Level 1 Mine Emergency Exercise 2017

Broadmeadow coal mine

November 2017

Queensland Government

This publication has been compiled by the Level 1 Mine Emergency Exercise Organising Committee, and the Department of Natural Resources and Mines.

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Abbreviations and glossary

Term	Definition
Approved standard	A standard made for safety and health under the repealed Coal Mining Safety and Health Act 1925 stating ways to achieve an acceptable level of risk to persons arising out of coal mining operations
Bord and Pillar	Another name for room and pillar where roadways are driven to a pattern and pillars of coal are left to support the roof
CABA	Compressed air breathing apparatus
CPR	Cardio pulmonary resuscitation
CH4	Methane
CITECT	Brand name of SCADA system
CO	Carbon monoxide
CO2	Carbon dioxide
CHPP	Coal handling and preparation plant is a facility that washes coal of soil and rock; crushes it into graded sized chunks (sorting); stockpiles grades preparing it for transport to market; and (more often than not) loads coal into rail cars, barges, or ships. They can also be referred to as a coal preparation plant, prep plant, tippler or wash plant.
CMW	Coal mine worker
CoB	Change over bay
Continuous miner (CM)	Coal cutting machine used to develop new roadways in a mine
Crib room	Location where mineworkers eat and a meeting station for the ERZ controllers
CRO	Control room operator
CSE	Brand name of a self-contained self-rescuer
Cut-through (c/t)	A passage cut through the coal, connecting two parallel headings
DAC	Underground intercom system also referred to as the tannoy
Deputy	Safety supervisor who makes statutory inspections not referred to as an ERZ controller in Queensland regulation
DNRM	Department of Natural Resources and Mines
Driftrunner	Brand name for a flameproof diesel powered man-riding vehicle carrying up to 12 personnel
Eimco	Brand name of a flameproof diesel powered mechanical loader
EMP	Emergency management plan (interchangeable with ERP)

Term	Definition
EMQnet	Brand name for a business resilience communication solution which has been adopted by some mines for everyday management as well as communications and information handing during an emergency response
ERP	Emergency response plan (interchangeable with EMP)
ERZ	Explosion risk zone
ERZ controller	Mine worker responsible for safety inspections 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
FREEK	First response emergency evacuation kits. These are the containers that hold the CABA and associated equipment
Gas chromatograph.	A laboratory instrument used to analyse the composition of gas samples
“Go line”	An assembly area on the surface where mobile plant is left after servicing and when available for use
HMP	Hazard Management Plans
IAPs	Incident action plans. Plans developed by the IMT and signed off so that each of the teams, logistics, operations and planning have clear direction
ICS	Incident Control System
IMT	Incident Management Team (term is interchangeable with ICT)
Inbye	Mining term for going into the underground mine (away from the surface) from the point of reference
Industry Safety and Health Representative (ISHR)	A person who is appointed under section 109(1)5 of the Coal Mining Safety and Health Act 1999 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
Level 1 mine emergency exercise	State level mine emergency exercise recommended in the Moura inquiry, 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 deposits, in which the working face is advanced over a considerable width at one time
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 who control the mines inspectors
MEMS	Mine emergency management system
MRAS	Mine re-entry assessment system

Term	Definition
MSHA	Mine Safety Health Administration, United States of America - Department of Labour
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_2	Oxygen
Outburst	An ejection of gas and coal from the solid face, where the gas is a mixture of methane and carbon dioxide
Outbye	Mining term for out of the underground mine (towards the surface) from the point of reference
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)	Ultra-low frequency through-the-earth communication system used for paging. Originally developed to provide a fast and reliable method of informing underground miners of emergency situations
PJB	Brand name for a flameproof diesel powered man-riding vehicle carrying up to 12 personnel
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 Coal Mining Safety and Health Act 1999 stating ways to achieve an acceptable level of risk to persons arising out of coal mining operations
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)
SCADA	Supervisory control and data acquisition. Software for monitoring and/or controlling plant and equipment
Self-contained self-rescuer (SCSR)	A respiratory device used by miners for the purpose of escape during mine fires and explosions. It provides the wearer a closed-circuit supply of oxygen for periods of time usually less than 1 hour
Simtars	Safety in Mines Testing and Research Station
SMV	Brand name for a flameproof diesel powered man-riding vehicle carrying up to 12 personnel
Stopping	A ventilation control device which stops ventilation flow through a roadway
Tag board	Peg board where underground personnel place a token to indicate their presence in a section of the mine

Term	Definition
Undermanager	Mineworker who is in charge of the mine on a shift basis (i.e. shift supervisor)
Ventsim	Ventilation modelling software
VCD	Ventilation control device an air door, stopping, seal or brattice
VO	Ventilation Officer. Person responsible for coordination of all ventilation related activities at the mine including running a computer base ventilation modelling system

Preface

This report has been compiled by the 2017 Level 1 Emergency Exercise Organising Committee (the Committee) with input provided by each of the assessors involved in the exercise. Assessors have provided an account of their part of the exercise for this report.

The Committee would like to thank all assessors for their input and acknowledge the co-operation and assistance of all those involved in the 2017 Level 1 Mine Emergency Exercise In addition, the Committee would also like to thank Broadmeadow mine for participating in the exercise and providing self-contained self-rescuers for use during the exercise, adding to the reality of the experience for evacuating coal mine workers.

Executive summary

This report relates to the 2017 Level 1 Mine Emergency Exercise (the Exercise) held at Broadmeadow mine between 10 am and 5 pm on Tuesday 21 November 2017. Broadmeadow underground mine is a top coal cave longwall punch mine located approximately 30 km north east from the township of Moranbah, in Central Queensland (Figure 1).

The Queensland Mining Warden's inquiry into the explosion at the Moura No. 2 mine in August 1994 recommended, "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. This 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 state-wide emergency responses by holding an annual exercise.

It is 23 years since the Moura No 2 disaster, and seven years since the Pike River disaster. The Pike River Royal Commission led New Zealand to adopt similar legislation regarding emergency exercises.

Since 1998, 20 Level 1 Mine Emergency Exercises have been held in Queensland.

Twenty four-assessors took part, with representatives from Broadmeadow, the host mine, Simtars, the Queensland Mines Inspectorate, Mines Rescue (Queensland and New South Wales), an industry safety and health representative (ISHR) from the Construction, Forestry, Mining and Energy Union (CFMEU), Minerals Industry Safety and Health Centre (MISHC), the Department of Natural Resources and Mines (DNRM) Corporate Communications and mine staff from Kestrel, Grasstree and Grosvenor mines.

Objectives

By using the requirements of RS8 and by reviewing previous exercise reports, the objectives were to test:

- self-contained self-rescuer (SCSR) donning and change-over to compressed air breathing apparatus (CABA); in one location South Mains
- donning of SCSR and escape everywhere else
- evacuation in a restricted vision scenario
- location of personnel
- emergency response mid-week with all personnel on site
- incident management team (IMT) process
- deploy rescue teams to recover personnel
- EMQnet interface with inspectorate/ISHR
- mutual assistance from Goonyella/Riverside Emergency Response Team

- interaction with the Queensland Police (police)
- And to provide a focal point for emergency preparedness in the state

Scenario

The scenario for the exercise was based on an incident that happened in 2006 where a water truck ran away down a ramp and collided with the conveyor structure and caught fire. The scenario for the exercise was a collision between a water truck and a Moxy truck under a conveyor underpass. The vehicles catch fire and the smoke and pollutants contaminate the intakes to the mine resulting in a mine evacuation. The driver of the water truck is trapped in the cab and dies at the scene.

This scenario presented the following issues to be addressed:

- CMWs had to effect an escape wearing SCSRs and one team undertake a changeover to CABA
- there would be an injured CMW in the South Mains
- formation of an IMT
- callout and communication systems (QMRS, Inspectorate ISHR and Simtars)
- QMRS attendance and deployment
- mine to establish IMT change over towards the end of the exercise
- opencut firefighting response
- interface with the police

Major conclusions

The major conclusions listed were made by reviewing the 24 assessors observing the response. A full list of observations is included at the end of this report.

Major observations:

- Issues were identified with the standards of the underground escape routes and also include the ventilation pressure differential across a set of air doors the CMWs had to traverse to escape the mine.
- Mine site access for key personnel responding to the call out was impeded. The mines inspector, the police and the QMRS brigadesmen all experienced delays with access to the site. Whilst some of the issues with QMRS was the fact the brigadesmen did not have their identification with them this was not the case with the mines inspector nor the police.
- Mine site staff identified that CMWs could be evacuated via the GAG boreholes, sourced a possible capsule and were looking for a crane with suitable man riding capability.
- There was a perceived delay in the deployment of QMRS teams underground. Brigadesmen were present on site however the briefing of the operations managers and team captains took time as did the provisioning of a signed off action plan, underground mine plans and underground vehicles for the search and recovery.

Recommendations

All mine sites and other agencies involved in mine emergency incident response should review the recommendations and utilise them in the gap analysis and periodic review of their emergency response systems as well as audit tool prompts and checklists.

Important recommendations arising from the exercise for the industry emergency response:

- Develop skills and competency requirements of mine first responders to deal with fire events, both on the surface and in underground environments, to reduce the probability of fire events propagating to major events.
- CMWs should practice the donning of SCSR and the changeover to CABA in very low visibility. It should be emphasised in the training that it is better to don in fresh air before any gas pollutants arrive.
- Develop an emergency response standard to ensure that all mines have the same:
    1. Coloured escape way droppers
    2. Life line protocols for cones and installation
    3. Non-verbal communications
    4. Communications between evacuating CMWs in their group and when they meet other groups
    5. CABA spacing
    6. CABA location ancillaries:, telephones/DACs, mine plans, white boards etc
- All mines should conduct an audit of their underground escapeways and correct any deficiencies found.
- The issue with police and carrying weapons on the surface of the mine needs to be resolved. It is not the intent of current Queensland mining legislation to inhibit police entry to the surface areas of a mine.
- Decide upon the design for a mobile emergency winder and arrange for emergency winding capability to be available.

Improving CMWs firefighting capabilities has been identified as an issue for several years.

Training and practice in the donning of SCSR and CABA will be an ongoing requirement.

The requirement for an emergency response standard has been identified over the past couple of years and is a particular issue for contractor mine workers moving from mine to mine. A working group has been established to prepare the emergency response standard.

The need for an emergency winder capability was identified as part of the Moura No 2 inquiry and has been identified in a number of level 1 reports. Another group of industry personnel will be meeting in February to work to resolve any outstanding issues relating to the development of an emergency winder capability.

The 2018 Level 1 Emergency Exercise will be held at Grosvenor underground coal mine.

Russel Albury
Chief Inspector of Coal Mines

Figure 1 Location of Broadmeadow Mine

Introduction

This report relates to the 2017 Exercise held at Broadmeadow mine between 10 am and 5 pm on Tuesday 21 November 2017. Broadmeadow underground mine is a top coal cave longwall punch mine located approximately 30 km north east from the township of Moranbah, in Central Queensland (Figure 1).

All Queensland underground coal mines are required to test their emergency preparedness by running simulated emergency exercises annually. This requirement was a recommendation of the Warden's inquiry into an explosion at Moura No. 2 underground mine on 7 August 1994 in which 11 miners died. One mine is selected to be the focal point of the state's emergency preparedness and is the host for the exercise.

The requirements for conducting mine emergency exercises are set out in *Recognised Standard 8, Conduct of Mine Emergency Exercise*, which along with reports of recent exercises, is available on the DNRM website at www.dnrm.qld.gov.au.

Objectives

The objectives of the exercise were set using the requirements of the recognised standard and reviewing previous exercise reports. The objectives were to test:

- SCSR donning and change-over to CABA (In one location South Mains)
- donning of SCSR and escape everywhere else
- evacuation in a restricted vision scenario
- location of personnel
- emergency response mid-week with all personnel on site
- IMT process
- deploy rescue teams to recover personnel
- test EMQnet interface with inspectorate/ISHR
- mutual assistance from Goonyella/Riverside Emergency Response Team
- interaction with the police

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

Broadmeadow underground coal mine

Broadmeadow is a longwall coal mine with two continuous miner development places. It was established in 2004, and achieved an annual run-of-mine (ROM) tonnage of over 8 Mt in 2016. The underground mine is developed from the old highwall of the Goonyella opencut operation. All the longwalls up to Longwall 12 have been developed from the highwall. From longwall 13 the development will take place from the south mains.

There are about 125 coal mine workers underground, and 320 people working on the surface. On the day of the exercise, 68 coal mine workers were evacuated from underground, and 140 from the surface. The location for the incident was in the congested area of the highwall and end-wall of the pit where there is an underpass as well as the loading points for the south mains conveyor and the longwall 12 maingate conveyor. Figure 2 shows the configuration of the longwall layout of the mine.

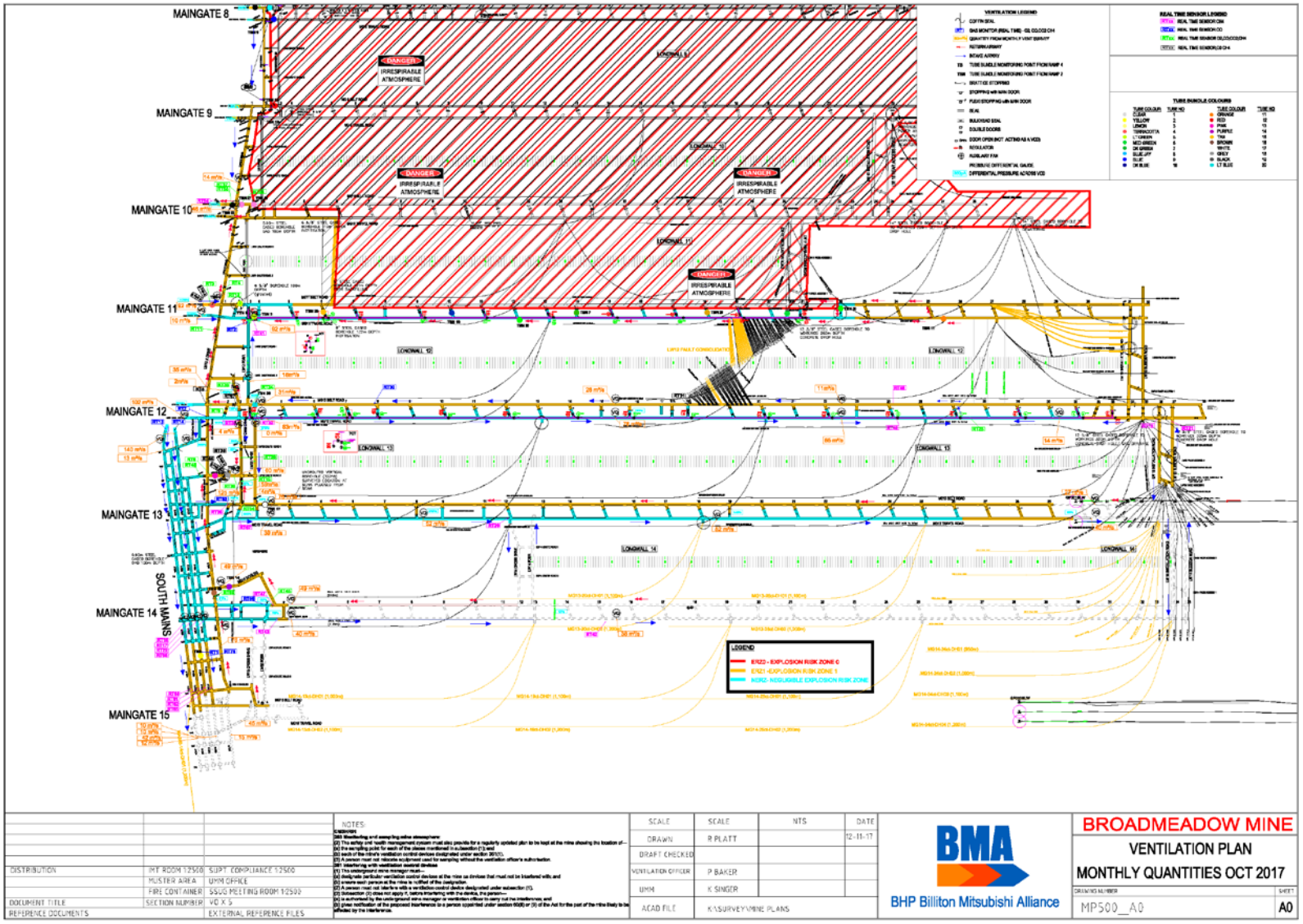


Figure 2 Longwall layout Broadmeadow Mine

Scenario

The scenario for the exercise was based on an incident that happened in 2006 where a water truck ran away down a ramp collided with the conveyor structure and caught fire. A considerable amount of smoke was created in the bench as a result of that incident. See Figure 3.

Figure 3 Water truck incident April 2006

On review of the mine plan and the current surface infrastructure at Broadmeadow it was identified that a surface incident close to the end-wall adjacent to the entries for the south mains and longwall 12 maingate could affect all of the intakes to the mine. This would then trigger an incident response and a need to evacuate from underground in reduced visibility and wearing SCSR/CABA. More than 50 CMWs were involved in the underground evacuation process.

Photographs of a water truck and a Moxy truck were taken close to the underpass on the conveyor within five minutes of each other. It was therefore decided that the incident triggering the underground evacuation would be a collision of a water truck and Moxy loader under the conveyor belt infrastructure which created a dense plume of smoke and toxic atmosphere that polluted all the intakes to the mine.

The scenario can be summarised as:

- Moxy and water truck collide on the surface in the conveyor belt area

- A fire starts on the vehicles which then involves grease and oils for the conveyors and conveyor drives
- The tyres on Moxy prevent firefighting teams getting too close
- One of the drivers is killed in the collision (this involves the police) - the decision was made to leave him in the vehicle cab
- The other driver has a broken arm and burns
- The fire pollutes all intakes of the mine with carbon monoxide and thick black smoke
- One person breaks/injures his leg and cannot be carried; this person will be left at a first response emergency evacuation kit (FREEK) station
- Any issues with SCSR changes/donning the CMW to be incapacitated and left where the issue occurred and QMRS would have to locate

This scenario presented the following issues to be addressed:

- CMWs had to effect an escape wearing SCSRs and one team undertake a changeover to CABA
- there would be an injured CMW in the South Mains
- formation of an IMT
- callout and communication systems, (QMRS, Inspectorate ISHR and Simtars)
- QMRS attendance and deployment
- mine to establish IMT change over towards the end of the exercise
- opencut firefighting response
- interface with the police

The mine's ventilation simulation was utilised to predict the possible spread of fire contaminants from the source location. Plans were prepared for the underground assessors which indicated the contaminated air locations and the approximate predicted arrival time for the pollutants (Figure 4).

A timeline of key events and activities was recorded by all assessors and a combined exercise timeline is presented at Appendix A.

A summary of activities at each location assessed is presented in the next section of this report. Recommendations for improvement have been made in each section for industry to consider; where they are specific to Broadmeadow are listed as 'Mine'.

Appendix C contains reference material from the assessors on recommendations to assist in the running of Level 1 exercises.

Twenty four assessors took part, with representatives from Simtars, the Queensland Mines Inspectorate, Mines Rescue (Queensland and New South Wales), an industry safety and health representative (ISHR) from the Construction, Forestry, Mining and Energy Union (CFMEU), Minerals Industry Safety and Health Centre (MISHC), the Department of Natural Resources and Mines (DNRM) Corporate Communications, and mine staff from

Broadmeadow, Grosvenor, Kestrel and Grasstree mines. Appendix B contains details of the assessors.

T +1 min

O2 ≈ 18.5%
CO2 ≈ 2.5%
CO ≈ 2000ppm

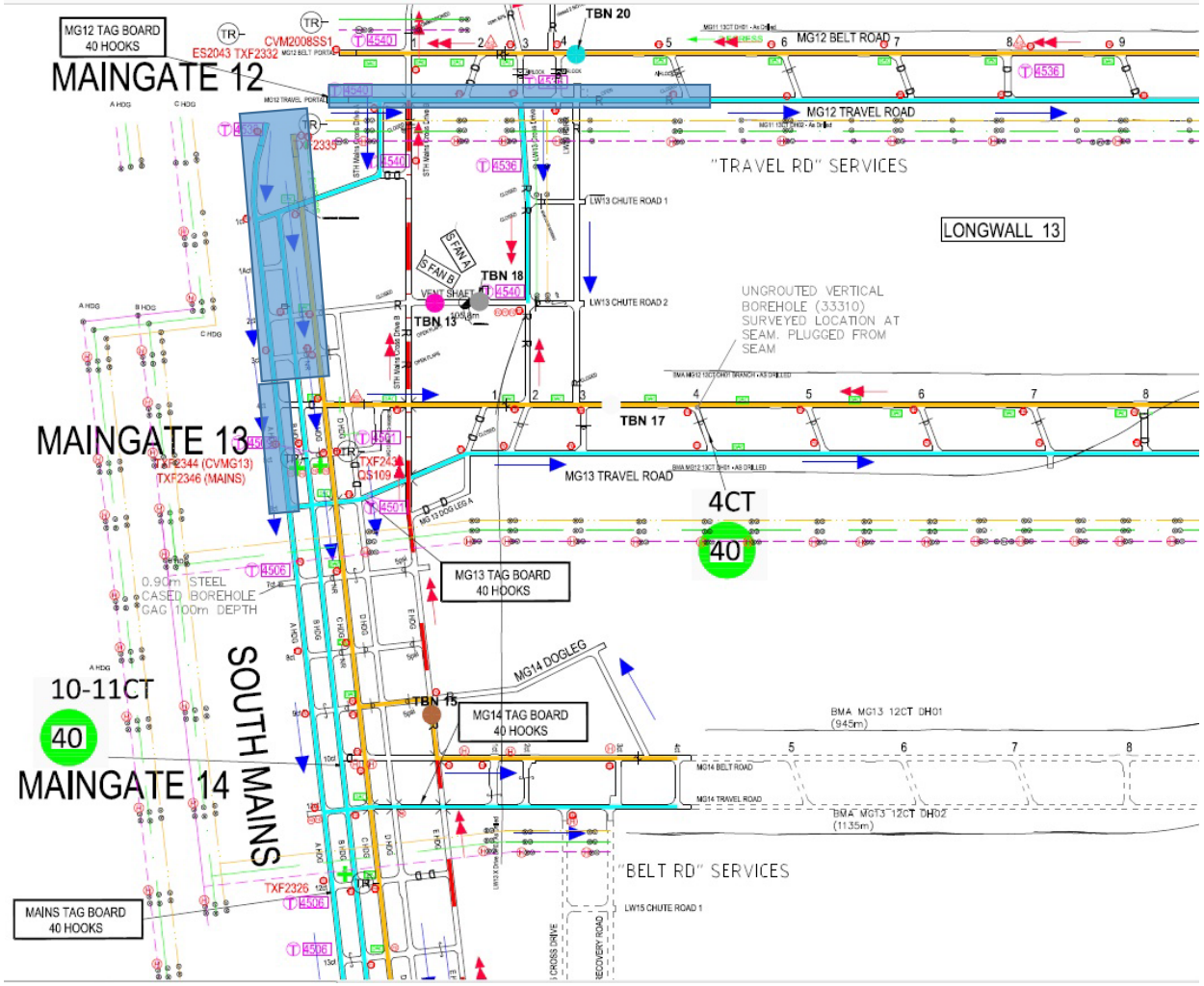


Figure 4 Smoke spread one minute after the incident

Underground assessments

South Mains development panel

Assessors: Kate DuPreez, Stephen Woods and Robin Bent (AV)

The objective of the exercise for the south mains was to observe/assess the crew donning SCSR, change over to CABA units, refilling the CABA units and evacuation process on foot. The evacuation was made more complicated by:

- Issuing the crew with darkened goggles which limited their vision
- Removing the natural leaders, the ERZC decided to wear a SCSR for its full duration and allow a second leader to take control (this meant he could not communicate verbally)
- One QMRS trained crew member was left at the continuous miner (CM) to create another person for QMRS to find when they re-entered the mine
- The other QMRS trained crew member was removed with a “broken leg” and left at the FREEK station to enable communications to the IMT and surface
- The escape route was changed to a tertiary escape route.

The South East Main crews were notified at 10:06 of smoke entering the panel and the ERZC requested gas readings — he was informed of irrespirable conditions.

The ERZC immediately withdrew the crew from the CM, and the team started donning their SCSRs. The donning of self-rescuers was proficient. The ERZC demonstrated good leadership by touching everyone’s shoulder to check if they were OK, completing a head count. At this time two crew members were “removed” from the evacuation process to become missing CMWs to be recovered by QMRS later in the exercise. The team gathered together and proceeded to the CABA changeover at the crib room at a good pace with good communication maintained and they handled obstacles easily. At this stage the lack of vision did not seem to be a hindrance.

At the crib room, the lack of visibility caused confusion and difficulties. Allocating CABA and change over to CABA was not efficient. Errors and confusion was mainly due to the lack of visibility and possibly a lack of leadership. The goggles themselves also played a role in hindering the smooth change over as they disrupted the process of putting the mask on. The teams arrived at different times from different sections of the panel, which resulted in the first team waiting until last crew had completed change over. Only two members refilled their CABA units before heading off for the evacuation.

Four crew members were under the impression that there were no more CABA and after approximately 15 mins had to be prompted by the assessor to check the other side of the FREEK station.

The ERZC and one CMW contacted control, informing them of the four injured crew members and how many CMWs were changing to CABA.

There were two CMWs at the CM being supplied with a breathable atmosphere from their “SCSR” and two at the FREEK station using CABA. One CMW at the FREEK station had a broken leg and could communicate; the others were deemed to be unconscious. Other than the difficulty changing from SCSR to CABA complicated by the issues surrounding the goggles, the SCSR donning was undertaken proficiently.

Once the changeover was complete, the crew formed a single file, with blind man's sticks, and implemented a good communication (head count) strategy of everyone having a number and shouting in sequence. This process was continually used throughout the exercise with great effectiveness. Three crew members decided to escape on SCSR's to test its effectiveness. No team member tried to use vehicles as an option.

The team communicated along the route where they were instructed to proceed to the tertiary escape route. At 9c/t, one of the CABA units ran out of air, and at no stage was the option of "buddy" considered. At this stage at least five other CABA whistles were going off. (The whistle indicates low pressure in the suit and is there to alert the wearer of the need to refill ASAP).

The CMWs refilled at the FREEK station at 2c/t B Heading. This was done proficiently under reduced visibility.

One CMW felt unwell and dizzy when evacuating under CABA with the limited vision goggles on. He took off his CABA and was tended to by the site medical team and was reported as fully recovered at the end of the shift.

Another CMW reported an injury caused by the "brittle" jockey goggles and was kept on the surface as a precaution the day after the exercise. This type of jockey goggles have been used for over 10 years in the emergency exercises. It has been decided to stop all use of this type of goggles for future exercises. Investigations will be undertaken by the committee to identify suitable alternatives, and one possibility is normal sun protected safety glasses.

Another CMW, not directly involved in the exercise, reported a twisted ankle walking in the escape route. He made a full recovery by the end of the shift.

The exercise risk assessment has been noted to ensure that these three issues are addressed in all future exercises.

What worked well?

- The evacuation went reasonably well. The SCSR donning with limited visibility was proficient and the team evacuated quickly.
- Communication was calm between team members when they were aware that the exercise would occur.
- Communication was good during the evacuation process on foot, implementing a numbering system which was used effectively providing regular head count during the evacuation process.
- The team linked up well and evacuated at a good pace and managed the obstacles i.e. ventilation doors, belt bridge etc with ease and limited visibility.
- The CMWs gave up positions for other CMWs that had whistles blowing indicating that they had reduced pressure in their cylinders and needed a more urgent top up
- Crew members did well assisting other CMWs with the head count to keep in touch with the evacuees.
- Use of actual rescuers and CABA made for a realistic exercise—crews appreciated being able to do this in a training environment.

- The CMWs who wore the SCSRs seemed to gain more confidence from using the units and knowing they got differing amounts of time from the units—most in excess of 60 minutes—even though they were uncomfortable and hot after prolonged use.

Areas for improvement

- Lack of communication present when the crew were notified that they could smell smoke. They were also shown the gas readings, but these were not written anywhere or given to the ERZC who was not there at the time.
- The control room officer (CRO) was confused with the initial communication with regard to the four members that had been “injured” as it was different from the message that they were expecting and provided instruction which confused the situation.
- Four CMWs were under the impression there were no CABA units left but the CABA units on the other side of the station were untouched. They realised after ~15 mins that they were there after being prompted by the assessor.
- The lack of visibility caused the changeover to CABA to be inefficient and some members had to remove the goggles to complete the task.
- One CMW suited up, then removed his face mask completely for reasons unknown. He was then placed unconscious because of this.
- Team members never refilled the CABA units before heading off from the crib room even though they had worn the unit for some time at this stage.
- None of the CMWs considered using the vehicle and driving out at any time.
- The team traveling on foot walked at a consistent and efficient pace. However, it was sometimes too fast for the three crew members who had chosen to remain on SCSR.
- There were a number of whistles going off when they reached the FREEK station at 2 c/t B Heading, and then again at the completion of the evacuation. One team member ran out of air and at no time was a “buddy” option considered. The fact that three CMWs had decided to wear their SCSR for the evacuation could have impacted on this result as the evacuation pace was reduced.
- The ventilation pressure differential across the air doors to access the tertiary escape route made it difficult to open the doors. There is a possibility that a CMW could be injured when travelling this route.
- Using the phone accurately with limited visibility was not effective as the numbers on the phone key pad could not be seen.
- The team was not confident in using the tertiary escape route, and had a few conversations to try and come to an agreement in which way was correct.
- The lifeline was mostly used. However there was uncertainty in the areas where the lifeline was broken.
- As the team reached the surface, no area was cordoned off with the team getting together to account for team members. There was also no water provided at this area.
- Surface process of providing debrief/counselling/area for the crew was confusing with no food and water provided.
- At no time were CMWs instructed not to use their mobile phones.

South mains injured man

Assessor: Andrew Smith

Smoke entered the south mains panel from a fire outbye of the working face. CMWs donned their SCSR and low vision goggles and made their way to the FREEK station to conduct a changeover to CABA. For the purpose of the exercise, one CMW suffered a broken leg and could not be evacuated. If the evacuating team had decided to use the man riding vehicle it would not have started for the purpose of the exercise, however the evacuating team did not consider the option of taking the vehicle and the CMW was left at the FREEK Station with a plentiful supply of compressed air.

One other CMW was also deemed to have failed in his change over and was also left at this station.

CMWs wearing CABA cannot carry a CMW on a stretcher unless it is a wheeled stretcher and therefore the two CMWs were left in a relatively safe location as the fire was on the surface. They had an adequate supply of compressed air.

Broadmeadow also has a telephone system that allows underground personnel to telephone any number in Australia. This was going to be utilised to stimulate the social media activities. When the injured CMW said he was going to telephone his wife this access was immediately suspended by the CRO.

The CMWs were in contact with the CRO and other surface personnel but no dedicated person was allocated to look after their welfare.

What worked well?

- Donning of self rescuers
- Donning of CABA
- Identification of persons within group/work area
- CMWs coped very well with long term use of CABA suites (7 hours) – both indicated at end of exercise that it was more a mental issue as opposed to a physical issue
- CRO suspended the ability of underground telephones to make external calls

Areas for improvement

- Communication between CMWs when the event occurred
- Communication between CMWs when gas make established in the panel
- Communication between Control and trapped/injured parties UG – numerous opportunities missed for information to be gathered on extent of injuries, equipment available to trapped workers and environment
- Control of communications – CMWs on the surface should not be able to ring the area where injured and trapped coal mine workers were unless authorised.

Longwall 13 preparation works

Assessors: Darren Parker, Gareth Kennedy and Damian Cavanagh

The assessor team deployed to Longwall 13. Preparation works consisted of three assessors and three Broadmeadow guides/mine escorts. There were three distinct work locations – the 13 CT contract drilling team, 20 CT Mastermyne contractors installing a conveyor belt structure, and a single CMW at 34 CT.

All three of the groups encountered similar difficulties in escaping.

The CMW from 34 CT was very fit and showed a good ability to guide himself through a gate road belt upgrade. He took 155 minutes to reach the surface; and 50 minutes under SCSR at a good walking speed and poor vision. The CMW showed good “pit sense” but was let down by poor guidance from the surface and was left to his own ability to escape.

The Mastermyne contractors had all worked at the mine for three years and were familiar with the mine. This showed in their ability to follow the route out of the mine.

Five members of the drilling team were located in the crib room at 15 CT. After being briefed, the exercise commenced at 10:06 hours. The team was advised they could ‘smell smoke’ and were instructed to wear the jockey goggles which obscured vision. They decided to don the self-rescuers immediately. One of the self-rescuers failed (suspected mechanical failure) so one member of the team opted to remain behind as an injured person. This was later investigated and found to have been heat affected and should not have been available for use.

The remaining four members of the team then proceeded to the end of 13c/t towards the belt road and instigated non-verbal communication with the control room. Communication was very difficult to begin with as the team member used the call button, instead of the response button for beeps. The control room established there were four members, and they thought they were at 12c/t and did not ask if there were any injured members present. The team were then instructed to proceed to the next DAC or c/t location.

The team found the life line and made their way out along the escape way. They had to navigate the drilling equipment as an obstacle. The life line was snagged in many places, sometimes broke, and in some cases absent. The team performed very well in adapting with these issues using the rib and other techniques to navigate.

The team missed the next couple of DAC locations as they were not clearly marked. They continued to 6c/t where the FREEK station was located. They were instructed that they were to simulate donning CABA at this point and able to initiate verbal communications via the DAC to the control room. The team were all offered to continue wearing the self-rescuers if they wished but they all decided to remove them at this point.

They used the call button on the DAC. This was ignored initially by the control room as they thought it was the other team in LW13 calling. The team persisted until there was an answer and then communicated with the control room. Further information was established including advising that a team member was left injured at 13c/t. The team were then advised of an alternate escape route as the main portal was not accessible.

The team continued following the life line to 2c/t and simulated refilling the CABA. They then returned to the tertiary escape route as instructed by the control room. They did call the control room to check in. They had to navigate for a short section between the ventilation

shaft and tertiary escape route without any lifeline but performed the manoeuvre well. They eventually found the new life line. Along the way the team found ‘do not enter’ tape crossing the roadway. However, a green tag was present instructing that access was permitted in the event of an emergency so the team continued. The team struggled with the high pressure ventilation doors along this section. Once through they continued to the mine portal and surface.

The team were met by other mine personnel and instructed to board a bus to the mine office location.

What worked well?

- The CMWs participated in the exercise openly
- The CMW at 34 CT was fit and showed very good pit sense in his evacuation
- Use of live CSE and the CMWs were competent in the donning of the SCSR and when asked to talk through the procedure for changing over to CABA seemed to have a good understanding of the changeover process
- The CMWs communicated well throughout the exercise both between themselves and the control room
- The CMWs knew the route that they had to take to escape the mine
- The use of the blind man sticks
- The team performed the self-escape exceptionally well, and coped with the need to adapt to changes
- Verbal communication with the control room officer seemed appropriate.

Areas for improvement

- Standards for FREEK stations for temp location or permanent locations And access was not standardised, nor were there any mine plan communications or whiteboards for leaving messages
- Life line broken/missing, not consistent and difficult to access (run over drill rig)
- Housekeeping around FREEK entries and around communications
- No inseam response to patient at 13c/t or to check sign of life
- Control communications very poor and instruction on process showed they were not knowledgeable of the area (turn lockout for location of CMW – lockout not wired in)
- ERZC didn’t take one gas reading on his way out or when he was asked to from control.
- Mine workers need to be reminded not to talk whilst using SCSR and utilise hand signals or writing on paper to communicate
- Lack of CT numbering in the belt road
- DAC – along MG13 they were sometimes not easily accessible and some DACs were located too high, some were not clearly visible/sign posted wearing the restricted vision goggles. At 6c/t the DAC was surrounded by pipework and other equipment, meaning the team had to climb obstacles to make a call
- Non-verbal communications were challenging for the team whilst communicating with the control room and there were potential issues around protocol and equipment failure to review

- Do not enter tape accessing the tertiary escape way caused confusion and should have been a warning tape
- High pressure ventilation doors were high risk to operate, particularly with restricted vision. The mine escort and assessor assisted with this and the single CMW was unable to open on his own.

Longwall 14 development

Assessors: Clay Brown and Brendan Iddles

There were 18 CMWs including two ERZC's in the longwall 14 development area. They were all briefed on the process to be followed for the exercise. The spare SCSRs were all located just outbye of 18 CT. A PED was received at 10:10 informing the team of an incident on the surface. One of the ERZC's contacted the control room and was instructed to evacuate.

All the CMWs boarded the two drift runners for the evacuation. At 10:17 they were informed of smoke coming into the panel and then decided to don their SCSR. This was done whilst in the Driftrunner with the restricted vison goggles on and most of the CMWs encountered difficulties in donning their SCSR.

The driver of the drift runner did not wear the restricted vison goggles but drove at a pace that the front passenger was comfortable with.

Both drivers used horn signals to communicate as they went past cut throughs and to control the movement of the vehicles.

A numbering system was decided for the evacuating CMWs and they used this to communicate with each other; that is, if a CMW was designated no 3 he always responded to assist in their communications and account for each other.

Blind men's sticks were used by the passenger to guide the vehicle out in a similar way that a roof bolt was used during the evacuation from Moura No 2 after the explosion in 1996.

Only one CMW changed over from SCSR to CABA (if more than one person had changed over they wouldn't have had enough CABA devices to recommence production). This CMW experienced difficulty in changing over to limited vision goggles, was deemed to have failed and was left as a casualty for QMRS to locate during the re-entry part of the exercise.

Most of the CMWs stayed under SCSR to get the most out of the units. This limited their ability to communicate with the surface and the control room but did provide the mine with useful information from a number of men on the experience of wearing a SCSR.

Issues were again identified by the assessors when the evacuating crew when they had to negotiate the air doors in the tertiary escape route. The issue was the pressure on the doors making opening them difficult.

On arrival at the surface instructions were given to the CMWs to go to the debrief room. This was not identified by any signage nor were any of the personnel giving instructions easily identifiable.

Debrief was undertaken using pre-prepared prompting questions. One question was the serial number of the ERZC's PGD. This had already been placed back in the charger.

The group participated openly in the debrief process. They were then instructed to go to the surface crib room and not to walk around. There were many coal mine workers in this area many of whom were walking around using mobile phones. There was no separation of personnel who had evacuated the mine from personnel who were on the surface and not evacuated.

What worked well?

- The use of blind man sticks outside the door of the Driftrunner whilst driving to navigate along the roadway out of the panel safely.
- The numbering or counting of crew members to ensure all was present before proceeding.
- Crew members communicating clearly with each other about the hazards present while traversing the mine's escape route.
- Group participated openly during debrief.
- Crew maintained single line whilst escaping.
- ERZC was at the front of the single line leading the group. The most "other confident" person was selected by the team leader, to monitor the group at the back of the single file.
- ERZC was calling out cut-through numbers, as the escaping group was passing.
- Using mine transport (driftrunners) for self-escape.

Areas for improvement

- Decision making around when and where to carry out the donning process for SCSRs. Try and avoid donning SCSR in confined complex areas e.g. back of Driftrunner. Don in an open area in a large group. This will ensure the donning process is smoother and the team leader can monitor the group in one location. (The South Mains crew donned their SCSR on the ground in a circle).
- Decision making when to carry out the change over from SCSR to CABA. This could have been done at 15ct MG14 – crib room but wasn't.
- The process of changing from SCSRs to CABAs was difficult with the limited vison available to the selected CMW.
- Obtaining and giving vital information that may be received from the CRO and/or other groups for evacuation purposes. This information needs to be relayed to team leaders of the evacuation group even if under SCSR (e.g. CMWs can use hand-written notes to communicate).
- Identifying the atmospheric conditions of the environment. ERZC's to monitor the atmosphere with their personal gas detectors (PGD), inspect real time gas monitoring systems and ask the CRO what the atmosphere is.
- The ERZC to give clear and decisive instructions to team members for evacuation purposes and to confirm each crew member in the group received the message.
- More control around persons exiting the mine to debrief.
- Did not see an escape plan at CABA locations.
- Different escaping parties from different parts of the mine end up in the same location, communicate with each other and ask questions. Different parties crossed paths and did not acknowledge each other or communicate.

Surface fire site

Assessors: David Carey and Scott Chapman

A water truck and Moxy truck full of coal were positioned at the required location to add to the reality of the situation. See Figure 5.

Mock up photographs were prepared for these two assessors to enable them to show responding CMWs the status of the fire. There was no way the heat could be simulated and CMWs were assessed as being heat affected/ burned for approaching the fire too closely and wearing inappropriate workwear. It was not until the ERT team from Goonyella-Riverside arrived that adequately clothed personnel fought the “fire”. Broadmeadow does have an emergency response vehicle on the surface to deal with surface incidents which has all the required equipment as well as firefighting apparel. This was not mobilised until late into the exercise.

Figure 5 Fire site with Moxy and water truck

Incident commenced at 10am with a collision between a water truck and Moxy truck under the 103 belt underpass adjacent to South Mains portals. Despite initial firefighting efforts by mine personnel the fire escalated and required the deployment of the Goonyella Riverside ERT members to bring it under control. High volumes of irrespirable atmosphere entered the mine and remained within the in-pit area of the mine surface.

Pictures representing the status for the fire and the smoke were shown to responding CMWs. An example is shown at Figure 6.

Figure 6 depicts the status of the fire

Aerial photographs were also prepared and Figure 7 shows the extent of the smoke for the purpose of the exercise.

All of the underground entries other than the conveyor portal to longwall 12 are engulfed by smoke in this figure.

Figure 7 fire and smoke at the peak of the fire

What worked well?

- Initial response by ERZC to manage the scene and to treat the Moxy truck operator and the initial preparation to attempt to fight the fire by mine personnel.
- The firefighting response by the Goonyella Riverside ERT
- The response by the mine ERT / first responders
- Management of potential hazard exposure for CMWs in the area by the ERZC

Areas for improvement

- Real time risk assessment prior to attempting to fight a fire needs to be more detailed to consider hazards that people may be exposed too, adequacy of equipment and provision of adequate PPE
- Hazard awareness when exposed to a large fire situation
- Timeliness of deployment of appropriate firefighting resources from Goonyella Riverside

Recommendations: underground and fire site

Mine

- Install asset protection of surface infrastructure, such as a deluge system for conveyor infrastructure that can impact underground environment if involved in a fire event.
- Hazard awareness in relation to firefighting and to emphasise this through fire training activities.
- Improve the FREEK standards to include: communications at each FREEK, designated walkway in and out, mine escape plan, first aid equipment, and whiteboards for CMWs to leave messages.
- Clearly mark all DACs with a sign and/or streamers.

  The installation and maintenance of life lines need to be monitored so that it is of a high standard. The life line is critical in low visibility escape. There were times when the life line was:

  1. broken
  2. hung up by safety clips
  3. caught on seagulls on the roof
  4. caught on a large hook
  5. running in and around cables and hoses from a drill rig
  6. tangled with belt alignment string
  7. various lengths of dropper string making the lifeline hard to reach in certain locations
  8. install directional signs in the escape ways
- Rooms allocated specifically for IMT to be clearly identified and adequately sized.
- Additional information to debrief questions

  1. ask if anyone was mines rescue trained
  2. mention employee assistance program, possibly have counsellors on site or have site personnel trained to give initial counselling/support
- Underground crib rooms to carry stretchers
- Check that CMWs can walk between FREEK and still have sufficient reserve of air in their CABA.
- Modify the ventilation doors on the escape route taken or reduce the ventilation pressure differential across them to enable them to be safely opened and closed by a single CMW.

Industry

- The risk to underground mine environment in the design of surface infrastructure should be recognised to ensure that adequate controls are included in the final design to manage potential hazards from surface fires.
- Develop skills and competency requirements of mine first responders to deal with fire events, both on the surface and in underground environments, to reduce the probability of fire events propagating to major events.
- CMWs should practice the donning of SCSR and the changeover to CABA in very low visibility. It should be emphasised in the training that it is better to don in fresh air before any gas pollutants arrive.

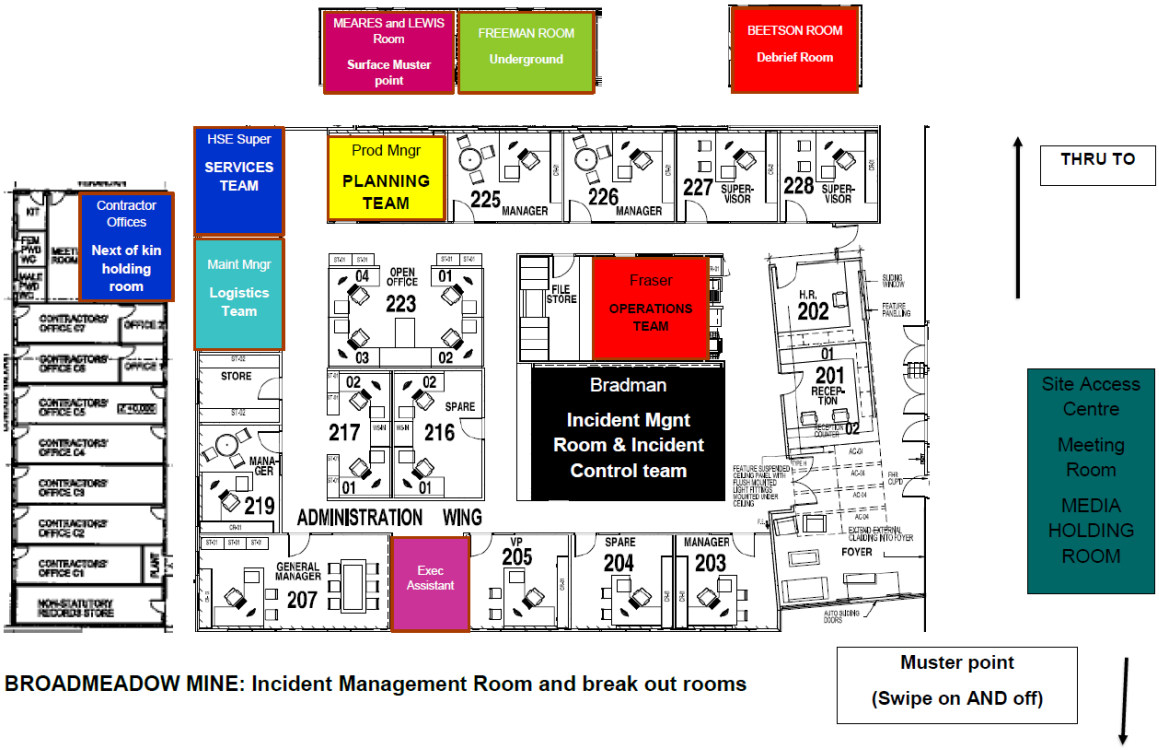
- All CMWs to practice evacuating from the mine using CABA walking at least 3 km and recharging at the standard FREEK distance. This should be conducted underground in real mine conditions at the mine.
- Develop an emergency response standard to ensure that all mines have the same:
    1. coloured escape way droppers
    2. life line protocols for cones and installation
    3. non-verbal communications
    4. communications between evacuating CMWs in their group and when the meet other groups
    5. CABA spacing
    6. CABA location ancillaries: telephones/DACs, mine plans, white boards etc.
- Control/separate evacuating CMWs from the rest of the workforce and control the use of mobile phones.
- All mines should check the ventilation pressure configuration across all doors at their mine to ensure that they can be safely opened and closed by a single CMW.
- Develop a specific procedure to address remote injury assessment for the cases where injured CMWs are able to contact control but not able to escape.
- Processes should be established to control external and unauthorised communications to and from underground.
- All mines should conduct an audit of their underground escapeways and correct any deficiencies found.

Surface assessments

Broadmeadow uses a dynamic trained system based upon the Australasian Inter-service Incident Management System (AIIMS) that is very similar to the QMRS mine emergency management system (MEMS) for emergency response. The recordkeeping and planning was all undertaken in EMQnet, a digital based system that allows the sharing of up-to-date status information with teams. Broadmeadow invested in the system after the 2016 Level 1 report identified the possible advantages of such a system. The mine has not utilised this system for managing issues such as longwall failures and has had limited practice in its use.

There are dedicated incident management rooms for planning, logistics and operations.

Figure 8 Incident management room configuration Figure 8shows the location of the rooms along with muster rooms for CMWs.



BROADMEADOW MINE: Incident Management Room and break out rooms

Figure 8 Incident management room configuration

Control room

Assessor: Peter Ring and Nikky LaBranche

A duplicate of the Broadmeadow mine gas monitoring system was established in the control room. The CRO was briefed on the system and at all times had to keep an eye on the real Broadmeadow monitoring system should any alarm occur which merited investigation. The advantage of this approach is that password access and other functionality is identical to the normal gas monitoring system at the mine. Duplicates of the mine gas monitoring system were also established in the ventilation officer's office and the IMT room.

Calls came in to say that a Moxy and water truck had collided in the pit and a fire had broken out. Smoke was entering the mine. CMWs underground were told to evacuate by the control room operator. The CRO handled location updates from escaping crews and deployments to the fire scene.

There was a trainee CRO in the room who became the assistant CRO as part of the mine emergency response. Previous level 1 exercises have recognised the need for a second person to assist in an emergency situation and this was again the case at Broadmeadow.

The shift manager was appointed as the On-Scene Coordinator (OSC), whose duties were to coordinate the first response team and resolve emergencies in an efficient manner. He was also required to provide regular situation reports (SITREPS) to the Operations Manager through the control room operator, liaise with the site QMRS team captain, and provide information and resources.

The OSC established himself in the control room and coordinated all activities from there. There was a whiteboard used to record the information which was relayed via telephone to the operations manager. See Figure 9.

There was one occasion where the IMT controller came into the control room and took a photograph of the whiteboard because there was valuable information that the IMT did not have.

At no time did the CRO or OSC enter any data into EMQnet which would have been a valuable way of updating all of the required information for the emergency response.

This activity is a possible example of the “Intelligence Cell” reported in the 2015 Level 1 exercise at Kestrel mine. The police sergeant who visited the site and evaluated the response recognised the operations, planning and logistics groups which is part of their emergency response but commented on the lack of an intelligence cell. Most mine control rooms could provide such a function as CMWs always contact control during the normal operation of the mine and will continue to do so in an emergency situation.

Linking the control room to the EMQnet system by computer and smart board access would enable this functionality to be established and ensure that up-to-date information is available to the decision makers in the IMT. This system could be used for every day running of the mine operation and not just in an emergency situation.

The CRO received a notification from the injured CMW at the south mains crib room. When the CMW informed the CRO that he planned to call his wife to let her know of his situation the CRO disabled the capability of underground telephones to make external calls.

The CRO coordinated the escape routes for underground CMWs as well as conducting information transfer via non-verbal communications protocols.

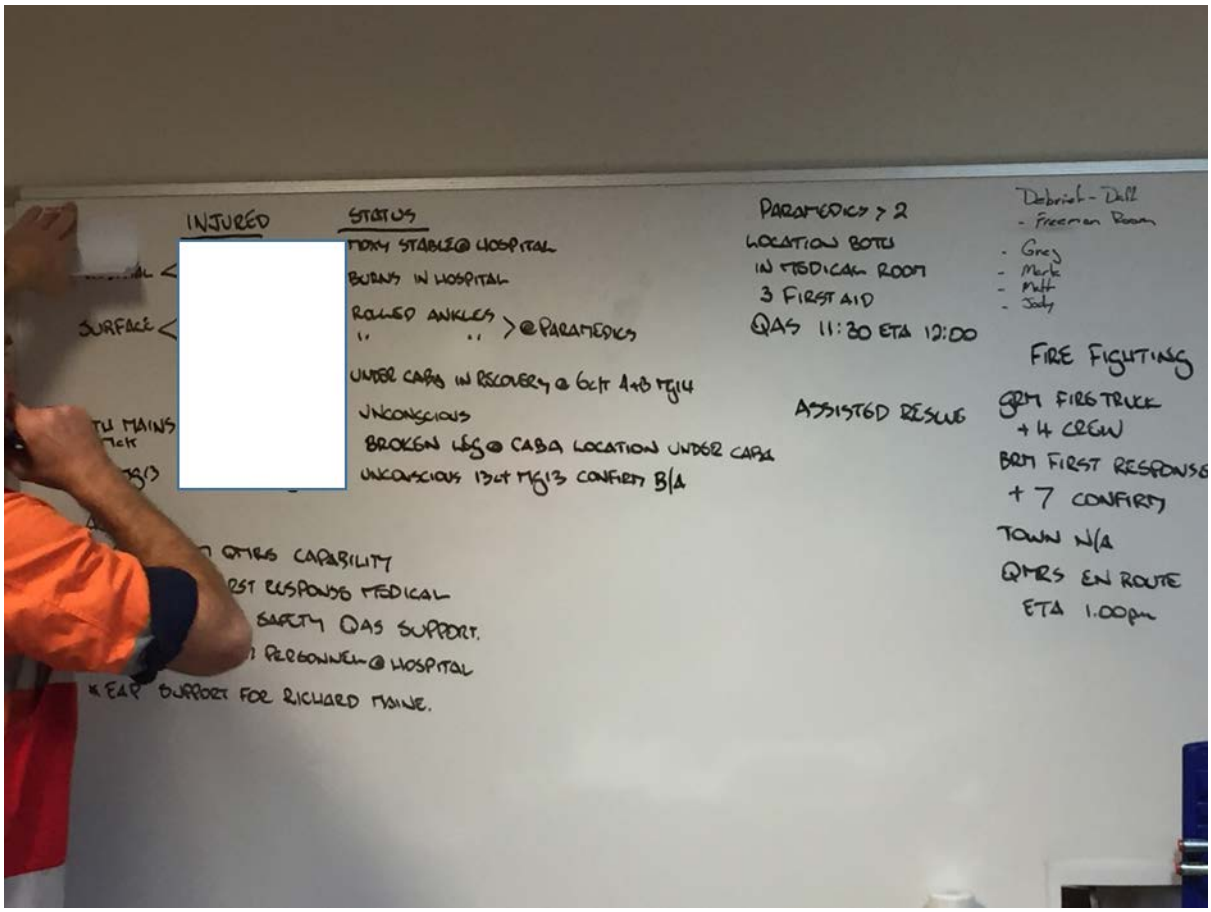


Figure 9 control room whiteboard

What worked well?

- Having three people in the control room taking calls and organising data. The control room was an important information cell for the incident. They had a whiteboard early in the exercise with the locations of all the crews and the progress of their escape and the status and location of all the injured parties.
- When the incident first happened they closed the blinds over the window and went into incident response mode.
- The control room operator realised that several of the real-time sensors hadn't alarmed in certain areas when he thought they would have. After some review it was revealed that the current sensors were only for CH_4 and didn't read CO so they didn't alarm.
- The CRO was able to advise crews of the best escape routes.

Areas for improvement

- Communications with the operations manager and IMT. The OSC was continually calling Operations with updates via phone call. It would have been better to enter data into EMQnet directly. A lot of information wasn't getting to the IMT in a timely manner.
- One of the phones was not producing the beeps for non-verbal communication so the crew just proceeded to the next one to try to talk.
- The injured CMW in the south mains kept calling from underground. The CRO requested another person to be able to talk to him and keep him calm, but no one was

found. It would have been good for the paramedics to talk to him as he had information on injured parties in his area and could update the SITREP on their conditions.

- It was 2 hours into the incident before a member of the IMT (other than the VO) entered the control room.

Incident management team (IMT)

Assessors: David Cliff and Russell Albury

There are five rooms allocated to the IMT process - see Figure 8. The larger room is the IMT room which has a large desk with mine plans covered in perspex along with two large computer screens. These are not the touch screen /smart screen type. See Figure 11.

The IMT formed very quickly after the incident started and personnel were quickly allocated duties as part of the incident management team. When the siren was activated all extra personnel on the surface had to tag off at a location outside the main offices. Various CMWs were selected from this group to assist the different teams in the incident response team. These personnel were left for approximately 40 minutes and were then moved to training room 344B/3B where they were briefed. CMWs were seen on their mobile telephones at several times during this exercise. This would have stimulated the input from social media. The site tagging system is called TAMS and there was an issue with the system account for personnel on site. At one stage the whole of the group in the holding area had to come back and tag on/off on the system to assist in the process of identifying who was where on the surface. See Figure 10.

Figure 10 Personnel at the surface tag off location

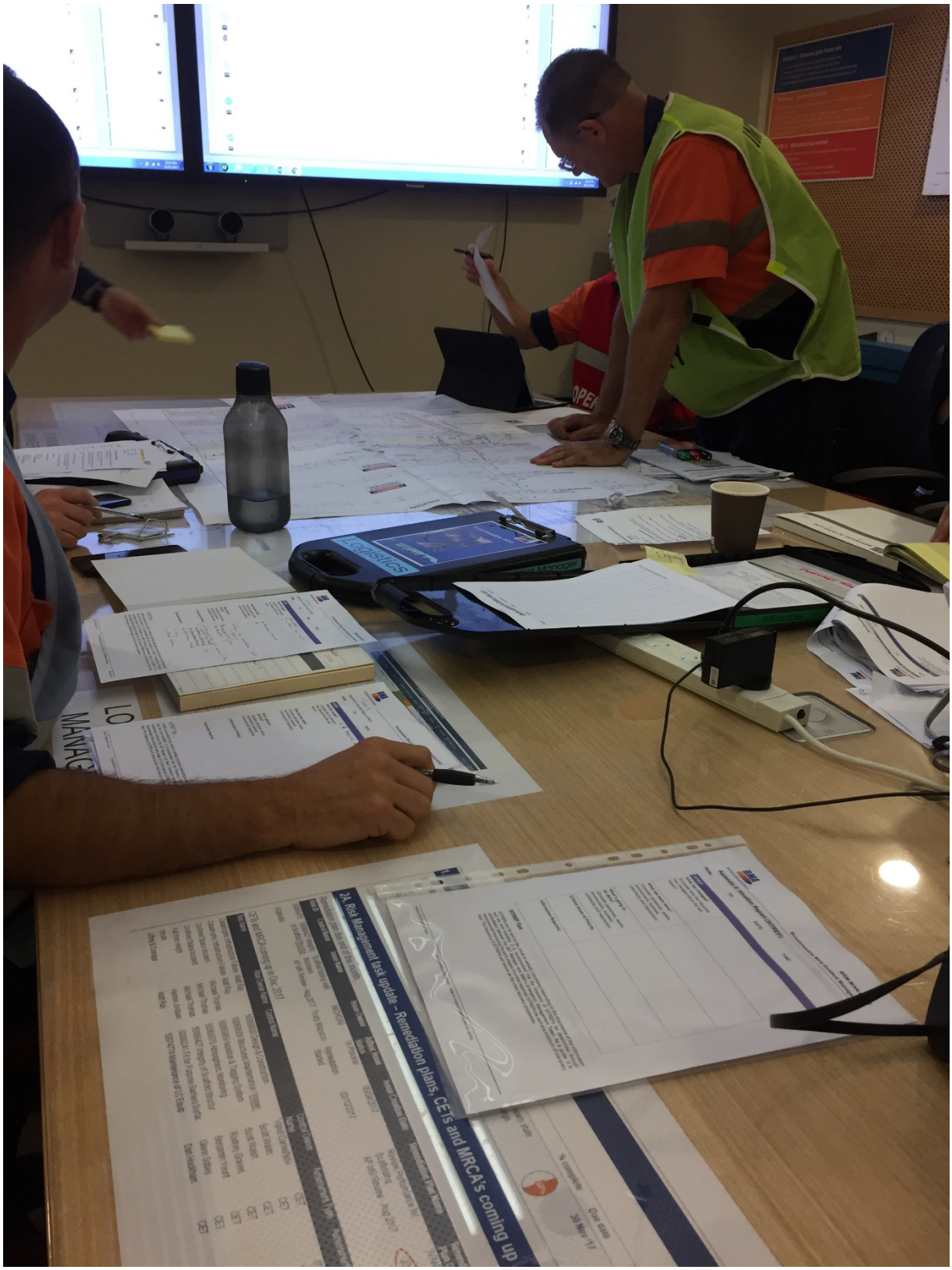


Figure 11 IMT room

The Operations room was also a small meeting room with a whiteboard and computer access. The Planning room and Logistics room were only normal offices and the ventilation group broke away to their open plan area where they could access EMQnet screens and plan scenarios as requested.

All site access is controlled by the issuing of visitor cards and at one point in the response there was a lack of spare visitor access cards that could have compromised site access.

Page 17 Entry to Site during and Emergency of the BRM Principal Hazard Management Plan version 10.0 states:
"Emergency response during an emergency situation no unauthorised persons shall be allowed access to or from site. Authorisation to access or leave site shall be via the approval of the site security officer (duty card 6.2) in consultation with the IMT manager. Access to site by external emergency services personnel arriving in organisational vehicles shall not be impeded in any way. The arrival of these personnel is to be communicated to the IMT manager. During an emergency should a regulatory official (Mines Inspector, Queensland Police Officer) arrive on site, which can prove their identity by displaying an appropriate identification badge, then these people shall also be admitted to site in an unimpeded manner and their arrival will also be relayed to the IMT manager. The IMT manager shall meet with the official at the earliest opportunity"

This particular section of the plan identifies a critical area for all mines to consider. In the case of Broadmeadow, the mines inspector was impeded in accessing the site and the police were not admitted to site. (The police had to deploy to another incident so this did not become a major issue).

One issue being addressed by the IMT was what to do with the police guns. It is a standing instruction to police officers to be in full control of their weapons and other equipment while they are in uniform. Mine sites need to address this issue because in the event of a fatality or major incident there will be a police response to the mine site and a subsequent investigation.

Some QMRS brigadesmen did not have their ID cards with them which also delayed their access to site.

The mines inspector arrived on site at 13:15 but did not get into the IMT room until 13:40 despite being assured that the site security was expecting him. A briefing was commenced by the IMT controller but was interrupted and never completed.

An IMT meeting was then held when conflicting information was provided on the number of persons missing.

Recovering the "missing persons" and the water truck operator who would now have been deceased given the intensity of the fire was not the number one priority.

After the meeting the inspector was given an update and explanation of the gas monitoring data by the ventilation officer (VO) and then was left alone in the IMT room.

The inspector then made his own way to the control room where he looked at the gas readings. On the simulation he could see from the readings that, although the CO sensors had been "poisoned", the readings of oxygen were near normal. This was explained to the VO and CRO but they stated that they were waiting for bag sample results for the gas chromatograph.

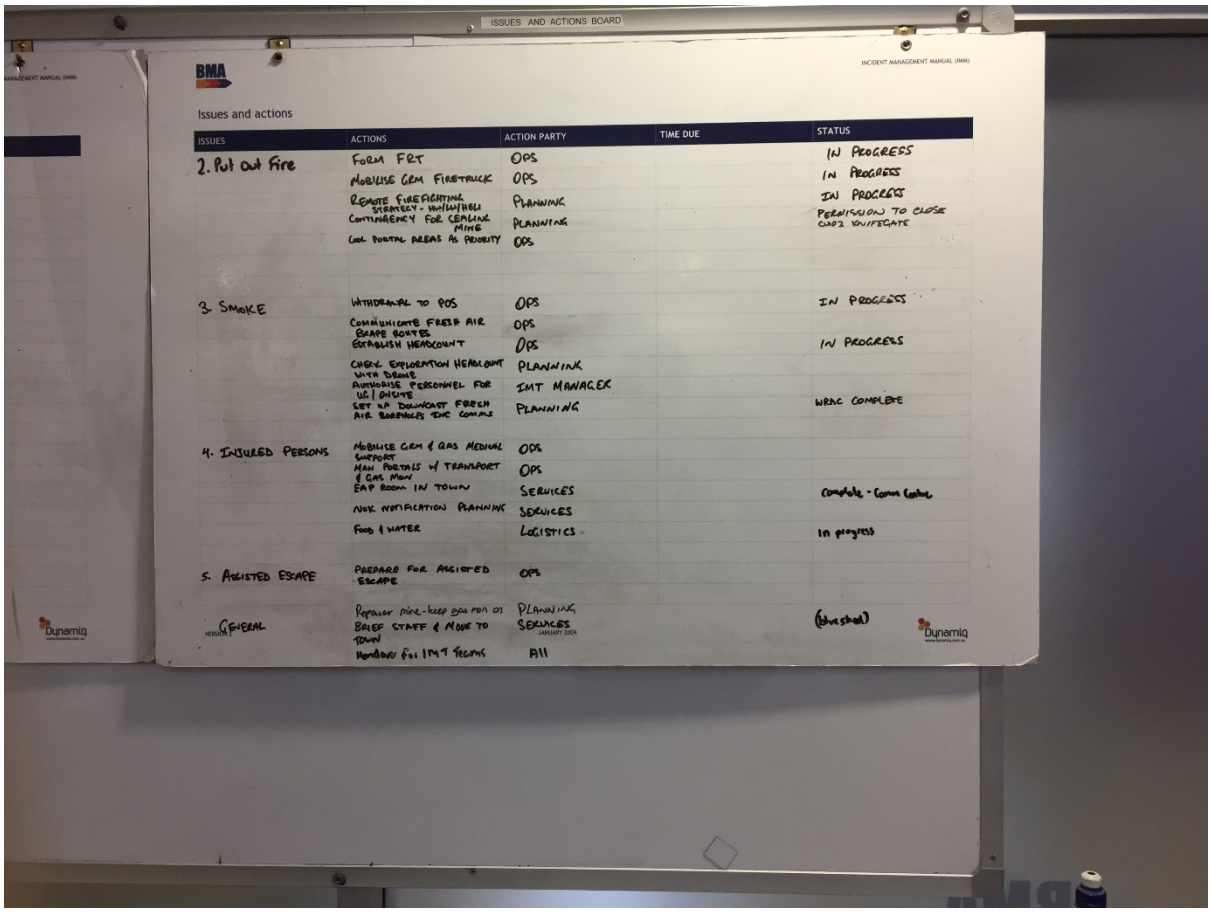


Figure 12 IMT priorities

The mines inspector then went to the Mines Rescue room where there were 20-30 mines rescue team members standing around as well as several QMRS personnel. He was informed that they had been briefed by the IMT controller that an MRAS process was being followed prior to re-entry.

At the next IMT meeting there did not seem to be any focus on recovering the missing people. There was confusion as to the status of people and the headcount was still in progress.

The inspector asked for a copy of the briefing notes being prepared for QMRS but the information was not provided.

The IMT response was well rehearsed and happened very rapidly after the start of the exercise.

What worked well?

- Regular IMT meetings were held and the status of the objectives was regularly updated.
- The incident management room was well equipped with dedicated white boards, TV screens and access to the site data highway including Safegas.
- The use of dedicated EMQnet data entry personnel was effective.
- IMT formed quickly.

- Access to the site video system allowed IMT to view the fire site and gauge nature of incident.
- The role of process checker undertaken by the Deputy IC was useful in ensuring issues were identified and addressed.
- The EMQnet computer software was utilised to record activities and decisions made within the IMT.
- The planning team provided options for solutions to scenarios ahead of time.

Areas for improvement

- It was clear that EMQnet was still being integrated into the mine emergency response plan and as such there were a number of teething problems including IT issues. For example: elements of EMQnet could not be printed as reports. EMQnet does not feature in the current Incident Management Manual supplied to the exercise organising committee (version 7A December 2016).
- It was not clear how much EMQnet was being utilised outside the IMT room. It appeared to only be used as a record keeper, and tracking allocation of actions and completion of actions rather than assisting in the decision-making.
- The rescue of injured and missing underground workers was not a priority. It may have been due to the IMT feeling that there was nothing that could be done until QMRS had arrived and organised rescue teams. The fire was defined as being beyond control quite early on which may also have contributed to this.
- The use of dedicated EMQnet data entry personnel in the various functional areas raised the question how this would have been handled on weekends or at night – would there have been a significant delay in commissioning EMQnet under those conditions? It took some time (approximately one hour) for EMQnet to become useful to the IMT, as there was a backlog of information to input. The hard copy white boards served in the interim and were the major focus of the IMT going forward.
- There were multiple communication mechanisms in place and not all were compatible, some were formal and part of the emergency response system and others informal and ad hoc. In addition, due to this multiplicity the main information recording process via EMQnet and the whiteboards in the IMT was not always current or accurate. For example: the OSC had information on the whiteboard in the control room relating to personnel injured and missing underground that did not get to the IMT till some hours into the incident and after the IC visited the control room and photographed the information on his phone. It was not until 2:40 pm that the casualty whiteboard contained a full list of injured and missing persons. It is noted that in the current duty card system it is the responsibility of the OSC to locate and identify affected persons and report to IMT (duty card 3.6 dated 1 December 2016)
- IMT did not directly track gas concentrations or smoke distribution underground relying on reports from functional groups. IMT did have direct access to Safegas if required.
- There were two large screen TV's in the IMT room, one of these could have been used to display the mine plan and current location of persons underground and whether or not they were injured – link to MINEDASH (the personnel tracking system) or perhaps the Safegas gas monitoring information.
- The delay in getting the rescue teams underground merits further investigation as they seemed to be onsite long before they were actually deployed underground. The mine had prepared MRAS for the arrival of the QMRS and QMRS quickly completed its task boards. This is important as the QMRS have been criticised in the past for the delay in

deploying teams, when it may be due to factors beyond their control. The point here is to identify the issues not apportion blame.

- As was noted at the 2016 level one emergency exercise, the EMQnet system would be much more valuable if it could be tailored to suit the emergency situations likely to be found at the mine, this includes:
    1. quick filtering of update information and quick identification of personnel emails
    2. better print functionality
    3. consider dedicated screens that track personnel status underground (missing persons etc) and gas status – integrate with MINEDASH
    4. integration with MRAS
- It would be advantageous to educate key external agencies in the operation of EMQnet so that when an incident occurs they are prepared and know what to expect and what can be accessed remotely. This may affect the way that they choose to respond.
- Site personnel were still reconciling the tag board and the onsite entry swipe card system at 13:45 to identify who was on site.
- More focus and urgency could be displayed in relation to rescue and recovery of personnel from the mine.
- Access to the mine for external people such as the police and mines inspectorate needs to be streamlined.
- The social media issues need to be given a greater profile in the emergency response at the mine.
- The mines inspector needs to be engaged by the IMT in a more considered manner

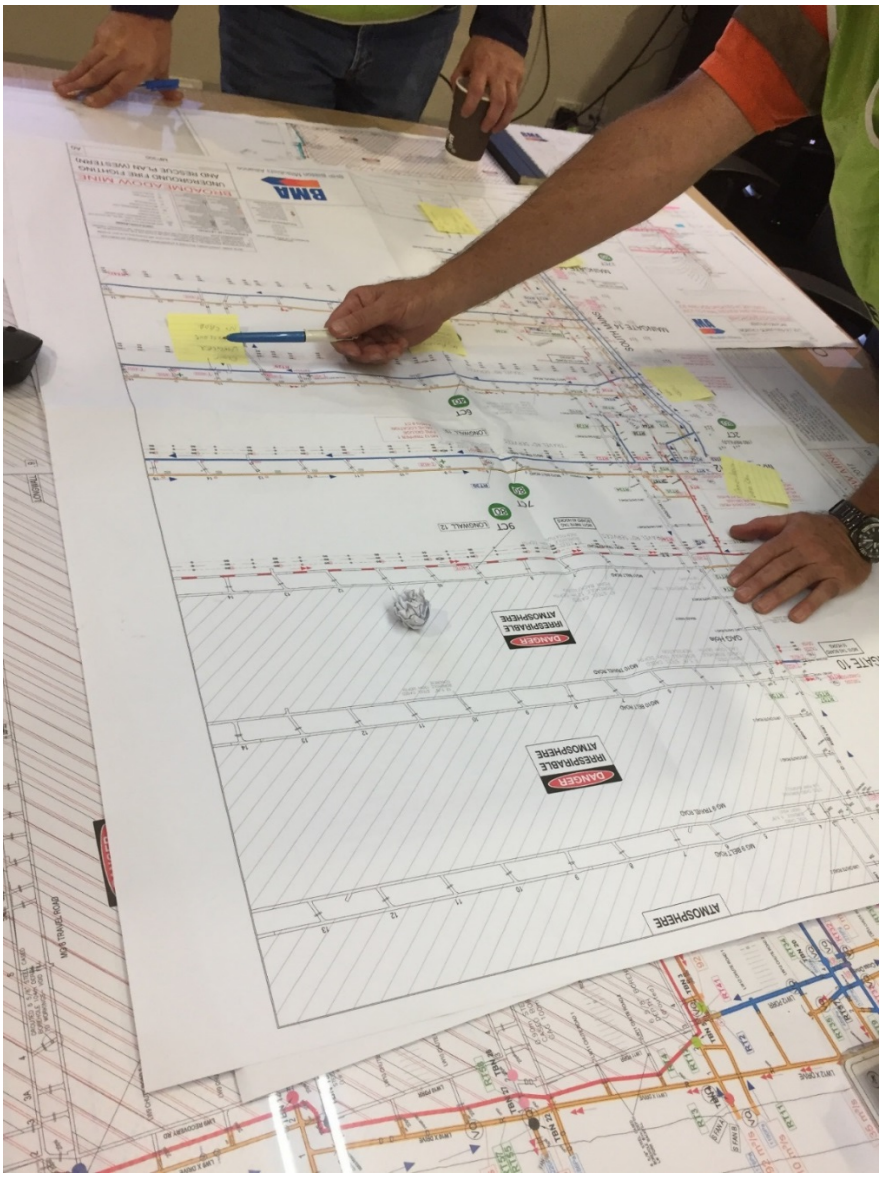


Figure 13 Post-its on mine plan

Operations

Assessor: Paul Brown and Theodore Georgia

The initial response to the emergency situation was fast and well-coordinated, but as the day progressed, the sense of urgency in the operations room dropped noticeably.

The operations team was aware of their roles and went about completing them efficiently and effectively. The team acknowledged when their processes were not working well and made changes to ensure they were completing their tasks in a timely and effective manner.

The interface with the Queensland Mines Rescue Service operations team could have been handled better and the needs of QMRS should have been anticipated earlier. For example, arranging vehicles for the rescue teams, providing up-to-date maps with last known locations and other materials which were needed for QMRS to complete their risk assessment and planning.

Overall, the operations team worked well together and completed their tasks effectively. The level one exercise has allowed them to identify shortcomings in their system and to identify solutions that can be implemented.

The intensity and urgency of the operations team was good, this momentum dropped off after the change-over was completed, this was expected but it was very evident in the different management styles.

The scribe was appointed very early, the EMQnet was being populated but the team did not go back to it to check off actions. This improved at around the 13:17hours mark. The screens in the operations room were not utilised, and was an opportunity lost.

The first 3 hours of the exercise the team were in bush fire mode, a lot of discussion, plenty of notes taken, but lacked the time to initiate all actions identified. This was a time constraint and not from a lack of trying.

The size of the room for operations was a bit small and realistically for the scale of the exercise more sub duty card holders are required to back up the operations manager.

What worked well?

- The team members were aware of their roles and were suited to the roles they were undertaking.
- The team was able to think on their feet and make effective changes to processes which were not working well.
- A list of unaccounted for personnel was established after an initial delay, but once established it was updated regularly allowing for an accurate list of personnel injured or still underground.
- There was a real sense of urgency, the team need to be commended on this, and it was a struggle as an assessor keeping up with them.
- Priorities were identified and focused on.
- The operations manager was professional and efficient.
- The support persons for the operations manager did their very best to meet any tasks assigned to them.

Areas for improvement

- The initial response was difficult because of the volume of information being communicated to the operations manager via telephone from the control room. This left no time to make decisions.
- Need to make better use of the technology available. Mostly a paper-based system instead of using the electronic emergency management system or the large screens in the room to display information.
- Need to interface better with QMRS operations to anticipate their needs.
- Consider an additional resource in the operations room for the initial response.
- EMQnet not fully utilised by operations.
- When receiving updates from the OSC the operations manager more often just used the phone in a normal manner and did not put the person on speaker phone, the operations team sat there wanting information and had to wait for the information to be reread out, and this wasted time. It inhibited the scribe from doing her job, as she had to sit and wait to get the hand written notes from the operations manager.

- Actions were not always checked off as completed fully, e.g. the issue of a head count came back time and time again through the day.
- The operations manager and duty card holder 3 did not follow all points of the duty card.
- There was little control of people coming and going especially when the operations team were being briefed or given instruction. Further into the exercise a CMW floated in and out very regularly, his presence was disruptive and it was information that should have been going onto EMQnet.
- The group lost control of the surface and underground vehicles, it was unclear who was to manage this during the exercise. This affected the QMRS deployment response.

Planning

Assessor: Cec Ivers

The IMT were obviously aware of the level 1 exercise early after the arrival of the assessors to the site.

The initiation was obviously well rehearsed and no delegation was made as people just walked into the IMT room to pick up their duty card folders. IMT was quickly formed and the initial brief was done describing the incident and possible multiple fatalities.

The planning/recovery manager was well organised and very energetic for the first couple of hours; he had a lot of spare capacity (he only had a small team) and was well organised. The scribe was very good with EMQnet and was at least asking question about status updates. She pointed out to the planning lead that he had tasks in EMQnet.

The planning/recovery manager reported back to his team but he did add information that had not been discussed with his group e.g. contacted SIMTARS

The planning group did not review EMQnet at any time.

The IMT never reviewed EMQnet at all despite a lot of good info being uploaded.

What worked well?

- The way the scribes updated EMQnet
- The setup of the status page of Broadmeadow EMQnet
- Finding out Broadmeadow could have used helicopters for firefighting within 1.5 hours
- Out of the box thinking
    - Reversing ventilation
    - Identified that the GAG holes could be a fresh air base(FAB) for evacuating CMWs
    - The use of a drone with a high powered camera to fly over the incident site
    - Helicopters for fire fighting
    - Dropping water over the end wall
    - Stopping pumps at sump 8 until the environmental advisors do a check on firefighting chemicals used
    - Using the two new ERZC to take gas reading in trench

- Using spare capacity to develop plan for restart
- Identifying structural damage for conveyor system working well
- Use of iPad/tablets.

Areas for improvement

- Not using the rural fire service as their chemical's may not be on register
- Too focused on the process and not enough focus on known injuries
- Slow reports, reading off phone when the planning manager could have been reading from big screens if they had used EMQnet
- Not using EMQnet for reviews, two screens for EMQnet, could have had a plan or MINEDASH or CITECT on the other screen or all three if required.
- Having to keep reconciling numbers of CMWs
- Allowing the mining inspector to roam and work outside the plan
- The inability for people to get in through the gate, particularly the QMRS
- Did not use EMQnet for the IMT changeover and information was not passed on
- Started to use SITREPS for report backs and then this dropped off fairly quickly
- External departments need to get EMQnet
- Big screens in breakout rooms.

Logistics

Assessor: Garry Morrissy

The Logistics group was a well-trained and functional team. From the initial siren they immediately acted by closing down site access before the completion of the initial IMT meeting. Communication and note taking from the team lead was concise and accurate. Actions were delegated efficiently and issues were resourced as required. Key areas of control were based around site access and accounting for all persons on site. Warehouse inventory including available food and water. External resources to be sourced as requested by operations and planning teams.

The facilities within the logistics room were limited because it was a normal office. A reasonable sized room with access to and the use of EMQnet should be organised.

Issues were reported with site access for the mines inspector, the police and QMRS brigades men when reporting to the mine.

The police were held at the security gate and not allowed on site. They had to re-deploy to a real incident so this was not escalated. In real circumstances all mine sites should facilitate the rapid access of the police. It should also be noted that it is a standard police instruction that when in uniform they carry their weapon and Taser. Mine sites therefore need to address this requirement in their emergency response principal hazard management plan. Should the police request/need to go to underground facilities there needs to be a place at mine sites for the secure storage of their weapons and other equipment.

It took 25 minutes for the mine inspector to access the site even though he was assured that site security was expecting him. This is unacceptable and the rapid access for key personnel needs to be facilitated in mine site emergency response plans.

What worked well?

- The relevant expertise in the team to deliver a solution to any action they received. With minimal fuss they confirmed the availability of two helicopters from Mackay capable of water bombing the fire within 1.5 hours. Attention to detail included the refuelling approval at Moranbah Airport and the available access to suitable dams for water collection. The request to implement communications at underground boreholes was quickly resolved via radio headsets being lowered. With an engineering focus the sets were tested to 300m achieving the required 260m depth of cover.
- The availability of a skilled team scribe was extremely beneficial to continually update EMQnet logistics team records.
- The use of a remote aerial drone, fixed cameras and tracking systems.
- Locating a man riding capsule at Cook Colliery for possible evacuation of CMWs out of the GAG borehole.

Areas for improvement

- Although the record keeping and communication sharing was accurate, potential stream lining of the process could be achieved via the EMQnet process. EMQnet was being continually updated as a record of events. The opportunity to use this system for immediate IMT information sharing of objectives, actions and current status at the logistics meeting would ensure accuracy. This would reduce the need for detailed note taking in meetings.
- A review of the site access process. The team found it difficult to account for all people on site including persons in the exploration area

Mines rescue response

Assessor: Peter Robbins and Darren Parker

The mine's rescue substation was activated by the site's emergency services liaison officer (ESLO) and two QMRS technicians who were onsite to conduct routine maintenance at 10.44am.

A request for mobilisation of QMRS resources was made by the mine 70 minutes after the surface vehicle collision and fire occurred at 10.00am.

Automated pages from QMRS were received by rescue trained personnel at 11.43am requesting an indication of ability to attend the mine.

The first mines rescue brigades person activated, arrived on site at 12:20 pm. By 1.26pm two six man mines rescue teams were onsite with all equipment checked available to deploy.

The QMRS operations manager arrived on site with the service trailer at 1:33 pm.

The tasks observed and assessed included:

- arrival on site
- organisation of teams and equipment
- team deployment risk assessment (MRAS)
- team briefing and deployment (search and rescue)
- FAB and team deployment.

Once an IMT decides to deploy mines rescue they need to ensure the attending QMRS operations manager is given clear and defined objectives. A rescue team cannot be deployed without due process being followed.

Following a request to assist the mine QMRS staff are required to complete a number of tasks before teams can be deployed. These include:

- understanding exactly what they are being requested to undertake
- MRAS form must be completed
- Each team's authority to enter and allocated task sheet needs to be developed and signed off
- QMRS teams had to be transported from the muster area
- team captains have to be briefed
- captains have to brief their teams
- FAB needs to be established before teams can go active under oxygen
- QMRS teams have to be transported from the muster area then deployed underground.

All of these activities take time to complete.

The QMRS substation is located in the mine office block complex. This complex sits adjacent outside the mine access trench. Once teams were deployed they had to be transported by light vehicle down into the trench to access the portals, a trip of around 10 minutes.

There were at least three occasions where informal briefings were conducted where mine site personnel provided information to responding QMRS personnel. Relevant information could be provided via EMQnet to the QMRS substation to facilitate some of this information transfer requirement which would cut down on the amount of paper records reducing the possibility of missed information.

What worked well?

- The QMRS call out system via text was tested and sufficient brigade's men were available for deployment within two hours.
- The rescue substation was activated appropriately with equipment readied for use, and duty card instructions were followed.
- The establishment of rescue teams with a good cross section of experience as well as local mine knowledge by the substation co-ordinator.
- Prefilling of site data in to the MRAS system by site personnel prior to the arrival of the QMRS operations manager.
- The site's emergency services liaison officer (ESLO) regularly updated substation co-ordinator and team captains of firefighting activities and situation within the mine prior to the arrival of QMRS operations manager. This included writing information on a large mine plan in the substation.
- As groups of additional QMRS brigade members arrived they were briefed on the situation by team captains using the mine plan. Lives at risk were emphasised in these briefings.
- The final briefing of teams by the QMRS operations manager was expedited by giving it simultaneously to the captains and vice captains of four teams.

- FAB was deployed to allow set up of a fresh air base before teams arrived.
- Three rescue teams were deployed to search for CMWs located in three different parts of the mine.
- Rescue teams had located three CMWs before the exercise was terminated.
- Mine site logistics organised multiple light vehicles to be available to transport teams to the mine portals.
- Water was provided by mine for rescue teams prior to deployment and food post deployment.

Areas for improvement

- Consider size of marshalling area and provision of seating for responding team members whilst waiting. Whilst waiting numerous team members congregated outside the rescue substation as there was insufficient space inside once five teams were onsite.
- Consider provision of seating for responding team members whilst waiting. Some team members were onsite in excess of three hours prior to deployment.
- Consider use of crew buses to transport teams to FAB. Once teams had been briefed some time was lost transporting individual teams and their equipment to the portals using light vehicles. At least two twin cab utilities were required per team**.**
- Clear, concise, structured and formal information to be provided from IMT to provide information to QMRS to facilitate deployment. Some data could be provided by the EMQnet system

Social media

Assessor: Elliott Franks

During the exercise BMA was encouraged to communicate as they would in a disaster. During the initial stage when rumours circulated on social media BMA did nothing to address any of the information. Information of the emergency would have travelled quickly to the family and friends in the local community. For example the Moranbah community Facebook group has 19,000 members. One post on this page and the locals would have been aware of the emergency.

BHP manages a Facebook page for Queensland and New South Wales. On this page, a wife of one of the injured workers asked a question. The response from the BMA team was to ignore the question and to add words surrounding the incident to the blocked word list - this could have caused more outrage in the community.

Communication from staff on site was not locked down. For example, many workers were on their mobile phones. The two injured workers in hospital were not escorted at all. During this scenario they could have spoken to the media and communicated the possibility of a fatality.

Areas for improvement

- BMA would have lost control of their message very early in the day. They would have been inundated with family members, concerned locals, media and union representatives on site.

Recommendations surface

Mine

- Review the appropriateness of the duty cards and the principal hazard management plan and associated documentation in the light of the application of EMQnet.
- Review communication paths especially from control room to OSC and IMT, to ensure consistency of information and instruction.
- EMQnet was utilised by the host mine during the 2016 level one exercise as they had fully installed it and utilised its functions to assist in the management of operational issues. This meant that key senior personnel were familiar with its operation and functions. Broadmeadow should consider similar usage.
- Use EMQnet to control minor emergencies such as issues experienced with longwall, the mine has been running an IMT on and off for some time, EMQnet would help them.
- The site needs to review duty cards as part of their own debrief, not all points of the duty cards were used and possibly should have. Is there a need to train staff in their own system?
- The Mines Inspector was obstructed for entry both at the first gate and the site access gate, which slowed him down getting in. The emergency management system needs to allow for key people coming onto site in a timely manner.
- Review the opportunity to install intake shaft communications for a potential fresh air haven.
- Consider use of crew buses to transport teams to the mine portals or FAB from the rescue substation.
- Provide appropriate mine personnel e.g. VO, surveyor, undermanager, to clarify any information required when rescue teams are being briefed for deployment.
- Consider whether underground ‘mine ambulance” can be used during simulated emergencies by rescue teams.
- Use social media to respond promptly to allay community fears.

Industry

- The issue with police and carrying weapons on the surface of the mine needs to be resolved. It is not the intent of current Queensland mining legislation to inhibit police entry to the surface areas of a mine.
- Explore wider applications of EMQnet or similar programs for emergency management.
- QMRS to explore potential communication systems for data transfer between EMQnet and MRAS.
- Develop project to allow QMRS and mine operations to interface better so that the data and information already collected by the mine can be used to complete the QMRS planning and assessment faster.
- QMRS to modify MEMS to include an intelligence cell.
- Review site access procedures to include a section designated specifically to the arrival of emergency services.
- Decide upon the design for a mobile emergency winder and arrange for emergency winding capability to be available.
- QMRS to consider breath testing and fatigue assessment for team members as part of the sign on process. If the exercise had been allowed to continue some rescue personnel would have been “at work” in excess of 12 hours having started dayshift at 6.00am prior to being activated to respond to the mine.
- Determine protocol for using site brigadesmen as part of the QMRS response who have been involved in the mine emergency i.e. firefighting or escaping from mine wearing a SCSR.

- QMRS to consider route marking protocol in relation to teams using underground man transport vehicles as part of deployment.
- MRAS system implementation process needs to be reviewed to ensure it can be implemented in a manner appropriate to the situation.

Conclusions

These conclusions have been made following the review of the exercise response by the 24 assessors. They are based on the assessor's observations of the exercise response at Broadmeadow.

Issues were identified with the conditions of the underground escape routes and also include the ventilation pressure differential across a set of air doors the CMWs had to traverse to escape the mine.

Mine site access for key personnel responding to the call out was impeded. The mines inspector, the police and the QMRS brigadesmen all experienced delays with access to the site. Whilst some of the issues with QMRS was the fact the brigadesmen did not have either identification with them this was not the case with the mines inspector, nor the police.

Some mistakes were made in the donning of SCSR and changeover to CABA, however the changeover to CABA was further complicated by the restricted vision goggles breaking and impeding the donning of the face mask.

Some of the CABA whistles were sounding as the CMWs evacuated. The contributing factors could be the fact that they did not re-charge before leaving the first FREEK station and their pace was slowed to allow the CMWs wearing SCSR to keep up.

CMWs attempted to fight the fire wearing inappropriate PPE. A first response vehicle with all the required equipment was available on site.

The mine used EMQnet for data entry in the IMT but the data was not reviewed nor were actions closed off. The IMT was not fully familiar with the use of EMQnet.

Critical data and information that was collected in the control room was not effectively relayed to IMT and some of the information did not get acted upon.

QMRS deployment was impeded by the lack of clear direction and authorisation from IMT. It was noted on several occasions that the atmosphere underground was not explosive. Key timings on QMRS deployment are:

Manning for 2 teams available	12:49
QMRS Ops managers arrive	13:33
FAB established	15:10
IC signs off action plan	15:34
QMRS deploy underground	16:00

The IMT rooms were lacking in facilities to run an effective response using EMQnet.

The mines rescue room is well proportioned and equipped however there wasn't enough space was for 30 brigadesmen to brief and kit out.

There was one CMW who became distressed during the evacuation.

Mine site staff identified that CMWs could be evacuated via the GAG boreholes, sourced a possible capsule and were looking for a crane with suitable man riding capability.

The accounting for personnel on site was complicated and prolonged. It was not until 16:16 that all personnel were accounted for. The Broadmeadow procedure also accounts for all surface personnel.

The use of nicknames in the industry also complicates accounting for personnel.

Recommendations

These recommendations have been made with the aim of providing continual improvement in the mines and states emergency response capability. Information is provided at Appendix C on issues to consider when running level 1 type exercises.

The recommendations have not been ranked in any order of priority. All mine sites and other agencies should review the recommendations and should utilise them in the gap analysis of their emergency response systems as well as audit tool prompts.

The numbering system being utilised is derived from a spreadsheet first put by Mike Caffery as gap analysis between level 1 exercise recommendations and coal mine emergency response schemes. This spreadsheet has been utilised as part of the chief inspectors initiative to form a second work group to follow up on the recommendations from task group 4 (Moura No 2 Disaster).

As this is the 20th level 1 exercise the primary number is 20. This will assist in cross referencing the spreadsheet and level 1 exercise reports.

Mine

20.01	Install asset protection of surface infrastructure, such as a deluge system for conveyor infrastructure that can impact underground environment if involved in a fire event.
20.02	Hazard awareness in relation to firefighting and to emphasise this through improved fire training activities.
20.03	Improve the FREEK standards to include: communications at each FREEK, designated walkway in and out, mine escape way plan, first aid equipment whiteboards for CMWs to leave messages.
20.04	Clearly mark all DACs with a sign and/or streamers.
20.05	The installation and maintenance of life lines need to be monitored so that it is of a high standard. The life line is critical in low visibility escape. There were times when the life line was: 1. Broken 2. Hung up by Safety clips 3. Caught on seagulls on the roof 4. Caught on a large hook 5. Running in and around cables and hoses from a drill rig 6. Tangled with belt alignment string 7. Various lengths of dropper string making the lifeline hard to reach in certain locations 8. Install directional signs in the escape ways
20.06	Rooms allocated specifically for IMT to be clearly identified and adequately sized
20.07	Additional information to debrief questions 1. Ask if anyone was mines rescue trained. 2. Mention employee assistance program, possibly have counsellors on site or have site personnel trained to give initial counselling/support

20.08	Underground crib rooms to carry stretchers.
20.09	Check that CMWs can walk between FREEK and still have sufficient reserve of air in their CABA.
20.10	Modify the ventilation doors on the escape route taken or reduce the ventilation pressure differential across them to enable them to be safely opened and closed by a single CMW.
20.11	Review the appropriateness of the duty cards and the principal hazard management plan and associated documentation in the light of the application of EMQnet.
20.12	Review communication paths especially from control room to OSC and IMT, to ensure consistency of information and instruction.
20.13	EMQnet was utilised by the host mine during the 2016 level one exercise as they had fully installed it and utilised its functions to assist in the management of operational issues. This meant that key senior personnel were familiar with its operation and functions. Broadmeadow should consider similar usage.
20.14	Use EMQnet to control minor emergencies such as issues experienced with longwall, the mine has been running an IMT on and off for some time, EMQnet would help them.
20.15	The site needs to review duty cards as part of their own debrief, not all points of the duty cards were used and possibly should have. Is there a need to train staff in their own system?
20.16	The Mines Inspector was obstructed for entry both at the first gate and the site access gate, it slowed him down getting in. The emergency management system needs to allow for key people coming onto site in a timely manner.
20.17	Review the opportunity to install intake shaft communications for a potential fresh air haven.
20.18	Consider use of crew buses to transport teams to the mine portals or FAB from the rescue substation.
20.19	Provide appropriate mine personnel e.g. VO, surveyor, undermanager, to clarify any information required when rescue teams are being briefed for deployment.
20.20	Consider whether underground ‘mine ambulance” can be used during simulated emergencies by rescue teams.
20.21	Use social media to respond promptly and allay family and community fears.

Industry

20.22	The risk to underground mine environment in the design of surface infrastructure should be recognised to ensure that adequate controls are included in the final design to manage potential hazards from surface fires.
20.23	Develop skills and competency requirements of mine first responders to deal with fire events, both on the surface or in underground environments, to reduce the probability of fire events propagating to major events.
20.24	CMWs should practice the donning of SCSR and the changeover to CABA in very low visibility. It should be emphasised in the training that it is better to don in fresh air before any gas pollutants arrive.
20.25	All CMWs to practice evacuating from the mine using CABA walking at least 3 km and recharging at the standard FREEK distance. This should be conducted underground in real mine conditions at the mine.
20.26	Develop an emergency response standard to ensure that all mines have the same: 1. Coloured escape way droppers 2. Life line protocols for cones and installation 3. Non-verbal communications 4. Communications between evacuating CMWs in their group and when the meet other groups 5. CABA spacing 6. CABA location ancillaries: telephones/DACs, Mine plans, white boards etc
20.27	Control/separate evacuating CMWs from the rest of the workforce and control the use of mobile phones.
20.28	All mines should check the ventilation pressure configuration across all doors at their mine to ensure that they can be safely opened and closed by a single CMW.
20.29	Develop a specific procedure to address remote injury assessment for the cases where injured CMWs are able to contact control but not able to escape.
20.30	Processes should be established to control external and unauthorised communications to and from underground.
20.31	All mines should conduct an audit of their underground escapeways and correct any deficiencies found.
20.32	The issue with police and carrying weapons on the surface of the mine needs to be resolved. It is not the intent of current Queensland mining legislation to inhibit police entry to the surface areas of a mine.
20.33	Explore wider application of EMQnet or similar programs for emergency management.
20.34	QMRS to explore potential communication systems for data transfer between EMQnet and MRAS.
20.35	Develop project to allow QMRS and mine operations to interface better so that the data and information already collected by the mine can be used to complete the QMRS planning and assessment faster.
20.36	QMRS to modify MEMS to include an Intelligence cell.
20.37	Review site access procedures to include a section designated specifically to the arrival of emergency services.
20.38	Decide upon the design for a mobile emergency winder and arrange for emergency winding capability to be available.
20.39	QMRS to consider breath testing and fatigue assessment team members as part of the sign on process. (If the exercise had been allowed to continue some rescue

	personnel would have been “at work” in excess of 12 hours having started dayshift at 6.00am prior to being activated to respond to the mine.)
20.40	Determine protocol for using site brigadesmen as part of the QMRS response who have been involved in the mine emergency i.e. firefighting or escaping from the mine wearing a SCSR.
20.41	QMRS to consider route marking protocol in relation to teams using underground man transport vehicles as part of deployment.
20.42	MRAS system implementation process needs to be reviewed to ensure it can be implemented in a manner appropriate to the situation.

Appendix A: Exercise timeline

Table 1: Summary of timeline for the exercise

Longwall 13 evacuation activities of the drilling contractors are shown in green; the Mastermyne team from 20CT are shown in red; and the lone mine worker from 34CT are marked in blue. This provides the opportunity to evaluate average walking speeds in reduced visibility while wearing a SCSR.

Key activities relating to the deployment of QMRS are highlighted in yellow. Key times are:

Manning for two teams available 12:49

QMRS ops managers arrive 13:33

FAB established 15:10

IC signs off action plan 15:34

QMRS deploy underground 16:00

Location	Surface Observation	Time	Underground Observation	Location
Control room	Call to CRO, truck collision, on fire. Q: Anyone hurt? A: not sure Q: Need assistance A: Yes please Q: Name Q: who do you work for A: UGL beltman	10:03		
Control room	Message to all PEDS Fire under mains belt underpass, evacuate. 6 people in control room at this point	10:05	Waited for PED message; ERZC informed us there is no service out here	34 c/t LW 14
Control room	CRO checks Safegas and identifies high CO starting to go off underground	10:06	CMWs advised they can smell smoke. Deputy immediately tells team to get off the CM, and put on self-rescuer. CMWS advised they can smell smoke	17CT SEM MG 13 13 CT
		10:08	2 members complete putting on self-rescuer	17CT SEM
Control room	CRO -> instructed to get mains evacuated, to get head count IMT to Broadmeadows boardroom	10:09	3 members completed putting on self-rescuer	17CT SEM
		10:09	CMWs given blackened jockey goggles to simulate the low visibility from the smoke. SCSR tubes were kinked and stuck together. CMWs	20c/t MG 13 travel road

Location	Surface Observation	Time	Underground Observation	Location
			use their hands to squash the tubes back in to place to give them a better flow	
IMT	IMT activated	10:10	Two CMWs put down at the CM for QMRS to "recover " later in the exercise	17CT SEM
		10:12	One SCSR fails; CMW deemed unconscious	MG 13 13 Ct
Control room	Safegas in IMT room and VO office up and running under simulation	10:13	PED message received UG stating: " Fire under Mains belt underpass"	14 Dev
Muster room	Social media initiated	10:14		
Control room	"Collision of Moxy & Water truck at CV103/CV104" Moxy driver identified with broken forearm and bruises. Water truck driver identified & still in truck. Requested firefighters to fight the fire	10:14	ERZC1 received information from control about the incident "Vehicle on fire" and evacuate from the mine. Informed control that there were 18 CMWs accounted for	14 Dev
IMT	IC established objectives 1. Extinguish Fire 2. Protect people 3. Care for sick and injured 4. Ensure no one affected by smoke. Statement made - plan for assisted escape as required	10:15	CMW advised unconscious/signs of life Drillers decide to evacuate on the belt road	17CT SEM MG 13 13 CT
Control room	Water truck driver still in truck	10:16	Message on PED fire at belt under pass fire. Reached 19c/t making quite a good pace (from 20 ct)	34 c/t lw 13 19 c/t lw13
Lamp Room	Noted 135 people showing UG on screen monitor	10:17	ERZC drives drift runner to phone control - engaged	MG 13 34 c/t
Control room	Nonverbal communications: Are you alone? 2. How many in group? 4. Correct? 3. What cut through? 12. Is that 12 c/t? Are you at 12? Out belt to surface? 3 Call at next DAC. Any injuries? 2	10:18	Reached 18 c/t from 19 CT	18 c/t lw 13
In pit	A CMW attempts firefighting and approaches fire with hose turned off and is deemed to have burns to the face and hands	10:20	CRO calls back and tells CMW to self-escape. Team started walking. The life line was snagged in the roof, so they followed piping along the rib until they found another drop-down	LW 13 34-33 c/t LW 13 13 CT
IMT	Operations room - source appropriate equipment and extinguish fire was the focus. Ensure FRT, first response team were mobilised. Notify QMRS, notify Goonyella riverside mine (GRM) for mutual assistance requirement	10:20	Reached 17c/t from 18 CT	17c/t
IMT	Discussion mobilises QMRS, paramedic, QAS, and Logistics and discussed coordination with Operations	10:21	Crew members drove in both driftrunners from 18ct to 15ct. Positive to see both vehicles were	14 Dev

Location	Surface Observation	Time	Underground Observation	Location
			using horn signals for movement control of both vehicles	
In pit	As CMWs approach water truck 2 x CMWs removed from team for attempting to fight fire with shirt sleeves rolled up due to radiation burns	10:25	Face crew arrived at Crib Room - advised that 2 CMWs unconscious and nil signs of life - Continuous miner E heading	17CT
		10:25	CMW broken leg during change over to CABA unit stays at crib room location. Only two members refilled when they left	SEM
IMT	IC rings requests GRM mutual assistance is activated	10:26	Drove two pillar the “vehicle broke down” and had to walk; decided to go the belt road and follow the life line	31c/t
Operations	Comfortable they had accounted for everyone on site	10:34		
Control room	Mastermyne called up on DAC on travel road (gave location) said they are on CABA	10:27	The lead CMW found the DAC in 17c/t in the belt road; contacted control and communicated the relevant information to control. The CMWs recognised that the belt road would have better visibility	17 c/t
In pit	Fire is engulfing the main conveyor, fire efforts from the north/east side have ceased	10:30	Use belt structure to guide his travel out CMWs at 10 CT	31c/t LW 13 10 CT
Control room	OSC priority changed, 2 people at south mains, only have self rescuer, need to call mines rescue to get the injured personnel	10:34		
QMRS substation	CMW commences pre-start checks on fire response truck	10:35	CMWs left 17c/t; found the life line pulling down from the roof as they went	17c/t
		10:36	CMWs now at 16c/t major issues with lifeline realised that DAC's are very 2 C/t	16c/t
IMT	IC contacted police - discussed CO poisoning possibilities - did not cover the driver in the truck	10:37		
		10:38	Walked pass lockout at 28c/t	28ct
social	Third social media post	10:38	CMW has issues with change to CABA deemed to be unconscious	South East Mains (SEM)
		10:39	Team missed 8 c/t. Did not see DAC point	LW 13 8 CT
Operations	IMT leader emphasised importance of 1. Mobilise QMRS 2. GRM water truck required to be mobilised to assist with firefighting	10:41		

Location	Surface Observation	Time	Underground Observation	Location
		10:43	Older CMW asked the group to slow the pace down a bit	15 -14 c/t
QMRS substation	ESLO directs two QMRS technicians to commence setting up QMRS substation	10:44		
IMT Room	IC requested a list of authorised personnel allowed on site. Action: Ensure escorts are available at gate to lead people to admin building; Update: Fire is uncontrolled, 1 x CMW fractured L/H forearm. Collision had occurred with a water truck - location to be confirmed. QMRS notified GRM response not confirmed to have been notified - in progress. QAS and QFS not confirmed to have been notified - in progress. No access by end wall portals (this means access to Mains Entry. Planning Manager- CO is off scale, no change in methane levels. Services Manager - 3 x social media posts are coming through - evacuated people are in a room on the surface - the room is overflowing	10:45	Came to a stone dust dam in the road there was no water but obviously a major trip point	15 -14 c/t
social	Social media post No 4	10:46	14 c/t contacted control. CRO gave them the best escape route out of the mine	14 c/t
		10:47	Heard a DAC at 25c/t but could not find it - too high and poor housekeeping around it	25CT
Control room	OSC comments it would be good to have a scribe in the control room	10:50	CMW has problems donning CABA and is deemed to be a casualty	14 Dev
QMRS substation	ESLO directs QMRS technicians to prepare suits and minimum equipment for two teams	10:50	No one tries the vehicle First communication with control, where the team was informed of the new escape route to be followed i.e. cannot use B-heading	South East Mains (SEM)
		10:51	ERZC attended to the casualty. The crib room did not have a stretcher. ERZC instructed to leave the casualty at that location	14 Dev
IMT	Planning Manager - brief of atmosphere content UG. Spoke of options of FAB and downcast shafts available for access. Mentioned again fire is out of control	10:51	Left 14 c/t to continue escape	14 c/t
Training Room 344B/3B	Noted that around 50% people using their mobile phones	10:52	Life line was held up on the roof and utilised blind man sticks to get the life line down	14-13 c/t

Location	Surface Observation	Time	Underground Observation	Location
social	Fifth social media post	10:54	13 c/t another "seagull" holding the life line to the roof	13 c/t
Control room	Call (messages to / from CRO are starting to get a bit mixed up at this stage). Group at 21 c/t travelling out; had to leave 1 person unconscious at MG13 13c/t	10:55	CMW at the phone (6ct) conducting non-verbal communication with control, tapping the phone against the crib room table for the "yes - no" comms. The CRO then relayed information that the portals of MG12 and south entry portals were blocked	14 Dev
		10:55	Calls CRO at 22 c/t engaged 4 calls still engaged - rang surface number 4310 CMW stated his name, location and travel route	22 c/t
IMT	Social media postings discussed, have a team in Brisbane actioning	10:56	Encountered another dam wall - this was well communicated by the team that displayed caution getting over the wall. They did communicate slippery conditions Team commenced without wearing self-rescuers, maintained physical contact - arms on shoulders / belts	MG 13 13-12 c/t MG 13 6CT
		10:57	Another dam wall encountered at the drill rig site; lots of obstacles in and around where the life line hung down. The team decided it was unsafe to go through this area holding onto the life line; hooked up to each other with the blind man sticks and came off the life line	12 c/t
QMRS substation	Fire response truck departs for pit	10:58		
Control room	16 people at 12c/t mains - heading out	10:59	Back on the life line and escaping out; 3rd guy stops wearing the SCSR as he had had enough of it	12 c/t
Control room	CMW "nickname" not accounted for. Need a real name	11:00	Going again, 21c/t try to call control via DAC could not message across	21 c/t
IMT	IMT manager - notified operations manager the Moxy driver still in cab of truck. Set priorities: 1.Fire 2. People 3. Escape 4. Rescue and assessment of risk of fire 5. Strategy required to find 2 missing CMWs in south mains	11:00	Stop walking to discuss where to go, some confusion with the new route	B Heading SEM

Location	Surface Observation	Time	Underground Observation	Location
Control room	OSC to injured CMW tries to calm him down - he is on CABA at the CABA station & can do refills. Lets him know the issue is poisonous gas (no explosion etc)	11:02	11 c/t looking for a DAC but found no DAC. The lead CMW gets tangled up on some surveyor string hanging from the roof and they have to use cutters to cut it free from him	11-10 c/t
		11:04	Team passed 4 c/t	MG 13 4 CT
		11:05	Drove in two drift runners from A6 to the panel tag board. No contact with control	14 Dev
		11:07	No DAC at 9 c/t the pace has picked up a little now due to not having to pull the life line down from the roof as another team has already escaped out this way	9 c/t
		11:10	Team reached 2c/t and called the CRO	MG 13 2 CT
		11:11	Drove to B7, Deputy 2 instructed to stop the vehicle because he could see persons ahead at the next C/T. Then asked all crew members to exit the vehicle and move to B2	14 Dev
		11:14	Made it to 7 c/t	7 c/t
Training Room 344B/3B	Manual roll call being done for aboveground	11:15	Confusion with gas stub and FREEK entry - CSE down to one bag CSE out (50 mins out CSE walk speed and older CMW)	18 c/t
		11:16	Identified the EBA at 6 c/t and questioned the last CMW that had the SCSR in his mouth of his condition - he stated he was all good	6 c/t
Control room	Should use Minedash to verify locations, we don't have manpower, should get IT person to do that	11:20	One CMW ran out of air at 6 C/t and was placed unconscious	B Heading 6 C/T South East Mains (SEM)
Control room	Injured CMW - 30 minutes since any contact; starting to sound panicked; CRO locks out all external calls from underground	11:23	CMW asked control about contact to wife - told control that his wife would know about the emergency and he needed to call her	17CT
		11:27	Leaving 6 c/t DAC and pulled down a different string line for a while; the guys then determined it wasn't the life line due to the different diameter of the rope. The CMWs then retraced the line and pulled down the right life line (the other line was some string line used for belt alignment) The team did not panic; the team used good	6-5 c/t

Location	Surface Observation	Time	Underground Observation	Location
			communication and problem solving skills to fix the issue	
Operations	QMRS ETA 1.5 hrs, contact details provided by emergency liaison officer	11:29		
Control room	CRO to injured CMW: Have restricted all calls going out. OSC: Plenty of air, plenty of time, OC coming to help with fire. Several hours to change in the fire. You can't call your wife. A liaison officer can call and talk to her	11:30		
		11:31	Last CMW comes off his SCSR stated that he felt fine but the SCSR had ran out of O_2	5 c/t
IMT Room	IMT Meeting #3 action: Logistics team to get communications to potential fresh air havens at bottom of borehole and GAG hole shafts. Ops manager states that we are no longer fighting the fire - we cannot deal with it – driver is still in the cab of the water truck. QMRS ETA 1 hr. Full brief on all underground personnel	11:32		
QMRS substation	One active rescue brigadesman arrives & 2 former brigadesmen (all Broadmeadow employees already onsite)	11:33	CMW tried to call undermanager - no answer.- control told CMW that they were working on fire - CMW advised that he had checked on unconscious CMW - control advised that they would call back in 30 minutes	17CT
QMRS substation	QMRS technicians phone QMRS Operations Manager and advise of their location and status	11:34	Leader was told to decrease his pace by the older CMW in the group he is the only one not hooked by blind man's stick with the group	5-4 c/t
Control room	Real person feeling unwell when coming out from U/G under CABA - real issue separated from Level 1 exercise	11:35	Refill CABA B2 FREEK station, communication very good. Split group according to their numbers in line, allowing members whose system was whistling priority	B Heading SEM 2C/T
IMT	Discussed all gas results - no issue with explosibility. Ventilation options discussed again. Have contacted Cook Colliery and Grasstree for options of winch cages and equipment. Checking on what's available and how soon.	11:38		

Location	Surface Observation	Time	Underground Observation	Location
Training room 344B/3B	Surface staff still not briefed on what was happening & noticed ambulance on mine site	11:40	Ring the CRO to confirm route of travel to go off the life line and continue out the dogleg. The CMWs knew the route as they had worked there	2 c/t
QMRS substation	QMRS SMS message "requesting availability within 2 hours to Broadmeadow" received by QMRS active Brigadesmen	11:43		
IMT	Media - statement yet to be approved for web site. Social media is creating issues	11:47	CMWs head into a ventilated stub just inbye of the upcast shaft they then realised it was a dead end and came out and continued outbye	upcast shaft area
Control room	CRO relief left to find out Dolly's real name	11:48	CMWs proceed past the upcast shaft	upcast shaft area
Debrief room for UG recovery	5 people now out from UG	11:50	CMWs are at 2 c/t F Hdg and identify the EBA sign, they discuss if they should fill up the CABA and were not going to do so but then decided that they should. They then grab the life line and walk against the life line to the EBA	2 c/t F heading Mains
IMT	IMT leader - priorities are 1. Communications. 2. Fresh air strategy – Borehole 3. Get phones down the shaft (GAG boreholes) 4. Send PED out re GAG boreholes 5. Need to confirm resources to plan aided rescue 6. QMRS must be briefed when they arrive	11:51	Going through the double doors at 2 c/t D to E mains	2 c/t mains
QMRS substation	Goonyella Riverside ERT truck arrives at rescue substation	11:54	Could see dropper 15m away - life line comes 10m out of FREEK	6c/t
		12:00	Crew reach main doors and air lock at MG12 cross drive which has very high ventilation pressure across the door. Door is marked with very high pressure and very unlikely to be able to be opened by 1 person alone	MG12 cross drive tertiary escapeway
QMRS substation	Minimum equipment and suits for 1 x 6 man. Rescue team checked and ready for use	12:02		
Control room	IMT deputy comes to control room for update OSC updates him; notes the "injured CMW" situation and "someone" should give him a call	12:04		
Training Room 344B/3B	IMT leader updated surface staff. Advised collision with a water truck and the truck was on fire. Looking at evacuating the people from UG. He said at Southgate Maingate 12 they can't get out and people are waiting at the portal. Several people UG can't self	12:06	Team encountered difficulty with air doors at MG 11	MG 11

Location	Surface Observation	Time	Underground Observation	Location
	escape and they will be waiting at the portal with the necessary help required. Mines rescue is on its way. Advised potentially there are people at 15 ct could have found fresh air. Also 7 ct looking at possibilities of using bore holes. Also looking at who can be released from site and will be setting up a room in town for support, info etc. Also looking at possibility of organising a night shift and asking for volunteers. Water will be provided to all shortly. Meeting finished			
		12:08	Team exited the mine at MG 11	MG 11
Control room	Phone call chasing decision on fire fight OSC to IMT scribe, need someone important to make a decision; South Mains crew out MG11 portal	12:10	CRO instructs CMW make his way to MG 11 portal chute road 2c/t and via fan shaft (no life line or escapeway dropper on route)	2ct
		12:12	CMWs identify that they are now at the MG 12 A hdg overcast and make their way outbye	F heading mains
		12:14	CMWs now cross the cross overbridge at the MG12 belt road	F heading mains
Control room	Water truck driver still in truck, 2 missing in mains, unconscious CMW	12:15	Arrived at MG11 TG machine doors. Deputy pulled the d-door cord to open the doors. Observed it being unsafe as another team could have been on the other side. The doors did not activate and it was decided to go thru the man door. Drilling contractors now at the surface muster area	14 Dev
		12:17	CMW went through another ventilation door, this door has very high pressure on it and one guys struggled to open the door	F heading mains
Security Hut	Two police officers arrive	12:20		
		12:23	Actual - issue identified with refill station line 3 - initially tagged out	17CT
IMT	Site security makes a comment that police are on site - does not inform the IMT - goes to casualty board and checks against his list and leaves the room	12:24	Life line is broken just near the LW T/G chute the CMWs find the other end of the life line and continue their escape	F heading mains
In pit	Goonyella Riverside fire crew arrives. Shown photos of fire scene. Dons CABA and wearing full turn out fire clothing	12:30	Activated the doors thinking it was a life line. Assessors stepped in, and classed as too dangerous to complete with low vision	MG12 cross drive tertiary escapeway

Location	Surface Observation	Time	Underground Observation	Location
IMT room	IMT Meeting #4. Logistics advised that: Head count issues was progressing; Borehole communications solution was being investigated; Helicopter was being sourced	12:34	Phones the CRO at 12c/t cross grade crib room (CRO informs CMW to keep wearing CABA all the way to surface) high ventilation pressure on doors - one man wouldn't able to open doors	12 c/t
Control room	Four Mastermyne personnel out of mine	12:34	CMWs reach the portal MG 11 the CMWs ring the CRO and confirm that they have made it out and awaiting a lift to the main building	T/G 11
Muster room	Police left site	12:42		
QMRS substation	Substation coordinator and QMRS technicians brief 7 x QMRS brigadesmen on current situation	12:45	CALL IN - control Mains told them that he had changed out DC suite and control told him that rescue would be on site at 1pm and that they were still fighting fire	17CT
QMRS substation	ESLO arrives and briefs Substation coordinator as follows: QMRS Operations mangers still on way to mine, Substation coordinator asks for details on patient sizes i.e. weights, and questions ESLO whether road conditions in South Mains suitable for wheeled stretcher	12:48		
QMRS substation	Two QMRS rescue brigadesmen arrive. (Now have manning for 2 x 5 man teams)	12:49		
IMT	Media strategy is now in place	12:50		
IMT	IMT leader review of objectives and establish action plan for QMRS	12:55		
QMRS substation	QMRS technicians phone QMRS; Ops manager has two teams onsite	13:00		
Operations	Information to check with IMT deputy (delegated to Debrief coordinator)	13:02		
Control room	OSC to Operations manager - the water tanker drive has no signs of life	13:08		
QMRS substation	QMRS rescue brigadesmen hold impromptu briefing on current situation. Work up a basic action plan. Two team captains assigned	13:08	Call out to control - advised to remain under CABA - advised that control was unaware of mines rescue were on site	17CT
QMRS substation	QMRS brigadesmen split into individual teams (2) and captains introduce themselves and team members and emphasise life at risk situation	13:16		

Location	Surface Observation	Time	Underground Observation	Location
IMT	IC and IMTD working out plan for mines rescue for priorities, reviewed map and person locations, IC requested to identify essential services for night shift	13:23		
V.O duty Card holder office	Operations manager walked around to V.O duty card holder office and requested the MRAS process to be activated; this was delegated to V.O duty card holder	13:23		
QMRS substation	Two QMRS operations managers arrive with response trailer	13:33		
Operations	Operations team sure they have now accounted for everyone on site again	13:35		
IMT	IC calling to find police. They were told they were on site, but can't find them	13:36		
QMRS substation	Goonyella Riverside ERT truck leaves site	13:36		
IMT	Mines inspector arrives - QMRS enter the room - IC gives QMRS a quick update & sends them for a briefing with the Ops mgr. More would have been gained by conducting a formal briefing of QMRS in the IMT. This would have allowed them to question and challenge the present state of the response	13:38		
IMT	Plan mgr - planning for re-entry, no change in gas monitoring, no further increase in methane, Inspector asks if we have got our priorities right - is the integrity of the conveyor gantry a priority?	13:46		
Meeting room (room 213)	Two QMRS Operations managers given briefing by OSC. Advised MRAS has been prepopulated and will get mine plans of panels. Suggest QMRS deploy two teams with key aim to recover 3 missing men in South Mains	13:47		
IMT	Update of EMQ Net requested by IMT leader - no one was using the screen	14:05		
QMRS substation	One QMRS Operations manager advises QMRS employee he is to establish FAB in pit adjacent to main belt	14:05		
Outside QMRS substation	ELSO provides Sitrep to 2 x 7 man QMRS teams. Fire on trucks contained (still smouldering) - number, location, lamp no's and condition of missing men	14:07		

Location	Surface Observation	Time	Underground Observation	Location
Meeting room	Two QMRS Operations managers briefed by VO and Operations team leader. Commence reviewing MRA documents and preparing Authority to Enter permits and team task sheets	14:10		
Outside QMRS substation	IC leader addresses MRS brigadesmen. Thanks them for attending; asks group to come up with a strategy to recover missing men	14:16		
Logistics office	Logistics team meeting #5 - Action: ERC requested priority for a bus, light vehicles and escorts for Mines Rescue teams. IMT leader requested confirmation of numbers of people on site. Logistics leader confirmed this was not complete for all surface personnel. Action: continue head count process and filtering via excel. Verify assessors, QMRS	14:20		
QMRS substation	QMRS teams one and two discuss potential deployment strategies amongst themselves	14:20		
V.O duty Card holder office	OSC briefing with QMRS. Plan referenced to last known locations of persons discussed, this was done without referencing EMQ net or hand notes. Advises QMRS operations manager no driftrunners available on surface for teams to take underground. Advises driftrunners left underground during mine evacuation process	14:32		
IMT Room	IMT meeting #6 (no Mines inspector in room until 14:53). Logistics update confirming that security is out of visitor tags and manual list being populated. 56 people still unaccounted for on surface, all underground accounted for via interviews and Minedash IMT leader questioned status of borehole headsets - Logistics to confirm	14:47		
QMRS substation	Two by six man QMRS Rescue teams sent to lamp cabin to obtain cap lamps	14:50		
IMT	QMRS are ready to deploy, have 16 members on site	14:59		
IMT	QMRS are believed to be moving. IC get MRAS and sign off. Teams seem to operate in silos. IC had to physically sort making vehicles available to QMRS to	14:59		

Location	Surface Observation	Time	Underground Observation	Location
	enable deploy underground by visiting three different rooms and arranging them			
QMRS substation	FAB officials depart for FAB opposite LW 12 portal low wall side of main belt	15:06		
In pit	FAB set up	15:10		
Meeting room 225	IC leader arrives. Asks QMRS operations manager "what is mines rescue's status?" QMRS operations manager advises that without driftrunners teams can't get to 17c/t south mains from FAB due to distance. IMT leader departs to organise vehicles for teams	15:15		
Meeting room 225	IC leader returns. Discusses QMRS deployment plans. Advises of location of 2 GAG holes (7 c/t South Mains & in MG 13) which are down casting fresh air and could be useful fresh air refuges	15:20		
QMRS substation	Four teams ready but nobody down yet	15:23	Call in from CRO - advised that rescue teams deployed	17CT
V.O duty Card holder office	OSC briefed QMRS on transport locations underground	15:25		
Operations	Lamp room attendant highlighted again a discrepancy in the reconciliation of lamps vs tags	15:27		
QMRS substation	QMRS Operations manager briefs four rescue team captains & vice captains. Sitrep given on number of missing men, locations, status, background gas levels (only tube bundle now as real time sensors poisoned by high CO levels) and use of vehicles (must pick up in pit). Confirm FAB is opposite LW 12 portal.	15:30		
Meeting Room 228	IC signs off QMRS authority to enter and captains task sets	15:34		
QMRS substation	Rescue teams depart for FAB in fleet of twin cab utes. 2 utes required per team and only 5 utes available	15:45		
In pit	First mines rescue team arrives at FAB	15:55		
QMRS substation	First team goes down	16:00		
South mains transport portal	Team 2 pass two driftrunners parked adjacent to portal. Neither vehicle checked to confirm availability	16:09		

Location	Surface Observation	Time	Underground Observation	Location
Logistics	Logistics mgr - Full reconciliation of the head count finally achieved	16:19	Team 2 - have difficulty contacting FAB by radio. Return to FAB. Left reel at B 2c/t	South mains - B hdg 2 c/t
		16:27	Team 1 depart FAB	FAB -
		16:34	Team 2 - return underground	South Mains - Transport Portal
		16:35	Team 3 - arrive portal. Contact FAB by phone	South mains - Transport Portal
IMT	New IC - key focus to get people out from underground	16:38		
		16:44	Team 2 - locate CMW. Read tag on CMW (assumed deceased). Contact FAB by radio	South mains - B hdg 6 c/t
		16:45	Team 1 - arrive and take over casualty assessment	South mains - B hdg 6 c/t
		16:50	Team 2 & 3 arrive. Captains identify 2 x driftrunners and decide to take 1 Driftrunner per team and head inbye. Depart for 17 c/t	South mains - B hdg 7 c/t
		16:54	Team 2 departs 7 c/t in Driftrunner for 17 c/t	South mains - B hdg 7 c/t
		16:59	Team 2 locate a CMW in Crib Room 17c/t C hdg. Commence assessment	South mains - C hdg 17 c/t
		17:00	Team 2 locate 2nd CMW in Crib Room 17c/t C hdg. Find no signs of life	South mains - C hdg 17 c/t
		17:02	Team 3 arrive 17 c/t B hdg	South mains - B hdg 17 c/t
IMT	Exercise closed (underground personnel now approaching fatigue limits)	17:03		

Appendix B: Assessors

Russell Albury | Chief Inspector of Coal Mines, DNRM

Russell Albury is currently the Chief Inspector of Coal Mines. He is employed by the Queensland Government and his primary role is to assist the industry to operate safely through compliance with the mining safety legislation.

He commenced mining as a cadet manager in the Ipswich area in 1980. He has a first class mine manager's certificate of competency in coal and has worked at coal mines in Ipswich, the Bowen Basin and the Hunter Valley.

He has fulfilled a number of positions in the industry managing mines at Alliance and Glennies Creek in the Hunter Valley.

Russell has a graduate certificate in Risk Management from Griffith University.

He joined the Inspectorate in 2012 and has worked as Senior Inspector of Mines and Deputy Chief Inspector of Coal Mines before being appointed to the Chief Inspectors position.

Robin Bent | Senior AV Designer, DNRM

Robin has been the videographer and photographer for the last three emergency exercises.

Clay Brown | Shift Supervisor Kestrel Mine

Clay Brown has been the Shift Supervisor on A crew at Kestrel mine since 2014. He was recently seconded to the Longwall Relocation team to co-ordinate the install and take off of LW405. He was appointed as a Deputy at Kestrel Mine in October 2006. Clay has operational experience in mains development and some longwall operations. Prior to becoming a Deputy, he was a coal mine worker.

Paul Brown | Inspector of Coal Mines, DNRM

Paul has considerable operational experience having worked underground from 1984 to 2015 as a Deputy, Shotfirer, Undermanager, Undermanager in Charge, and Superintendent. Paul is mines rescue trained and has 6 years experience with the Queensland Rural Fire Service.

Paul has participated in L1, 2 and 3 exercises. He has completed the Advanced Diploma in Mine Management and is currently preparing to sit a law examination in preparation to sit a First Class Mine Managers certificate of competency.

David Carey | CEO, Queensland Mines Rescue Service

David commenced as CEO for QMRS in late 2014. A Mining Engineer with 39 years experience in underground and open cut coal mining, he has held roles in general management, mine planning and mine management in NSW, QLD and Indonesia.

Qualifications include BE (Min) Hon, statutory qualifications as mine deputy, undermanager, coal mine manager, Queensland site senior executive and an MBA in Technology Management.

Damian Cavanagh | Longwall ERZ controller Grasstree Mine, Anglo-American

Damian Cavanagh started in the coal industry in 1991 as apprentice fitter at Capcoal German Creek open cut. Throughout his apprenticeship he worked at both central and southern collieries underground coal mines. He worked at all five of the Capcoal underground coal mines. He gained his deputy level of competence in 2008 while working at Bundoora colliery. He now works at Grasstree on the longwall as ERZ controller.

Scott Chapman |

Scott Chapman has over 25 years underground coal mining experience commencing in 1984 at Laleham Colliery. He obtained his deputy certificate of competency in 1989, Diploma of OH&S 1990 and has five years QMRS service. He is currently studying for his 2nd class certificate of competency. He has operational experience at 10 underground mines in Queensland he is currently a Shift Supervisor at Kestrel mine.

David Cliff (Organising Committee and IMT observer) | Professor of Occupational Health and Safety in Mining, Minerals Industry Safety and Health Centre (MISHC) University of Queensland

David Cliff has been Professor of Occupational Health and Safety in mining since 2011. His primary role is providing education, applied research and consulting in health and safety in the mining and minerals processing industry. He has been at MISHC for over 14 years.

Previously David was the Safety and Health Adviser to the Queensland Mining Council, and prior to that Manager of Mining Research at SIMTARS, providing expert assistance in the areas of health and safety to the mining industry for over 26 years. He has particular expertise in emergency preparedness, and fires and explosions, including providing expert testimony to the Moura No2 Warden's inquiry, the Pike River Royal Commission and the Hazelwood Mine Fire Inquiry. He has also attended or provided assistance to over 30 incidents at mines involving fire or explosion.

Kate DuPreez | Commissioner for Mine Safety and Health, Queensland Government

Kate DuPreez is the Queensland Commissioner for Mine Safety and Health. Kate has more than 20 years experience in the mining industry in Africa and Australia, including working in underground coal mines and in management positions. She holds a Bachelor of Science in Mining Engineering and was the first woman in South Africa to hold a mine manager's certificate of competency in coal mining. As a miner herself, Kate is passionate about the mining industry and is a strong advocate for mining safety and health issues.

Elliott Franks | Social Media Manager, DNRM

Elliott Franks is the Social Media Manager for the Department of Natural Resources and Mines. He has been working in social media for more than 15 years. He specialises in community engagement and disaster responses.

Theodore Georgia | Manager Stakeholder Coordination

Theodore Georgia is the Manager, Stakeholder Coordination in the Office of the Commissioner for Mine Safety and Health. He has regularly participated in state-wide emergency responses as part of the State Disaster Coordination Centre and in the Department of Health State Health Emergency Coordination Centre. Theodore has more than 15 years of experience in media, communication and social media roles in the Queensland Government and private sector.

Rodney Graves | Compliance Superintendent Broadmeadow

Rodney started his career in mining as an apprentice fitter in 1996 and subsequently worked at various underground mines. From 2001 he undertook multiple roles at Kestrel mine including Compliance Supt, Development Co-ordinator/ ERZC, Production ERZC until 2011. In 2015 Rodney transferred to Broadmeadow in his current role.

Brendan Iddles | Shift Undermanager Kestrel Mine

Brendan has over 15 years mining experience working in different roles at Broadmeadow, Grosvenor, Cook, Crinum and Kestrel Mines. He is currently employed by Rio Tinto at Kestrel Mine as a shift Undermanager.

He has operational experience in longwall, development and outbye fulfilling the roles of operator, supervisor, coordinator, deputy and shift undermanager

Brendan has completed all studies for 2nd class mine managers' certificate and is currently preparing for oral examination early 2018. He is a passionate mines rescue member; is currently the team captain of Kestrel's mines rescue competition side and has competed in Australian and international mines rescue competitions.

Cec Ivers | Underground Mine Manager Grosvenor Mine, Anglo-American

Cec Ivers has over 30 operational experience in longwall coal mines and has been a mine manager for over 15 years. Cec used to operate a contracting company undertaking outbye works including the installation and upgrade of tubes for tube bundle gas monitoring systems.

Sharon Jones | Senior Administration Officer, Simtars

Sharon has been at Simtars for 10 years and was responsible for the coordination of all activities to prepare and organise the other 23 assessors to ensure the efficient running of the L1 exercise.

Gareth Kennedy | Director MSTRC, Simtars

Dr Gareth Kennedy is the Director of the Mine Safety Technology Research Centre at Simtars. He holds a degree BEng (Hons) Electronic Engineering, and a PhD in Mining Engineering. Gareth and his team are responsible for providing mine technical support services, consulting, research and development for the industry. Gareth has 15 years of experience working in both the coal and hard rock mining. He has held public and private sector roles in Australia and the UK, and in managing large-scale research projects. He has particular expertise in mining safety technology, mining automation systems, underground communications, energy management systems, instrumentation and telemetry.

Nikky LaBranche | Principal Mining Engineer, Simtars

Nikky LaBranche recently joined Simtars as Principal Mining Engineer. She has 10 years' experience in surface and underground coal through her work in the US, Colombia and Australia. Her research interests include human factors, lost-time injuries, self-escape, and built in-place shelters. During her time at Simtars Nikky has written a virtual reality self-escape from underground coal training module. Prior to her current position Nikky has worked in various mining engineering roles for BMA Coal, NIOSH Office of Mine Safety and Health Research and Drummond Company.

Garry Morrissy | Undermanager Grosvenor Mine, Anglo-American

Garry has over 20 years' experience across six underground mines in Queensland and NSW. An Undermanager qualification and a Master's Degree in Occupational Health and Safety, Garry has held management roles in operations, projects, health & safety as well as the petroleum and gas industry managing coal mine interactions.

Darren Parker | Rescue Coordinator, Newcastle Mines Rescue Station

Darren has been employed by the NSWMRS for over 11 years and has 31 years of industry experience. He is currently Rescue Coordinator and second in charge at Newcastle Mines rescue station.

Darren has responded as a Mines Rescue Duty officer to a number of incidents in Newcastle district, and has been a member of the Australian Mines Rescue competition committee for 9 years. He is a

member of the NSW Mines Rescue standardisation committee and was involved in the review of MDG 1029 (guidelines for agency coordination during emergencies and body recovery at NSW mines).

Peter Robbins | Training Co-ordinator, NSW Mines Rescue Service

Peter is a Mining Engineer with 37 years' experience in underground coal operations in the Illawarra coalfields. He has spent time in both technical and production functions including Mine Manager, Undermanager & Ventilation Engineer.

Peter holds tertiary qualification in the areas of mining engineering, geology, mine ventilation, adult education and occupational health and safety as well as statutory qualifications of mine deputy, undermanager, coal mine manager and ventilation officer.

He has been involved in mines rescue for 34 years and participated in numerous simulated emergencies providing input into the planning, running and assessment of the events from both the industry's and mines rescue perspective.

Andrew Smith | Principle Investigation Officer, DNRM

Andrew's role in DNRM is to assist in the co-ordination of nature and cause and compliance investigations and emergency responses to mines in conjunction with regional personnel. As well as assisting in the investigations into mine fatalities and serious injury accidents at mines throughout Queensland.

He was previously employed with the Queensland Police Service (1989 - 2010) where he attained the rank of Detective Sergeant leading investigations for a wide range of criminal offences, child abuse and major incidents.

Martin Watkinson (Chair of the Organising Committee) | Executive Mining Engineer, Simtars

Martin is the Executive Mining Engineer based at Simtars providing technical assistance to the Australian mining industry in the fields of ventilation, gas monitoring, emergency response, risk management and developing safety management plans.

Martin has been involved in the level 1 mine emergency exercises between 2001 and 2008 and was the Chair of the committees for the 2006, 2007, 2013 and 2014 exercises.

Between 2007 and 2013 Martin worked for Vale and Adani in senior management roles. He has provided emergency response advice and coordinated emergency exercises in Queensland, New South Wales and New Zealand.

Stephen Woods | Industry Safety and Health Representative, CFMEU

Stephen started as an apprentice fitter and turner with Coal Resources of Queensland (Cook Colliery) from 1988. He has worked at Mount Isa Mines and later North Goonyella where he worked in several roles including Fitter, Washplant operator, ERZ controller and Site Safety and Health Representative (SSHR).

From 2012 Stephen was elected as ISHR and is the CFMEU member on the level 1 exercise committee.

Appendix C: Things to consider when organising an emergency exercise

Recognised Standard 8 defines that an audit approach should be taken in developing the scenario for a level 1 exercise. The time frame available for the exercise is one shift.

The standard requires the underground deployment of QMRS. Given that this will take a minimum of four hours, only certain elements of the mine's and States' emergency response system can be checked every year.

Previous recommendations have been made to split the underground deployment of QMRS away from the level 1 exercise. This would enable a full test and interaction of ISHR, Inspectorate at the site IMT meetings and a separate underground deployment could be conducted with deployment sheets and MRAS completed thus not delaying the underground deployment.

Every year the assessors identify ways to improve the exercise. These are presented here to help guide other organisations in their preparation of such exercises.

Many mines that have had exercises held on day shift during the week do not fare well in the assessor's review of the incident management process.

These are the issues that the 2017 assessors identified as possible things to consider when preparing for an emergency exercise.

- Prepare likely gas scenarios for surface areas of mine effected by the fire so that a consistent story is portrayed to the responding mine workers.
- The mine IMT staff will learn more if they do not know the date and time of the exercise. Key people who know will plan their day around it.
- More radios and/or better batteries needed for communication between assessors on the surface.
- Lollies for underground assessors. These are provided for the assessors but also go down very well with personnel after evacuating the mine.
- Do not use the normal smoke goggles with the CABA units. There was an eye injury from the use of these goggles with the CABA face masks. Possible solution is to use the CSA goggles as they are more close fitting and able to be blacked out without damaging the CABA masks.
- The exercise had to be ended due to some underground personnel getting close to fatigue limits.
- Two observers to cover mines rescue activities. One to observe substation and team deployment, the second to observe QMRS Operations Managers, IMT and FAB operations.
- Provide mines rescue teams with details of underground atmosphere i.e. gases and visibility, in real time once they deploy underground.
- Improve the standard of details on information tags left on casualties underground to ensure they are clear and concise.

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