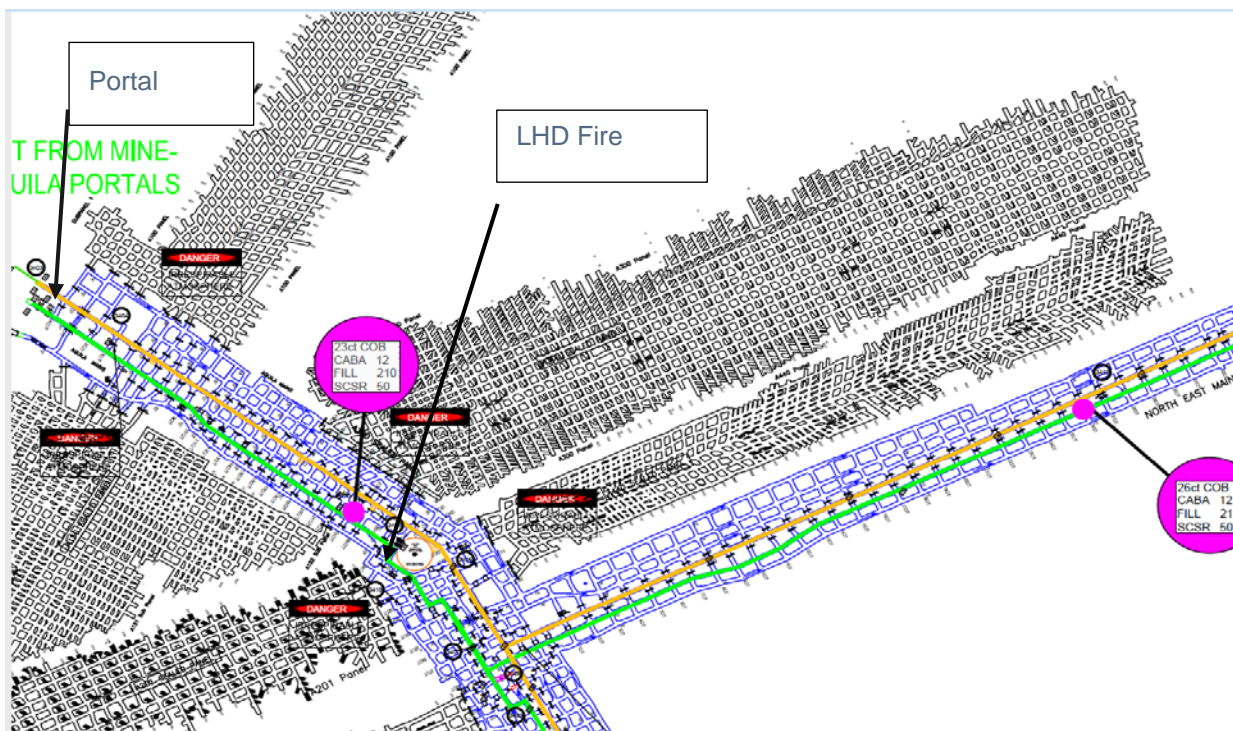
Assessors: The underground assessors were positioned at the active work areas before the Level 1 exercise activation, as in the list above, in locations 1 to 7.

Area and scenario description.

The simulated fire location was chosen to ensure it affected all the underground mine locations at the time being worked. The areas being worked on included LW902, LW801 take-off face, MG802 Development Panel, MG904 Development Panel and North East Mains Stoneworks Development Panel, Conveyor Installation Team, Outbye works and maintenance.

- The LW902 crew consisted of 18 x CMWs and 1 x ERZC
- The LW801 take off face crew consisted of 24 CMWs and 1 ERZC
- MG802 Development crew consisted of 11 x CMWs and 2 x ERZC
- MG904 Development crew consisted of 6 x CMWs and 1 x ERZC
- North East Mains stonework crew consisted of 8 x CMWs
- North East Mains – Conveyor build project team – 4 x CMWs
- Outbye works – 12 x CMWs 3 x ERZCs
- COB at 26ct North East mains
- COB at 23ct Aquila Mains

The figure below illustrates the location of the LHD fire, the nearest COBs and the mine entry.



**Figure 16: Aquila Mains and North East Mains**

All personnel inbye the simulated fire site (Aquila Mains G Heading 27-28ct) experienced the primary impacts of the LHD fire. Ventsim modelling indicated that the carbon monoxide (CO) reading theoretically rises to a range between 1000ppm and 2500ppm depending on the location and air quantity being drawn across the fire site and fresh air drawn from other intake airways. The legislated long-term exposure limit for CO is stated to be 30 ppm as per Schedule 6 of the Coal Mining Safety and Health Regulation 2017. Anything above that requires a withdrawal.

The simulated conditions the assessors presented to CMWs and their possible actions are outlined below in the Assessors Exercise Scenario Guideline. See the table below.

Time	Condition	Action
1130hrs	<p>LHD diesel fuel fire at Mains G Hdg 27-28ct dogleg</p> <p>At approximately 11:35hrs, contaminants are recorded at outbye RT monitoring.</p> <p>The contamination spread throughout North East Mains and into LW 801 takeoff face, LW902 and development panels.</p> <p>Communication has been established with the LHD operator at the Aquila Mains COB 23ct phone at 11:45 am. LHD Operator has reported an uncontrolled fire on the LHD at Mains G Hdg 27-28ct. He has started self-escape on foot. He reports to be suffering burns to his face and hands.</p> <p>In this scenario, the ERZ Controller in LW902 will be inspecting the tailgate and has not returned from the tailgate</p>	<p>There is expected to be an orderly withdrawal per GAS MANAGEMENT TARP s149 (b). Over 30 ppm withdraw to a place of safety.</p> <p>Assessors will liaise with the ERZ Controllers and ensure face areas are secure and withdrawal is carried out as per the mines SHMS.</p> <p>LW801 (take off face), LW902 (production face), Development panels 802, 904 and NE Mains Stoneworks plus other unspecified outbye work areas will self-escape, assuming smoke is visible in the atmosphere as per Emergency Response Provisions.</p> <p>The LW902 crew must act independently of the District ERZ Controller.</p>

Time	Condition	Action
	<p>inspection. The longwall crew must make their own decisions.</p> <p>This ERZ Controller will remain underground to maintain statutory compliance.</p> <p>Estimate IMT has formed at 1200hrs</p>	<p>Elsewhere:</p> <p>A CMW in NEM Stoneworks Panel 903 has a heart condition and is a stretcher case, and no ERZC are with them at the time of the event.</p> <p>A CMW in Development Panel 802 has a severe ankle sprain and is a stretcher case.</p> <p>Observe the ERZ Controller or CMWs call the CRO to report or ask if there is an issue. Information will be provided per the CRO observations from the assessors in the Control Room.</p>
	<p>CMWs will commence self-escape to the surface in transports wearing either CABA suits or training self-rescuers.</p> <p>When driving out of the mine, the CMWs will encounter two assessors at 26ct North East Mains. The assessors will explain there is heavy smoke at 26ct North East Mains, and everyone self-escaping must park up and walk out the second egress (belt heading) to the surface.</p> <p>The Assessors will advise personnel self-escaping not to refill their CABA suits until they arrive at North East Mains 26 ct COB and again at 23 ct Aquila Mains. Spare refills have been set up at these locations.</p>	<p>A parking area at North East Mains around 27ct has been set up to facilitate easy parking and keep the transport road open for any emergency response.</p> <p>The mine would then be deprived of 90% of its underground man transporters for the exercise. It creates an issue for the IMT in transporting CMWs from the portal to the main surface facilities.</p> <p>The incident controller will brief the QMRS OPS Manager, including sitrep and incident action plan/objectives developed by IMT.</p> <p>CMWs disembark transports at 27ct NE Mains. Recharge CABA suits at COB at 26ct NE Mains and continue self-escaping on foot via the conveyor heading to the surface.</p> <p>Assessors should observe the following matters:</p> <p>Do crews self-escape at the pace of the slowest person?</p> <p>Is there good communication between the team leader and the crew to check their condition and compressed air levels in CABA suits?</p> <p>Is the condition of stretcher cases checked?</p> <p>Has the crew's ability to continue carrying the heart condition patient as a stretcher case been considered?</p> <p>For this . Casualties are to stand and walk over any belt bridges.</p> <p>Observe and note if the self-escaping CMWs investigate the location of the fire once it is on the fresh air side and attempt to go back in and extinguish the fire.</p> <p>Observe if the self-escaping CMWs, carrying a Personal Gas Detector (PGD), remove CABA sets face masks when arriving at fresh air. Crews will be advised that the COB at Aquila Mains 23ct is fresh air.</p>

Time	Condition	Action
	CMW reach the surface and are accounted for on the TAG board	<p>CMWs should receive a debrief (assessors to attend)</p> <p>If CMWs respond to issues identified underground, such as fighting fires, assessors should monitor and record activities in notes.</p> <p>Please note: if personnel go back in to fight the fire at the Aquila Mains 27ct dogleg, it will be sufficient for hoses to run out. For this exercise it was suggested by the organising committee to not allow crews to activate hydrants, fire hoses, or high or low-expansion foam.</p>

**Table 4: Assessors exercise guideline**

Activities and decision-making being reviewed by assessors included:

- response to environmental change from the diesel fire event and the effectiveness of donning SCSRs and changeover to CABA
- recognition of the fire hazard and consideration of potential fuel sources, including gas drainage pipes, coal ribs, and other combustibles
- method of self-escape. i.e. by vehicle or on foot, individually or as a group
- first aid response and assisted escape tactics for incapacitated coal mine workers: suspected heart condition in stonework crew and sprained ankle in MG 802
- CMWs decision-making when no ERZC was with the stoneworks crew and the CMW with the heart condition
- CMWs decision-making when the ERZC is unaccounted for in Longwall 902
- CMW actions in the absence of ERZCs i.e. do any CMW step up to leadership role and monitor the atmosphere in the absence of ERZCs?
- effectiveness of communication and information transfer from underground with the CRO while self-escaping.

## 14.4 Scenario response in each area of the mine

Two hours before the exercise commenced, the Level 1 exercise assessors were positioned in the mine districts: LW801, LW902, MG802, MG904 and North East Mains Stoneworks Development Panel. There were two assessors sent to each district. The assessors were in position by 10:30 am and the exercise was due to commence at 11:30 am. The assessors were introduced to each districts' ERZ Controllers and crews and informed them that the Level 1 exercise was scheduled for that shift. Care was taken to ensure the districts were prepared to be left in a safe condition.

At approximately 11:45 am, the assessors in each district provided the ERZ Controller and crew with a placard or handout for the simulated atmospheric conditions experienced in that district.

### LW801 take-off face

At the commencement of the exercise, the LW801 crew were conducting maintenance tasks on the take-off face. Eighteen personnel were in the district. All the personnel donned a self-rescuer and made their

way on foot to three personnel transports parked at NEM 70 ct E Hdg. Two of the personnel in the crew were mines rescue trained, which proved to be an advantage for the rest of the crew. The rescue-trained crew members assisted others in the crew in donning their self-rescuers. The ERZ Controller also checked all personnel had donned their self-rescuers before departing the crib room.

Some personnel tended to walk ahead of the rest of the crew. The ERZ Controller took control and advised his crew to stay together and walk at a steady pace to the personnel transports. From 70 ct NEMs, the personnel, including the ERZ Controller, drove to NEM 56ct COB and changed over to CABA suits.

During the SCSR to CABA change, the assessor made these observations at the 56ct CABA changeover COB.

Time	Location	Action/activity / Key Decision/comments
11:56	I got to COB at 56c/t NEM; AMT871 was in the roadway	<p>All CMW left vehicles and entered NEM's 56 ct COB. Stoneworks Crew was in there with the injured person. An ERZC advised the crew they were in fresh air, take off self-rescuer and don CABA. It was congested, I couldn't hear instructions, and there was no room for anyone to work with the casualty on a stretcher.</p> <p>Mine rescue personnel and our crew assisted and helped with the casualty. Personnel were gathering around and a little confused about the next steps. The 801 crew vehicle driver in AMT904 was getting impatient and was beeping the horn.</p> <p>Casualty CMW carried to AMT871, where 801 mine rescuer crew assisted in loading the patient into Driftrunner. Stretcher brackets were taken from AMT904. I'm unsure if it was because there was none in CM871 or because CMW didn't know their location.</p>



Figure 17: CMWs self-escaping in personnel transport

## LW902 production face

At the commencement of the exercise, the LW902 production crew produced on the longwall face. The shearer was cutting the tailgate to the main gate at 70 shields. For the exercise scenario, the longwall 902 ERZC was set aside and not included in the emergency response. The ERZ Controller stayed underground

to maintain statutory compliance with the districts. This scenario left the LW902 crew to make their own decisions about self-escape in the absence of the ERZ Controller.

A trained mines rescue brigadesman in the crew was an advantage to the rest of the crew. The crew members assembled at the crib room and donned self-rescuers, assisted by the Mines Rescue crew member. One assessor described the initial donning of self-rescuers as very ‘busy’ and scattered; however, the rescue-trained member of the crew calmed the team down and established a clear direction for how they would proceed.

The crew then drove two pillars outbye to the nearest COB at 21ct and changed over from self-rescuers to CABA suits. The crew stopped at 12ct COB (recharge) and 2ct COB (recharge), panel tag board and NEM 26ct COB (recharge).

One assessor made the following observation at the LW902 21 ct COB.

Time	Location	Action/Activity	Key decisions/comments
12:04	LW 902 21ct. 2 pillars Outbye. CABA Station.	The crew arrived at CABA Station and transitioned from the SCSRs to CABA.	<p>The crew activated compressed Air ‘showers’ once inside the COB.</p> <p>1 CMW found that his CABA was empty and was instructed to place that suit to the side and get another suit from the pod. The CMW then said this suit was also empty, but upon investigation, we found that the suit had not been turned on. We checked the first suit, and it was empty.</p> <p>Although it was hard to simulate for the exercise, while in the COB, I spoke with the CMW briefly about the suit failure and observed that the CMW did not have his SCSR in his mouth while this happened. Again, the Mine Rescue team member of the crew stepped in and remedied the issue.</p> <p>Communication was also made with the CRO once the CABA was worn—very good communication standard.</p>

A CABA suit being empty at MG902 21ct COB is of concern and was further investigated by Aquila Management and was the subject of an incident investigation and report.

Stoneworks and some Projects Crew redeployed to North East Mains B-A 82 c/t:

At the commencement of the exercise, an eight-person crew were constructing a concrete base for longwall 903 drive head and loop-take-up at North East Mains Development B-A Heading 82ct. There was no ERZ Controller with the group when the exercise was initiated. However, a supervisor took control. The group’s objective was to evacuate to the surface wearing breathing apparatus. This group had an added challenge: one of their group was designated in the scenario to suffer a medical episode believed to be a heart attack. This person became a stretcher case to be managed by that crew.

At the start of the exercise, the crew was given a placard by an assessor indicating that visible smoke was entering the workplace. The crew elected to don their self-rescuers (training units) immediately. The crew supervisor took the lead and decided that the crew should drive out. The crew drove in B Hdg from 82ct to 59ct underpass and then via D hdg to 57ct COB.



At NEM 57ct COB the crew member assigned the role of simulating a medical episode (heart condition) commenced his role and promptly collapsed. The remaining 7 fit personnel managed his medical condition, fitted him with a CABA suit, loaded him onto a stretcher and put him into the personnel transport. All crew members donned CABA at 57ct COB. The crew continued outbye in their transport to NEM 26ct COB.

At NEM 26ct COB, the crew were forced, as per the scenario, to walk to the surface due to thick smoke on the transport road. The stretchered patient was transported via stretcher with additional mines rescue trained personnel from 801 recovery, which allowed for regular rotation of the CMWs to carry the CMW with the heart condition via the belt heading. The activity was reported as exhausting for the team transporting the patient with the stretcher. The 801 had caught up with the stretcher team and assisted as required. Ultimately, all personnel in this crew were self-escaped to the surface.

The assessors travelling with this crew made these observations:

**What worked well:** SCSRs and CABA were donned competently by all CMWs observed. The supervisor took control and led the team in the situation. There was good communication within the team, the pacing of the self-escape was well managed, and the CMWs showed competence in dealing with the CMW having simulated heart issues.

**What didn't work well:** The crew's tags were on the TAG board when the exercise commenced. The crew headed out and did not go in to collect tags from the section tag board.

The changeover from SCSRs to CABA was managed poorly by some personnel, with no flushing of face masks within the protected COB cut-through. Overcrowding within the COBs, with upwards of 30 personnel pressed into the COB cut-through, trying to change SCSRs to CABA, recharge CABA, and fit CABA to stretcher case. Training and leadership are critical for control. It was almost impossible to communicate with the Control Room at COBs due to the noise coming from the air pressurisation system. Whereas the ERZC from MG802, when he reached this location, turned the air curtains off to make a more effective communication.

Having arrived on the surface, the personnel organisation for debriefing was less than adequate. The crews may have believed the exercise was over once they arrived on the surface. However, there was still the need to identify key personnel for debriefing and transportation to the surface TAG Board. There appeared to be a loss of focus at the portal.

## MG802 development

At the commencement of the exercise, the MG802 production crew were producing in LW802 install face, and the bullgang was in the crib room. For the exercise, a coal mine worker (CMW) suffered a simulated severely sprained ankle while proceeding from the face to the crib room. The change of conditions necessitated using the stretcher to manage this person's injury from the crib room to the surface.

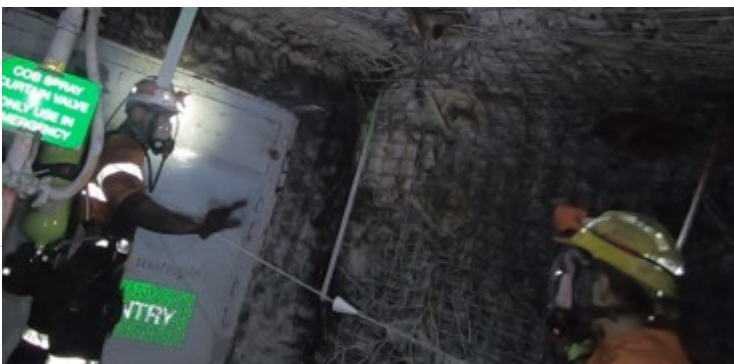
At the crib room all personnel donned a self-rescuer and proceeded to self-escape in the section transport. According to one assessor's report, three pairs of smoke goggles were reported to be broken when donning self-rescuers at the crib room. The CMW with the simulated sprained ankle had first aid applied at the crib room and was assisted into the transport. A wheeled stretcher was attached to the side of the transport as a contingency. The handles for the stretcher were inadvertently left behind in the emergency pod at the crib

room. This made it necessary to fabricate stretcher handles from blind man sticks carried by each CMW, creating steering issues for the crew.

Proceeding outbye from the crib room in the personnel transport, the crew stopped at the first COB at MG802 22ct and changed from self-rescuers to CABA. The crew focused on ensuring the injured man in the transport was fitted with a CABA set. CABA suit pressures were checked at MG802 2ct COB and then topped up CABA at NEMs 58ct COB. The COB cut-through pressurisation arrangements at each COB are manually activated to increase the pressure within the COB. The downside to this arrangement is the loud noise created by the air outlet and the chatter from personnel wearing CABA. This made communication between the ERZ Controller and the CRO via phone difficult. This ERZC showed common sense when turning off air curtains, particularly when unnecessary, due to the door being shut, and the flow of CMWs through this COB was well controlled.

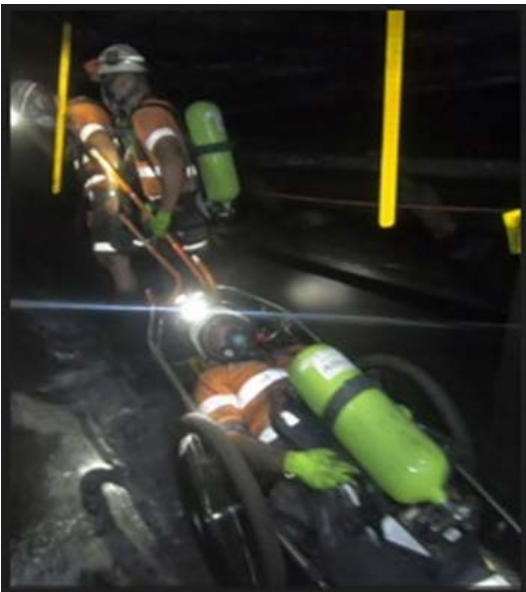
The following observation was made by one assessor observing the MG802 Crew at NEMs 58ct COB:

Time	Location	Action/Activity	Key decisions/comments
12.20	58ct COB	Top-up air for CABA Contact CRO	The air top-up was done well and in an orderly manner. ERZC, knowing the difficulty of hearing on the phone, decided to turn the ventilation air off inside the COB, which made a big difference. ERZC contacted CRO, discussed who, status, injured person, location, and fire, and established a plan. CMW's collected a spare CABA for the injured CMW who remained in the Drifty Patient status checked regularly - good.



**Figure 18: Better control and discipline were shown with this crew at 57 ct COB.**

From NEMs 26ct COB, the exercise scenario required the escape to continue on foot on the belt road. The CMW with the sprained ankle was placed in the wheeled stretcher and the escape continued on foot. Negotiating the narrow walkway in the belt heading proved challenging but not impossible. When the crew arrived at the next outbye COB at Aquila Mains 23 ct, some CABA suit whistles had sounded. Additionally, the crew were showing signs of fatigue.



**Figure 19 Wheeled stretcher patient.**

## MG 904 Development crew

The North East Mains (NEMs) Stonework crew experienced several unexpected difficulties in self-escaping. The air receiver on their personnel transport parked at their crib room at NEMs 84ct was reported to be discharged. An investigation conducted by the mine after the Level 1 exercise determined the real reason for the vehicle not starting was the low coolant level. Regardless of the cause, the vehicle would not start, and this crew walked a considerable distance from the NEMs 84ct cribroom, wearing self-rescuers and then changing over to CABA at the first COB at NEMs 79ct.

The NEMs ERZ Controller reported to the CRO at 79ct COB. The ERZ Controller informed the CRO he had sited eight tags on the combined MG904 / NEMs tag board located inbye. These eight tags belonged to the NEMs Stoneworks crew. This crew had exited their district but did not remove their tags. The MG904 crew was advised to wait at the 79ct COB in case they needed to go back in bye and search for the missing MG904 crew. This presents an issue. Aquila's Safety and Health Management System (SHMS) allows CABA to be used for 'Inseam Response' if the personnel are trained to use it. This is a specific training

package for 'Inseam Response'. Here, the personnel from the MG902 development crew had generic CABA training but not the specific training package for 'Inseam Response'.

At such short notice, the CRO could not have known who was or wasn't trained to conduct the first response with CABA. After a brief period, the missing Stoneworks crew were located outbye and the MG902 development crew continued to self-escape wearing CABA on foot. Purely by chance, a personnel transport had been parked at NEMs 57ct. The NEMs stonework crew used this opportunity to commandeer this vehicle and drive it out bye to the COB at 26ct NEMs.

The assessor observing the NEMs Stonework crew reported excessive background noise at each of the COBs transited by the crew due to the less than adequate noise suppression applied to the positive pressure air showers at the COBs.

## North East Mains 26 ct COB

The Level 1 exercise scenario simulated heavy atmospheric smoke visible from North East Mains (NEMs) 27ct. Requiring all crews self-escaping in their personnel transports to park up at that location, walk outbye one pillar to the 26ct COB, refill their CABA suits, communicate with CRO and continue on foot via the conveyor heading secondary escapeway to the surface and safety.

Assessors accompanied each crew. Additionally, there were two assessors stationed at NEMs 26ct COB. The comments summarise those remarks made by a cross-section of assessors as the crews transited this location.

The expected process for self-escape at each COB is to enter the COB and turn on the compressed air positive pressure air shower on entry. Keep doors closed, keep the pressure balance effect robust, communicate with the Control Room Operator (CRO) to give and receive an update and instructions on self-escape and the mine status and recharge CABA suits.

The assessor's reports indicated large groups arrived simultaneously at the NEMs 26ct COB. The second group consisted of approximately 40 people. Management of personnel in such a confined space became chaotic. The training provided to the workforce is to use the air conditioners to reduce COB contamination. When entering the COB and closing the door, once entry is made, never open one heading door simultaneously as the opposite heading door. Otherwise, the primary mechanism of separating the velocity pressures in both headings fails, and the COB can become contaminated.

A pressurising central defusing point ensures the COB is always effectively ventilated. It also assists in diluting any contamination from small leakages in the VCDs making up the COB, particularly in the mains where cut-throughs are smaller. The COBs are never to be regarded as fresh air bases, and the mechanisms in place are only meant to reduce the risk of contamination. Personnel are trained to assume it is contaminated unless gas monitoring indicates something different. This is why water bottles supplied in the COBs are in pelican cases with tamper tags. They will not be used unless gas monitoring is completed, giving the all-clear for a contaminated atmosphere. The mechanisms can only remain in the most robust state if the doors remain closed to reduce the risk of egress of polluted air. Crews were reported to be leaving the doors open. The positive pressure air showers were reported to be noisy, making it difficult for the ERZ Controllers and other leaders to communicate effectively with the CRO, give an update, and receive information on the mine status.

## Aquila Mains 23ct COB

Two assessors were positioned at the Aquila Mains 23ct COB. This COB is a short distance from the portal. In the scenario, this COB was identified to be on the fresh air side of the simulated LHD fire at 27ct, four pillars inbye.

The assessors were observing to see if the self-escaping personnel arriving on foot, wearing CABA, considered their options at this COB. Did the group leader stop and consider the possibilities? For example, did the group have a personal gas detector (PGD) that could be used to check for carbon monoxide gas? Did the group use the PGD? Did the group contact the CRO at this COB to give an update and seek further information on the state of the LHD fire? Did any group, having determined the 23 ct COB to be on the fresh air side of the fire, head back inbye to fight the fire, or did they continue to self-escape? Did any personnel remove their CABA suits after establishing they were in fresh air?

One observer noted that at least one CABA suit whistle was sounding. This belonged to one of the CMWs in the group pushing/pulling a wheeled stretcher as they arrived at the 23 ct COB. The whistle indicated that 50 bars were left in the suit. Warning the user, perhaps 5 – 10 minutes of suit storage remains until drained. However, it is recognised that all personnel had a spare self-rescuer with them due to the modified system used at Aquila Mine.

The following observation was made by one assessor observing the MG802 Crew in control of a wheeled stretcher and the sprained ankle casualty at Aquila Mains 23ct COB:

Time	Location	Action/Activity	Key Decisions/comments
13.14 – 13.18	23ct COB	Arrive at 23ct COB  Top-up of CABA done	The whistle on CABA started to sound on several suits as CMWs arrived at this location.
13.19 – 13.25	23ct COB	Crew splinted the leg of the patient.  ERZ C confirmed fresh air  ERZ C directed CMW to contact CRO for the update status of the injured CMW	Crew showing signs of fatigue. Capillary refill was done on the patient.  The crew forgot it was still an emergency and needed to continue to the surface. They had to be reminded of this.  ERZ C and crew discussed returning to fight the fire, but they followed CRO's instructions and continued escaping to the surface.
13.28 – 13.46	23ct to portal	Walk out to the portal	Headcount is done of crew before the walkout. Going as slow as the slowest person initially  Some of the crew went ahead, ERZC stayed with CMW, who had to stop several times due to apparent fatigue.



Figure 20: CMW recharging CABA suit

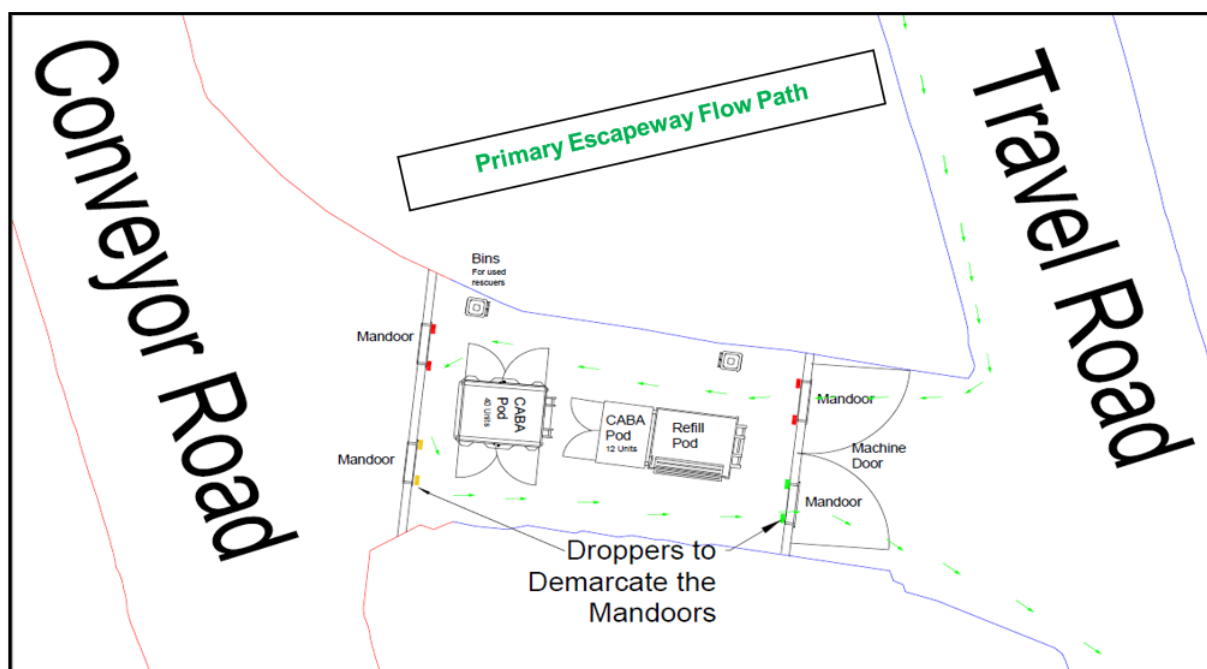


Figure 21: Example of a primary COB at Aquila Mine

## 14.5 Observations at the mine portal

Comments made by several assessors suggest that the portal's activities need improvement. The following is a cross-section of the assessor's comments:

- “When on the surface, persons didn’t have clear instructions on where to go, and rooms were too small for all CMWs.”
- “On the surface at 13:16, there was only one person not knowing what to do and people walking around not knowing what is going on.”
- “Portal control, when contacted, wasn’t sure what they needed to do. They had 2 X sets of cards and were unsure what to do with them.”
- “Only one portal guard. Sort of lost the group here as there were so many people at this point.”
- “Portal phone ringing, no one answering”.
- “No direction from the portal attendant on the surface”
- “There seemed to be no cohesive order at the portal area.”

### 14.5.1 What worked well

- Care of injured workers. The three stretcher cases (the medical episode in stoneworks crew, the LHD that caught on fire, the driver with burns, hard to breathe and unable to walk and the severely sprained ankle in MG802) were provided with appropriate first-aid care. Both individuals were transported to the surface in personnel transport via wheeled stretchers.
- Donning of self-rescuers and change-over to CABA suits was very good.
- The control and leadership of the ERZ Controllers and Mines Rescue Brigade personnel were excellent. Clear information and directions were given to the crews.
- Good standards for the primary and secondary escapeway markers and signage
- ERZ Controllers stayed with the slowest person in the group.
- In NEMs, using a measuring tape as a guide to help egress from the continuous miner to the crib room was a great idea. They also used glow sticks when changing over to CABA.
- The Longwall 902 crew performed very well. Single file, hand placed on the tank in front, they proceeded steadily and calmly, rescue trained personnel took control of the team, positive communications, refills, and checks done at the COBs, closed the COB doors, glow sticks were used.
- ERZ Controllers took control of groups. In the absence of an ERZ Controller, the Mines Rescue Trained personnel stepped up and took control, plus a supervisor in the stoneworks crew.
- The LHD fire, was put out effectively and the use of two-way communications between the firefighting team members greatly increased their effectiveness. Even though they were delayed fighting the fire due to having to treat and take the severely injured LHD driver to the surface for treatment at the portal area.

### 14.5.2 Areas for improvement

- Overcrowding within the CABA COB cut-throughs, particularly in the Aquila Mains and NEMs COBs. Upward 40 personnel arrived at some COBs simultaneously, creating a chaotic environment for recharging CABA suits without supervision control and CMWs discipline to wait for access and follow the quicker direction of an even flow design layout.
- Noise from the positive pressure air showers at each COB made phone communication with the CRO difficult.

- One assessor theorised using the positive pressure air showers at each CABA COB to deplete the compressed air line pressure within the underground workings. Investigations conducted since the exercise have determined the inability to recharge the MG 902 development crew vehicle was due to the engine protection system indicating a low coolant level rather than low pressure in the reticulated compressed air line. The reticulated compressed air pressure underground did not drop below acceptable levels. The air curtains have a tiny orifice that does not allow for an excessive air flow, but when the restriction mechanism fails, the noise increases substantially.
- They were negotiating a wheeled stretcher along a narrow conveyor heading pathway adjacent to it. The crews were determined to make it through. The consumption of compressed air by the crews both dragging or pushing the wheeled stretcher may put them at risk of running out of compressed air before reaching the next COB while simultaneously exhausting those providing aided escape. Although the backup self-rescuer the CMWs carry helped mitigate this risk.
- The handles for the wheeled stretcher were stored separately from the stretcher in the MG802 emergency pod. The handles were accidentally left behind when the crew attached the stretcher to the personnel transport, giving the team difficulty steering the stretcher through tight areas.
- The current one-size-fits-all approach to the face masks on the CABA suits. This approach doesn't consider the range of facial features, particularly in the smaller CMW, which may result in some personnel not achieving a good seal between the cheek and face mask, resulting in leakage and reduced endurance from the CABA suit.
- In the MG802 panel, an observer reported three self-rescuer goggles being broken when donning the self-rescuer. This matter will require further investigation. All self-rescuer units used in the exercise were reported to be either training units or in-service units approaching the end of their 10-year operational life.
- In the MG902 panel, one CABA suit was reported to have been discharged or empty on donning, at first COB, two pillars outbye the crib room. The mine indicated at the time of this report that the investigation's finding showed the provider for the CABA cylinder water static test, on two cylinders, the valve on top of the cylinders was not tensioned to the recommended amount. All CABA 670 cylinders at the mine were checked, and additional work order-based checks were put in place to monitor the CABA units deployed underground. The supplier for these tests has also been changed.
- The process at the portal for exiting the mine and being corralled to the correct debriefing area did not run smoothly. The Aquila Mine Emergency Response System identifies the portal area as a potential blast exclusion zone. However, personnel were observed to be resting and waiting for transport within the 158-metre longitudinal exclusion zone. Additionally, the debriefing system separates all personnel exiting the mine into three distinct groups. These are: (1) critical debriefs, (2) important debriefs and (3) general debriefs. The single portal attendant struggled to process all the people exiting the mine and classify them into the correct debriefing group. Valuable information may have been missed. Several observers commented that the system for corraling personnel for debriefing needs refining.
- Several observers commented that the buddy system was not widely used when donning self-rescuers or CABA suits. However, the MG802 crew were reported assisting others once they had donned a self-rescuer or CABA suit.
- The firefighting team arrived at the site of the simulated LHD diesel fire at Aquila Mains 27 ct two hours after the scenario began. The author recognises that they encountered the severely injured



CMW (the LHD driver) which caused them to prioritise treating and extracting the casualty to the surface and deliver them to the paramedic before returning to fight the fire.

## 15.0 Surface assessments

The Aquila Mine Emergency Response System (MERS) structure for emergency management utilises a modified version of the Anglo American Emergency Management Command and Control System (ECCS). The MERS utilises the QMRS MEMS system, EMQnet, for Anglo American internal communications and aligns to The Australasian Inter-Service Incident Management System 4 (AIIMS4) Incident Command and Control System (ICCS) and principals.

## 15.1 Aquila Coal Mine emergency response framework

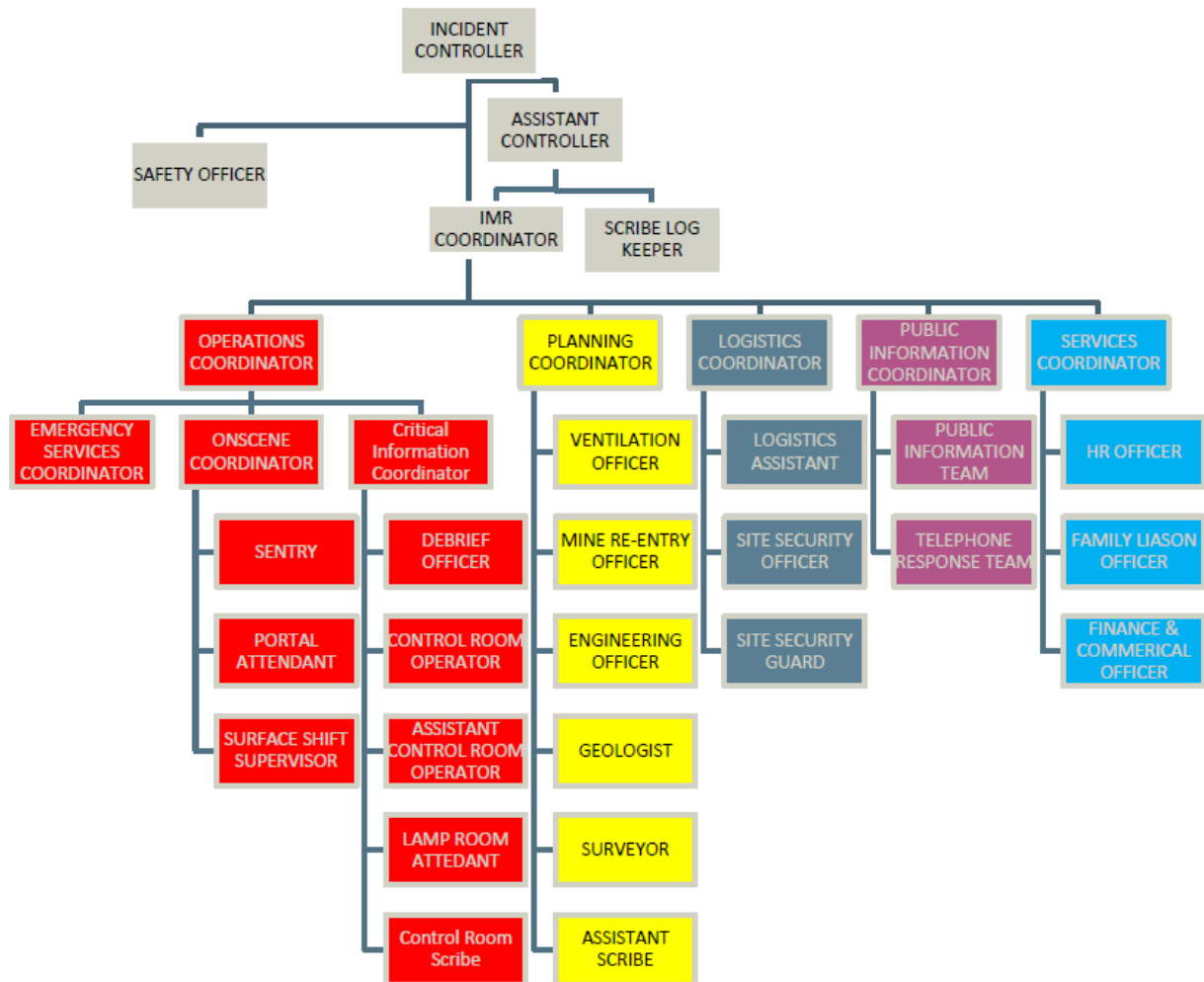


Figure 22: Aquila IMT Structure

## 15.2 Surface assessment locations

Assessors were placed in various locations on the surface to monitor the response to the incident. These locations varied as the response to the incident developed. Assessors observed the response from these locations/functions:

- Control Room
- Incident Management Team (IMT)
- Operations team
- Planning team
- Logistics team
- Queensland Mines Rescue Service (QMRS) office at Dysart
- Tag board and debriefing rooms

The following are comments made by assessors considering the surface response during the exercise.

## 15.3 Control room, debriefing rooms and tag board

**Assessor: Andrew Adamson, Graham Fuller, Martin Watkinson, Les Marlborough**

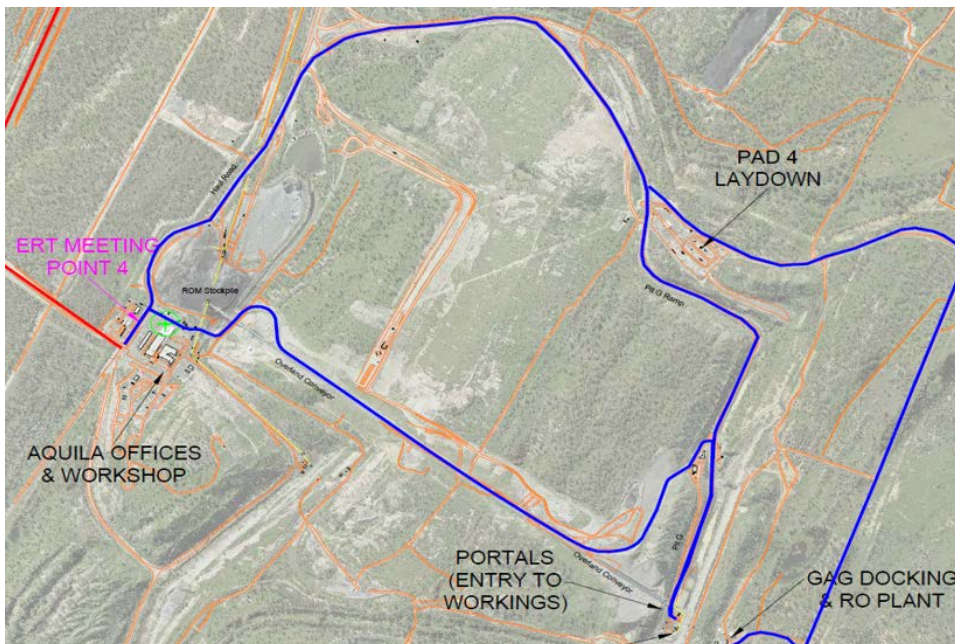
The scenario was initiated at 11:30 am by an assigned CMW contacting the Control Room Operator (CRO) via phone from the Aquila Mains COB 23 ct. The CMW advised the CRO of a simulated uncontrolled diesel fire on a Load Haul Dump (LHD) at Aquila Mains G Hdg 26-27ct.

The simulated gas readings from the scenario were identified using the mine ventilation model supplied by SIMTARS. The Safegas system (Simtars software) manages the mine gas monitoring system. Simtars developed a training tool called Safesim which replicates the mine site gas monitoring system and enables different scenarios to be played in real time along with anticipated gas levels and alarms as seen on the individual mine system.

The Safesim computers were set up parallel to the mine control room computers to ensure normal mine site gas monitoring was not interrupted.

The scenario was played out with the simulated LHD diesel fire and the expected build-up of carbon monoxide product of combustion in the North East Mains (NEMs) and all panels running off NEMs.

This report section covers the activities observed in the control room, the tag board area, debriefing rooms and interactions with IMT.



**Figure 23: Overview of the mine site – shows the location of the portal and the Aquila Office infrastructure**

## 15.4 What worked well

- Recording of all actions and events on the EMQnet system. Making EMQnet the one source of information throughout the event.
- The CRO used and followed TARPs, procedures, and available resource material.
- Having an assistant CRO available helped reduce the initial workload for CRO.
- AusDac Phone System Manager is a great asset in seeing UG phones calling and displaying the UG phone keypad number being pressed. Great for non-verbal comms.
- CRO methodically works through the process to activate emergency response and panels to withdraw.
- Two scribes are available to the control room early to set up EMQNET and remote connections into Teams (planning, operations and logistics).
- CRO's utilised site Citect System to track persons activating lockouts whilst escaping along the belt road.
- Tracking of personnel through NLT System.
- CROs used good communication with the DAC, radios and phones.
- CROs stayed calm while talking to CMWs, trying to withdraw from the mine.
- CRO highly skilled with Safegas, RT and Tube Bundle Systems.
- CRO is highly skilled with Gas Chromatograph and interpreting and understanding results.
- Enacted emergency protocols, including emergency siren, site ambulance, etc.

## 15.5 Areas for improvement

- Could use the mine plans in the control room to plot the initial emergency location and then work groups/panels with numbers of CMWs as they escape. Or use smartboard systems for digital plans and easy uploading into EMQnet.
- The control room has a whiteboard, but a desk and scribes setup prohibit its use, i.e. writing incident out (LHD Fire Mains 26-27ct GHDG) and other vital info. Again, a smart board system could be used for this.
- Look at setting up another notifier panel run from the control room fire panel to set up the Public Address (PA) box on the control room desk, so the CRO need not leave the desk to use PA and Evacuation Sirens.
- Consider creating a Citect page with all the UG belts Dupline lockouts so the CRO can easily visualise people activating lockouts whilst escaping.
- Depending on the particular scenario, when Tube Bundle CO readings go over range, another person with gas chromatograph (GC) training could start testing bag samples from those locations to get accurate readings, which happened after the fire was out and near the end of the exercise. CROs might be too busy to do bags.

- Display of helicopter landing pad coordinates somewhere in the control room for when escalating to Queensland emergency services.
- Mine should do more mock exercises with IMT groups and control room practising using EMQNET to become proficient in the system.
- CCTV of the muster area showed that many persons waiting in this area were on their mobile phones. That should be policed to prevent information from being spread across social media.

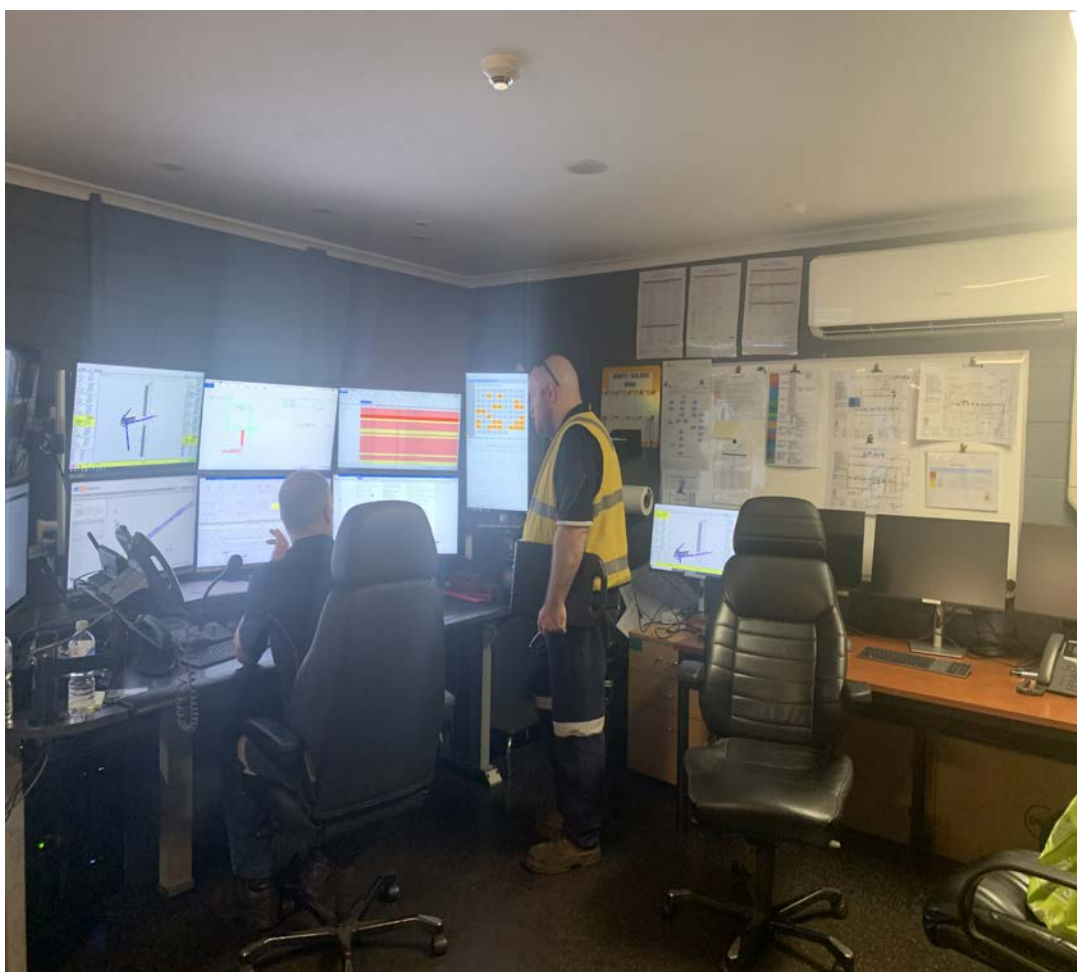


Figure 24: CROs and assessor reviewing information and data in the control room

## 15.6 Incident Management Process

**Assessors: Shaun Dando, Jason Fairweather, Ron Wilkinson, Mark Lydon, Nikki LaBranche**

The Incident Management Team (IMT) is scalable, allowing the Incident Controller and coordinators to expand or contract depending on the size and nature of the crisis or emergency.

The IMT is split into operational groups with a dedicated focus on planning, operations and logistics, and Public Information Coordinator and Services Coordinator. The assessor's reports for the Incident Management process groups have been summarised in this report section.



Figure 25: Incident Management Team (IMT) Meeting

### 15.6.1 What worked well

- The Incident Controller took control, communicated expectations and objectives regularly, remained calm, spoke clearly and listened to input from initial briefings and throughout the exercise.
- IMT meeting routine, reminders and timing were well managed and controlled by the Incident Controller.
- Incident Management Team members provided relevant input, suggestions, and ideas throughout – the team worked well together.
- The visual and audible link between the Incident Management room and functional team rooms was utilised during IMT meetings, which kept functional teams informed firsthand of IMT discussions and updates.
- Multiple scribes or resources in the IMR assisted with gathering information, checking actions and inputting updates, especially with the intermittent functionality of EMQNET.
- Sourcing or confirming access to additional resources from nearby mines to assist.
- Safety officer role – some good prompts questions when considering risks and safety of personnel outside of the operational focus.
- Regular updates directly from the Control room via EMQNET.

- A succession plan was developed for IMT for an ongoing situation into the next shift.
- They successfully transported escaping CMWs from the portal to the mines main complex, even with 90 per cent of their man transports still underground, blocked by the simulated LHD fire.

## 15.6.2 Areas for improvement

- EMQNET (maintains a time-stamped log of all actions and event updates entered) is the software platform used to manage emergencies, communicate incident action plans, provide situation updates, allocate tasks, and track the status of tasks. The system was slow and needed to be refreshed regularly during the exercise. Information was typed into a Word document and then uploaded to the status boards to improve efficiency. There were also some technical issues with screen displays in the IMR. EMQNET's functionality, therefore, could not be fully utilised.
- Accounting for personnel - there were some delays and confusion when accounting for all personnel underground. Numbers were reported as accounted for and their locations were sometimes inconsistent. Some of this may have been because of the exercise itself. The electronic tracking system was different to the physical tagboard numbers.
- Visual display of information for IMT – a whiteboard was used to display objectives, but several other key status boards in the Aquila MERS were not observed or communicated in the IMR, including the IAP Board, Resources Board, Actions Board, Casualty Status Board, Logistics Status Board, IMT Organisation Structure Status Board, which are also available to use in EMQnet.
- Information received to the IMT from the fire site was limited, resulting in assumptions being made at times on the status of the situation underground, the extent of the fire, the success of firefighting efforts etc.
- ISHR and RSHQ IOM responded to the site and were updated regularly by Incident Controller. This took time between each IMT meeting for the Incident Controller and allowed minimal time for other duties.
- Some confusion over whether QMRS had been notified or activated to respond to the site, resulting in a delayed response by QMRS Operations Managers.
- The utilisation of QMRS mutual assistance if needing additional resources – some internal calls were made to determine if mines rescue-trained personnel were available at Anglo Moranbah mines. There are closer nearby mines that a QMRS callout can activate.
- Setting clearer objectives from which SMART strategies (Specific, Measurable, Attainable, Responsible, and Time-Bound) and tasks can be developed, communicated, actioned, and reported.



Figure 26: Operations Group Meeting

## 16.0 Conclusions

The objectives of the emergency exercise as per *Recognised Standard 08 Conduct of Mine Emergency Exercises* have been met. The 2023 Level 1 exercise achieved the following:

- Safely tested the facilities and strategies at Aquila Underground Coal Mine to manage emergency events in all circumstances.
- Tested the competency of mineworkers in using those facilities and implementing the strategies.
- Enhanced the confidence and ability of mineworkers at Aquila to respond in an emergency.
- Identified opportunities for improvement.
- Shared the learning outcomes with the industry via this report.

2023 was the second year in which the Level 1 exercise has been split into two separate events. Conducting two separate events was found to be highly time-consuming and possibly wasteful. The individual events did not provide real, measurable advantages regarding the learnings that came out of them. The effort effectively doubled for the Organising Committee, QMRS, and Aquila Coal Mine. Consequently, the planned 2024 Level 1 exercise will return to the previous format of a single exercise.

The QMRS-focused exercise demonstrated and verified the overall effectiveness of the QMRS emergency response capability.

The mine-focused event demonstrated Aquila's leadership by individuals and the excellent teamwork by each crew member to self-escape and extract the three stretcher case CMWs.

The report has identified several improvement opportunities for QMRS, Aquila U/G Coal Mine and industry. A restating of key findings and recommendations follows:



# 17.0 Key findings and recommendations

## 17.1 Recommendations for Queensland Mines Rescue service

### 17.1.1 QMRS Head Office

QMRS will review the fatigue management risk assessment and policy to determine if improvement opportunities are necessary. This matters, especially for the early stages of an ongoing incident response where the event may extend over several shifts, days or weeks.

### 17.1.2 QMRS Operations

- QMRS will review the suitability of existing emergency response trailers to ensure the security and potential impact on operational readiness for emergency response equipment during transport.
- QMRS will review the process for maintaining up-to-date certificates of conformity for the BG4 breathing apparatus.
- QMRS will review the process to ensure that the batteries sourced for the BG4 BODYGUARD mechanism align with the battery named in the certification.
- QMRS will review maintaining an overhaul history for the BG4 breathing apparatus.
- QMRS will review the process for maintaining the serviceability of the Mcomm radios. The Ingress Protection (IP) rating of the first batch of radios presented to Aquila was identified as compromised.
- QMRS will review the process for maintaining an up-to-date certificate of conformity and overhaul history for Mcomm radios.

## 17.2 Recommendations for Aquila U/G Coal Mine and industry

### 17.2.1 Surface Incident Management key recommendations

- Effective debrief of CMWs – Aquila should review the process at the portal for personnel exiting the mine under escape conditions and being corralled to the correct debriefing area. The observation from some assessors suggests this did not run smoothly. All emergency response systems should have a well-prepared corraling/mustering/debriefing process with pre-prepared questions and sufficient competent resources to ensure systematic, controlled gathering of relevant technical data and information. The whole system cannot afford to have one deficient part.
- EMQNET maintains a time-stamped log of all actions and event updates entered. EMQNET is the software platform used to help manage the emergency, communication of incident action plans,

situation updates, allocated tasks and status of tasks. The system was slow and needed to be refreshed regularly during the exercise. Information was typed into a Word document and then uploaded to the status boards to improve efficiency. There were also some technical issues with screen displays in the IMR. EMQNET's functionality, therefore, could not be fully utilised. Aquila should review and improve the operability of this system.

- In the mine-focused exercise, there was some confusion in the IMR over whether QMRS had been notified or activated to respond to the site at the earliest possible stage. This resulted in a delayed response from QMRS Operations Managers. Aquila should review their duty cards to ensure this action is not missed.
- The utilisation of QMRS mutual assistance if needing additional resources – some internal calls were made to determine if mine rescue-trained personnel were available at Anglo Moranbah mine. Other nearby mines can be activated by a QMRS callout, such as those from Oaky North. Aquila should review their current call-out process to ensure it aligns with the intent of the mutual assistance process.

## 17.2.2 Control Room

- Aquila should review the Public Address System in the control room. Consider adding a connection from the fire panel to a Public Address (PA) System on the control room desk so the CRO need not leave the desk to use PA and evacuation sirens.
- Aquila should create a Citect page with all the UG belts and duplicate lockouts so the CRO can easily visualise people activating lockouts while escaping.

## 17.2.3 Underground Recommendations for Aquila U/G Coal Mine and Industry

### Self-escape and in-seam response

- Aquila should review the process for providing aided escape to stretcher cases. Some crew members who managed the wheeled stretcher cases experienced high fatigue. Some stretcher bearers were close to emptying their CABA suits to provide an aided escape to their work colleagues. However, it is recognised that Aquila Mines's system of having self-escaping CMWs to have a spare self-rescuer helps to reduce this risk and not all areas of the mine would be subject to the drag on the wheeled stretcher going through rib spall. Still, such disadvantages should be considered, and controls should be implemented. It is a subject that needs a rational review and reassessment. The 2023 mine-focused Level 1 exercise required most personnel to walk part way out of the mine, approximately 1800 metres from 26ct North East Mains COB to the portal. Compare this to the furthest inbye gate road CABA COB, approximately 8000 metres from the portal. Other options for self-escape should be considered, including a refuge chamber and a pre-driven escape shaft at the refuge chamber.
- Aquila should review overcrowding within the CABA COB cut-throughs, particularly in the Aquila Mains and NEMs COBs. Up to 30 personnel arrived at some COBs simultaneously, creating a chaotic environment for recharging CABA suits. Training and leadership are critical for control.

Aquila should consider noise suppression for the positive pressure air showers at each COB. Telephone communication between the COB and CRO was difficult due to noise from the air curtains.

- Aquila should review the current one-size-fits-all approach to the face masks on the CABA suits. This approach doesn't consider the range of facial features, particularly in the smaller CMW. This may result in some personnel not achieving a good seal between the cheek and face mask, resulting in leakage and reduced endurance from the CABA suit.
- It has been recognised that Aquila Mine designed its system by assessing the recommendations from the previous Level 1 exercise. For the first time, no CMWs were evaluated as being at high risk from a contaminated atmosphere while changing the breathing apparatus. Other system changes have reduced the risk to CMWs to varying degrees of success, and their future Emergency Response System upgrades, including the recommendations from this report, will continue to reduce the risks to CMWs during their operation. The Level 1 exercises are designed to be a learning exercise, not just for the mine but for the industry, to improve the Emergency Response Systems continuously, and the industry should note Aquila Mines's efforts to do this.

## 18.0 References

- Queensland Government [Coal Mining Safety and Health Act 1999](#)
- Queensland Government [Coal Mining Safety and Health Regulation 2017](#)
- Queensland Government [Recognised Standard 08 Conduct of Mine Emergency Exercises](#)
- [Report on an Accident at Moura No. 2 Underground Mine on Sunday, 7 August 1994](#), Windridge, F. W., Parkin, R.J., Neilson, P.J., Roxborough, F.F. & Ellicott, C.W. 1996: Wardens Inquiry, Queensland Government