Resources Safety & Health
Queensland

2020 Level 1 exercise

Held at Moranbah North coal mine

Monday 6 December 2020

Contents

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Abbreviations and glossary

Term	Definition
Afterdamp	Old terminology for gases found in underground coal mines post explosion normally nitrogen, carbon dioxide, carbon monoxide and low percentages of oxygen
Approved standard	A standard made for safety and health under the repealed *Coal Mining Safety and Health Act 1925* stating ways to achieve an acceptable level of risk to people arising out of coal mining operations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
CH_4	Methane
CITECT	Brand name of SCADA system
CO	Carbon monoxide
CO_2	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, and 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	Direct audio communications 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
DNRME	Department of Natural Resources, Mines and Energy

Term	Definition
Drift runner	Brand name for a flameproof diesel powered man-riding vehicle carrying up to 12 personnel. Sometimes interchanged with PJB which is a different brand.
Downcast	Shaft of bore hole where air enters the mine. Sometimes referred to as an intake shaft.
Eimco	Brand name of a flameproof diesel powered mechanical loader. Can be referred to as a load haul dump (LHD) machine
EMP	Emergency management plan (interchangeable with ERP)
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 (GC)	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 plan
IAP	Incident action plan—developed by the IMT and signed off so that each of the teams, logistics, operations and planning have clear direction
ICT	Incident control team
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	A person who is appointed under section 109(1)5 of the *Coal*

Term	Definition
Health Representative (ISHR)	*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
Intake (roadway)	A name or fresh air as defined in the coal mine regulations
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 retreated 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 which controls the mines inspectors
MEMS	Mine Emergency Management System
MRAS	Mine Re-entry Assessment System
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 vehicle carrying up to 12 personnel. Sometimes interchanged with Driftrunner which is a different brand.

Term	Definition
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 people arising out of coal mining operations
Return (Roadway)	Name for air that has ventilated a working face often contaminated with heat, dust and gases
Rib	The solid coal on the side of a gallery or longwall face; a pillar or barrier of coal left for support
Safegas	Brand name of a mine gas monitoring system (developed by Simtars)
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
Undermanager	Mineworker who is in charge of the mine on a shift basis (i.e. shift supervisor)
Upcast	Shaft of borehole where the air leaves the mine. Sometimes referred to as a return shaft
Ventsim	Ventilation modelling software
VCD	Ventilation control device—an air door, stopping, seal or brattice
VO	Ventilation Officer—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 2020 Level 1 Emergency Exercise Organising 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 2020 Level 1 Mine Emergency Exercise. In addition, the committee would also like to thank Moranbah North coal mine for participating in the exercise and providing self-contained self-rescuers (SCSRs) and compressed air breathing apparatus (CABA) for use during the exercise, adding to the reality of the experience for evacuating coal mine workers.

Level 1 Assessors at the debrief in Moranbah

Executive summary

This report covers the 2020 Level 1 mine emergency exercise held at Moranbah North coal mine between 02:00 and 14:16 on Monday 7 December 2020. Moranbah North coal mine is an underground longwall mine producing premium hard coking coal and is located 16 kilometres north of the township of Moranbah in Central Queensland (see Figure 1).

In all, 29 assessors took part in the exercise, with representatives from Moranbah North coal mine, Simtars, Queensland Mines Inspectorate, Queensland Mines Rescue Service (QMRS), an industry safety and health representative (ISHR) from the Construction, Forestry, Mining and Energy Union, Minerals Industry Safety and Health Centre, Office of the Commissioner for Resources Safety and Health and mine staff from Kestrel, Oaky North, Broadmeadow, Grosvenor Grasstree and Carborough Downs coal mines. This report contains a number of writing styles and each input has been reviewed and edited to provide a consistent theme.

The exercise was run late in the year due to restrictions related to COVID–19, which also prevented the involvement of assessors from New South Wales mines rescue service.

The scenario was based on an underground loader fire in the intake necessitating the evacuation of inbye coal mine workers to a place of safety. The loader driver was injured during the incident and needed first aid assistance. A fan stoppage then caused a whole mine evacuation. Once the mine had been evacuated it was recognised that there was a coal mine worker unaccounted for and missing underground.

A risk-based approach was used by the mine and Queensland Mines Rescue Service to prepare a plan for the mine re-entry.

The responding mines inspectors and industry safety and health representative attended the mine and were briefed in a room separate to the incident management team room. There were a number of communication issues identified during the exercise.

The major conclusions on the emergency response at the mine made by the review of the comments from the 29 assessors were:

- the paramedic response was excellent
- mine staff responded professionally
- improvements are needed in training for SCSR and CABA, possible cause of the fitment issues
- there were issues identified with the underground phones, personal emergency devices,

Wi-Fi and tracking system

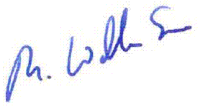
- the briefing of the ISHR and mines inspectors was not adequate
- there were issues identified in the quality of information supplied to the mines inspectors for mine re-entry
- there was excessive pressure noted on an air door in the QMRS search area.

A full list of recommendations are made at the Recommendations section of this report and are split between recommendations for the *Recommendations for the mine* and for *Recommendations for industry.*

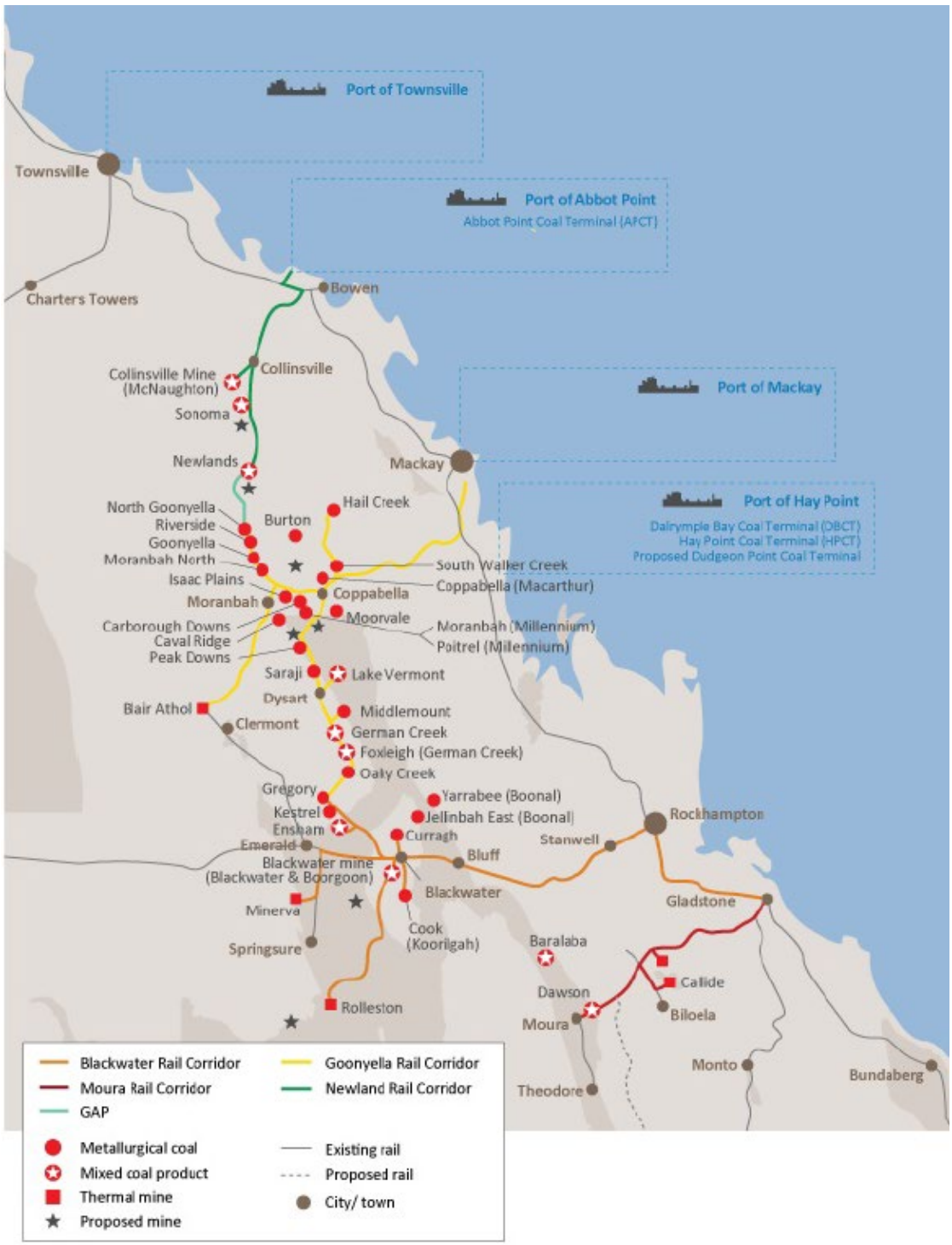
The recommendations have not been ranked in any order of priority. All mine sites and other agencies should review the recommendations and should use them in a gap analysis of their emergency response systems, as well as audit tool prompts.

The exercise committee will continue to draw assessors from other operations to participate in the level 1 exercises, in particular coal mine workers who are studying for statutory certificates. Previous assessors have stated they have benefited from participating in the level 1 exercise. This will benefit them as individuals and their operation. Individuals wishing to be involved in the 2021 level 1 exercise are requested to contact a member of the organising committee: Geoff Nugent, Inspector of Mines, Mark Freeman QMRS, Stephen Woods ISHR or Martin Watkinson, Simtars.

The 2021 Level 1 emergency exercise will be held at Oaky North Coal Mine near Tieri in central Queensland.



Martin Watkinson



urce: Queensland Competition Authority, Aurizon Rail, March 2017

Figure 1 Location Map for Moranbah North

Introduction

This report covers the 2020 Level 1 mine emergency exercise held at Moranbah North coal mine between 02:00 and 14:16 on Monday 7 December 2020. Moranbah North coal mine is an underground longwall mine producing premium hard coking coal and is located 16 kilometres north of the township of Moranbah in Central Queensland (see 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 at an underground mine.

It is 26 years since the Moura No 2 disaster, and 10 years since the Pike River disaster in New Zealand. The Pike River Royal Commission led New Zealand to adopt similar legislation regarding emergency exercises.

Since 1998, 23 Level 1 mine emergency exercises have been held at coal mines in Queensland.

Objectives

The objectives of the exercise were set by using the requirements of RS8 and by reviewing previous exercise reports. The objectives were to test:

- the ability of coal mine workers (CMWs) to self-escape
- mine site incident response
- the ability for triage on the injured CMW
- donning of self-contained self-rescuers (SCSR) and the changeover to compressed air breathing apparatus (CABA)
- interaction with industry safety and health representative (ISHR) and the Queensland Mines Inspectorate
- mobilisation of Queensland Mines Rescue Service (QMRS), risk assessment process for the mine re-entry, the establishment of a fresh air base (FAB) and locate a missing CMW
- notification of next of kin and interaction with social/mainstream media.

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

Scenario

The scenario commenced at 02:00 on Monday 7 December and was based on a fire occurring on an underground loader in the intake necessitating the evacuation of inbye coal mine workers to a place of safety. The vehicle was located in the travel roadway at E75-76. For details of the vehicle and the mine plan showing other relevant location refer to Figure 2.

Other factors for the scenario included:

- The driver was injured and could not fight the fire.
- Inbye personnel had to escape in an irrespirable, smoke-contaminated atmosphere.
- The personnel outbye of the incident could respond, as could evacuating CMWs.
- There was restricted vision for the donning of SCSR transfer to CABA and the evacuation.
- The missing CMW was getting a bag sample from a seal—this information was relayed to the control room officer early in the night.
- The fan stoppage caused a build-up of methane in the longwall tailgate.
- Misinformation was circulating on social/mainstream media regarding the incident and affected people.

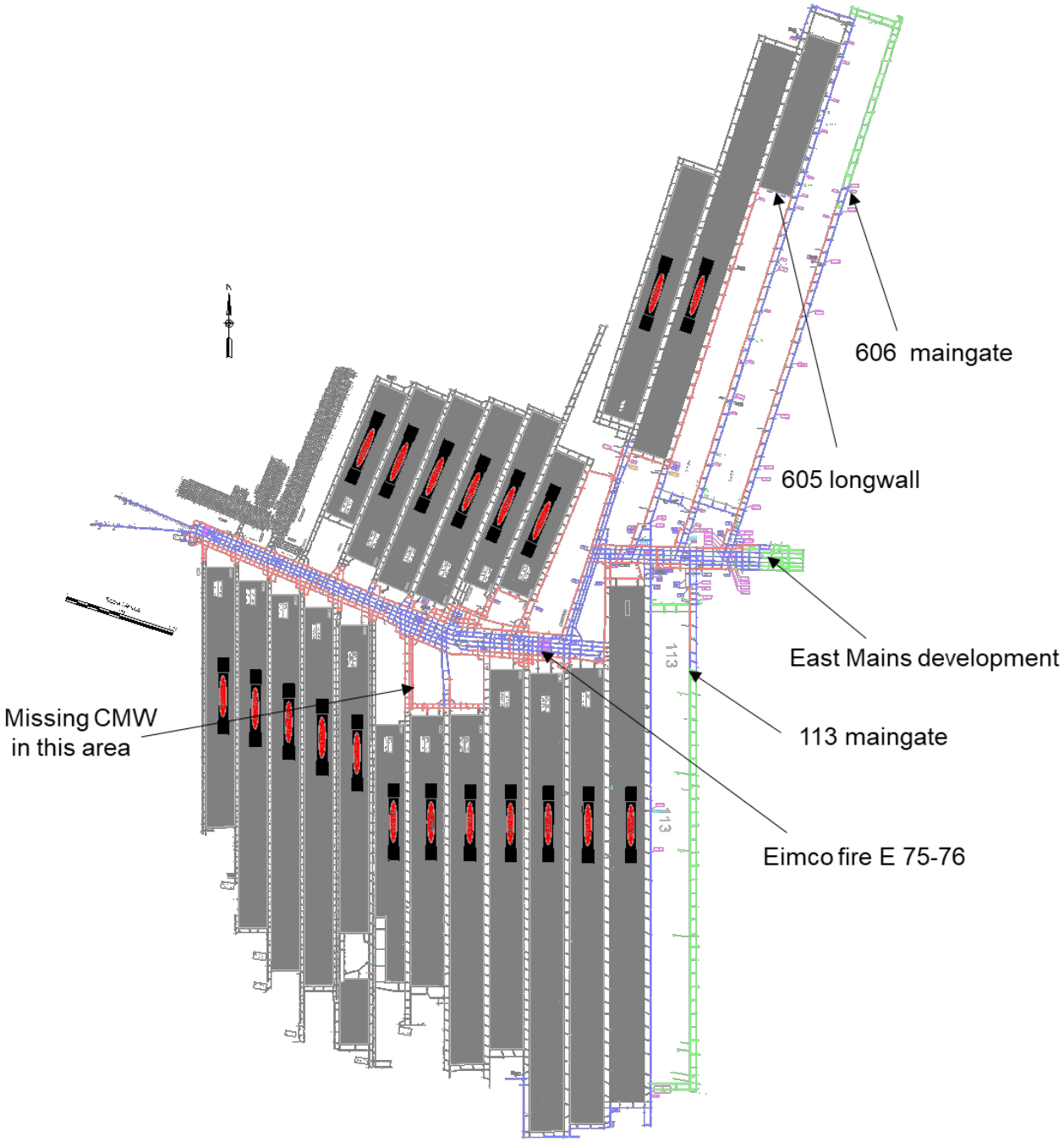


Figure 2 Moranbah North Mine Plan with key areas identified

Assessment of the scenario

The format for the 2020 level 1 exercise was slightly different to previous exercises with the exercise being organised to run over two shifts. The underground evacuation was planned to be complete by 05:00, enabling the mine to deploy its 05:00 shift to normal operational duties. Surface incident management team (IMT) activities were then carried on until the successful deployment of QMRS and the location of the missing CMW.

The surface assessors arrived at coordinated times to ensure that site and industry fatigue limits were not exceeded. Two control room assessors and the exercise chair arrived on site at 00:00, along with most of the underground assessors. Fatigue limits meant they had to leave the site by 12:00. Two underground assessors arrived at 23:00 to prepare for the arrival of the underground team and the control room assessors.

Two assessors arrived on site at 02:00 to assess the initial repose by the two nightshift undermanagers (UM). The remainder of the team arrived at 04:00 when the surface response and IMT process would be forming.

Underground assessments

Assessors were placed in six locations underground:

1. longwall 605
2. maingate 606
3. location 606 outbye 20 C/T Drillers Stub
4. maingate 113
5. east mains
6. outbye.

Longwall 605

Assessors—Joel Treasure and Brendan Clinch

When the assessors arrived at the face the longwall team was in the process of *double chocking* to secure the roof. This is a process where the longwall supports are advanced twice when poor roof conditions are experienced.

It was decided to exclude the two CMWs undertaking this from the exercise.

The assessors read out the Level 1 pre-scenario brief and it was discussed that, in the event of a

real emergency, the securing of the face would not have continued. The briefing notes for the assessors are included in the appendices at *Briefing notes for Assessors*. The explosion risk zone controller (ERZ controller/deputy) instructed his CMWs to don the training SCSRs and smoke goggles provided (see Figure 3) and proceeded to assist them. He stated his intentions were to get the CMWs under SCSR and then proceed out into the travel road and then inbye to the fresh air from the end of panel shaft and contact the control room.

Figure 3 Smoke goggles

As the CMWs were donning the SCSRs, the control room called the longwall over the direct audio communications (DAC) underground intercom system stating there was a Load haul dump machine (LHD) on fire at E Hdg 75 – 76 CT in the mains, with an injured CMW and that assistance was required.

The deputy did not answer the first call as he was assisting a CMW who was having issues donning their SCSR. The SCSR was difficult to open at first and once open it would not start via either the starter or via breathing into it. The decision was taken to continue on without the third SCSR being worn.

The deputy responded to the control room operator (CRO) call on the DAC the second time and was told assistance was required in the mains to fight an LHD fire. This clearly changed his plan as he then left with the crew to the last open cut through and boarded the Driftrunner.

The deputy led the CMWs with the goggles on, the pace was slow and accounted for their lack of

vision. Once back at the crib room, the CMWs were instructed to swap over to CABA. Two CMWs swapped quite quickly and efficiently and they then assisted the third CMW. The deputy then went to ring the CRO and the UM and was unable to contact either. He informed the crew of what the scenario was. There was discussion about how they would be escaping. It was stated that in the event of a real emergency all CMWs would evacuate in the PJB but, for the purpose of the exercise, two CMWs were going to stay behind to finish packing up the panel and no longer be part of the exercise.

The deputy did manage to contact the control room prior to leaving the crib room and was once again requested to head outbye and assist in the response. Travelling outbye was done at a slow pace replicating low visibility and the driver was wearing CABA. The deputy instructed the crew to stop at a number of CABA refill stations on the way out which was not necessarily required given the CABA wearers would have had minimal air usage sitting in the back of the Driftrunner. Once the Driftrunner got to 79 c/t B Hdg the deputy was informed that they were now in fresh air. He instructed the CMWs to remove their CABA.

At 77 c/t B Hdg the deputy went and attempted to ring control. It took a number of times to make contact. A personal emergency device (PED) was received stating that fans had been lost. On contact with the CRO, the UM was in the background and instructed the crew to evacuate the mine. The deputy was also informed that there was 50 ppm carbon monoxide (CO) at the bottom of the fan shaft at E Hdg 1 – 2 CT. The crew then proceeded out of the mine.

On arrival on the go line, the deputy informed the crew to remove their tags from the board. In doing this there were tag board monitors in place who directed the CMWs to the training room.

In later conversation with the deputy, he stated that his thoughts had been to go inbye into fresh air but his concern was that if they lost fans they would lose the ventilation inbye the wall. His other thought was to go to the 16 CT shaft which does not lose ventilation if the main fans go off. However, he made the decision to evacuate to the mains based on the request from the CRO for assistance in the emergency response.

What worked well

The assessors felt the following worked well:

1. The response from the deputy and the CMWs was good. Two of the CMWs were very efficient in donning their SCSRs and CABA. The third was not quite as efficient but was assisted by the others. The evacuation was straight forward with no areas for concern.
2. The goggles worked really well in simulating the type of vision that would be experienced in low visibility atmospheres.

Areas for improvement

The assessors identified the following areas for improvement:

1. One of the SCSRs was difficult for the CMW to get open and then would not activate either via the starter or breathing into the bag. The deputy attempted to assist to get it working but could not.
2. In the response, the longwall crew was told repeatedly to respond to the incident. The safest option for them would have been to retreat inbye of the wall into the fresh air and wait by a telephone. If the CRO had organised for the whole mine to respond, there could potentially have been a whole shift of personnel in the one area attempting to respond. A better plan could have been to have certain crews to respond and then have all other personnel (such as the longwall with a fresh air source) go to a place of safety and await further direction.

Maingate 606

Assessors—Sam Lindley, Tim Jackson and Steven Smith

On arrival, the crews were at the continuous miners. They were briefed on the level 1 exercise using the briefing notes.

What worked well

1. The overall response of the MG606 crew members was sound. The initial donning of the SCSR in response to seeing smoke was good, although it was the SCSRs themselves that were an issue. The CMW had difficulty opening up the SCSR and hit it on the ground. He then had problems with the breathing hose being crimped tight. He worked the hose and activated the unit successfully.
2. The crew walked together back to the crib room and the CMW carried out the changeover to CABA after some difficulty. The main issues being:
3. One CMW could not find the bag cutter without prompt
4. The CMW then lifted the mask straps over the top of the mask making it difficult to fit.
5. The deputy did an excellent job in guiding CMWs through the changeover process and evacuation procedure. He provided clear and concise directions and instructions to the crew and had complete control of the situation. The crew successfully planned their route of travel prior to leaving but there was an issue with the lack of vehicle capacity for the evacuation.

The assessors identified the following areas for improvement:

1. There was only one vehicle in the panel which could not accommodate the full crew.
2. There was a delay in starting the vehicle as it was out of air and required multiple deputy resets due to a false methane trip. This was reported as a regular issue with this vehicle.
3. The CMWs successfully evacuated via the appropriate escapeways while consistently and monitoring their CABA pressures at each CABA refill station on the way out. After challenging some of the CMWs on CABA duration and escapeways, it identified gaps in CABA training and familiarisation with outbye refill stations.
4. During the refill process, it was also identified the need for better communication systems as the phone at the refill station could not contact control.

Overall, the response was completed in a timely manner. It took a total of 75 minutes to evacuate from 37c/t MG606 to the go line on the surface. The crew followed the appropriate procedures for emergency response.

Figure 4 Image of Drift runner on the surface

Location 606 outbye 20 C/T drillers stub

Assessor—Ben Muller

The overall response to the incident was sound. The deputy took this opportunity to test the

knowledge of his outbye work groups and intervened as necessary prompting them with communication and also giving feedback with regards to donning and changeover/refill techniques. His communication was conducted well, updating his crew with environmental readings and giving them an indication of the type of conditions one would expect with the changing of CO levels.

A Mastermyne crew was picked up and continued with the initial group when the group was exiting 606. Although missing the initial incident briefing, they joined with the 606 group and continued for the rest of the exercise.

What worked well

Overall, the response went well. The use of the restricted vision goggles made for a good experience for an operator to understand limited visibility. These were issued to the least experienced operator and he was giving guidance to the ERZ controller driving the Vehicle for the speed and direction of the vehicle.

In addition, the assessor felt the following worked well:

1. The SCSR donning process was executed well by CMWs. It was the units that failed.
2. The ERZ controller took control of the situation and provided clear and concise directions to all personnel. He also ensured everyone watched the SCSR to CABA changeover so they could learn what to do and what not to do.
3. The detailed communication of information between the ERZ controller and the CRO.
4. The evacuation plan prior to leaving i.e., route of travel, location of refill stations, etc.
5. The deputy was quite new to Moranbah North coal mine, but handled the situation with confidence and knew the emergency procedures well.
6. The crew were well aware of CABA refill locations.

Areas for improvement

The assessor noted the following areas for improvement:

1. As the crew were trying to get in contact with CRO at the 6 c/t CABA in 2 Nth Mains the phone cut out while ringing and then could not dial control. Unsure of what caused this issue.
2. The phone at B1 cache was unable to contact control.
3. No phone at the Tag board.
4. The crew initially were not paying attention to the CMW donning the *real* SCSR. It was pointed out how valuable the learning would be and everyone focussed on the task being

performed. This was invaluable given the difficulty opening the unit then working the crimped air hose to open up as well.

5. The Drift runner would not start. It had a CH_4 trip and had insufficient air to start. The CMW's already had an airline run out and the tap was only 20m away due to regular issues with this vehicle. CMW's made the comment that the pressure in the air range was typically insufficient to start the vehicles.
6. The crew stopped at the tag board, they decided not to contact control, when asked why they indicated no phone, just a DAC that didn't work properly
7. The crew stopped at B1 refill station East Mains to refill, they all walked to the wrong side of the refill and were confused showing no familiarisation with that particular location.
8. Once at 70c/t Mains, three deputies were present but they did not take any information from the crew and told them keep going and get out. This was a lost opportunity for updating IMT on underground movements.
9. Where the stonedust was applied to a high standard, the roadway was distinguishable. However, it was very difficult in recently shotcreted and poorly stonedusted areas.

Maingate 113

Assessors—Mark Sanim and Michael Van Der Meer

The Maingate 113 crew were briefed on the level 1 exercise and then undertook face checks and pulled the miner back before the commencement of the exercise.

When the exercise started and the deputy instructed the crew to don SCSR, the other crew members assisted the three CMWs to put the SCSR on. This was an excellent example using the buddy system, although the other crew members did not have low vision goggles and were able to see clearly. The assessors addressed the crew to allow only the CMWs wearing SCSR to assist each other at the crib room when donning the CABA.

The crew did a controlled retreat from the continuous miner to the crib room via the belt road using the belt structure as a lifeline taking them to the crib room.

Once the crew arrived at the crib room, they were instructed not use the live CABA in the station but to use the training CABA that was brought down for the exercise.

The crew were instructed to put their lamps on low beam for the changeover to CABA and only the three CMWs with low vision goggle to assist with the changeover. The changeover went well with no issues.

The deputy and the crew were instructed that, once the CABA units were donned, verbal

communication was re-established. The deputy then contacted the CRO and informed him of the situation and his intention to evacuate the mine. The CRO informed the deputy of the location of the fire and established the deputy's intended travel route and the next communication point. The deputy passed on the information to the crew and kept the crew well informed of any information received and the intended travel route.

The crew travelled to 11 c/t refill station where they were instructed by the deputy to refill. No actual refill was undertaken. It was brought up that it was difficult to see the refill station signs and the CMWs had to rely on prior knowledge (this would be difficult when being disorientated during a real emergency). CMWs recommended that they should have larger/better signs, flashing beacons, and chimes.

The deputy contacted the CRO at each stop and communicated very well, informing the CRO about crew numbers and condition and asked for information about the event and travel route.

The crew were calm and led by the deputy who was in control at all stages. The crew were aware of the situation and understood the travel route and the intention of the deputy to travel to fresh air and then assist the firefighting team.

Once the crew arrived at the event 71 c/t, they were prepared to fight the fire. However, the deputy in control of the firefighting teams instructed the 113 deputy to continue evacuating from the mine as multiple firefighting teams had the fire under control.

The crew then evacuated the mine via D hdg to the surface go line and then presented to the tag board attendant and followed his instructions. The crew were then sent to the training room for debrief.

The crew did a good job of evacuating the panel. The deputy took control of the crew and the situation and had a very good understanding of the mine and its ventilation system leading his crew to fresh air.

There were no PED communications throughout the exercise apart from the one about the surface fans being off. The crew did not refill at the crib room before leaving. The evacuation time from the initial inseam response at MG113 C Hdg 17-18c/t at 02:15 to training debrief room at 03:45 was approximately 90 minutes.

What worked well

The crew did a good job of evacuating the panel and the deputy took control of the crew and the situation and had a very good understanding of the mine and its ventilation system, leading his

men to fresh air.

Areas for improvement

The assessors identified the following areas for improvement:

1. There were no PED communications throughout the exercise, apart from the one about the surface fans being off.
2. Improved signage and indicators for refill stations.
3. The 113 deputy informed the CRO of the environmental CO -950 ppm and neither the CRO or deputy recognised the real time sensors maximum detection range is 50 ppm.

East mains

Assessors—Shannon Doherty and Luke Augustin

The East mains crew and deputy were briefed on the level 1 exercise. The panel was not operating at the time of the exercise due to an electrical issue. The donning of the SCSR went smoothly, taking approximately three minutes to complete. During the changeover to CABA there was very little flushing of the face mask prior to donning.

The CMWs had a good knowledge of the escape routes from their panel, as well as the location of the refill stations. It was noted that the mine plans in the crib room were not up-to-date and there was very little communication via the PED system due to an indicated lack of coverage.

What worked well

The assessors felt the following worked well:

1. Communication and instruction from all deputies both in the panel and outbye—especially the deputy in control of the fire site.
2. Personnel and vehicle movement was communicated to CRO each time there was a change in the situation.
3. Panel standards were very good, which meant that personnel and machinery could interact throughout the districts fluently and safely.
4. The East mains deputy responded quickly to the smoke entering the panel.
5. The East mains deputy left a note on the crib room table of the planned escape route.
6. The deputy at 71c/t directing through traffic.

Areas for improvement

The assessors noted the following areas for improvement:

1. Donning of the SCSR, as well as the switch from SCSR to CABA.
2. Hoses and straps twisted, nose clips not fitted, goggles not fitted correctly (high CO).
3. Not purging the CABA mask before donning the suit.
4. CMWs did not spread out when switching over to CABA.
5. No use of the crib room table to save bending over.

Outbye

Assessors—Joe Martorana, Keith Brennan, Stephen Woods and Rebecca Blines

An Eimco driver and his vehicle were located and directed to drive to E75-76 and park there for the purposes of the exercise. The driver was deemed to be injured and unable to fight the fire. The driver managed to escape to 71 c/t and inform the CRO after 20 minutes. There were issues noted with the 555 emergency number cutting out on a number of occasions.

Once the CRO was notified of the location of the fire, the outbye response was quick to assess the fire and commence a simulated firefighting response. There were communication issues due to the location of the telephone at 71 c/t and the fire location at E75-76. The mobile phones carried by the deputies were not effective and a decision was made to extend the telephone line from 71 c/t to the fire site.

Initial medical assistance was provided to the injured CMW until the arrival of the underground ambulance and the paramedic who was very proficient in the treatment of the injuries.

The firefighting response was effective. However, some of the responding CMWs were not familiar with hose procedures and effective firefighting processes. One CMW attended thinking the fire was at 67 C/T loop take up.

What worked well

The assessors felt the following worked well:

1. The clear communication and information gathering by the CRO about the location of the fire, the injured CMW and the injuries he had sustained.
2. The ambulance response was quick and effective with a competent paramedic.
3. Quick initial repose by outbye CMWs to the fire scene.
4. Effective firefighting process once experienced CMWs were at the location.

Areas for improvement

The assessors identified the following areas for improvement:

1. The 555 number cut out multiple times during calls.
2. Underground tag board in maingate 605 had a personnel tag on it that had to be confirmed that they were offsite. Control room completed this task by checking the surface tag board and then swipe history on scenario.
3. Communication and recording of Driftrunners exiting passed 71CT – personnel or Driftrunner numbers weren't recorded by the deputy at that location.

Conclusions: underground

These conclusions have been made from the review of the comments of the underground assessors on the observations they made while assessing the evacuating CMWs:

1. Issues were identified with the supplied SCSR—kinked hoses and units being very difficult to open (it is acknowledged that these were older out of service SCSRs that could have contributed to this issue).
2. CMWs lacked knowledge on the donning process for SCSR, the changeover to CABA and re-fill processes.
3. Some of the responding CMWs to the fire site lacked knowledge of firefighting processes.
4. Issues were noted with the site communication systems:
    a. poor PED coverage
    b. lack of telephones at tag boards
    c. some installed telephones not working
    d. 555 number cutting out
    e. poor mobile phone coverage.
5. One of the vehicles in use in maingate 606 had issues with starting, including loss of air and false CH_4 trips.
6. At least one underground tag board had a tag left on it from a previous shift.

Surface assessments

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

- control room
- incident management team—initial response
- incident management team
- operations team
- planning team
- logistics team
- Queensland Mines Rescue Service
- social and mainstream media.

Moranbah North coal mine emergency response framework

The mine emergency response system (MERS) framework consists of three tiered teams, each with a different focus aligned with their capability and the severity of the incident/issue. These are the Brisbane-based crisis management team (CMT), the site-based IMT, and the emergency response team.

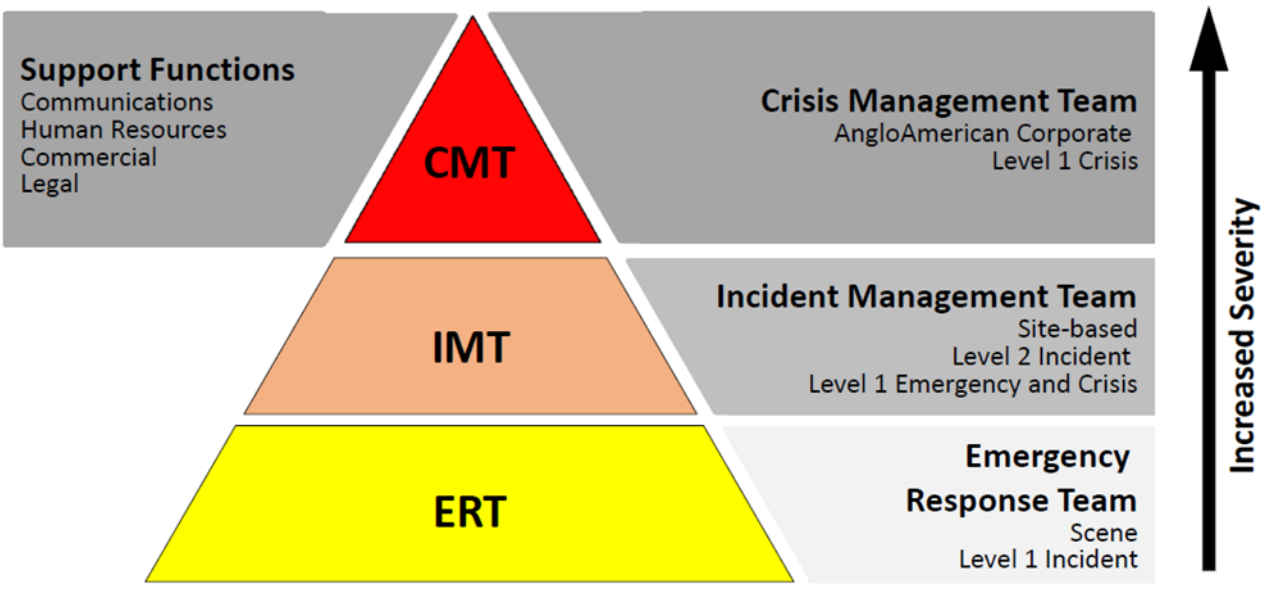


Figure 5 Moranbah North coal mine emergency response framework

Section 1.4.1 Moranbah North Mine's approach of the MERS states:-

"The team and organisational structure of the MERS aligns to The Australasian Inter-Service Incident Management System 4 (AIIMS4) Incident Command and Control System (ICCS) and principals. These systems represent the nationally recognised system of incident management for emergency service agencies, and ensures the Mine has full interoperability with any responding emergency service agencies."

Control room

Assessors—Snezana Bajic, Michelle Brunker and Lachlan Bartrop (at 04:30)

Simtars prepared a Safegas simulation of the mine gases and alarms that would have been notified in the control room as a result of the Eimco fire. This was accomplished by using mine ventilation simulation (Ventsim) to model the scenario and using the real gas data from the mine gas monitoring system to adjust the gas levels to reflect the products from burning diesel, rubber and coal.

Moranbah North coal mine currently uses the CITECT system for gas monitoring and is in the process of transferring across to the Safegas system. The CROs were not assessed on their ability to use Safegas, which they were not familiar with, but on how they responded to the alarms and gas data that was available. Figure 6 shows the control room layout. Moranbah North control room operations are different to most Queensland mines as they have two control room operators—one who deals with the operation of the mine and one who concentrates on the gas monitoring system and alarms.

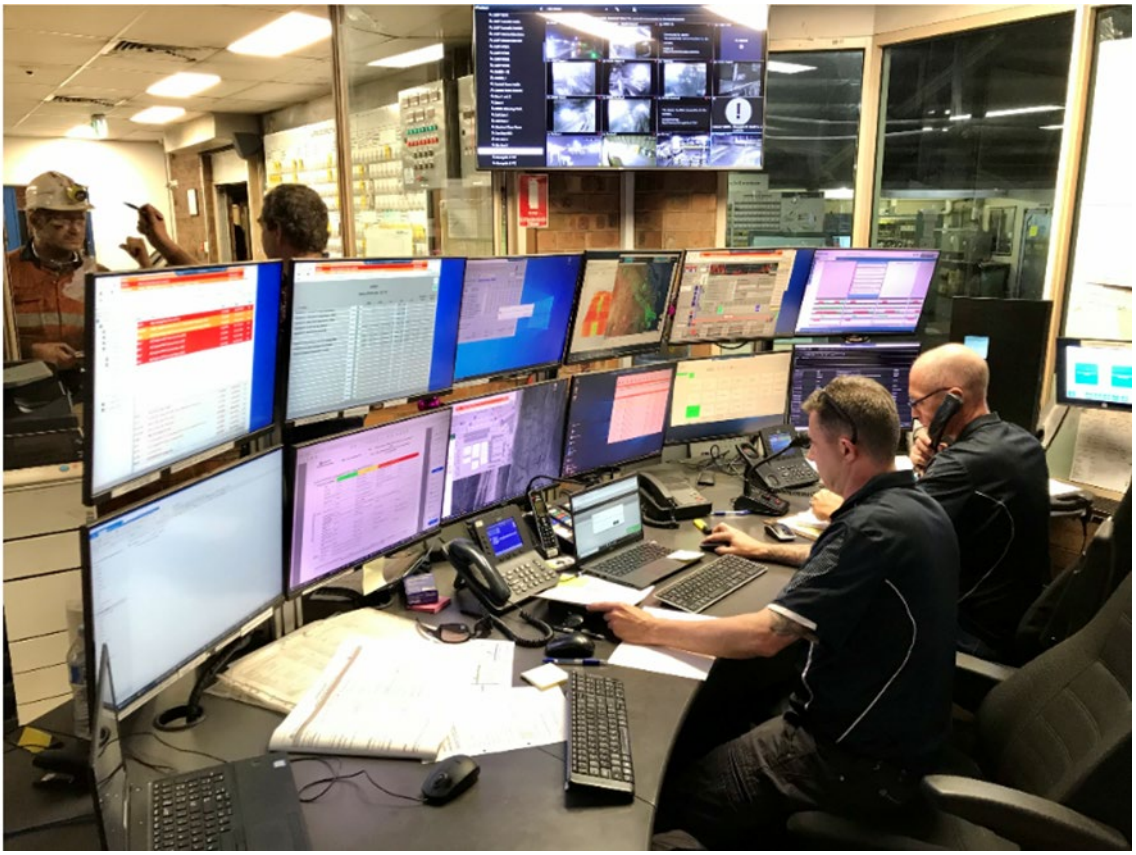


Figure 6 Moranbah North coal mine control room

The first simulation gas alarm was in East mains at 02:05, followed by many other CO gas alarms as the simulated products of combustion spread through the mine. Both CROs were proficient in the handling of the alarms and the communication processes required. All the relevant information was recorded when the injured CMW phoned in at 02:20 with the details of the incident.

Duty cards were handed out to the CROs, but were not used continuously.

The Safegas simulation provided a reading of 50 ppm CO for most of the underground sensors. This is the full scale of the detector. A reading of 950 ppm CO was relayed to the CROs from underground, but it was not until later in the day that it was realised that the actual gas readings underground were higher than 50 ppm.

There was a continual stream of personnel in and out of the control room causing unnecessary noise and distractions. A computer for EMQnet had recently been installed in the control room and neither of the CROs had been fully trained in the use of the system. Later on in the exercise, a scribe was brought into the control room to enter data into EMQnet.

There were several issues with the phone lines during the exercise. One issue in particular was that when a CMW dialled 555 it automatically cut off the CMW on the line talking to the CRO. This was frustrating for both the CRO and the underground CMWs.

The CROs changed over to day shift at 05:00 as the exercise progressed to a desktop exercise. The information flow in and out of the control room was disjointed at this stage. Numerous CMWs were assigned duty cards which were then reassigned.

It was not clear if QMRS has been deployed or not and who was controlling the deployment. The MERS was not fully utilised as there was a lack of briefing material and communications to the CROs. It was mostly one-way communication from the CRO to IMT.

The MineDash system failed to register people on the surface and underground, and created confusion. This is a known issue at the mine.

Despite the challenges and failures in technology, the CROs managed to perform their duties, remain calm and in the control of incident. Their internal communication was clear and detailed.

What worked well

The assessors felt the following worked well:

1. Communication among the team was always positive; the individuals obviously respected one another and knew each other well enough to give each other tasks without arguing. Considering personnel would have been tired, and also had normal operations to take care of, the team worked successfully.
2. Gas data was displayed on a Safegas system/screen for the control room to interpret the data and record alarms. Considering the CROs, or any other personnel were not familiar with this data display before, they interpreted it efficiently and were able to acknowledge alarms and trend data.
3. Shift changeover was managed exceptionally well.
4. Open communication was maintained with all employees at all times.
5. The large TV touch screen was used to display maps and monitoring points and it was found to be very useful in the emergency situation.
6. The ventilation department communicated with the CROs and provided assistance and guidance.

Areas for improvement

The assessors identified the following areas for improvement:

1. The MineDash system failed. This is critical software in an emergency situation as it indicates where personnel are located underground. With this system not operating properly, personnel showed that they had been underground for up to 12 months. While

this caused initial confusion, a tag board audit was used as a final determination of who had returned to the surface.

2. Some task allocation could have been more efficient in the gas chromatograph room. While the gas chromatograph became available from 10:00, gas data trends were not started to be made until approximately 13:45. This was a reactive response to a request from the inspectors and potentially delayed re-entry by QMRS personnel. Trending was also done twice by two personnel in different areas of the mine.
3. Some interpretation of the Safegas gas data system was missed by all—for example, 50ppm of CO on real time sensors is off-scale.
4. Limited training had been provided in EMQnet.
5. The control room became crowded and noisy on occasions.
6. There was no audible gas alarm in the control room.
7. The 555 emergency number caused a number of problems including cutting out and disconnecting ongoing calls from CMWs.

Initial response and formation of incident management team

Assessors—Ben Lang & Michael Webber

The two assessors arrived on site and talked to both of the Undermanagers on shift and discussed the format for the level 1 exercise (night shift evacuate and day shift to return to work as per normal shift).

When the first emergency call came in relaying the information of the Eimco fire, the first Undermanager identified the need to establish an IMT and organised for the duty cards to be handed out. This task was given to the shift electrical engineer who had arrived at the control room after hearing the emergency call. The emergency siren was sounded for several minutes and was extremely loud in the control room building. It was reported that it could not be heard in some areas on the surface.

The CRO had limited training in the use of EMQnet. However, he started an *EMQnet event* and started populating updates. This sent an automatic text message to the emergency response coordinator and he was the first member of the leadership team to get to the mine.

The first Undermanager took on the role of incident controller and the second Undermanager took on the role of operations coordinator.

Both the Undermanagers worked well together, systemically working through the process of evacuating the areas of the mine affected by CO, organised assistance to the injured CMW and deployed CMWs underground to fight the fire.

The shift engineers played a large part as “gophers” and organising what the incident controller needed.

The shift engineer explained to CMWs who were handed a duty card that they were not familiar with that they should read the duty card and follow the duties as they read.

When the tag board was covered with no-road tape in a cross to prevent access to the board (see Figure 7), it was observed that the tape covered the tag of the missing CMW.

When the Operations Manager arrived, he let the incident controller know he was on site and, prior to the handover, he walked around and checked out the underground board and availability of diesel vehicles. The IMT scribe arrived on site at a similar time to operations and prepared the IMT room for EMQnet. She set up a brand new EMQNet event and was unaware the CRO was already updating one with all the latest updates. EMQnet was also in New South Wales time (daylight savings time) not local Queensland time.

The incident controller handed the roll over to the Operations Manager and took over the role as operations coordinator. The second Undermanager stepped away from the exercise and back into the Undermanager role to allow the operation to resume day shift as normal.

The incident controller started to form a more formal IMT meeting and notifications were made to all stakeholders including Anglo Coal corporate officers.

The first IMT meeting was held and all current issues were covered.

The surface tag board was checked at 04:05, and the CMW (who had not moved on MineDash since 22:30) was identified at 04:22. The CMW’s tag was actually behind the tape and not easy to spot (see Figure 7).

Figure 7 Surface tag board (note the danger tape covers some of the tags)

What worked well

The assessors felt the following worked well:

1. The two Undermanagers and two shift engineers worked well forming a basic IMT for an effective first response.
2. Response time and professionalism of the paramedic was excellent.
3. Use of the Driftrunner ambulance and blue flashing light allowed for very quick response time.
4. EMQnet updates from multiples teams worked well allowing for communication of updates (once it was properly established).
5. The control room had a large touchscreen with the latest ventilation plan on display, which proved to be very useful in the first hour of the emergency when analysing which CO sensors were in alarm and the ventilation system (see Figure 8).
6. The start times of the Undermanagers were staggered by 30 minutes which allowed for a smoother transition of information.
7. The mine used teleconference technology to communicate with offsite support staff.
8. EMQnet had automatic notification messaging set up to alert the emergency response coordinator as soon as the CRO started an EMQnet event.
9. Two ventilation officers (VOs) and a ventilation and gas superintendent are employed at

the mine, which would have provided adequate (and necessary) coverage if the event continued over the next few shifts/days. The VOs have a face-to-face handover on Mondays so there is a guarantee that at least one of them is always available in Moranbah to respond within 30 mins if required at the mine.

10. "Gopher" duty cards were very effective and allowed for greatly improved response times for tasks and communication.

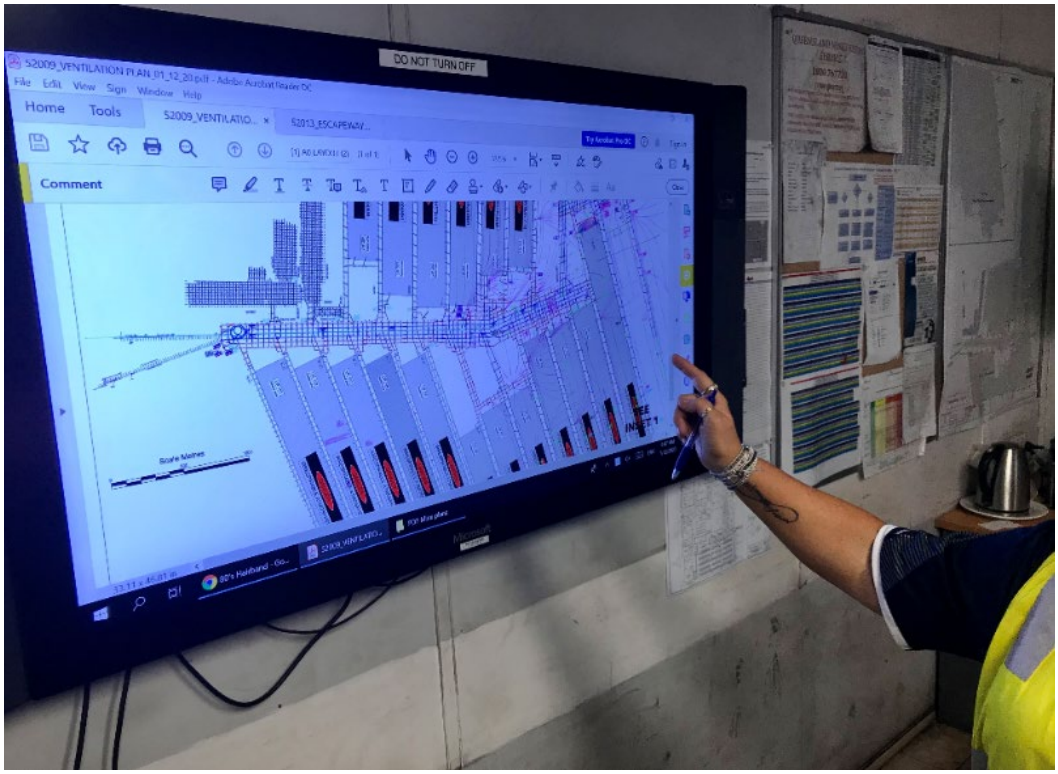


Figure 8 control room touch screen display

Areas for improvement

The assessors identified the following areas for improvement:

1. The duty cards were dated 13/03/2013 and should be updated to reflect the current version of MERS.
2. Duty cards were being issued from different locations which created confusion.
3. Limited training had been given in the use of EMQnet and all of the functionality was not being used.
4. EMQnet only sent out an alert to the emergency response coordinator and could be expanded to include other key site personnel.

Incident management team

Assessor—Nikky LaBranche

The IMT process was assessed from 04:20 onward, just as the IMT realised there was a missing CMW.

The Operations Manager was appointed the incident controller and all functional leads had been assigned by 03:40. As more senior personnel arrived at site, they assumed to role of the coordinators i.e., the Technical Services Manager took the role of planning coordinator when he arrived. The Site Senior Executive was offsite and travelling back that morning as was the Underground Mine Manager (UMM) who was in Newcastle in New South Wales.

EMQnet was used to provide updates and manage tasks. Objectives were discussed in IMT meetings, but were not written down in EMQnet or on the whiteboard. The IMT also spent a great deal of time on the fans being inoperable and became distracted from the objective to find the missing CMW.

What worked well

The assessor felt the following worked well:

1. The IMT was great at identifying learnings during the level 1 exercise and writing them down for later review. The team performed their own debrief after the exercise.
2. The IMT tapped into the resources of the CMT when needed for social media and gas data analysis.
3. EMQnet seemed to work well across the board. Information was flowing from most of the groups. Some individuals' EMQnet was on New South Wales time instead of Queensland time.
4. Technology was used well in IMT with screens for EMQnet and the ability to display the mine map. The CMT was able to listen to IMT meetings using videoconferencing.

Areas for improvement

The assessor identified the following areas for improvement:

1. The IMT was late in notifying the next-of-kin of the missing CMW. Human resources wanted to notify when they knew he was missing, but the incident controller made the call to wait until the end of the shift. The other workers had already been sent home.
2. IMT spent a considerable amount of time updating the CMT with information that came

through EMQnet. The CMT could have read these themselves.
3. Lack of primary information for the loader fire and injuries. IMT did not know who found the injured worker.
4. Initially the updates were slow getting from QMRS to IMT.

Operations

Assessor—Mark Lydon

The initial response from the night shift personnel appeared to work well. The mine was evacuated in an orderly and timely manner and it was identified that one coal mine worker was missing.

The information transfer from nightshift to day shift had the appearance of lacking in detail and there seemed to be some confusion about who was in the oncoming operations team. However, distractions from the production crew (05:00) who were deployed for production as usual would have complicated the situation as they were not part of the incident and had to be briefed as well as deployed for normal duties. The operations coordinator, after a brief with the nightshift Undermanager, chased information and real time data and logistics in the first hour and then started to build a team which worked well together.

The response to the MERS procedures was mixed. Duty cards were not issued to team members and at times personnel had a tendency to operate in silos. This was apparent from a lack of a sequenced, unemotional, data-driven procedure. The morals and ethics of the group were still focused on the primary objective of locating the missing CMW, but when challenged with information and decision making, some team members drifted off into separated conversations, possibly missing and not knowing some important facts.

What worked well

The assessor felt the following worked well:

1. Operational work areas were experienced in their field and could pull from their knowledge base to make confident decisions.
2. Operations did not deviate from the structured rescue plan.
3. The operations coordinator made decisions based on data not emotions.
4. When the team came together, the collaboration was of a good standard.

Areas for improvement

The assessor identified the following area for improvement:

1. The operations team could have been formed earlier having dedicated team members assigned to task to report back into the operations coordinator allowing a focus on issues moving forward and planning.

Planning

Assessor—Phil Fletcher

The planning group was up and running early in the exercise. The planning co-ordinator, who was the site Technical Services Manager, received a 03:00 phone call and responded swiftly, along with the VO. By 04:50 the planning group was in operation and started to assess strategies. In particular, the focus was on ways to get the fans up and running to provide ventilation underground.

The planning coordinator returned from the first IMT with a briefing of the event and a focus on starting fans at shaft 1 then work on the fans at shafts 2 and 6 had major problems (feedback from assessors) – a strategy to start at 80 per cent capacity was developed.

Initially the team worked from duty cards, but started EMQnet at 05:41. A VO assistant was allocated to monitor Safegas. An electrical and mechanical engineer were added to the planning group early.

Significant issues were identified with the generators for fans at shaft 2 and 6 and they were unable to be started. However, shaft 1 fan was started at 80 per cent and the ventilation circuit monitored for gas levels to avoid drawing a plug gas out of the longwall tailgate.

The planning coordinator attended the IMT meetings throughout the day and contributed constructively to the meetings. The engineering component on the team worked diligently throughout the day and liaised with the logistics group to fix, restart and ultimately replace the damaged fan generators.

When the ventilation and gas superintendent arrived at 06:30, he was allocated the task of monitoring and updating EMQnet. The allocation of someone to maintain EMQnet for the group was a good strategy. However, there was a missed opportunity to have a dedicated team member on EMQnet earlier and also to free up a key member of the technical services team to focus on ventilation—a key issue in this event.

A group of alternates was identified for the planning group by 07:37. With the arrival of additional key external stakeholders—including the Queensland Mines Inspectorate, an ISHR and QMRS—the planning group were involved in briefing and communicating plans.

A re-entry risk assessment was started by a sub-set of the planning group to identify risks with Moranbah North coal mine staff prepared to re-enter. Entering the data into the QMRS MEMS system did not go smoothly due to issues extracting the data from EMQnet and Safegas.

When a gas chromatograph (GC) sample with 75 ppm and small traces of ethylene and hydrogen was presented to the team they became distracted because the sample indicated a possible coal fire. This was one of the first GC samples analysed. The CO was low and the location of the Eimco was in a roadway with no shotcreted ribs so the coal would have been exposed and some coal would have burned. The CO readings were falling at this time.

When QMRS deployed, the planning group continued to provide monitoring and updates as required until the exercise finished.

What worked well

The assessor felt the following worked well:

1. The planning group started early and effectively.
2. The group developed a plan early to restart the fans.
3. A run about/gopher was part of the group.
4. The group deployed someone to watch Safegas.
5. The planning coordinator attended IMT meetings promptly.
6. Worked as a team to prepare plans for problems—for example, power/Ergon and ventilation/gas.
7. The group identified alternates early in the event.
8. Identified additional team members promptly as required.
9. The group made good use of EMQnet.

Areas for improvement

The assessor identified the following areas for improvement:

1. The group missed potential opportunities to engage with technical services personnel as they arrived — for example, to drive EMQnet/gophers.
2. Didn’t start EMQnet until 05:41 — only on the PC and then on to the projector.
3. The group did not have a dedicated EMQnet operator until 06:30.

4. Could have used whiteboard to identify and cross off critical issues.
5. The group was distracted at 09:12 with 75 ppm CO in one gas sample.
6. The group experienced challenges transferring data from EMQnet to other systems and presenting them.

Logistics

Assessor—Carl Skinner

The Logistics team worked well during the exercise, but could have had more people to assist with their duty cards.

The logistics area was separated from the rest of the building by a partition wall and door. This reduced the impact of distraction from the day-to-day activities which were underway at the mine during the desktop phase of the exercise.

The team processed requests from IMT in a timely matter, but some tasks took longer due to a lack of personnel allocated to the duty cards.

What worked well

The assessor felt the following worked well:

1. The logistics coordinator knew her role and delegated jobs without push back.
2. Being separate to other workgroups while mine was operating.

Areas for improvement

The assessor identified the following areas for improvement:

1. Handover notes were lacking in detail.
2. Some team members showed a lack of urgency when dealing with allocated tasks.

Queensland Mines Rescue Service

Assessors—Shaun Dando and Gareth Kennedy

For most of the level 1 exercise, the assessors were considering different parts of the QMRS response and their individual assessments are presented separately.

The assessors were tasked with observing the actions taken by the mine and QMRS in responding

to and locating the missing CMW. This involved the activation of QMRS, and the gathering, collating and communication of the data and information necessary to make an informed and risk-based decision about whether an acceptable level of risk was present to allow mines rescue teams to be safely deployed to re-enter the underground workings. Mines rescue teams were required to conduct a search of the last known work area of the missing CMW to locate him, as well as visually confirming if the vehicle fire had been fully extinguished.

Part 1

The personnel observed in this exercise should be congratulated on their involvement, contribution and professionalism. The mine employees, QMRS team members and staff were tasked with activating, deploying and managing the response and successfully and safely re-entering the mine to locate and retrieve the missing coal mine worker.

A total of 26 mines rescue team members from Moranbah North coal mine and a number of neighbouring mines were deployed underground, with four teams of six people plus a fresh air base (FAB) controller and assistant.

Moranbah North coal mine and QMRS used the site emergency response procedures in conjunction with the QMRS Mine Event Management System, and QMRS mines rescue guidelines to conduct the response.

While the objectives were achieved, there were several areas that were identified that should be addressed with some urgency to improve the efficiency of the response process, and to ultimately allow decision makers the opportunity to make well-informed decisions in a timely manner, especially when lives are at risk.

Finding 1;

It is imperative that key industry stakeholders such as QMRS, Coal Mines Inspectorate, ISHRs, and mine operators make a commitment to working together to identify, clarify and understand the requirements each have in how they quantify and determine an acceptable level of risk. This will ensure delays are minimised when lives are at risk and if coal mine workers require rescue or assistance in an emergency situation underground.

Part 2

Part 2 covers the initial response at the mines rescue substation, the planning and surface preparation, and through to the deployment underground and rescue.

The tag board was released at around 04:40 and it was confirmed that a coal mine worker was

missing shortly afterwards. The QMRS alert was received by all mines rescue trained personal at 05:02 and there was a subsequent call for all mines rescue trained personnel at Moranbah North coal mine to proceed to the mines rescue substation immediately. Mines rescue volunteers started to arrive at the substation from 05:18 and the substation coordinator arrived at 05:30.

Mines rescue team members on site commenced completing T-cards. The missing coal mine worker's last known location was confirmed at 106/107 sealed areas. Mines rescue planning and equipment preparation was underway from this point. By 07:05, 25 mines rescue team members had arrived onsite, including a QMRS staff member. There was some initial confusion over access due to the conflicting road signs, and a locked gate to the substation. A meeting was held at 07:11 with the team captains and vice captains. The teams were divided into four rescue teams plus FAB. Equipment checks were started (see Figure 9).

Figure 9 Queensland Mines Rescue Service performing equipment checks

The QMRS Operations Manager arrived at the substation at 07:38. By 08:00, all Driftrunners and remaining equipment had been sourced and 27 team members were on site. At 08:30, all mines rescue team members were requested to relocate to the surface muster area to collect their lamps, rescuers and tags.

An initial rescue deployment briefing was given at the muster area at 08:41. All team members were called to the planning room at 09:18 for a briefing from the IMT leader, VO, operations controller and QMRS Operations Manager. Environmental conditions, urgency and team tasks were discussed. The teams then waited for approval from the Underground Mine Manager and confirmation from the Queensland Mines Inspectorate prior to deployment. Mines rescue team captains and QMRS operations managers continued to discuss tasks including operational deployment of the m-Comm and use of WiFi phones.

All mines rescue team members were told to wait at or near planning room. Team 1 were called to the deputy's room at 10:38 for briefing. At 11:20, the QMRS operations manager provided an update and did a welfare check-in with all team members ensuring no one would exceed the fatigue hours etc. There seemed to be conflicting information between mines rescue standard TARPs for working in an irrespirable atmosphere and the Queensland Mines Inspectorate's expectations. This was compounded by some software issues experienced on site where some information was missing between the mine EMQnet system and the QMRS MEMS system. At 11:38 the IMT provided a further briefing that the Queensland Mines Inspectorate had deemed the rescue operation was being managed to an acceptable level of risk, and the UMM granted permission to deploy underground.

All four team members plus the FAB team arrived at the FAB location—53 c/t D-E heading mains—at 12:03. The teams unloaded equipment and commenced equipment preparation and checks. An issue with the telephone at 53 c/t was identified. FAB informed IMT via the WiFi phone that the telephone at 53 c/t was non-functional. IMT called back via the WiFi phone to advise that if the telephone at 56 c/t was operational, the 53 c/t location could remain as the FAB with communication being maintained through the WiFi phone. Two mines rescue team members checked 56 c/t and confirmed the phone was functional. All teams continued with equipment checks ready for deployment. Team 1 deployed first.

Team 2 suited up and completed donning long-duration breathing apparatus. The team 2 captain confirmed with the FAB, noting a phone number change. The team 2 captain returned to team 2 and completed donning of his long-duration breathing apparatus and performed final checks with his team. Team 2 deployed from FAB at 12:46. The m-Comm cable was reeled out with them. Team 2 headed through the double vent doors to 107 A heading. Gas readings were taken, confirming a simulated irrespirable atmosphere, CO at 430 ppm. The team captain confirmed the readings with FAB. Initially there was some difficulty in communications. The FAB could not understand the instructions from the team due to background ventilation noise. Team 2 proceeded and repeated the communications once a quieter location was found.

Team 2 completed additional location check at 13:05 from 107 heading 1 c/t to 54 c/t as advised by IMT. Gas readings were still irrespirable, CH4 at 1 per cent and wet bulb temperature at 28°C. The team captain confirmed a new return time of 13:55 with FAB.

Team 2 split into two to search along 107 B heading and C heading from 1 c/t. The team continued through to 4-5 c/t. C heading had poor roof conditions beyond this point so all team members travelled along B heading towards 6-7 c/t. Team 2 completed all checks to 7-8 c/t at 13:40. Team 2 attempted to return via A heading. A heading ground was too difficult at 7-6 c/t. The team captain called the FAB to inform all team members returning via B heading and expected to return in 10 minutes. The team captain called the FAB to confirm location at 2 c/t B heading at 13:50. There was an accidental diversion to sealed doors at B heading which could not be opened but the team then quickly diverted to the A heading doors. Team 2 arrived back at the FAB at 13:55. The FAB confirmed that the casualty had been found by team 1 and was currently on the way to FAB.

What worked well

The assessors felt the following worked well:

1. The early activation of QMRS response, once it was identified that a CMW was missing and a re-entry to the underground workings would be required.
2. Interaction and teamwork between undermanagers, who were the operations coordinators for night shift and day shift, the compliance superintendent and emergency services officers who were also experienced mines rescue personnel. Logical thinking was used, valid input from all personnel in narrowing down the most likely location of the missing CMW, the best location for the FAB for mines rescue and area to commence searching. Consideration also of the unknown status of the LHD fire in the mains and potential for escalation.
3. Experienced mines rescue trained personnel working for Moranbah North coal mine promptly implemented the process of gathering and inputting information using multiple computers into the MEMS online software tool to provide to QMRS for a mines rescue deployment to occur.
4. Prompt response from QMRS and team members with sufficient personnel to deploy underground with four teams and a FAB. Having Moranbah North coal mine team members allocated among teams was beneficial due to the local knowledge of the mine.
5. Mines rescue team captains showed excellent leadership, communicated clearly, and used their time to understand tasks, conditions and gather relevant information from site-based rescue team members.
6. Teams took additional mine site gas monitoring and communication equipment as backup and to assist when searching multiple headings. A Wifi phone was used when the

telephone at the FAB was found to be not operational—although this may have been more difficult if there had been no underground power.

7. The FAB and teams worked well together to identify problems and find solutions.
8. All mines rescue team members (QMRS and volunteers) were highly professional and efficient throughout the exercise.
9. Mines rescue volunteers arrived promptly to site.
10. Information was quickly shared with all team members.
11. The teams were able to quickly adapt to changing situations—faulty underground phone, poor roof and ground conditions, delays to deployment. Team 2 also had to reduce their return time to the FAB due to the additional location to search and the increased temperature constraints.
12. The mines rescue captains were calm and clear in their communications and led their teams efficiently. All four teams and the FAB interacted well.

Areas for improvement

The assessors identified the following areas for improvement:

1. The documented and practical process for gathering MEMS information pre-incident, and when an incident has occurred, answering questions and providing supporting evidence did not go smoothly. This led to clarification questions being asked by the Queensland Mines Inspectorate.
2. The EMQnet tool was effectively used by the IMT for incident management, communication and task allocation, while the QMRS MEMS tool was used by site compliance and emergency personnel to gather relevant information to answer and validate incident questions required for the QMRS response and re-entry. Some delays were experienced among those site personnel required to use both systems.
3. The mines rescue building and staging area was used and served its purpose, but could have been tidier and more organised. Use of these areas for other functions during normal operations is common, but a documented process and responsibility for clearing and preparing the substation to receive, manage, and deploy multiple team members and equipment once a mines rescue response is triggered would be beneficial. The system for communicating and receiving up-to-date information to and from IMT could be improved.

Social and mainstream media

Assessor—Theodore Georga

An important element of any emergency response is to ensure that next-of-kin of any injured or

affected workers are informed in a timely manner. Social and mainstream media can adversely impact that process and can cause increased distress for family members and friends of workers affected by emergency situations. Mainstream and social media discussion can also serve as a distraction during an emergency and must be managed appropriately to ensure that the focus remains on the health and safety of affected workers.

The assessor attempted to recreate a simulation of the potential reaction to the emergency situation and response on mainstream and social media. The scenario was designed to test the mine's ability to:

- notify next-of-kin in a timely manner
- communicate accurate information to the media and public
- correct misinformation.

The scenario also tested the response of Resources Safety and Health Queensland.

The elements of the scenario were communicated to the mine's corporate communication team and to the Resources Safety and Health Queensland media team using publicly available contact information. Simulated mainstream and social media scenarios and simulated phone calls were used by the assessor to communicate the elements of the scenario. No external media or social media channels were used and scenario elements were sent to nominated contacts via email. Responses were provided to the assessor via email.

What worked well

The assessor felt the following worked well:

1. Notification of next of kin was treated as a priority. In-person support was provided to family members.
2. In-person support was provided to injured worker while in hospital.
3. Responses to media did not divulge sensitive or personal information about injured or missing workers. Information was updated throughout the exercise in a prompt manner.
4. Including corporate communication in IMT meetings ensured the latest accurate information flowed to mainstream and social media as soon as possible.
5. The mine's crisis communication plan was thorough and guided the mainstream and social media response effectively.
6. Having a procedure/script in place for dealing with media/family members arriving on site.
7. Chief Inspector of Mines, Coal was aware of internal Resources Safety and Health Queensland media response protocols and responded appropriately to media enquiries.

Areas for improvement

The assessors identified the following areas for improvement:

1. Communication between the mine's corporate communications team and Resources Safety and Health Queensland is strongly advised to ensure accuracy of information and communication and privacy of affected parties is maintained.
2. The Resources Safety and Health Queensland media team was included in the exercise at late notice and the mine's corporate communication team were unaware of their involvement.
3. The mine's corporate communications team advised that normal procedure would have been to include Resources Safety and Health Queensland media as a stakeholder in all communications.
4. The mine's corporate communication chose not to engage directly with posts on Facebook. Instead they chose to only communicate via the official AngloAmerican Facebook page. While there are positives and negatives to this approach, it did allow misinformation to be propagated without proactive correction. While it could be assumed that the AngloAmerican Facebook post would be shared by the community, this may not happen in all instances and may allow misinformation to spread.

Conclusions: Surface

These conclusions have been derived from the review of the comments of the surface assessors on the observations they made while assessing the surface response.

1. The two night shift Undermanagers quickly dealt with the initial response to the underground incident and dealt with it in an efficient manner.
2. Some issues were identified with the emergency response system
    a. lack of training in EMQnet
    b. some EMQnet computers were on New South Wales daylight saving time
    c. duty cards were stored in multiple locations and were dated 2013
    d. the 555 phone was disconnecting live calls
    e. the alarm siren was run for a long period of time but could not be heard in some areas on the surface
    f. the control room became congested and noisy at times.
3. There were delays in obtaining data to populate the MRAS forms to sign off on the deployment of QMRS.
4. Having two CROs on shift created some complexity with recording clear updates, messages and phone conversations. By the end of the night shift, there were three separate written logs and one typed log. This was not consolidated into a master log throughout the exercise.

Interactions with the Queensland Mines Inspectorate and ISHR

Queensland Mines Inspectorate

It was noted that during the responses to incidents at North Goonyella in 2018 and Grosvenor in 2020, the inspectorate does not participate in IMT activities but require briefing and updating on the proposed incident response by the mine site. The timing of the 2020 exercise enabled this approach to be followed and the inspectorate provided a review of the information flow and briefings received.

1. Call received by weekend duty officer (WDO) at **03:53** from the Underground Mine Manager. Call lasted 7 minutes.
   UMM was in Newcastle at the time of making this report.
   Primary information given in this call is recorded in official notebook 000852:
   - Level 1 Exercise
   - At 02:30 a LHD had caught fire at 76-77ct E/Hdg Mains—this was later corrected at 75-76ct.
   - One CMW (operator) injured, sustained a knock to the head and broken right arm when

the LHD contacted the rib.
- Operator self-extracted and is on the way to hospital.
- Fire watch in progress.
- Site has just lost main fans (approximately 03:30), all persons withdrawing.
- QMRS notified for standby.
- About to notify ISHR and SSHR.
- Requested who is site contact—incident controller and mobile number provided, he is site contact.
- Informed UMM if real event isolate scene, pit is withdrawing people anyway.
- Teams meeting at 04:30, invite will be sent to weekend duty officer and regional inspector.
- Injured CMW is a Mitchell Driller name provided.
- Asked UMM if the site is running EMQnet, answered yes. Asked UMM to add regional inspector straight away (possibly more to add later), weekend duty officer contacted regional inspector to pass on primary information and check if the inspectorate were deploying persons to site.

2. Contacted acting Regional Mines Inspector by phone and passed on primary information.
3. After viewing mine plan, contacted UMM by phone 04:24 and asked for confirmation of 76-77 E/Hdg Mains, this is when UMM corrected it to 75-76ct E/Hdg.
4. Received an email message 04:49 that weekend duty officer had access to EMQnet, logged in and read messages. At this point noticed for the first time there was a one hour discrepancy in times on EMQnet.
5. Contacted Regional Mines Inspector again to update on EMQnet developments.
6. Received a telephone call brief from incident controller for an update 05:45, information same as EMQnet notifications.
7. Teams meeting invite for 06:15.
   From this point on, focus was on EMQnet notifications and dial in via Zoom to IMT meeting to observe discussions. The inspectorate did not interrupt this process, any questions for incident controller were asked after the IMT was completed. At this point there were no serious concerns with how Moranbah North coal mine was managing the emergency.
   Inspectorate were informed one person (name provided) was still missing, QMRS at site and commenced on MEMS process, only one main fan operating at 80 per cent, next meeting 07:15.
8. 07:15, IMT by Zoom. Still one fan operating, dampeners still open on fan 2. Investigating 75-76E if LHD fire out. All intakes have fresh air, no methane. Checking pressure differentials for indication of change. Raised in IMT possibility of approaching Broadmeadow Mine for mutual assistance for resources. ISHR has arrived at site. Mines rescue not underground yet. SSE (not on site) prompted IMT to consider a succession plan for a change over later.

9. 07:45, Inspectorate only Teams meeting to discuss primary information.
10. 08:29, IMT update. QMRS still not underground, three teams ready, one standby, plan to establish an FAB at 53ct when deployed. Generators plan to start up 09:00. Decision made to not make any change to current ventilation arrangement or increase ventilation while QMRS underground. Next meeting planned for 09:30.
11. 08:37, first iteration of MEMS form, signed off by UMM. The document was very much incomplete. 08:45, weekend duty officer attempted phone contact with incident controller and Inspector of Mines on site, neither answered. Call was returned within minutes, weekend duty officer spoke to both incident controller and IOM on site, three sections of MEMS document were not populated, must be done to consider a QMRS deployment. Informed incident controller this needs to be completed correctly. Reinforced inspectors do not provide approvals, check the systems are applied and process followed. Teams not to be deployed until MEMS process has been followed and full sign off.
12. 09:45, second iteration of MEMS. Still incomplete. Top of page 3 stating greater than 90 per cent explosibility in areas of the mine, no other detail for locations. Lack of detail and analysis of gas data demonstrated. Details that were provided raised more questions than provided answers. Informed by onsite inspector that hydrogen had been identified in a sample, nothing mentioned of this in MEMS form.
    Informed incident controller this was again not accepted for teams to deploy.
13. 10:00s. IMT update, aligned to EMQnet updates. Still waiting for MEMS form to be completed.
14. 10:09–10:20, phone call with IOM on site and QMRS operations manager, asked for updated MEMS form and asked for an explanation of 60 ppm H_2 in East mains 23ct (not a sealed area). QMRS Operations Manager believed this to be by-product of fire, weekend duty officer asked Operations Manager if any other higher hydrocarbons detected, answer was no.
15. 10:20, third iteration, again signed by UMM as well as QMRS Operations Manager. The QMRS rep name was not identifiable. Same concerns about explosibility not being able to be explained, could not answer what ratios are considered and checked. H_2 present in East mains, this is not covered in the MEMS form. The MEMS form was still very much incomplete.
16. Inspectorate Teams meeting—mines rescue teams cannot deploy if there is a TARP trigger in place that would and should prevent re-entry. This was passed on to site inspectors.
17. 10:30, gas chromatograph results received from Operations Manager. Results identify ethylene, ethane, and hydrogen in sample, time of sample 08:17—other emails received of gas data after this point. Operations Manager stated hydrogen was trending down, asked what ethylene was doing in the sample and asked was anyone on site analysing the data for why there were higher hydrocarbons present, what they were trending and had the tube bundle point at 23ct East mains been put on hold to monitor, asked if there were any considerations made to other ratios and what were they.

Operations manager stated there were three VOs on site looking at the data.
Inspectorate expressed concern that there was a lack of reference to the gas data analysis in the MEMS form. Inspectorate informed QMRS operations manager that teams cannot be deployed if there is an unacceptable level of risk present including a TARP trigger that would under normal circumstances prevent re-entry. One person underground unaccounted for and condition unknown, it is not acceptable to risk four teams for one person with so much unknown about the mines environment, MEMS process must be adhered to.

18. 11:00, weekend duty officer contacted QMRS operations manager and expressed concern again about MEMS process incomplete and, requested the *trends* for the higher hydrocarbons in previous bag samples. *This request was not received, the last iteration of the MEMS form 11:51 only makes reference to analysis for trends is occurring, it doesn't identify what the trends are doing.*
19. 11:51, last iteration of MEMS form signed 11:31, received 11:51 after teams already deployed. MEMs form identifying:
    - Still identifying "50 ppm at multiple points", page 1 & 2.
    - Page 2 identifying the fire substation, "there was no report on condition left in", why was this not debriefed from the persons withdrawn?
    - Still identifying "greater than 90 per cent explosibility" on top of page 3.
    - Would have been an advantage to record which real time points were able to be validated with TB. Unknown how this record was maintained. Would have been good information to the team captains.
    - Many questions throughout the MEMS form were provided with responses but the responses do not answer the question. The MEMS form is a record, as far as maintaining records it was very poor quality.

What worked well

The inspectors identified that the following worked well:

1. Using Zoom for IMT, Teams for RSHQ, phone connections and EMQnet were all used successfully. While there is always room for improvement, it is a bonus that these systems were tested.
2. Forming IMT support for inspectors who responded to site worked well, Mackay was the central point of contact, additional support provided by Rockhampton and Brisbane inspectors.
3. Inspectors having to respond from Mackay in real time was test of response capability.

Areas for improvement

The inspectors identified the following areas for improvement:

1. Industry requirement to ensure actions from Level 1 exercises are closed off at the mine in question, and other mines review and correct their systems based on the learning.
2. Mines to ensure all aspects of the Level 1 exercise are treated seriously with all aspects completed as in real event eg., Repeated incomplete QMRS MEMS signed off by mine and submitted to Inspectorate.
3. Deployment of QMRS teams. At 08:37 the UMM signed off on the MEMS form which was incomplete, 90 per cent of questions not answered. The UMM was in transit by plane from Newcastle to site, there is no indication this form was reviewed prior to signing, the IMT put it forward that teams were ok to deploy. With the volume of information that supports the MEMS process it would be difficult to review this adequately while in transit.
4. Was the UMM normalising the deployment? Could the UMM have used his delegate appointed under section 60 to have the review done by his Undermanager on shift and validate the decision with the IMT for sign off?
5. QMRS signed off on incomplete MEMS form in the 2nd iteration at 09:02, then again at 10:08, then again at 11:31. The last version of MEMS the Mackay IMT did not see, the version sent at 13:06 was incorrect, they had resent the 09:02 version.
6. MEMS process was incomplete. In each iteration provided to the inspector, responses in the MEMS form for most parts raised more questions than provided answers.

Industry safety and health representative

Initial notification under s198 of the *Coal Mining Safety and Health Act 1999*

The first phone call for notification from the UMM was received at 05:45, and text message at 05:48. The UMM attempted to call again at 05:52 and I returned his call at 06:00 and was verbally notified of the incident. The UMM had tried to telephone another ISHR and left a message on his phone. This does not comply with s198 of the Act. The mine is required to notify (orally or by notice) the ISHR of the incident.

The UMM provided all primary information required by s198, except for name of injured, witnesses and who found injured person. He made undertaking to get back with this information. Other information given by the UMM at initial notification included;

- Status of injured CMW—transported to hospital with suspect broken arm and head injury.
- Fire extinguished and stable with fire watch in place until evacuation required.
- Lost mine ventilation with some build-up of gases.

- Missing CMW.
- QMRS deployed.
- Inspectorate notified (name provided) notified at 04:10, site safety and health representative (SSHR) 1 notified at 04:04 by message, SSHR 2 at 04:05 verbally.

I notified the UMM, as the site senior executive representative, that I was in Moranbah and would attend site (s119(b)).

Site observations

Arrived at site 06:45. Contacted incident controller on arrival from the swipegate communication system, and a person was sent to get me in good time. Escorted into the mine by the training and compliance co-ordinator who was assigned to accompany me at site. I immediately requested briefing of events and was taken to training room 1 to wait with the training and compliance co-ordinator. At 07:35, I advised the training and compliance co-ordinator that we had been waiting more than 30 minutes, and that he should enquire about promised briefing. 07:40, received briefing from the IMT human resources co-ordinator and IMT liaison. The brief included

- reading out of media statement released at 06:30
- brief description of event
- In general, the briefing was poor with my inquiries, including primary information, unable to be answered. Questions that could not be answered included
  - name of injured CMW—was told this was not being released. I advised that this was primary information and required to be provided, was told will get back to me
  - witnesses, first responders to injured person
  - status of fire
  - time everyone accounted for (except missing CMW)
  - status of QMRS
  - what caused mine ventilation loss and status
  - didn't know of any gas build up/readings
- I advised that I would go to control room to seek ventilation and gas info and was told I couldn't. I advised ISHR powers allow this but was requested to stay until clarification from IMT sought.

08:00 briefed by IMT human resources co-ordinator

- was told injured CMW worked for Mitchell's but could not divulge name at this stage
- still seeking answers on other questions.

08:10 briefed by IMT human resources co-ordinator. I was informed of the following

- last known location of missing CMW 106/107 area—when queried, was unsure how this was determined and tracking system used
- told gas levels normal in intake, CH_4/CO/CO_2 sensors poisoned. I asked which ones, were unsure

- was advised IMT agreed I could go to control room
- lost power due to offsite issue—gensets u/s due to dirty fuel
- Night shift CMWs accounted for 04:30
- status of fire—extinguished
- still not releasing name of injured person
- missing person's family notified
- no inspectors or SSHR on site.

I visited control room and other surface areas. 08:40, briefed by IMT human resources co-ordinator—informed of the following

- QMRS status unsure but not underground yet
- name of injured person given
- inspectors expected at site at 08:35—was told would get briefed with inspectors
- next IMT 09:30.

Attended crew update and pre-shift at 09:00.

09:40, spoke to IOM and told they had briefing—requested re-entry risk assessment from IMT.

10:20, briefed by new IMT human resources co-ordinator—risk assessment finalised, would get soon.

10:40, received update from incident controller and IMT planning co-ordinator. Was given a thorough briefing on the following

- risk assessment re-entry status
- QMRS ready to deploy
- missing person's name and last known location—last check in around 00:00
- details of tracking system
- status of injured person in hospital and stable
- status of gas monitoring—only CO sensors poisoned, TB monitored
- fan shaft 1 vent re-established to around 170 m^3/s, shaft 2 and 6 currently unserviceable
- gas trends and peaks
- bag samples taken 08:17
- asked for copy of risk assessment.

11:50, met with IOM, and QMRS operations manager Smith for briefing and discussed the following

- MEMS input and program issues
- received MEMS risk management document that had just been completed and signed off—QMRS deployed 11:45
- re-entry not under s330
- inspectors relayed concerns and controls, including TARPs
- I relayed concern with gas verification via TB—last one was advised by IMT to myself at 08:17, was told it was being done every 30mins

- estimate 2.5 hours to find missing CMW
- missing CMW last checked in at 22:40, not midnight as I was told.

13:00, received IMT update—QMRS deployed but no news yet.

13:59, IMT update CMW still missing.

14:01, IMT update CMW found unconscious but breathing.

14:20, CMW back at FAB and exercise finished.

Areas for improvement

1. Poor initial on site briefings. I received more information from initial UMM notification than first few briefings on site. Some of this was due to genuinely not knowing, but I felt that some was due to unwillingness to share info, including that required by law such as primary information under s198.
2. At the first briefing on site, it was difficult to get any more information than the media statement.
3. Would prefer operational people to give briefings to allow for answering of technical questions.
4. ISHR functions and powers impeded from accessing information and surface areas of the mine such as the control room. Also requested copy of risk management for re-entry and took a couple of hours to finally receive, after QMRS deployed.
5. Would be advantageous to have an information management system. This would ensure correct up-to-date information is available and reduce the need for several briefings and back and forth that is time consuming and inefficient for all parties. For example, if I was briefed with inspectors, by the same system, by more senior technical people from IMT, I would have had the correct information earlier.

Conclusions: Interactions with inspectorate and ISHR

1. The Queensland Mines Inspectorate and ISHR were both dissatisfied with the quality of information they received.
2. The MEMS documentation was not completed correctly and lacked information when submitted to the inspectors.
3. Zoom meetings and EMQnet access both proved very useful.
4. The inspectors were talking directly to QMRS to clarify information that the incident controller should be providing.
5. Mine sites are not familiar with the MRAS process and do not provide sufficient information to QMRS in a timely manner.
6. ISHR received a briefing from non-technical mine staff who were not fully aware of the access rights and powers that are allocated to the ISHR in the Act and Regulation.

7. Mine required to treat level 1 process as a real event in all respects including communication with Inspectorate and ISHRs inc;
    a. ISHR notification of the incident was delayed
    b. ISHR was restricted from accessing information
    c. ISHR was impeded from accessing site locations
    d. documentation supplied to inspectors was not completed correctly.

Recommendations

These recommendations have been made with the aim of providing continual improvement in the state's coal mines and in the Queensland emergency response capability. Information is provided at Appendix C on issues to consider when running future emergency exercises.

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

The numbering system being used is derived from a spreadsheet first established by Mike Caffery as gap analysis between level 1 exercise recommendations and coal mine emergency response schemes.

As this is the 23rd level 1 exercise, the primary number is 23. This will assist in cross referencing the spreadsheet and level 1 exercise reports.

Recommendations for the mine

23.1 Investigate and correct the issues with the mine's communication systems:
    a. The 555 number was cutting out and incoming 555 calls disconnecting existing calls even if a 555 call.
    b. Issues with mobile telephone coverage underground not covering the whole mine.
    c. Issues with PED coverage not covering the whole mine.
    d. Lack of communication infrastructure at tag boards, phones not working at B1 East mains FAB was not working 53CT.
    e. Perform routine corrections of the system to remove any remaining persons from system errors in the mine tracking system. *The underground tracker reporting 10 people still underground after mine evacuation*.
    f. Investigate alarms on the system for CMWs who do not move.

23.2 Review and amend the emergency response scheme at the mine:
    a. The mine's response to incidents should be adapted to take advantage of the ventilation

circuit i.e. “The longwall crew could have been left to retreat inbye and await further instruction rather than send everyone underground to the single incident”.

b. More visible egress droppers both primary and secondary escapeways.
c. Review the layout of the district inspection boards to make them clearer to read with all relevant information needed by CMWs entering the district.
d. The requirement for vehicles to be readily available in panels for evacuation in the event of an emergency.
e. Take corrective measures to ensure compressed air pressures are maintained at a level to guarantee diesel engine start.
f. Refresher training in real time and personal gas detector sensor limitations.
g. Have up-to-date mine plans in crib room.
h. Consider alternative way of *no-roading* the tag board without having to run tape over the board (covering up some of the tags).
i. Ensure duty cards are reviewed and updated and all stored in same location, or at least a reference in the IMT leader’s duty card for where all the duty card packs are stored and can be located.
j. Develop and allocate an intelligence duty card within the mine site emergency response scheme to liaise with the planning group as identified in the *Australasian Inter-Service Incident Management System*.
k. Have radios charged up ready to go at all times for the CRO to assign to portal guards, marshal and site security duty cards.
l. EMQnet daylight savings time to be adjusted to Queensland time.
m. A1/A0 size hard copy of statutory mine plans to be stored in IMT rooms (planning, logistics, operations, IMT) for IMT to access and use if required, updated monthly by surveyor with latest version.
n. Mines rescue substation access—ensure the signage is updated due to the changed road conditions and that all mines rescue members can quickly access site.
o. Extra signage to be installed to direct Queensland Ambulance Service directly to the IMO first aid room so they can immediately access any casualty.
p. Change process for AngloAmerican corporate involvement in the IMT as a view only function in IMT Teams meeting and allocate a duty card under the mines site MERS and a point of contact outside of IMT meetings for clarifications of information required.

23.3 Increase the frequency of training for personnel on SCSR and CABA. with a focus on:

a. opening SCSR, including dealing with crimped hoses and difficult to open units.
b. flushing face mask before donning CABA mask.
c. outbye refill stations processes—“One deputy made a comment that the guys don’t do it often enough. This was in reference to the processes around exiting the vehicle and entering a refilling station and returning to the vehicle again. He was prompting and

reminding personnel of the importance of head count and sequence for refilling"

d. increased regular intervals of training in firefighting—consider the first response training offered by QMRS
e. familiarisation of CROs and UMs with ventilation and general body contaminant TARPs and what response actions are required—VO was only notified one hour after the CO alarms were triggered

23.4 Review air door pressure differentials and ensure that any CMW can open them unaided.

23.5 Ensure CH_4 system issues on Driftrunner HFM28 is resolved.

23.6 Review the ventilation TARP using a risk management process to cover fan stoppages—the 30 minute evacuation is not prescribed in current legislation.

23.7 Change the telephone system setup to be able to direct external calls away from the control room to a dedicated operator during an emergency.

Recommendations for industry and Queensland Mines Rescue Service

23.8 The testing and familiarisation of all personnel for their work areas in particular the location layout and practical application of the CABA refilling locations.

23.9 Communication protocols to be developed at mine sites to ensure that QMRS members working on shift at other mine sites are made aware of the emergency call out by their Control Room/ Undermanager (Workers currently on shift do not have mobile phones on them to receive the call out)

23.10 Ventilation related level 1 findings to be presented at the six-monthly VO workshops (Presented by both the VO at the mine that experienced the level 1 and also VO assessor).

23.11 Key industry stakeholders (i.e. QMRS, RSHQ, ISHR, operation representatives) form a working group to urgently review, clarify and communicate the data, information, systems and conditions required and expected to enable a timely, informed and risk-based decision-making process for personnel to remain or re-enter underground during an emergency event, especially when lives are at risk:

a. Training required for senior and technical mine site staff on their duties and obligations to provide substantive data and information for completion of the MRAS/MEMS forms.
b. Enable data entry to be streamlined in the system with clear definitions of the level of detail required.
c. Understand pre-population of the MEMS software to enhance the deployment of QMRS.
d. MERS should be reviewed to incorporate triggers, actions and responsibilities for gathering the relevant information for the MEMS software tool where a mine's rescue deployment may be required. This needs to include a system or process for regular updating of pre-incident information. The person/s completing the MEMS tool require

access to relevant technical expertise—dependant on the nature of the event—to answer the incident questions and to provide sufficient and appropriate information/data to support the answer where necessary.

e. Have data available at the rescue substation for the briefing of team members and keeping team members up-to-date this should include the EMQnet/MEMS data in read only access and up-to-date mine plans.
f. Work order system to identify data for MEMS to be updated with.
g. Integrate MEMS into the mine sites gas monitoring system to have live data.
h. Identify where the MEMS duty card should be allocated in the mine emergency response scheme.
i. QMRS to identify a schedule and process update their records of each mine site's MEMS.

23.12 QMRS and mines rescue coordinators at each mine to review the process and flow to efficiently manage multiple mines rescue teams onsite:

a. Identify best practise for preparation and clearing of mines rescue staging area, substation coordination.
b. Initial communication and gathering of T-card information.
c. Preparation of equipment, briefing, waiting areas, deployment and packup.
d. Review of previous (most recent) statutory reports of areas being entered by rescue teams to identify any conditions that may affect FAB setup or impede access by mines rescue teams—e.g., phone not operational at proposed FAB, impassable swilly (water in the roadway) and air door with high ventilation pressure differential.
e. Identify most effective and efficient means of avoiding congestion at FAB on arrival of rescue teams—e.g., staggering departure times to give FAB additional time to set up.
f. Identify technological solutions to deliver efficiencies may be able to be gained when managing team member and resource movements, preparing team briefing and tasks sheets, mine plans—e.g., electronic swipe ins, tablets or similar.

23.13 QMRS to review with the team members involved to determine equipment/procedural improvement opportunities and provide clear team communications between FAB and teams while teams were active.

23.14 CMWs to have access to vehicles to be for evacuation in the event of an emergency.

23.15 Mine sites use the first responders' course offered by QMRS.

Appendices

Resume of assessors

Luke Augustin

Luke Agustin is currently employed at Broadmeadows mine as an underground operator with 10 years of mining experience and two years of mines rescue service. Luke is currently studying to become a deputy.

Dr Snezana Bajic

Dr Snezana Bajic is the Technical Services Manager at Simtars. She holds a Bachelor of Science, Bachelor of Engineering (Mining Engineer of Mineral Processing, Dipl. Ing. Rudarstva za PMS) degree, PhD Mineral Processing (UQ) and Graduate Certificate in Business. Snezana and her team are responsible for providing mine technical support services, emergency support services, consulting, research and development for the industry. She has been a level 1 exercise assessor three times and has recently become a spontaneous combustion trainer on accredited Simtars courses. Snezana has more than 18 years of industrial experience in both the coal and hard rock mining and has been responsible for executing projects on many mine sites in Australia, USA, Serbia, Canada, China and Turkey. Snezana currently looks after the mine emergency response unit, Safegas and CAMGAS mine support.

Lachlan Bartrop

Lachlan Bartrop has been an analytical chemist at Simtars for 12 months. In this time, he has gained experience as a gas chemist working with gas sampling equipment, analysing samples, troubleshooting and hardware installation. He has studied a Bachelor of Environmental Science and a Graduate Certificate in Chemistry as well as pursuing postgraduate research studies in microbiology. He has previously worked as an environmental consultant in Queensland and Victoria for 2–3 years sampling and advising on various coal mines and contaminated sites.

Rebecca Blines

Rebecca Blines commenced in the coal industry working as an exploration geologist in 2009 at North Goonyella with a Geology degree and moved to underground mine geology in 2010 at Oaky Creek. For the next seven years, Rebecca worked at Oaky North and then Moranbah North as a mine geologist and later as a geotechnical engineer following post graduate study (Graduate Diploma in Coal Mine Strata Control in 2016). While in these roles, Rebecca worked closely with the technical services team and was exposed to mine planning, ventilation and gas drainage

planning and activities. From there she headed underground and completed her Certificate IV in 2019 and was appointed a deputy at Grosvenor Mine in April 2020.

Keith Brennan

Keith Brennan is an experienced coal mine worker currently employed as an inspector of mines in the Mackay office. He commenced his career in the early 1970s at Westfalen Colliery Redbank. He joined Booval Mines Rescue in 1977. Keith received his deputy's Certificate in 1979 and commenced working as Deputy at New Hope Colliery in 1980. In 1991 Keith moved to Middlemount 1991 working Southern Colliery as a deputy in Development and Longwall production. Keith then moved to North Goonyella and passed his undermanagers exam in 1997. Keith joined the inspectorate in 2008.

Michelle Brunker

Michelle is currently employed as a control room operator at Grosvenor Coal Mine. Michelle has 25 years' experience working at various coal mines. She commenced at Collinsville Coal Mine in the purchasing/warehouse department and has also worked at Broadmeadow Coal Mine and Carborough Downs Coal Mine. Michelle has been employed as a control room operator for the past 10 years, seven of those at Grosvenor Coal Mine.

Brendan Clinch

Brendan Clinch is currently working as an ERZ controller/assistant undermanager at Grosvenor Mine and is working towards attaining his advanced diploma in underground coal mining. He has experience in both production and outbye across New South Wales and Queensland. He is a Queensland mines rescue member with 18 years of experience and has a mechanical trade background. Brendan has worked as an ERZ controller/deputy for the last nine years.

Shaun Dando

Shaun Dando is currently employed at Grosvenor mine as an ERZ controller. He commenced coal mining in New Zealand on the west coast in 1982 and is experienced in monitor coal mining. He moved to Australia in 1999 working at several underground coal mines. Sean is a member of QMRS and a trained mine inertisation unit operator. Shaun has been the team member of the QMRS board since 2011 and holds the following qualifications. Member of the Australian Institute of Company Directors, certificate IV in coal mine operational management and a Queensland deputy's certificate.

Shannon Doherty

Shannon Doherty is currently employed at Carborough Downs as ERZ controller and has 23 years of mining experience with 19 years as a QMRS member.

Phil Fletcher

Phil Fletcher is an underground coal professional with more than 26 years of industry experience. Phil currently works at Kestrel as a senior mining engineer. In addition to an Honours degree in mining engineering, he has qualifications as an undermanager, deputy and shotfirer and has worked in such roles for a variety of New South Wales and Queensland mining operations, including Grasstree, Blakefield, Kestrel, Cook, Narrabri, Ashton, North Wambo, Broadmeadow, Appin, Tahmoor, North Goonyella and Alliance. Phil has worked as a technical services manager, as a compliance and outbye superintendent and consultant and started his underground career at Oaky No1 mine.

Theodore Georga

Theodore Georga is currently employed as the Manager, Stakeholder Coordination in the office of the Commissioner for Resources Safety and Health. He has more than 16 years of experience in media, communication and social media roles in the Queensland Government and private sector.

Theo has regularly participated in statewide emergency responses as part of the State Disaster Coordination Centre and in the Department of Health State Health Emergency Coordination Centre. He has participated as an assessor in four level 1 emergency exercises.

Tim Jackson

Tim Jackson was appointed to the role of General Manager Operations at the Queensland Mines Rescue Service in February 2019. Tim has 47 years of experience in the coal industry, nationally and internationally, having worked at mines in the northern, southern and western coalfields of New South Wales, Bowen Basin in Central Queensland, Indonesia and the United States of America. For 10 years he was an active member of mines rescue in New South Wales and Queensland. He has held a variety of operational and corporate positions during that time, including mine mechanical engineer, maintenance manager, undermanager in charge, production manager, longwall manager, mine manager, general mine manager, inspector of mines and corporate risk manager.

Tim holds 1st, 2nd and 3rd class certificates of competency (Queensland and New South Wales), Mine Mechanical Engineers Certificate of Competency (New South Wales), Ventilation Officer

(Queensland), Shotfirer (Queensland & New South Wales), Master's Degree in Business & Technology (MBT) from the UNSW and is a fellow in the AusIMM.

Sharon Jones

Sharon Jones is the Senior Administration Officer at Simtars. Sharon has worked at Simtars for 11 years and was responsible for the coordination of all activities to prepare and organise the other 28 assessors to ensure the efficient running of the level 1 exercise.

Nikky LaBranche

Nikky LaBranche is Research Manager Occupational Health and Safety and was the inaugural industry fellow in the Minerals Industry Safety and Health Centre within the Sustainable Minerals Institute (SMI) at the University of Queensland. She is pursuing her PhD characterising the impact of dust on the respiratory health of coal mine workers and has been awarded the AusIMM Education Endowment Fund Postgraduate Scholarship. She is a mining engineer with 15 years of experience in surface and underground coal mining through her work in the United States, Colombia and Australia. She is a board member of the AusIMM Health and Safety Society Committee, past chair of the AusIMM Southern Queensland Branch, and has been awarded the John T. Boyd Young Engineers Award. Nikky has worked in various mining engineering roles for Simtars, BHP, and the NIOSH Office of Mine Safety and Health Research. She has participated in six level 1 emergency exercise assessments.

Gareth Kennedy

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, including emergency response, mine gas monitoring systems and services, consulting, research and development for the industry. Gareth has more than 18 years of experience working in both the coal and hard rock mining. He has held public and private sector roles in Australia and the United Kingdom, and in managing large-scale projects. He has particular expertise in mining safety technology, mining automation systems, underground communications, energy management systems, instrumentation and telemetry.

Ben Lang

Ben Lang is currently employed as shift undermanager at Kestrel Coal mine. He has 20 years of underground mining experience in Queensland and New South Wales, from operator, deputy to undermanager with the last 15 years at Kestrel. Ben has 14 years of mines rescue experience.

Ben has participated in two level 1 exercises, one as a deputy in a development Panel and as an assessor in an underground panel.

Sam Lindley

Sam Lindley is a mining engineer/statutory candidate from the University of Wollongong, New South Wales. Sam graduated with Class I Honours and Scholar in December 2016. He started his professional career in December 2016 working at Clermont open cut as mid-term planning engineer completing design and scheduling work and then moved to Oaky North underground in September 2017 where he gained exposure to all areas of the technical services department and worked underground in development and longwall. Sam completed Class III deputies modules and is aiming to sit his law and oral exams in mid-2021.

Mark Lydon

Mark Lydon is currently employed by Resources Safety and Health Queensland as an inspector of mines electrical. He has a broad spectrum of experience in the coal mining industry spanning more than 43 years, encompassing trade certification, engineering qualifications and operational experience in mining and strata control, as well as participation in EL23 Australian Standards Committee and industry safety forums.

Ben Muller

Ben Muller is an ERZ controller for Kestrel Mine where he works in the outbye areas of the mine and does relief undermanager work as required. With 22 years of underground experience, Ben has worked in all areas of the mine and has supervised teams in development and longwall operations. Ben is an active rescue member of six years and vice-captain of the Kestrel coal mine competition team. He is currently studying his advanced diploma with an aim to gain his undermanager's qualification.

Mark Sanim

Mark Sanim is currently employed as a shift supervisor Broadmeadow coal mine. Mark has over 31 years operational experience in coal mines. He commenced his underground career a as an underground diesel fitter then progressed to become a mine fitter and longwall operator. He the studied to become an ERZC and has six years operational experience in that role at different coal mines. He has been the shift supervisor at Broadmeadow for the last five years and obtained a second-class ticket in May 2020.

Carl Skinner

Carl Skinner was a carpenter before changing to mining for a lifestyle change. He has been employed in the mining industry for 10 years. Carl started working on conveyor belt installations, longwall moves and finished as a development operator where he obtained his miner drivers ticket. Carl now works as the emergency response coordinator at Carborough Downs mine and he has been a member of mines rescue for five years.

Stephen Smith

Steven Smith has 23 years of coal mining experience and is an electrician by trade. He has been an ERZ controller for 19 years, and has 12 months at New South Wales under mutual recognition. He completed an Advanced Diploma of Coal Mine Management in 2015 including VO's RII. He gained his 2nd Class underground coal mine managers in May 2020 and is working towards toward his 1st class certificate of competency. He has been employed at Anglo-American's Grosvenor Mine for two years as undermanager and most recently as ventilation and gas superintendent.

Stephen Smith Inspector

Stephen Smith is currently employed as the regional Inspector of coal mines but acting in the role of deputy chief Inspector of coal mines, employed by the Coal Mines Inspectorate since 2017, functions are primarily conducting inspections, audits and investigations at coal mines. Stephen commenced in mining in 1982 . His primary underground experience is in bord and pillar and longwall operations at Wallarah, Liddell, Glennies Creek and Ravensworth North underground mines. He gained his surface mining experience at Hunter Valley No. 1, Baywater Colliery and Wambo mines.

Prior to joining the Queensland inspectorate Stephen was an Inspector of Mines in Western Australia conducting inspections, audits and investigations at all mines for five years. Stephen has the following qualifications BE(Mining), and NSW certificates of competency as Open Cut Coal Mine Manager, Open Cut Examiner and Underground Coal Mine Shift Undermanager.

Joel Treasure

Joel Treasure has worked in the mining industry for 10 years. He started in the industry in a trades role as an electrician at Grasstree mine. He then gained experience as an operator on the longwall, becoming the longwall coordinator. He has been a deputy at Kestrel coal for the last two years. Joel holds the following mining qualifications—Diploma in underground coal mine operations, Certificate 4 in underground coal mine operations , ERZ controller ticket, electrical engineering manager ticket and an electrical license for underground coal mines.

Michael Van Der Meer

Michael Van Der Meer is currently employed as a graduate mining engineer and finishing his studies as a trainee deputy at Grasstree mine . Michael has previously worked for Mastermyne at Grosvenor and Simtars as a Project Officer. He is currently operating in the longwall and has experience in gate road and mains development.

Martin Watkinson

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 emergency exercises between 2001 and 2008 and has been the Chair of the committees for 10 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.

Michael Webber

Michael Webber is currently employed as Development Operations Coordinator at Grosvenor mine. Michael is a mining engineer (AusIMM chartered professional) with more than 10 years of experience in underground coal mining operations. He is also a qualified ventilation officer and has held ventilation officer appointments at Newlands Northern, North Goonyella and Grosvenor. Michael is scheduled to undertake the Queensland deputy oral in February 2020. He has five years of mines rescue experience (QMRS).

Briefing notes for Assessors

Surface observers

- *This is an emergency exercise that you have already been informed about.*
- *Please treat this exercise as a real event.*
- *I am the observer for this group.*
- **Start communication with Level 1 exercise communication**
- ***Do not ring 000 or any external services***
- ***Please tell me if you would have contacted an external service as part of your response/Duty card***
- ***You are free to call QMRS, Inspectorate, ISHR, Simtars or Anglo personnel as required***
- *You are free to make your own decisions.*
- *You are not to endanger your own or any other persons safety in this exercise.*
- *As I am an observer I am not allowed to assist you by answering questions.*
- Engage with the site personnel until T=0 general discussions about objectives and learnings of level 1 exercises

Underground observers

- *This is an emergency exercise that you have already been informed about.*
- *Please treat this exercise as a real event.*
- *I am the observer for this event*
- ***Do not put your belt worn self-rescuer on. You will be given one if required.***
- **Start communication with:**

"This is a Level 1 exercise communication"

- *You are free to make your own decisions.*
- *You are not to endanger your own or any other persons safety in this exercise.*
- *I will give instructions/information with regard to the environment.*
- *I may ask you to perform activities as part of the exercise test*
- *As I am an observer I am not allowed to assist you by answering questions.*
- Engage with the site personnel until T=0 general discussions about objectives and learnings of level 1 exercises.

LW 605 (Joel Treasure Brendan Clinch)

Use the briefing sheet to put the people at ease.

Ensure LW is OK shearer not in a bad place ideally parked towards the MG end of the face ensure there is no support issues:

T+25 LOC

Inform them of smoke coming into the panel.

Use the pollutant spread sheets if they get the call to evacuate earlier

If they decide to go to the downcast shaft record this decision but get them to evacuate.

If this occurs for the purpose of the exercise these CMW's are underground waiting for the fire to be extinguished.

Three persons to don SCSR than change over to CABA wearing the smoke goggles light on dip.

Bring the bits of SCSR to surface for correct disposal.

Do not overload the PJB limits on numbers due to COVID.

Ask them what they would have done and account for it.

If we have to leave CMW's in the panel due to lack of transport contact MW to organise. Gas readings:-

LOC

CO	300
CO_2	0.2%
O_2	20.6%
CH_4	0.2

In travel road

CO	430
CO_2	0.3%
O_2	20.3%
CH_4	0.2

Outbye of shaft

CO	650
CO_2	0.3%
O_2	20.1%
CH_4	0.1

East mains

CO	1200
CO_2	0.6%
O_2	19.5%
CH_4	0.3

North Mains

CO	430
CO_2	0.3%
O_2	20.3%
CH_4	0.2

We will not assess debrief check if they have identified the need and resourced it.

(Similar sheets were provided to the other underground assessment areas.)

Surface

Use the briefing note to put people at ease.

Need to work on the shift hand over.

Early team take note of when management arrive on site we will invoke their fatigue management later on.

<u>You are allowed to interject if they have gone off track</u>

Keep an eye on the tag board.

Identify the 2IC night shift then day shift explain what is happening with the day shift they are then not involved.

Fans stop at 03:30.

Need to help keep the IMT and the underground deployment separate.

Need to keep the IMT working on recovery and checking the gas data when QMRS deploy.

Level 1 exercises

These are notes provided by the assessors relating to issues to ensure the smooth running of a level 1 exercise along with suggestions for improving the process. These notes will be used in the preparation for next years exercise and discussed at the team briefings to determine the applicability of each one.

1. More SCSR/CABA training aids are required for all to don, changeover and refill. From an assessors point of view the only CMWs who benefited from the exercise were the ones wearing the gear (3 x CMWs)
2. Have a greater understanding of contamination pathways to provide realistic environmental readings. This can be achieved by going over this in more detail in the prior briefing meetings.
3. To be more discreet about the exercise. I understand the difficulty around planning the event without people knowing but the deputy and the crew knew we were coming.
4. If possible, instead of 1 man per unit, I believe having an entire production unit don SCSR's including Deputy would have valuable learnings.
5. More Assessors to cover groups. A work group we came across as we were exiting the 606 had not responded to the incident, they joined our group but without an assessor in the area missed out on the initial stage.
6. Breathing Apparatus. None of my group had the SCSR and or CABA I was unable to assess the practical use of the units and only able to assess a simulated version during the exercise.
7. Additional SCSR and CABA units to ensure more CMWs participate in the exercise
8. The low vision goggles are difficult to wear under a CABA mask.(the clear plastic bag used to seal the CABA unit from dust would be a good substitute to place over the mask to limit vision
9. If possible make all participants in the level 1 wear "smoked out" googles to help replicate smoke filled atmosphere. I feel this would help in replicating a real life fire emergency as well as restricting CMWs not wearing the googles assist with SCSR to CABA change outs.
10. From an exercise perspective the firefighting responders were prevented from putting water on and would give them a little more confidence/practice with the gear. This would also give them an extra chance of further training opportunity.
11. Very difficult to understand what is being said due to one sided conversation. It relied on the person to speak and repeat the information otherwise it is just yes and no answers most of the time. At times the assessor doesn't even know who is on the other end of the call.
12. Set clear assessment task and area prior to exercise to avoid information loss

13. Two assessors are minimum for control room assessment
14. Confirm alarm set points prior to exercise
15. The VO made a point that if Fans were ready to go then he would still model the scenario and then provide his approval to start fans to the CRO. Perhaps in future scenarios the Assessor provide instruction that Fans are now ‘available’ instead of ‘running’. Could Safegas be programmed to run the degassing simulation when the VO decides to start Fans rather than just a time trigger?
16. Staggering the start time of IMT assessors worked well in regards to fatigue management.
17. The mine found it difficult to use the Safegas laptops and were not familiar with the Safegas software. Safegas laptops in Planning Room and IMT Room kept crashing and having to be reset.
18. I believe there was an adequate amount of assessors for most IMT functions used on Surface to monitor the effectiveness of the systems. Any more in the IMT Room would have crowded the room too much. The only area I would recommend an extra assessor would be for individual assessors to the Planning Coordinator and also the VO.
19. Make a reservation for dinner
20. The splitting of the groups made the briefings much more efficient, but more detailed Hand over notes for oncoming shift to review
21. 1 or 2 more assessors available for observing the mines rescue operations.
22. Confirm all participant organisations early in the process and communicate to all stakeholders to allow for suitable planning.
23. Extended exercise time frame with staggered start and finish times for assessors allowed a more realistic time frame of exercise. Also allowed handovers to occur, and mines rescue deployment to be worthwhile.
24. MEMS process not fully tested as designed.

References

Coal Mining Safety and Health Act 1999, Queensland Government, Brisbane, Queensland.

Coal Mining Safety and Health Regulation 2017, Queensland Government, Brisbane, Queensland.

Recognised Standard 08 Conduct of Mine Emergency Exercises 25 June 2009 Queensland Government, Brisbane, Queensland. www.dme.qld.gov.au/mines/recognised_standards.cfm

Queensland Department of Mines and Energy Safety and Health Division 1999, *Approved standard for the conduct of emergency procedures exercises*: QMD 96 7393, 3rd revision, Queensland Department of Mines and Energy, Safety and Health Division, Brisbane, Queensland.

Windridge, F. W., Parkin, R.J., Neilson, P.J., Roxborough, F.F. & Ellicott, C.W. 1996, *Report on an Accident at Moura No. 2 Underground Mine* on Saturday, 7 August, 1994: Wardens Inquiry, Queensland Government, and Brisbane, Australia.