

*Report on the Simulated
Emergency Exercise
held at
North Goonyella Coal Mine*

Monday, 4 November 2002

EXECUTIVE SUMMARY

Distinct from previous years, the 2002 Level 1 Emergency Preparedness and Response Exercise was initiated with the Mine Manager and the Ventilation Officer off-site (ostensibly in Mackay, 2 hours away). Further, operational considerations at the time saw the underground response and evacuations being done with all the shift deputies quarantined from the exercise. Such circumstances provided an opportunity to gain insight into the response capabilities of the systems in place at the mine when such systems were not being supported by the customary supervision.

As well as providing valuable experience to the personnel involved, any discussion with the manager or ventilation officer will leave no doubt about the frustrations and stress inherent in being remote from critical operations over which you have obligations - something to be considered carefully when designing relief protocols for key personnel involved in extended responses. In addition to the core elements of emergency response capabilities, the change-over protocols at North Goonyella were a key issue under examination during this exercise.

The mine generally performed well given the complex nature and cascading sequence of events in the scenario. However, one person was lost due to disorientation during the evacuation as he battled impaired visibility for an extended time (approx 70 minutes). This issue has consistently emerged as a key learning from these exercises. The real difficulties of evacuating through smoke filled roadways with critically reduced visibility can only truly be learnt through experience - and only truly resolved through practice, practice and more practice.

The first response capability of the mine was focussed almost exclusively on the safe evacuation of the mine, with little consideration given to fighting the fire. There were a number of issues leading to this circumstance, not the least of which is the industry focus on getting people to "safety" first and then worrying about controlling the threats to that safety later. Such an approach appears well founded, but perhaps it is time for the industry to broaden this single issue, linear approach and examine the concept of a coordinated and rapid first response aimed at controlling these threats early - often when they pose less risk to those charged with controlling them. Given the expanding role of compressed air breathing apparatus in our industry and the ongoing imperative for a suitable vehicle to act as a support platform, such issues are worthy of considered debate.

The issue of an apparent industry-wide loss of experience and a general lack of appreciation of the circumstances and hazards associated with fighting fires underground arose early in discussions. This scenario was based on the Avon colliery fire (1976) in which a diesel vehicle initiated a fire which ultimately combusted nearly 700 tonnes of coal and which took over 14hours to control. The majority of mine-sites today appear not to be equipped with appropriate turn-out gear and adequate fire-fighting resources (and reserves) which appears to give testament to our collective loss of corporate memory.

This year's exercise provided further objective evidence of the reality of the self-escape philosophy being a mineworkers best chance of survival (although people are still walking past perfectly serviceable vehicles in order to continue an evacuation on foot).

Additionally, the exercise highlighted the critical need for Incident Management Teams, Duty Systems and aided rescue agencies such as the Mines Rescue Services to set clear, complementary and unambiguous goals and objectives, establish priorities and tracking mechanisms for attaining such goals and to maintain a strict discipline of process management throughout. The critical need to have appropriate tools and aids to conduct the business of emergency response was also apparent. There also appears to be an opportunity to further explore the areas “outside the box” of the Mines Rescue Guidelines. These excellent, high quality and comprehensive mines rescue protocols and guidelines are consistent across both New South Wales and Queensland and the services are to be congratulated for this. The opportunity for persons to become comprehensively familiar with the content and intent of these guidelines is now there and should be taken up. Based upon discussions with the services, the guidelines are not designed to prevent mines rescue organisations from operating outside certain parameters, but rather to provide guidance on how to operate within a given set of parameters. When confronted by circumstances outside the guidelines (as, from time to time, they inevitable will be) actions can be sanctioned provided they are subject to valid risk management – that is, the guidelines do not automatically “forbid” actions outside their mandate.

This report contains a comprehensive and detailed analysis of the year 2002 Level 1 Emergency Exercise and frames a further 48 recommendations to add to the over 200 recommendations to come from the previous four Level 1 Exercises.

At a recent seminar in Emerald (18-19 June, 2002) an open invitation was extended to stakeholders on ways to advance the uptake of these recommendations and to seek guidance on the future focus for these exercises. This year’s exercise management committee furthered these discussions and there appeared significant support for the development of a fit-for-purpose model/ideal IMT room for training purposes, a range of demonstration videos and some scenario based desktop exercise resources. The reactions of industry stakeholders to such suggestions are keenly sought and are most welcome.

In conclusion, it remains only to express my congratulations to the owners, operators and mineworkers at the North Goonyella mine for their whole-hearted cooperation and success in surviving what is a most strenuous test, and to thank sincerely all those dedicated members of this year’s exercise management committee for their tireless efforts in achieving another most worthwhile result. Thank you.



Greg Rowan
Chairman : Emergency Exercise Management Committee

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SCENARIO

In addition to testing the core Emergency Preparedness and Response capabilities of the mine, the exercise scenario was designed to meet these additional exercise specific objectives.

- Test the response capability of the mine when the Mine Manager and the Ventilation Officer were off-site.
- Provide a technical challenge to the Mine Manager and Ventilation Officer when they eventually arrived.
- Provide a background to comprehensively examine the change over protocols and communication / data exchange functions of key people in the Incident Management Team over extended timeframes.
- Examine the data collection, recording and communication channels.
- Examine the Mutual Response Support provided to North Goonyella coal mine.

In order to persist in promoting a measure of corporate/industry memory and to provide historical substance to the scenario, the exercise committee continued its custom of highlighting past events as baselines for the scenario development. In this case, the initial fire scenario was based on the Avon Colliery diesel vehicle fire of 1976.

The scenario provided for a first response fire-fighting effort. It would appear, however, that as an industry we are losing perspective on the scale, difficulties and circumstances involved in fighting fires underground. The Avon colliery vehicle fire required several hours of concerted fire-fighting to bring under control – and then only after it had combusted some 700 tonnes of coal. Provided on the following page are some photographs of the remnants of the Rhino vehicle involved (courtesy of <http://www.illawarracoal.com>) and a photograph of what a large surface diesel vehicle fire looks like (courtesy of <http://www.mishc.uq.edu.au/NMIRAG/NMIRAG.asp>). Certainly the surface vehicle needs to be reduced in scale to match the size of an underground vehicle, but the photograph provides some indication of the levels of heat and smoke generated by vehicle fires. These conditions will be all the more concentrated once confined in a 5 x 3 metre roadway and fanned by 50 odd m³/sec of air.

Having identified the fire as out of control, it was anticipated that a mine-wide evacuation order would be given. It was determined by the exercise committee that the 4 North Development crew were to be restricted to an evacuation on foot - with two crew members using “live” SCSR’s. Such determination was made in order to obtain an accurate duration rate for these SCSR units under “real” conditions.

The second stage of the exercise scenario involves a fall on the breaker stage loader (BSL) in the 3 North longwall panel. The fall separated the crew with some workers on the outbye side and others trapped on the inbye side. Those inbye the fall would need to evacuate along their alternate escapeway. In this scenario, one of these workers would succumb to heat exhaustion necessitating the Queensland Mines Rescue Service to mount an aided rescue.

All evacuees, other than those using “live” units, were required to wear training SCSR’s. All had their vision impaired (from 3m to 5m) depending on circumstances at the fire-site.

The final stage of the exercise scenario was designed as a technical challenge for the Mine Manager, Ventilation Officer and the Incident Management Team in analysing and interpreting a range of raw gas readings, ventilation data and ratios. The challenge was to understand the impact of the fall in the longwall panel on the airflow along the face and the ventilation pressures in the panel. According to the detailed ventilation modelling conducted by the exercise committee in developing the scenario, these dramatic changes would allow the products of any incipient heating in the active goaf, undetectable until the pressure differentials altered, would start to report to the tailgate monitoring point.

Additionally, detailed and careful interpretation of absolute quantities, makes, gas ratios and ventilation flows could be used to indicate the changing circumstances of the separate combustion processes and fuel sources - from diesel and rubber in the vehicle fire, to diesel and rubber and coal as the fire spreads to the rib, to coal only as the fire is extinguished and the spontaneous combustion event is unmasked. A detailed discussion on these matters is provided in the section of this report titled *Data Analysis and Interpretation*.

AVON COLLIERY PHOTOGRAPHS



Rhino diesel vehicle fire – Avon Colliery
1976

<http://www.illawarracoal.com>



Surface haul truck fire

<http://www.mishc.uq.edu.au/NMIRAG/NMIRAG.asp>

SCENARIO TIMELINE

		REAL TIME (HOURS)
- 1week	Mine Manager advised that exercise scenario will require that he and the Ventilation Officer will be quarantined from part of the exercise - not advised of which part, or when.	
-0:10	Eimco operator notices smoke coming from engine compartment as he is driving down the drift.	
0:00	Operator parks Eimco in 'D' Heading, 9 - 10 cut-through (chock wheels) and attempts to extinguish the fire - unsuccessful	09:13
0:12	Impassable fall occurs on BSL, 3 North longwall trapping workers on inbye side. The fall: <ul style="list-style-type: none"> ▪ Reduces airflow along face line from 43.9m³/sec to 13.2m³/sec. ▪ Increases pressure drop at tailgate double doors from 249 Pa to 633 Pa. ▪ Increase air quantities reporting from goaf to tailgate return from 0.1m³/sec to 1.3m³/sec. ▪ Communication systems NOT cut. 	09:25
0:17 - 0:22	Smoke enters 3 North longwall and 4 North development panel face areas.	
0:25	<ul style="list-style-type: none"> ▪ 3 North longwall crew outbye of fall have access to vehicle if desired - vision impaired to 5 metres. ▪ 3 North longwall crew inbye fall to walk out tailgate - vision impaired to 5 metres. ▪ 4 North development crew advised their transport is unavailable and they must walk - vision impaired to 3 metres. 	
0:45	D9 borehole HT tension to trip if not previously isolated.	
activity dependant	Fire out after 35 minutes of <i>effective</i> fire-fighting using fog and foam.	
location dependant	Smoke clears after fire extinguished.	
travel rate dependant	3 North evacuee collapses at 6 cut-through tailgate return - heat exhaustion, unable to continue.	

* All times are indicative only and at the discretion of the Assessor depending upon the circumstances prevailing at the time.

PLANNING AND CONDUCT OF EMERGENCY EXERCISE

Several planning and scenario development meetings were conducted between July and November 2002 and a detailed risk assessment process was undertaken during the finalisation of this exercise scenario. The scenario and subsequent events were based on the hazards and risk profiles specific to the North Goonyella mine.

All mine atmosphere and ventilation monitoring data was provided through a network of laptop computers stationed in the mine control room and Ventilation Officers room. All data was presented in real time and in a format compatible to computer assisted analysis and system interrogation. As in previous years, the software program development by SIMTARS proved invaluable in the provision of this data. The data was presented in formats identical to those used at North Goonyella and with which the personnel at North Goonyella were familiar.

It was anticipated that the exercise would be dealt with in five components:

1. In-seam self escape of personnel using self-rescuers.
2. In-seam fire-fighting against Eimco 913 loader.
3. Detailed planning, risk assessment, options and decision analysis for the search and rescue of missing persons.
4. Establishment of appropriate re-entry protocols.
5. Search and aided rescue by Queensland Mines Rescue Service teams.

The practise adopted by the Emergency Exercise Management Committee in previous years of providing advance notice of the “window” during which the exercise was to be conducted was continued, and advance notice was provided to stakeholders including police, ambulance, hospitals, the mine’s Nominated Medical Advisor, community, media and other emergency services.

The Emergency Exercise Management Committee itself comprised members of the Mine’s Inspectorate, Underground Mine Managers, Industry Safety and Health Representatives, Qld and NSW Mines Rescue Services, SIMTARS, MISHC, mine personnel and other subject matter experts. It is with pleasure that the names, qualifications and experiences of these members are included as an Appendix to this report.

SCOPE

To conduct an emergency exercise in accordance with the *Approved Standard for the Conduct of Emergency Procedures Exercise* as established by the Moura Inquiry Task Group 2.

These guidelines proposed that exercises:

- Be systematic;
- Be consistent with the concept of mutual assistance from other mines;
- Require direct reference to the risks at the mine;
- Recognise that exercises should not necessarily be held on day shift;
- Be inclusive of external agencies such as QMRS, police, media and senior company officials;
- Have an audit and evaluation process;
- Be subject to risk assessment principles to ensure that exercises do not introduce new safety risks to persons at a mine;
- Require intertisation equipment to be put in place, as well as confirming airlocks and emergency stoppings on the surface are found to be safely accessible and operative.

In recognition of these guidelines:

- A strategy was developed for establishing the systematic initiation, control and assessment of the exercise;
- A scenario was developed strictly in accordance with the hazards present at North Goonyella coal mine;
- QMRS, police, media, senior company officials, SIMTARS, Department of Natural Resources and Mines, Industry Safety and Health Representatives, hospitals and ambulances were involved;
- Formal risk assessments were conducted by the Emergency Exercise Management Committee. This risk assessment covered risks at the mine and risks to the general community.
- Formal audit tools were developed and validated by members of the Emergency Exercise Management Committee;
- Formal de-briefings of assessors and North Goonyella personnel were conducted to evaluate the results. This report is the result of this audit and evaluation process;

All audit and assessment tools were developed against the internal procedures of the agencies involved and in line with accepted practice for systems audits.

OBJECTIVES

The objectives of the exercise were to:

- Test the response capability of the mine when the Mine Manager and the Ventilation Officer were off-site.
- Provide a more technical challenge to the Mine Manager and Ventilation Officer when eventually they arrived.
- Provide a vehicle to comprehensively examine the change over protocols and communication / data exchange functions of key people in the Incident Management Team over extended time-frames.
- Examine the data collection, recording and communication channels.
- Examine the Mutual Response Support provided to North Goonyella.

Additionally, the exercise sought to:

- Ensure no personnel injury, equipment damage or introduction of additional risks. Please note that the design of the emergency exercises was done using risk assessment methods.
- Test the ability of the current mine emergency procedures to meet the desired outcomes of an emergency response.
- Demonstrate a coordinated response involving North Goonyella, QMRS, NR&M, Industry Safety and Health Representatives, SIMTARS, Emergency Services and other stakeholders.
- Enhance the confidence and ability of personnel to respond to an emergency.
- Allow for a performance analysis and debrief to occur following the exercise, with the outcomes recorded and relevant information disseminated to industry.

To meet these objectives, audit and assessment tools were developed to cover the following functions:

- Emergency Initiation;
- Surface Communications (*including the Duty Card System*);
- Incident Management, Emergency Control and Incident Management Team Change-over;
- Emergency Evacuation and mine site first response capability;
- Underground Fire Fighting;
- QMRS Performance and Response (*ability to respond, mutual assistance, mandatory performance criteria*);
- Technical support personnel;
- Location and de-briefing of underground personnel;
- Communication channels and systems.

SUMMARY OF RECOMMENDATIONS

CONTROL ROOM OPERATIONS

1. The communications interaction between the various operation areas needs to be systematically organised such that all operational areas are provided with the necessary information and updated regularly. Consideration should be given to undertaking this electronically to minimise the disruption of phone calls.
2. A more autonomous/automatic mechanism to identify where personnel are located underground and when they have returned to surface would be of great value.
3. Relief Duty Card Operators need to be fully trained in all their roles, responsibilities and functions.

DATA ANALYSIS AND INTERPRETATION

4. SAFEGAS access should be extended to each key area.
5. There should be more personnel trained in the operation of the tube bundle system and SAFEGAS, including all its functionalities (especially from the taking of bag samples and how they could be analysed in a timely manner).
6. Considerations should be given to installing differential pressure sensors / velocity sensors to enable changes in ventilation to be accurately monitored.
7. Considerations should be given to installing further real time gas sensors - CO and O₂, at more key points in the mine to allow characterisation of mine atmospheres. This would allow personnel underground who do not have personal gas monitors to be aware of the mine atmosphere at the sensor location. Locations could include: escapeways; caches; belts; transformers and intakes.

INCIDENT MANAGEMENT TEAM

8. A central point is needed where all current duty cardholders are identified with name, location and contact phone number and possibly have something to identify them to outsiders that come to the site.
9. When duty cardholders change, it needs to be identified formally. Handover procedures for the Incident Management Team and a range of suitable personnel to fill various roles should be defined.
10. Numbers of people in Incident Management Team room needs to be reduced, maximum should be 5 or 6, not 13 as was the case at various times. Possibly only have sufficient seating for the main players.
11. Provision of at least two telephones with people assigned as scribes to take incoming calls and make outgoing calls. One telephone should be assigned for incoming calls and one telephone assigned for use by the Incident Management Team for outgoing calls only. Lines of communication need to be clearly defined so that 'closed loop' communications can be achieved, with automatic feedback. Lines of communication will curtail some telephone traffic to the Incident Management Team and allow improved operation.
12. Process management (decision making process, time wasting, verification of data, information flow in and out of the incident management room, briefings done on time, checking milestone events, interaction of members) remains a vital part of Incident Management and must always be at the forefront of the operations within the IMT.

13. Authorities between the Underground Management Room and the Incident Management Team needs to be revisited and operational effectiveness analysed.
14. The Mine Manager should be part of the Incident Management Team.
15. Reviews and assessments of critical issues needs to be done in a coordinated manner and followed through to completion.
16. Incident Management Team members should not be going in and out of the room while the IMT is meeting
17. Fire Officer to review quantities of low expansion foam held on site and the first-response capability of people with respect to fire fighting.
18. Develop improved incident management aids for the Incident Management Team to assist in the application of a discipline system for information management, recording and decision-making. Possibly pre-designed whiteboards on the back of the day-to-day whiteboards, that is, flip them over and they are laid out ready.
19. Develop a structured 'decision' (authority) delegation tool for assisting the Incident Management Team to remain strategic.
20. IMT needs to have direct communications to all critical personnel and functions. This may include de-briefing of key witnesses, briefing initial team, briefing persons / teams for a critical task and getting direct updates from crucial areas underground. The more important the persons / teams task is to a successful outcome the more direct the communications need to be with IMT.
21. Emergency incident management training is to be considered to mid and upper level management.
22. The creation of a position of "Emergency Officer" specifically to address and facilitate expertise in emergency management, firefighting, chemical hazard management and emergency safety training and systems (not simply another hat but a specific position). The Health and Safety Officer is a different role to this position but would work each other.

OPERATIONS CONTROL ROOM

23. Review of the tag board / location system to ensure this is as simple / efficient as possible. A similar control system could be useful for key equipment such as diesel vehicles.
24. Additional telephone line into the Operations Control Room and a separation of the phone traffic from the main activities of the operations control room team. This may allow the operations control room team to stand back from the hectic activity to respond more 'strategically'.

MINES RESCUE ACTIVITIES

25. There needs to be a review of the number of brigadesmen that the mine can supply at any time of the day or work roster. This could also be expanded to other mines in the mutual assistance group.
26. Consideration could be given to training more of the workforce in basic fire-fighting.
27. Protocols on how mines rescue trained personnel on site are to utilised should be developed. This can taken into account the type of emergency, number available and specific Duty Card or other specialised needs. It can be that the person that you would want to be the Captain of your first team has a role in the Incident Management Team so that they are getting all of the information as it comes in and understand what is to be done. This can reduce the briefing time and also means that this Team Captain (first team) is clear on all aspects.
28. Protocols need to be developed of what inseam personnel can and cannot do while they are still underground. This commences with a company protocol and leads to a mines rescue

- guideline on actions and barriers that are required for in-seam intervention, *eg., could the mines three rescue trained personnel coming out of the mine have gone to the fire and put it out?*
29. Greater effort and focus from key mine and mines rescue personnel needs to be given to getting the first team off the surface.
 30. Whiteboards should be developed for use in the Rescue Room which clearly show:
 - Locations and state of critical equipment
 - Team membership and their equipment
 - Captains type board with basic emergency information
 - Team deployment information and critical times
 31. Risk assessment of critical and / or hazardous activities should be undertaken, *eg., when Team 1 decided to fight the fire – how many men should they have had; what BA should they have had (there was CABA on the surface also); what communications should they have had; what turnout gear and first aid equipment do they have; method of fire-fighting; active times, etc.*
 32. That a method of checking that the recommendations from previous exercises have been implemented - or at least considered by the mine, mines rescue and the industry in general, *eg., the actions taken which come from recommendations effecting QMRS are audited during its annual audit – this does not mean that they must be implemented but it does mean that they must be considered.*

UNDERGROUND ESCAPE

33. Investigate the number of SCSR in the longwall return caches. In this scenario there were sufficient numbers, but there were only nine people on the face. If the miners who were just outbye of the face had to escape by this route there were no spare units in the caches
34. Communications using pens and notebooks, and not talking through mouthpieces, should be adopted as an industry standard. Where verbal communications cannot be used, the mine should investigate simple systems which may allow surface to communicate with persons underground using SCSR.
35. When the deputy is taken away from the crew there is no gas detection capability to determine the necessity to continue wearing self rescuers. The provision of fixed station visible display gas readings *eg.,* at positions in the primary escape roadway may be worth investigating. The potential for the provision of multi-gas detectors and relevant tubes in caches and training in their use should be investigated.
36. With regard to the message given to the collapsed worker in the tailgate, consideration should be given to a persons authority to direct others to take a certain course of action. Also with regard to their obligations to provide another person with information that can affect their safety and health (*Coal Mining Safety and Health Act, Section 39*). When assistance is provided to persons escaping from a mine it should not be issued as an instruction but as factual information that will assist that person to decide how to exit the mine appropriately. This learning is also relevant to control room operators when communicating with persons escaping from the mine.
37. The mine fire-fighting capability should be reviewed and consideration given to allow in-seam persons to fight fires as a first response. This may include evacuations to a place of safety other than the surface, *eg.,* pit bottom. Use of such persons may allow a more effective and timely response to the fire.
38. The introduction of change-over stations to the mine should be evaluated. This would allow verbal communications with the surface en-route and provide a place to leave injured persons if required. It also allows a safer environment for the changeover of SCSRs.

39. Implementing a system to ensure ALL personnel underground receive notification of an emergency as quickly as possible – 4 North crew did not receive any notification.
40. Instructing crews to discuss escape options and have a plan and nominate a leader prior to starting escape.
41. Training of crews in ‘escape’ in poor visibility conditions – this will result in the formulation of plans and systems that the crews would use in an emergency (eg., communication system while wearing SCSR).
42. Implementing standardised SCSR caches to ensure all personnel are familiar with what is in them and how to access this gear – ie., plans with escape route marked, writing material to assist communications, boxes in which SCSRs are contained should be standard, walking sticks and their location etc.
43. Put a system in place to ensure cut-throughs in which SCSR caches are to be placed are cleaned out to improve accessibility – particularly in poor visibility.
44. Implementation of a guidance system to get personnel into escape roadway ie., ‘F’ Heading.
45. Undertake a review of effectiveness of cache indicators.
46. Implement a communication system to the surface from each of the main cache locations for tracking of crews escaping and one-way communications from Control for updates etc.

UNDERGROUND FIRE FIGHTING

47. Operators should maintain appropriate housekeeping standards on mobile plant. Poor housekeeping can increase risk of fire.
48. Consideration should be given to develop procedures and systems that allow:
 - a. Competent persons to use more than one fire extinguisher prior to it being classified as a *major emergency*. The SOP allows no objective way of risk assessing and managing the fire. Consequently, there is a reluctance to assess a fire and take other appropriate action. There are situations where more than one fire extinguisher is required to douse a fire. That does not necessarily increase the risk profile.
 - b. Competent persons (other than mines rescue trained teams) to be deployed in inspecting and / or fighting fires with water hoses (eg., ERZ Controllers). In some cases it is an acceptable risk to allow persons to inspect fires. The time taken to deploy mines rescue teams allows fires to increase in intensity.
 - c. Personnel that have evacuated to the outbye side of a fire (subject to appropriate health and fitness checks) to inspect or participate in fighting fires under the guidance of a suitably trained person(s).
 - d. Information from debriefing sessions to be incorporated into the decision making process. For example, the operator of the vehicle may have provided useful information to assist that decision making process (eg., the fire was relatively small, the fire was actually 20m inbye 9 cut-through). Critical witnesses should be identified and also de-briefed by IMT so that they can get a better understanding of underground conditions.
 - e. Resources to be used to fight fires to be identified prior to mobilising fire-fighting teams.
 - f. Personnel assigned fire-fighting duties should be competent, and adequately briefed of the risks and their duties. The fire watch team was not considered competent to perform their duties to standard.
 - g. Direct operators out of smoke (eg., vehicle operator went into smoke).

EXERCISE TIMELINE - COMPOSITE

		EVENT TIME
0913	Fire on 913 Eimco, 9 – 10 cut-through, 'D' Heading.	0:00
0915	Emico fire and smoke reported to Control.	0:02
0919	Driver of Emico tried to fight fire with extinguisher – unsuccessful.	0:06
0920	Operator of Emico instructed by surface control to evacuate mine.	0:07
0921	DAC message sent underground to evacuate the mine.	0:08
0923	Surface siren sounded.	0:10
0925	<ul style="list-style-type: none"> ▪ All of mine PED message sent to evacuate the mine. ▪ Roof fall on BSL, Maingate, 3 North. 	0:12
0927	<ul style="list-style-type: none"> ▪ Longwall crew at Maingate donning SCSR after reporting all accounted for. ▪ Duty Card 2 (A to D) allocated. 	0:14
0930	<ul style="list-style-type: none"> ▪ Longwall outbye crew muster at crib room, 3 North. ▪ Site Senior Executive officially declared emergency. 	0:17
0931	Longwall outbye crew commenced evacuation.	0:18
0933	<ul style="list-style-type: none"> ▪ Smoke arrives at face 4 North Development panel. ▪ Longwall personnel outbye fall on BSL commence evacuation on foot – do not use available diesel transport in panel. 	0:20
0935	Security briefed – dispatched to Portal and Gates.	0:22
0936	Six men outbye coming out of drift – message sent to Control Room.	0:23
0937	Longwall crew change SCSR to SSR90 at tailgate drive.	0:24
0939	4 North crew contacted Control, notified they were on foot and crew had donned SCSR.	0:26
0940	Queensland Mines Rescue Service activated.	0:27
0941	4 North crew started evacuation from 16 cut-through.	0:28
0944	Site Senior Executive advised by Control that no communication received from 4 North.	0:31
0952	Longwall 3 North reach cache, 9 cut-through.	0:39
0954	4 North crew reach cache, 12 cut-through.	0:41
0957	Part of 3 North outbye crew reached Coffin Seal, 'B' Heading.	0:44
0958	<ul style="list-style-type: none"> ▪ Other part of 3 North outbye crew (contractors) reached surface – notification sent to Operations room. ▪ Site Senior Executive contacted Mines Inspectorate. 	0:45
1001	Site Senior Executive contacted Mine Manager (who was in Mackay with Ventilation Officer – 2 hours drive).	0:48
1005	<ul style="list-style-type: none"> ▪ Longwall crew reach tailgate, 6 cut-through, intermediate cache. ▪ 1 man collapses from exhaustion / heat stress – cannot continue. 	0:52
1007	<ul style="list-style-type: none"> ▪ Site Senior Executive contacted Industry Safety and Health Representative. ▪ 3 North crew arrive at fresh air, 28 cut-through, 'F' Heading. 	0:54

		EVENT TIME
1011	First expiration of real SCSR (oxybok) 4 North. Duration - 32 minutes.	0:58
1020	<ul style="list-style-type: none"> ▪ Control Room contacted by Mine Manager from Mackay requesting further information of incident. ▪ Directive given by Underground Controller to form fire-fighting team. 	1:07
1023	High-tension borehole feed at D Heading, 9 cut-through, isolated at direction of IMT.	1:10
1025	Mine Manager and Ventilation Officer depart Mackay.	1:12
1028	Longwall Face crew reached 26 cut-through, 'F' Heading - fresh air (given sign - this road has no smoke - kept rescuers on).	1:15
1030	Underground Controller given instructions to prepare vehicle for fire-fighting team.	1:17
1034	GAG mobilised.	1:21
1040	Four fire-fighting volunteers located.	1:27
1048	4 North crew contacts Control Room - reports one man missing.	1:35
1100	3 North outbye crew arrived at surface.	1:47
1109	Formation of Incident Management Team - first meeting held at 1130	1:56
1110	4 North crew reached pit bottom, contacted Control requesting transport - refused and told to walk.	1:57
1115	Longwall Face crew - arrives on surface.	2:00
1124	Mine Manager and Ventilation Officer arrive at Nebo - attempted and eventually made contact with Control.	2:11
1135	Incident Management Team convened and informed that one additional person missing.	2:23
1150	Mine Manager and Ventilation Officer depart Nebo.	2:37
1152	Queensland Mines Rescue Superintendent arrives on site.	2:39
1158	Two team members from Moranbah North Mines Rescue arrive at site.	2:45
1202	<ul style="list-style-type: none"> ▪ QMRS vehicle 2 arrived on site. ▪ First rescue team could be formed. 	2:49
1220	Fourteen Newlands Mines Rescue Team personnel arrive at site.	3:07
1225	<ul style="list-style-type: none"> ▪ De-brief of 4 North crew commenced. ▪ North Goonyella volunteer fire-fighters stood down. 	3:12
1246	Underground Controller instructed and briefed fire-fighting teams.	3:33
1252	Two QMRS fire-fighting teams ready.	3:39
1310	Three mines rescue teams briefed.	3:57
1318	Mines Inspectors arrived in Incident Management Room.	4:05
1322	Operations room notified by Control Room - CO increase to 100 ppm.	4:09
1355	Persons stopped entry to mine at portal - no authorisation.	4:42
1358	FAB Controller and First Aider left surface to set up FAB at 17 cut-through, 'F' Heading.	4:45
1400	First QMRS rescue team goes down to check fire.	4:47

		EVENT TIME
1407	Fire team under Oxy.	4:54
1425	Decision made by Mines Rescue Team 1 underground to fight fire.	5:12
1434	Team 2 leave surface (search for missing man in 3 North Tailgate)	5:21
1435	Team 3 leave surface (standby team for Team 2).	5:22
1444	Both teams arrive at FAB.	5:31
1451	Water on fire.	5:38
1457	Team 2 deployed from FAB.	5:44
1504	Fire team rang Incident Management Team advising fire " under control "	5:51
1506	Team 4 ready on surface.	5:53
1529	GAG and operators arrived.	6:16
1530	Incident Management Team notified by Team 2 " fire out ".	6:17
1543	Team 2 leaves FAB, 'F' Heading in clear visibility.	6:30
1550	<ul style="list-style-type: none"> ▪ <i>Un-trained</i> fire watch crew leave surface to tend fire. ▪ Team 4 leave surface for FAB. 	6:37
1600	Industry Safety and Health Representative arrives on site.	6:47
1611	Team 3 departs FAB (search for missing man, 4 North Development Panel).	6:58
1618	<ul style="list-style-type: none"> ▪ Team 2 contacts FAB – found patient at 3 North Tailgate, 6 cut-through. ▪ Operations Room report to Incident Management Team – fire out and fire watch in place. 	7:05
1635	Team 2 and patient arrived at fresh air outbye tailgate double doors.	7:22
1637	Incident Management Team advised by Ventilation Officer problems with CO, 3 North, Tailgate.	7:24
1645	Mine ambulance ready to collect patient from FAB.	7:32
1648	Team 2 and patient arrive at FAB.	7:35
1657	Incident Management Team discuss action plan for CO increases in Tailgate.	7:44
1703	Ambulance and Team 2 back on surface.	7:50
1704	<ul style="list-style-type: none"> ▪ Team 3 found second missing person – deceased. ▪ Incident Management Team asked by FAB if required to retrieve body from 12 cut-through, (<i>body actually at 14 cut-through</i>). 	8:01
1718	Tomlinson Boiler hooked up to 19 cut-through borehole, 3 North longwall.	8:05
1721	Incident Management Team approve decommissioning of FAB.	8:08
1723	Incident Management Team advised by Acting Ventilation Officer of estimated CO make of 44 m ³ /min (greater than Level 3 TARP trigger).	8:10
1726	Acting Ventilation Officer indicates CO level > TARP level.	8:13
1727	Incident Controller made decision to send rescue underground to take bag samples.	8:14
1733	Team 3 arrive on surface.	8:20

		EVENT TIME
1735	Fire watch team instructed to evacuate mine.	8:22
1804	Whole mine evacuated.	8:51
1810	Mines Rescue Team 1 Captain, now working in customary role as North Goonyella employee, directed to return underground to take samples and ventilation readings at 26 cut-through behind double doors, 3 North Tailgate.	8:57
1825	Ventilation readings and samples taken.	9:12
1907	Underground exercise terminated.	9:54
1908	Nebo police arrived on site.	9:55
1927	Desktop exercise terminated.	10:14

CONTROL ROOM OPERATIONS

Assessors: Martin Watkinson & David Cliff

OBSERVATIONS:

1. In general the Control Room Operator carried out his roles in a systematic and effective manner. At all times he remained unemotional.
2. The Control Room Operator regularly ensured that the Incident Management Team and Underground Control Room were kept aware of gas concentrations. This could have been achieved electronically if SAFEGAS terminals were in these rooms.
3. The Control Room Operator had good communication skills – for example, key information transfer was ensured through asking recipient to repeat message back.
4. Control Room Operator was incompletely informed on key issues and changes. This hampered his ability to answer queries and pass information on. An example of this was the query he received regarding the status of the GAG – he did not know the GAG had been ordered.
5. The Emergency Response Log is incomplete. Some key communications are not recorded here – they may be recorded on other documents but not referenced.
6. Control Room Assistant changed without proper briefing and replacement was not fully versed in role or responsibilities.

FINDINGS:

1. The communications interaction between the various operation areas needs to be more systematically organised.
2. Effort needs to be expended to ensure that all operation areas are provided with the necessary information and updated regularly. Consideration should be given to undertaking this electronically to minimise the disruption of phone calls.
3. Multiple documents should be avoided and consolidated into one document for all information.
4. There needs to be an effective mechanism to identify where personnel are located underground and when they have returned to surface.
5. Relief Duty Card Operators need to be fully trained in all functions required.
6. The gas monitoring simulation software should have the capability to simulate CITECT and other PLC based gas monitoring system outputs.

TIMELINE:

		ASSESSORS COMMENTS
0913	Fire on Eimco, 9 – 10 cut-through, 'D' Heading.	
0915	Eimco smoking reported to Control.	Undermanager enters the Control Room.
0919	<ul style="list-style-type: none"> ▪ SSE advised of fire. ▪ Driver tired to fight fire with extinguisher. ▪ Undermanager takes Duty Card 2A. 	
0920	Operator of Eimco told to evacuate mine by phone.	SSE and contract Ventilation Officer enter the Control Room to assess the situation.
0921	<ul style="list-style-type: none"> ▪ DAC message sent to evacuate the mine. ▪ Production Superintendent and Weekend Undermanager enter Control Room. Production Superintendent takes Duty Card 2A, Weekend Undermanager takes Duty Card 3A. 	Not noted in the control room emergency response record. Individual groups underground rang back to tell where they were, how many there were and where they were going. Follow up of 4 North non-response. Not actioned till 0933.
0923	<ul style="list-style-type: none"> ▪ Surface siren sounded. ▪ SSE takes Duty Card 1 	Not noted in the control room emergency response record.
0925	<ul style="list-style-type: none"> ▪ All of mine PED message to evacuate mine. ▪ Fall at Maingate, 3 North. 	Not noted in the control room emergency response record.
0926	<ul style="list-style-type: none"> ▪ 3 North crew report of fall on DAC. ▪ Duty Cards 2B, 2E and 2F assigned. 	
0927	Duty card family of 2 A-D allocated.	
0930	SSE officially declared emergency.	
0933	Homotropical CO alarms.	
0935	Issued Duty Cards 2C and 2D, security briefed and dispatched to Portal and Gates.	
0936	Six men outbye coming out of drift – message to Control Room.	
0939	4 North crew contacted Control, notified on foot and crew donned SCSR.	
0940	Queensland Mines Rescue Service activated and briefed by Control Room Assistant.	
0944	SSE advised by Control that no communication received from 4 North.	
0951	Tomlinson Boiler test was initiated.	
1000	CO alarm appears at point 18, E35, 70ppm.	
1004	<ul style="list-style-type: none"> ▪ Gas alarms, Point 3, Tailgate, 3 North 'B ½' cut-through, 323ppm. ▪ 2.1% - CH₄; 16.5% - O₂; 3.1% - CO₂ 	
1011	First expiration of real SCSR (oxybok) at 4 North – 32 minutes.	
1014	<ul style="list-style-type: none"> ▪ Gas alarm, Point 6 ▪ CO – 280ppm; 0.6% - CH₄; 17.8% - O₂; 2.9% 	

		ASSESSORS COMMENTS
	- CO ₂	
1015	<ul style="list-style-type: none"> ▪ Gas alarm, Point 14 ▪ CO - 290ppm; 0.6% - CH₄; 17.8% - O₂; 3.0% - CO₂ 	
1016	Ventilation Officer queries status of power underground.	
1017	<ul style="list-style-type: none"> ▪ Gas alarm, Point 16 ▪ CO - 368ppm; 0.1% - CH₄; 16.9% - O₂; 3.6% - CO₂ 	
1020	<ul style="list-style-type: none"> ▪ Gas alarm, Point 19 ▪ CO - 180ppm; 0.2% - CH₄; 19.2% - O₂; 1.9% - CO₂ ▪ Control Room contacted Mine Manager to advise of incident. ▪ Directive given by Underground Controller to form fire-fighting team. 	
1021	<ul style="list-style-type: none"> ▪ Gas alarm, Point 20 ▪ CO - 264ppm; 0.6% - CH₄; 18.3% - O₂; 2.7% - CO₂ 	
1023	High tension feed at 9 cut-through borehole cut.	
1033	Control Room Assistant relieved to form fire-fighting team.	New Control Room Assistant had no training in responsibilities and key functions eg. abilities to use phone for redirect and call forward.
1038	Electrician at fan room monitoring fan.	
1039	<ul style="list-style-type: none"> ▪ Control Room Assistant rang longwall, maingate to see if anyone was there. 	Not possible to identify accurately who was actually in what location pre incident.
1040	Phone call from 505 - no-one was there - actually 'F' Heading, 17 cut-through where longwall crew were exiting from tailgate - attempt at non-verbal communication.	Control Room Officer did not recognise the location nor this as an attempt at non-verbal communications from underground - is this a recognised communications protocol for North Goonyella?
1042	Problems with compressed air supply (real) - cannot start ambulance.	Loss of air not part of exercise.
1048	<ul style="list-style-type: none"> ▪ 4 North Crew reported one man missing. ▪ Acting Ventilation Officer attempted to modify tube bundle sampling sequence. 	Difficulties encountered due to lack of familiarity with current North Goonyella SAFEGAS operations.
1056	Control notified that one man left at 6 C/T Tailgate, 3 North with suspected CO poisoning - under air link with only one Fenzy.	
1100	3 North Outbye Crew arrived at surface.	
1105	QMRS Superintendent rang for update and notified EBA 11:50am.	
1107	Confirmation from Control Room to	

		ASSESSORS COMMENTS
	Operations Room - missing persons named and confirmed.	
1110	4 North Crew reach pit bottom, contacted Control and told to walk.	
1112	Managed to start ambulance.	
1115	Longwall Face Crew arrives on surface.	
1124	Mine Manager and Ventilation Officer arrive at Nebo attempted and eventually made contact with Control.	
1135	Incident Management Team convened and informed that one additional person missing.	
1150	Mine Manager and Ventilation Officer left Nebo.	
1152	QMRS Superintendent arrives at site.	
1158	<ul style="list-style-type: none"> ▪ Village security in place. ▪ Two team members from Moranbah North mines rescue arrived at site. 	
1200	Control Room Officer asked for status of GAG - telephoned Incident Management Room to find out.	Control Room Operator did not know that the GAG had been called.
1202	Vehicle 2 for QMRS arrived on site.	
1205	Underground Operations Room rang Control Room Operator in attempt to contact Contract Ventilation Officer regarding gas concentrations.	Locations of key personnel should be known. Control Room Operator could not locate Contract Ventilation Officer.
1215	Confirmed power tripped on longwall due to CH ₄ levels.	
1220	Newlands mines rescue teams (14 people) arrived on site.	
1245	Mine Manager and Ventilation Officer onsite.	
1307	<ul style="list-style-type: none"> ▪ Moranbah North Rescue Captain contacted Moranbah North to discuss the availability of rescue personnel using control room telephone. ▪ Control Room Operator requested 3 PJB's serviced and ready to go underground. 	
1310	Control Room Assistant leaves the control room to service PJB's as no one else was available.	Vehicles ready at 1357
1322	Operations Room notified by Control Room - CO increase by 100ppm on all points.	
1355	Persons stopped entry to mine at portal - no authorisation.	
1400	First QMRS rescue team goes down to check fire.	

		ASSESSORS COMMENTS
1434	Team 1 left surface.	
1435	Team 2 left surface.	
1451	Water and foam on fire.	
1457	First team deployed from FAB.	
1506	Team 4 (imaginary) ready on surface.	
1515	Fire team advised Control Room Operator that they were out of low expansion foam, continued fighting fire with water - advised status of fire.	
1529	GAG and operators arrived.	
1530	Fire out.	
1550	Splash crew (fire-watch team) left surface for fire.	
1602	Fire watch team changed out.	
1611	Team 2 departs FAB.	
1618	Team 1 contact FAB - found patient at 6 cut-through, tailgate.	
1635	Team 1 and patient arrived at fresh air at 26 cut-through.	
1645	Ambulance ready to pick up patient - 'F' Heading.	
1703	Ambulance and Team 1 back on surface.	
1704	Team 2 found second missing person - confirmed deceased.	
1718	Tomlinson Boiler hooked up to 19 cut-through, longwall goaf portal.	
1733	Team 2 arrives on surface.	
1735	Fire watch team instructed to evacuate mine.	
1804	Whole mine evacuated.	
1810	Two North Goonyella workers go underground to take samples at 26 cut-through, 3 North Tailgate.	
1825	Samples taken inbye double doors, 3 North Tailgate.	
1840	Mine Manager shuts down Underground Operations Room (joins IMT).	
1847	Sample results phoned through from 26 cut-through.	
1907	Underground exercise terminated.	
1912	North Goonyella workers arrive back on surface.	
1927	Desktop exercise terminated.	

DATA ANALYSIS AND INTERPRETATION

Assessors: David Cliff & Martin Watkinson

GENERAL GAS MONITORING AND VENTILATION ANALYSIS

OBSERVATIONS:

1. It was not clear who was responsible for ensuring the quality of the gas monitoring data. The Control Room Operator would regularly update the Incident Management Team, Acting Ventilation Officer and Underground Management Room on changes in gas concentrations, but did not interpret the data. The Acting Ventilation Officer provided interpretations.
2. The interpretation provided by the Acting Ventilation Officer was timely and accurate. The Acting Ventilation Officer effectively used the ventilation simulation program to model the fire and the subsequent spontaneous combustion.
3. The use of the methane concentration in the longwall return pre- and post- fall to estimate the change in the ventilation quantity was innovative.
4. Due to the truncated time available for the second phase of the simulation (the spontaneous combustion event) it was not possible to evaluate the investigation of this, nor was the mine able to set in place the full processes that they would have used. This includes calling for external support, collection of bag samples and analysis of background trend data.
5. The gas chromatograph was not used nor was it evident that any steps taken to ensure that it was operational. Had the incident progressed any longer it would have been used to investigate the spontaneous combustion incident. The inherent limitations of this device would have significantly hampered the effective investigation. The analysis time for this particular model GC is approximately 25 minutes and there are significant detection limit problems (hydrogen and carbon monoxide).
6. The gas data was transmitted by phone and written notes, data could have been available automatically via a SAFEGAS terminal in the Incident Management Room or Underground Management Room. There was network access in the Incident Management Room. There was a SAFEGAS terminal in the Ventilation Officer's room (across the hall from IMT), but the Acting Ventilation Officer often accessed the SAFEGAS terminal in the Control Room. Direct access to SAFEGAS would have reduced the need for telephone conversations – reduce the disruption to the Incident Management Team and allow direct display of gas concentrations and trends over time. Another location that would have benefited from a SAFEGAS terminal would be the rescue room. This would have enhanced the quality of the briefings given to rescue teams.
7. Personal need to be conscious of the limitations of tube bundle systems:
 - The samples are taken once per cycle ie., updated only every 54 minutes, however, the tailgate tube is sampled three times in every cycle.
 - The samples take time to travel from the underground to the surface.

Thus the data does not represent what is currently happening underground.

8. Real time sensors, for CO and O₂, along the belts and at other key locations would reduce the lag time in reporting changes in concentrations and facilitate better definition of hazardous zones. Sensors have limited accuracy and ranges and thus it may not be appropriate to use in detailed interpretation.
9. The use of whiteboards to record information was in general well done. The tracking of persons underground was not well done.
10. Due to the truncated time available to treat the second part of the exercise, it was not possible for the mine personnel to adequately address the investigation of the spontaneous combustion incident.

FINDINGS:

1. Consideration should be given to replacing the paper systems for recording information and risk assessment with electronic systems. Electronic systems can be networked and thus information can be shared in real time without disrupting other functions.
2. SAFEGAS access should be extended to each key area.
3. Consideration should be given to implementing an electronic record keeping process to track actions, status of actions and responsibilities. This could include electronic whiteboards.
4. Consideration should be given to how an investigation of a spontaneous combustion event in a goaf would progress especially from the perspective of number and location of bag samples and how they could be analysed in a timely manner.
5. There should be more personnel trained in the operation of SAFEGAS system including all its functionalities.
6. Considerations should be given to installing differential pressure sensors / velocity sensors to enable changes in ventilation to be accurately monitored.
7. Consideration should be given to installing real time gas sensors – CO and O₂, at key points in the mine to allow characterisation of mine atmospheres. This would allow personnel underground who do not have personal gas monitors to be aware of the mine atmosphere at the sensor location. Locations could include: escapeways; caches; belts; transformers and intakes.

INVESTIGATION AND INTERPRETATION OF THE GAS ATMOSPHERE AT 3 NORTH LONGWALL TAILGATE (TUBE POINT 3)

When the alarm at tube point 3 re-alarmed post vehicle fire at 34ppm CO, an investigation of the gases present would clearly identify that the source of the pollutants was not the original vehicle fire.

The fingerprint of this atmosphere is substantively different to the previous events. Analysis should include a range of indicators to characterise the atmosphere.

For example, examining the CO concentration - the initial assumption may have been that the sample was a residue from the fire. If this was the case it should be simply the fire products diluted by increasing air quantities. In turn other gases should be affected in the same way and the relative amounts of these gases should not change.

Thus, if CO reduced from ≈ 400 ppm to 34ppm (a dilution of ≈ 12 times) the CO₂ should also be reduced by the same quantum. However, it reduced from 4% to 0.2%, dilution of ≈ 20 times. Another way of looking at this is to look at the CO to CO₂ ratio directly - this changes from 0.01 to ≈ 0.02 .

Derived ratios such as Graham's ratio and Trickett's ratio are not affected by dilution with fresh air. Thus a residual fire gas should have ratios that are the same as before, independent of the change in concentrations. However, in this circumstance, Grahams ratio changed from ≈ 0.7 to 1.1 (original background value being ≈ 0.3). Trickett's ratio was consistent with a coal fire (value being 0.8).

The calculation of CO make would also clearly indicate the change in underground conditions.

Thus there is a consistent indication that the atmosphere at tube 3 after the vehicle fire has been extinguished is not simply residual vehicle fire gas.

Another indicator that could have usefully been employed but is not commonly used is the hydrogen to carbon ratio. This measures the ratio of hydrogen to carbon in the atmosphere. Hydrogen in the fuel will be converted to water vapour and hydrogen gas, plus any hydrocarbon fragments. Carbon will be present as hydrocarbons and oxides of carbon. Seam gas contributions need to be allowed for. As there is no mechanism for the measurement of water vapour it must be estimated from the unaccounted for oxygen deficiency.

Fuel	H to C ratio
Diesel	2
Coal	1
Methane	4

Notes:

Trending of all ratios which depend upon oxygen analysis, are prone to major fluctuations when the air being analysed is very close to fresh air.

Graham's ratio and Trickett's ratio tend to underestimate and it is the change and rate of change rather than the absolute value that is significant.

ASSESSMENT OF LONGWALL 3 NORTH FACE CREW ESCAPE

Assessors: Martin Olsen, Allan Purse & Greg Dalliston

OBSERVATIONS:

Exercise commences – 0913.

At 9:21am the longwall crew received a message over the DAC on the face that there was a fire at D9 in the main headings and that thick black smoke is flowing down the main travel road.

At this time, three members of the crew were at the tailgate and the other six members were at the maingate. The Deputy who was at the tailgate at the time was informed that for the purpose of the exercise he was not in the face area.

The crew members from the tailgate made their way to the maingate end of the face and at 9:24am, the longwall face crew were given the following information –

“You hear a roof fall across the maingate and stageloader which is impassable. Air quantity has been cut drastically”.

The crew discussed the situation including the escape route to be taken, and took a head count before communicating the names of those accounted for to the control room operator. A decision was made to have two experienced miners at the lead and at the rear of the group for their exit.

At 9:25am a message was broadcast across the PED that read “EVACUATE MINE”.

They were then informed by the assessors that:-

“You now notice smoke entering the face from the intake roadway over the fall. The smoke is getting darker and thicker. DO NOT PUT YOUR SELF RESCUER ON, DO NOT CROSS THE AFC. Act as you see fit”.

The initial donning of the (training) Oxybok units was carried out efficiently whilst all persons had smoke glasses fitted. Eight crew members were given trainer units and one was asked to don his belt-worn unit. The crewmembers initially escaped to the tailgate end of the face where they indicated that they would change over to the Fenzy Biocell 90 units (rated at 60 minutes). They did not indicate if they would have taken the spare units with them. There was no lifeline or walking canes at the tailgate cache, but the leading two members found drill steels and used these to assist in escape.

Access over the tailgate into the roadway was difficult but the team assisted each other.

The crew were not exposed to any restraints and made their second change over at 9 cut-through, 25 minutes after the initial donning.

At 6 cut-through, one team member was overcome by the conditions (given sign by assessor stating, *“You are suffering from headache, dizziness, shortness of breath and suffering from exhaustion. Collapse in a semi-conscious state until told otherwise”.*

A decision was quickly made to leave him there and through use of note pads the crew communicated with each other and decided to leave him under a temporary air shower from the

compressed air line. There was no air hose so the tap approximately two meters above his head was turned on. In the debrief, a crew member stated that they would have used the pump hose to supply air closer to the patient. A message was given to the patient that read, *"Wait here, rescue coming. Do not move"*. A sign reading "Intermediate cache" was hanging from the 6 cut-through intersection. The cut-through contained a quantity of cog timber but no SCSRs were located.

The group continued to escape through the tailgate and passed through the tailgate doors at 26 line of cut-throughs in the main headings. A large pool of water was located between the two sets of doors that was above the level of the workers boots as they walked through in close proximity to the rib line.

When the group assembled in C26 intersection, they were informed that there was thick black smoke coming down the heading. Two members of the group walked up to a cache at C25 and changed over and looked at the laminated mine plan located in the cache. As the two persons who changed over were leaving the cache the rest of the group arrived and turned around and followed the other two and were not observed to change their self-rescuers.

The group walked back to C26 and then proceeded on to F26 crossing under the belt at E26. When the group was assembled they were informed, "There is no smoke in this heading". The question was then asked by a member of the group, "Is this fresh air?" Due to the absence of any gas monitoring equipment it was not possible to inform the group of gas readings.

The group walked up 'F' Heading and reached F23 where a SCSR cache was located. The group changed over Fenzy Biocell 90s here and one member of the group opened the trapdoor at 23 cut-through, 'F - E' Heading to check the belt road for smoke. This person was informed that the roadway contained thick black smoke. At F17 a decision was made to phone Control. After phoning the control room, the man hung up without speaking. This was done to let Control know that there was someone in the area -but without exposing himself to the unknown atmosphere.

At this stage, the group separated with two of the team members racing ahead of the others. Their intention was to retreat to a location outbye of the fire so they could take off their rescuers and notify Control about their collapsed team mate.

The two team members that were in front of the others reached F9 cache and changed over. The rest of the group performed this changeover 1 minute later.

The route of escape from there was along 'F' Heading to 5 cut-through and then across to 'C' Heading. The two team members in front of the others reached C5 intersection and contacted Control over the DAC. Control was informed that a team member had collapsed in the tailgate yet this message was not understood by Control for another 5 minutes when it was again repeated. This was due to Control and the person at C5 both talking into the DAC system simultaneously without realising. The person communicating with Control was later deployed from the surface as part of Rescue Team 1 (fire team). This occurred approximately 3 ½ hours later.

The group arrived on surface between 11:15am and 11:28am. One crew member was distressed on arrival at the surface and required oxygen in first aid. The crew re-hydrated in the muster area until the de-briefings occurred. The members of the longwall crew were debriefed individually between 11:38am and 1:10pm.

SUMMARY:

1. The donning and change out of SCSRs in reduced visibility was excellent. During the debrief the crewmember that donned the real 'SCSR' commented that he had not been trained on donning an Oxybok. This requires addressing at the induction process.
2. The assistance and cooperation between members of the team was also excellent. Two experienced men were put out in front and two at the rear during the escape of the 9 workers.
3. When the evacuating person reached fresh air they were unable to determine if they were in fresh air, as they had no gas detection equipment. The ERA controller for the longwall ERZ was not part of the group of evacuees.
4. When Control was first notified of the collapsed worker in the tailgate the message was not received by Control. Both parties were using the DAC system at the same time and the message failed to receive. This delayed Control from realising that a man had collapsed in the tailgate for a further 5 minutes.
5. The cache location's, contents, demarcation and cut-throughs were not clearly marked and would be easily overlooked. There needs to be an auditable process in place to ensure that there are no inconsistencies in these caches. The fact that this cache location had no SCSRs could have resulted in the person left at 6 cut-through in the tailgate not surviving.
6. There is no evidence of any procedure for non-verbal communications. This could have allowed the control room operator to be informed earlier of the crewmember left in the longwall tailgate. The phone call made from F17 where the phone was immediately hung up created confusion and inadvertently sent an incorrect message to another group of persons evacuating.
7. The de-brief process lacked structure and consistency. Information was without doubt lost during this process.
8. Not all caches, eg., 3 North tailgate, contained link lines, mine plans, writing materials or walking sticks.
9. Insufficient communications available in the primary escapeway ('F' Heading).

FINDINGS:

1. Investigate the number of SCSRs in the longwall return caches. In this scenario there were insufficient numbers, but there were only nine people on the face. If the miners who were just outbye of the face had to escape by this route there were no spare units in the caches. The sign at 6 cut-through in 3 North Tailgate indicated there was an intermediate cache. Changes to caches should be passed on to all mineworkers when the changes are made. The mines safety and health management system should be reviewed to ensure this is incorporated. Self-escape routes need to be planned and serviced by sufficient SCSRs for the maximum number of personnel in the panel in both primary and alternate routes.
2. Communications using pens and notebooks, and not talking through mouthpieces, should be adopted as an industry standard. Where verbal communications cannot be used the mine should investigate simple systems which may allow surface to communicate with persons underground using SCSRs.
3. Standardise the contents of caches across the mine site.
4. When the Deputy is taken away from the crew there is no gas detection capability to determine the necessity to continue wearing self-rescuers. The provision of fixed station visible display gas readings eg., at positions in the primary escape roadway, may be worth investigation. The potential for the provision of a multigas detector and relevant tubes in caches and training in their use should be investigated.

5. With regard to the message given to the collapsed worker in the tailgate, consideration should be given to a persons authority to direct others to take a certain course of action. Also with regard to their obligations to provide another person with information that can affect their safety and health (*Coal Mining Safety and Health Act , Section 39*). When assistance is provided to persons escaping from a mine it should not be issued as an instruction but as factual information that will assist that person to decide how to exit the mine appropriately. This learning is also relevant to control room operators when communicating with persons escaping from the mine.
6. The mine fire-fighting capability should be reviewed and consideration given to allow persons to fight fires under site guidelines. This may include evacuation to a place of safety other than the surface, eg. pit bottom. Use of such persons may allow a more effective and timely response to the fire.
7. The benefit of changeover stations to the mine should be evaluated. This would allow verbal communications with the surface en route and provide a place to leave injured persons if required. It also allows a safer environment for the changeover of SCSRs.

TIMELINE :

		ASSESSORS COMMENTS
0921	Call over DAC from Control that there is a fire at D9 in the main headings and that thick black smoke is flowing down the main travel road.	Longwall ERZ Controller was required by the site and was considered not part of the exercise.
0924	<ul style="list-style-type: none"> ▪ Assessors showed sign to crew members at maingate end of face: <p><i>"You hear a roof fall across the maingate and stageloader which is impassable. Air quantity has been cut drastically. You notice smoke entering the face from the intake airway over the fall. The smoke is getting darker and thicker.</i></p> <p>DO NOT PUT YOU SELF-RESCUER ON. DO NOT CROSS THE AFC. Act as you see fit".</p>	
0925	<ul style="list-style-type: none"> ▪ PED message broadcast to evacuate the mine. ▪ Crew discussed route and method of retreat, accounted for all persons. Notified Control by DAC of names of those present, fall had occurred at maingate and their proposed route of escape. 	
0927	Longwall crew donned smoke glasses and then donned training oxyboks. (<i>Note: one person donned a real oxybok</i>)	Excellent result. Could not find any fault. Person selected to don real unit was initially hesitant to wear rescuer as had previously experienced failure of rescuer.
0928	Person donning real Oxybok burnt finger on starter.	
0931	Crew started to retreat from maingate to tailgate.	Experienced persons at front and rear of them. Good logic applied.
0937	Changeover to Fenzy Biocell 90s at the tailgate simulated.	Crew did not indicate that they would take spare units with them (<i>this may have been because of not actually donning rescuers here</i>).
0942	Crossing tailgate drive. Needed to climb over top of tailgate motor cover area to access tailgate roadway. <i>It had been discussed prior to donning SCSRs that the drive and AFC were isolated and tagged.</i>	Good assistance between crew. Poor access to tailgate through tailgate drive.
0944	Crew assembled in tailgate roadway then proceeded to evacuate in a controlled manner. Steve Kell who took on leadership of the group picked up a drill steel from the rib and used it to negotiate his way from the tailgate.	
0952	9 cut-through reached, mock change-over performed. Search of cache was conducted by team member - no life-line or writing material could be found.	Mine should consider the placement of life-lines, mine plans and writing materials in cache boxes.

		ASSESSORS COMMENTS
0953	Person wearing real oxybok changed over to training Fenzy 90 at this time.	Unit had lasted for 22 minutes and was not exhausted at time of changeover. Let crew experience the heat generated by this unit by passing around team.
0955	Left 9 cut-through.	
1005	<ul style="list-style-type: none"> ▪ Worker collapses from exhaustion after being shown the following sign: <i>"You are suffering from headache, dizziness, shortness of breath and suffering from exhaustion. Collapse in a semi-conscious state until told otherwise"</i> ▪ Crew checked area for safe place in regards to rib etc, to position John. After some discussion and note passing the collapsed worker is positioned under an air outlet. A message given to worker to read "Wait here for rescue – do not move". 	<ul style="list-style-type: none"> ▪ A decision was made quickly that the exhausted crew member would have to be left where they were. ▪ The communication difficulty created by wearing self-rescuers was substantially reduced by the use of note pads and pens. Communications between crew were sufficient to ensure that no critical information was overlooked – while this method takes time, it is very thorough and creates a permanent record of the discussions taking place and the decisions being undertaken.
1006	This cut-through was marked "intermediate cache", however no Fenzy Biocell 90s could be found in the cut-through.	<ul style="list-style-type: none"> ▪ Sign should be removed and crews should be notified when any changes are made to escape system. The mines safety and health management system should be reviewed to ensure that this is built into it.
1011	Air and water outlets were tested and John was repositioned under the correct air outlet.	<ul style="list-style-type: none"> ▪ The connection of the hose was not actually done. From the debriefings, a team member confirmed that this <u>would have occurred</u> at this point.
1025	The main part of the group stopped around the tailgate doors. 2 people proceeded to a Fenzy Biocell 90 cache at C25 and changed over. The rest of the group joined the first 2, but were not observed at change-over. The whole group then returned to the tailgate doors area (26 cut-through?) and then proceeded to walk towards 'F' Heading.	<ul style="list-style-type: none"> ▪ Excellent recognition that 'F' Heading would contain fresh air when a fire is at D9.
1028	Group reached 'F' Heading and the statement was given: "This road has no smoke"	<ul style="list-style-type: none"> ▪ Assessors repeatedly asked whether the group was in fresh air. The group had no gas instrument so they were not provided with gas readings. They were advised several times "This road has no smoke". The provision of fixed station visible display gas readings, eg., at positions in the primary escape roadway may be worth investigation. At minimum the provision of multi-gas detectors and relevant tubes in caches and training in their use may be a valuable asset.
1032	Fenzy Biocell 90 changeover at F23.	

		ASSESSORS COMMENTS
1033	Member of the group opened trapdoor in stopping and looked through. Member was informed that there was thick black smoke in the belt road.	
1038	1 worker phoned control room from F23 cut but hung up when they answered.	2 workers separated from the group at this stage in an attempt to expedite the relay of the message of their stranded crewmate in 6 cut-through, tailgate.
1044	2 workers changed over Fenzy Biocell 90s at F9.	Pace of walk was brisk and two persons where becoming distanced from leader. One person was an asthmatic.
1048	Same 2 workers arrived at C5 pit bottom. Contacted Control over DAC and explained what had occurred since they left the tailgate. Control and the worker were both speaking into the DAC at the same time. The outcome of this was that the message was not received.	This emphasises the need to ask for messages to be repeated to the sender.
1052	Group was informed by Control over the DAC that they were in fresh air.	
1053	The rest of the group arrived at C5. A disagreement started between crew about the first 2 workers taking off from the rest of the group.	
1054	Discussion over DAC with control. Again mentioned worker stranded in the tailgate. Control seemed to be very surprised by this! Control told the group to 'standby'	The time saved by separating the group was wasted by a failure of communications.
1100	Workers contacted Control and asked, "Should we wait or should we walk out?"	
1101	Control contacted group and said to walk out the drift.	
1115	Group started arriving on surface.	
1128	<ul style="list-style-type: none"> ▪ Rest of group arrived on surface. ▪ Crews were dehydrated at this time. 	One crew member was distressed and required oxygen in first aid.
Tailgate Ventilation Readings		
1802	Underground Mine Manager briefed 2 North Goonyella workers on their task to conduct a ventilation reading in the longwall tailgate.	
1810	2 workers left surface.	
1819	Arrived at tailgate doors.	
1820	Checked the number of Biocell 90s in 25 cut-through cache.	Was informed that there were 9 Biocell 90s taken from the cache.
1825	Pressure reading taken over outbye set of tailgate doors.	Informed a pressure drop of 300Pa over the outbye doors.
1828	Pressure reading taken over inbye set of	Informed a pressure drop of 333Pa over the

		ASSESSORS COMMENTS
	tailgate doors.	inbye doors.
1829	Entered the return - one waited on the outbye side of the first intersection. Other proceeded on to the ventilation station.	
1833	Air readings taken.	
1838	General body air sampling taken. Information tag filled in with location, sample type, time, samplers name, date and minigas and dragger CO ₂ tube readings.	Excellent job done filling in information tag.
1843	Wet bulb / dry bulb reading taken.	
1847	Left tailgate and phoned IMT and informed of readings.	
1849	Phoned Control and informed of intention to leave for the surface via D9.	
1856	Stopped at C9 and checked hose layout at Eimco site.	
1857	Only one hose run out to the machine tyres.	The whiteboard in the IMT room said that both hoses had been run out as requested.
1901	Rang IMT and informed of hose layout.	
1904	Informed Control returning to surface.	
1912	Arrive back on surface.	

3 NORTH OUTBYE CREW

Assessor: Mark McCamley

OBSERVATIONS:

1. Crew of eight men (all contractors) had no deputy for leadership and gas detection. They did an excellent job of escaping to safety without leadership or direction from an experienced permanent employee.
2. The crew correctly reacted to the fall by going back to the crib room to ring up Control and advise them.
3. When they were advised over DAC to evacuate the mine, they went and got three other men and as a group decided on action after being told they could see smoke.
4. Crew correctly decided to don self-rescuers and take walking sticks but tended to talk with rescuers in their mouth a few times when a decision had to be made.
5. Crew decided to use link line so they would stay together.
6. Men walked outbye accessing cache's of LD units but did not utilise a PJB or MPV that were available for transport.
7. Crew used lifeline to good effect to get them into 'F' Heading.
8. Crew did not stop to communicate position or conditions to Control.
9. Crew showed urgency during evacuation but walked at a safe pace.
10. Crew made conscious decision to stay together.

FINDINGS:

1. Consider placing detector tubes for gas detection at crib rooms and major caches of LD units.
2. Stress use of transport for evacuating the mine (if available) during training on escape.
3. Review number of LD units placed in intermediate cache's.
4. Assess suitability of access to second egress under belt at coffin seal in 3 North.
5. Reassess display of information relating to LD units on plan as men thought there should have been LD units at 26 cut-through but there were none there. Plan is confusing and needs to be in bigger scale to show more detail.

TIMELINE:

		ASSESSORS COMMENTS
0927	Fall in Maingate at BSL.	Three men (Contractors) were setting props and were told that roof was getting heavy. At 0927 they were told that roof has fallen and blocked access to longwall face. Considerable drop in ventilation.
0930	Men assemble at crib room.	Three men told two fitters (Contractors) working outbye to go to crib room with them. When at crib room, contractor went into the belt road to get three more contractors working in the belt road near the crib room.
0932	Don and wear self-rescuers and hook up link line.	Men told that smoke is visible and they get message over DAC to evacuate. Men were then told that smoke was getting thicker, they decide to don rescuers and evacuate via travel road. One man had a bit of trouble donning belt worn unit.
0933	Leave crib room walking outbye along 'B' Heading. Walked straight passed available diesel transport vehicle and continued on foot.	Men were given smoke glasses to wear to simulate impaired vision.
0935	B9	Men were using walking sticks and walking at good steady pace.
0946	A6	Men accessed long duration Fenzy units at 7 cut-through, 'A - B' Heading. Only five units available so decision made to go into belt road to access next cache at A3.
0948	A3	Men accessed long duration units and all men said they would have changed to a new unit.
0957	Coffin Seal	Men had some trouble getting under belt, limited room.
1000	First overcast	Men crossed over first overcast in 29 cut-through, good use of life line. Walking sticks used to identify lip at end of overcast so men didn't trip.
1004	29G intersection	Stopped and worked out where life line was going and changed direction to go up 'G' Heading, had some trouble walking up 'G' Heading due to poor floor conditions (loose coal piles).
1007	F28 - fresh air	Followed life line through man doors into 'F' Heading. Men told that there was no smoke in 'F' Heading, they asked if they were in fresh air and were only told that they could see no smoke. They were told they could take their glasses off at 27 cut-

		ASSESSORS COMMENTS
		through (assessor forgot to tell them at 28). Men decided to keep rescuers in their mouth's and go to 26 cut-through to get new long duration units.
1015	F23	Men could not find any long duration units at 26 cut-through, proceeded to 23 cut-through and would have changed out units. Men take link line off.
1021	F18	Walking pace increased.
1025	F16	Found cache of long duration units at 16 cut-through and would have changed over again.
1030	F10	
1038	B5 – bottom of drift	Men went past cache at 9 cut-through, discussed change over but decided not necessary. Stopped at bottom of drift and communicated with Control, telling them who and where they were and asked for PJB to get out drift. Request was denied and they walked out.
1100	Surface	Men stopped along drift for slow man to rest, group stayed together. Names were taken by lamproom attendant when on surface.

4 NORTH PANEL ESCAPE

Assessors: Greg Dalliston & Peter Baker

OBSERVATIONS:

1. **4 North crew were not notified of the incident - the first they knew of a problem was when smoke entered the panel 20 minutes after the fire had started. Neither DAC or PED message were received in the panel.**
2. Good information passed onto Deputy from Control when Deputy made phone contact. Deputy passed on MOST information to crew prior to donning his SCSR. He explained the route of travel that should be taken but did not tell the crew the location of the incident.
3. Donning of SCSR at face was conducted well. The crews were well rehearsed in this procedure and confident in the use.
4. In good visibility escape appeared orderly - this changed however when visibility was reduced.
5. It did not appear that any one person took the role of 'crew leader' in the absence of the Deputy.
6. Cache of SCSRs at cribroom were not used - another SCSR cache 1 pillar outbye.
7. At 12 cut-through cache there were no plans and writing material as per the standard for North Goonyella. Men were not aware that walking sticks were located at this point.
8. Changeover from Oxy K to Fenzy Biocell 90 was conducted proficiently by all four men who undertook this task.
9. Crew splits occurred often on the escape route due to visibility and inability to communicate - in these conditions it is true 'self' escape.
10. **There was no guidance system in the roadway the men used for escape - disorientation was to the point that most would have struggled to find their way to fresh air (F Heading). This disorientation led to the probable demise of at least one of the crew members.**
11. Crew used ribline as guidance system. This can create hazards from slips and trips but also from loose rib coal falling, protruding rib bolts and damaged rib mesh.
12. Droppers at SCSR caches assisted in the crew finding these changeover points but some of the crew stated that they could not see them in every case.
13. One crew member 'banged' on the SCSR box at the cache point to assist the rest of the crew find this location - this worked very well.
14. When crew got to D35 intersection the change in airflow led to confusion and further crew splits - the crew were using the 'air in the face' to know they were going in the right direction.
15. All of the crew had the intention of getting into 'F' Heading - they did split but were all reunited at 17 cut-through. This was the initial instruction from the Deputy before the crew left the panel.
16. Barriers across belt walkways at underpass points proved to be very effective in preventing falls in poor visibility.
17. SCSR cache at 28 cut-through did not have droppers to indicate location - there was a sign on the roof only. Only one man found this cache (through thorough knowledge of the area).
18. Access to some of the caches was difficult in poor visibility due to walking conditions in the cut-throughs.
19. Real Oxy K SCSRs were used by two of the crew right through to run out (approximate weights are assessors estimation). Crew member No. 1 (approx. 100 kg) removed the unit after 32 minutes. Crew member No. 2 (approx 80 kg) removed the unit after 37 minutes.

Neither men were under any duress at the point of removal. Both men had travelled to 2 cut-through (approximately 1300 metres) before having to remove the unit.

20. Rate of travel during escape in these conditions averaged approximately 2 km/hour.
21. From leaving the panel at 16 cut-through, 4 North panel to initial contact with Control at the F17 telephone was 67 minutes – escape time from panel to drift bottom was 90 minutes in total.

FINDINGS:

1. Implementing a system to ensure ALL personnel underground receive notification of an emergency as quickly as possible – 4 North crew did not receive any notification.
2. Instructing crews to discuss escape options and have a plan and nominate a leader prior to starting escape.
3. Training of crews in ‘escape’ in poor visibility conditions – this will result in the formulation of plans and systems that the crews would use in an emergency (eg., communication system while wearing SCSR).
4. Implementing standardised SCSR caches to ensure all personnel are familiar with what is in them and how to access this gear – ie., plans with escape route marked, writing material to assist communications, boxes in which SCSRs are contained should be standard, walking sticks and their location etc.
5. Put a system in place to ensure cut-throughs in which SCSR caches are to be placed are cleaned out to improve accessibility – particularly in poor visibility.
6. Implementation of a guidance system to get personnel into escape roadway ie., ‘F’ Heading.
7. Undertake a review of effectiveness of cache indicators.
8. Implement a communication system to the surface from each of the main cache locations for tracking of crews escaping and one-way communications from Control for updates etc.

TIMELINE:

		ASSESSORS COMMENTS
0913	Fire breaks out on Eimco 20 metres inbye D9 intersect.	
0925	PED message sent - "Emergency exercise - evacuate mine"	PED message not received by either PED in panel (fitter and deputy).
0933	Deputy shown card - "Smoke entering panel"	Driftrunner in panel disabled.
0938	After notifying crew, 16 - 17 cut-through, 'A' Heading, deputy contacts Control to determine problem.	CO readings 20 - 30 ppm at this stage.
0940	All Oxy K units donned and deputy gives final instructions to crew of intentions.	60 minute Fenzy units were available but 25 minute units donned under assessors instructions.
0941	Crew left 16 cut-through under escape conditions (7 men).	Travel road selected as best escape route.
0943	Conditions deteriorated - visibility reduced.	Crews instructed to turn lights to low beam.
0945	Crew left cribroom without Fenzys.	Units were available but not taken.
0947	Conditions deteriorated - visibility reduced.	Crew instructed to put on 'smoke goggles'
0950	Crew arrived at SCSR cache at 12 cut-through - crew split - four men went into cut-through and conducted changeover and three men continued outbye along travel road.	Communication issue and inadequate guidance system initially highlighted at this point.
0954	Changeover complete and four men left 12 cut-through, three man crew now at 10 cut-through.	Changeover conducted competently in near zero visibility.
0956	Crew now broken up into three distinct groups - 4 men at 11 cut-through, two men at 9 cut-through and 1 man 50 metres ahead.	For safety reasons, man in front stopped by assessor to wait for other two in his group.
1000	Front crew at 8 cut-through, back crew split into 1 + 2 at 9 cut-through (1 man increased walking pace).	
1004	Front group split - one man turned and started to make his way back inbye.	Almost nil visibility becomes disorientating very quickly - guidance system would assist all personnel.
1006	Man from front group (now going inbye) collides with four men from back group (now back together).	Even after collision, disorientated man continues inbye - agreed by assessors that total disorientation would lead to inability to escape by himself - man assisted to go back with group.
1007	All 7 men reunited at SCSR cache at 7 cut-through (although no head count was conducted). First man to cache banged on box - this assisted all other to get to this point.	This was the first changeover for the three men in the first group (two of them were wearing real Oxy K units and were still okay).
1009	Crew together at 6 cut-through (one man lags by 10 meters).	
1010	Crew at 5 cut-through - now split into 1 + 5 +	One man led by 50 metres and one trailed

		ASSESSORS COMMENTS
	1.	by same.
1011	First man wearing real Oxy K pulls unit.	Two of crew asked by assessor to wear real Oxy K units to depletion to test durations.
1014	1 man at 2 cut-through, 5 men at 3 cut-through, 1 man totally disorientated instead.	
1015	6 men meet at cache at 2 cut-through. Second man wearing Oxy K removes unit.	
1017	6 man crew leave 2 cut-through.	Crew had left behind same man as before – this man was again totally disorientated and it was the opinion of the assessors that he would not have achieved ‘self escape’ – it was decided to terminate his involvement. For the sake of the this exercise termination point was back at 7 – 8 cut-through (where he was walking inbye).
1021	Crew at D35 intersection – crew split into three groups 4 + 1 + 1.	Due to airflow turbulence disorientation was evident by all.
1025	One man turned off ‘D’ Heading toward ‘C’ Heading at 33 cut-through and then over to doors ‘B – C’ Heading and attempted to enter ‘B’ Heading.	Again clearly disorientated in these poor visibility conditions. Assessor assisted man to return to ‘D’ Heading.
1029	Four men walked past cache at 28 cut-through – one man located cache and changed over – this meant he was now by himself. The other man (No. 6) was lagging at this point.	Sign was on the roof only – there were no fluorescent hangers at this location.
1032	Four men went from ‘D’ Heading to the belt road across 23 cut-through.	There was a sign at this cut-through indicating a SCSR cache, but there was not one in the cut-through.
1036	Four man crew started walking along the belt road across from 23 cut-through.	
1039	Four man crew ran into barricades across belt walkway at 22 cut-through (belt underpass).	Crew indicated that they would go under belt and down the ladder at this point – assessor asked men to remove goggles to eliminate potential hazard.
1041	Four man crew collided with previously lagging man (No. 6) at E22 intersection (belt underpass).	
1042	Single crew member (who had changed over at 28 cut-through) arrived at 17 cut-through, ‘F’ Heading, removed SCSR to answer phone.	This was an assumption, as no gas monitoring was available to the team. Phone call from John (Control?) – longwall crew(?) had rung from this number and hung up (they still had rescuers on).
1044	Five man crew found door ‘E – F’ Heading, 22 cut-through.	
1045	Five name crew enter ‘F’ Heading and informed that visibility is now “how you find it” (ie. Normal).	Smoke goggles removed at this point.
1047	Five man crew met up with other crew member (ie., crew member that stopped to	Single crew member was not wearing SCSR so other five men also removed their

		ASSESSORS COMMENTS
	changeover at 28 cut-through cache) at 17 cut-through, 'F' Heading.	units. This was an assumption as no gas monitoring was available to the team.
1048	Crew contacted Control from phone at 17 cut-through to inform them of crew status.	Good information passed onto Control – 6 men accounted for, one unaccounted for.
1053	Six man crew left 17 cut-through and walked to drift bottom.	
1110	DAC message to Control from pit bottom – told that no transport would be coming underground and to walk out of the mine.	

INCIDENT MANAGEMENT TEAM

Assessors: Mike Downs & Mark McCamley

First meeting of the Incident Management Team commenced at 1135. IMT only formed in response to confirmed persons missing underground. Prior to this, incident control was in the hands of the Underground Operations Room.

OBSERVATIONS:

The IMT room arrangement at the mine only had a single telephone. This became the 'centrepiece' in terms of activities revolving around incoming calls - usually taken by the SSE, and outgoing calls - usually made by the SSE. Calls therefore interrupted most IMT activities and were seen as disruptive. The use of the speaker phone was effective in ensuring all members of the IMT got the same message.

It was noted that the IMT discussions were usually interrupted and often covered the same ground without any course of action or decisions made. The facilitator could be better utilised to ensure that this does not happen.

The composition of the IMT provided good, widely based input into discussion. The main objectives of the IMT changed over time, in line with the change in circumstance.

Some confusion in role allocations was noted, with some mine officials continuing in active participation even through technically 'relieved'. This is indicative of a need to better define and the roles to be filled under emergency situations. Too many people in the IMT - up to 13 at times.

FINDINGS:

1. A central point is needed where all current duty card holders are identified with name, location and contact phone number.
2. When duty card holders change, it needs to be identified formally. Handover procedures for the IMT and a range of suitable personnel to fill various roles should be defined.
3. Number of people in IMT room needs to be reduced, maximum should be 5 or 6, not 13 as was the case at various times.
4. Provision of at least two telephones with people assigned for incoming calls and one telephone assigned for use by the IMT for outgoing calls only. Lines of communication need to be clearly defined so that 'closed loop' communications can be achieved, with automatic feedback. Lines of communication will curtail some telephone traffic to the IMT and allow improved operation of the IMT.
5. Safegas monitoring screen is needed in IMT to get gas readings quickly and accurately.
6. Facilitator needs to act in this capacity and monitor ongoing effectiveness of the IMT. Facilitator should be looking at issues such as decision making process, time wasting, verification of data, information flow in and out of IMT, briefings done on time, checking milestone events, interaction of members, etc.
7. One person needs to be in control of the event and everyone should know who it is.
8. Relationship between Underground Management Room and IMT needs to be revisited and operational effectiveness analysed.

9. Underground Mine Manager should be a part of the IMT.
10. Decision making process needs to be streamlined to identify and act on critical issues as soon as possible.
11. Review and assessments of critical issues needs to be done in a coordinated manner and followed through to completion.
12. IMT members should not be going in and out of room regularly to talk to direct, check on current status etc, a runner(s) should be used for this.
13. Capability of mines rescue to respond in a timely manner with sufficient numbers to get a team underground for first response needs to be reviewed.
14. Fire Officer to review quantities of low expansion foam held on site and proficiency of people to with respect to fire fighting.
15. Develop a procedure / work instruction for taking bag samples from the gas shed so that any person can do this with a minimum of training.

TIMELINE:

		ASSESSORS COMMENTS
1135	<ul style="list-style-type: none"> ▪ IMT formed in specified IMT Room. ▪ Initial brief concerned gathering of current data ▪ IMT breaks up after initial discussions with plan to reconvene once more data available 	No clear Goals, Objectives, Priorities or current resource status lists formed
1255	<ul style="list-style-type: none"> ▪ Mine Manager arrives on site and reports to IMT. On entering IMT room starts to read some notes and tries to find out what has happened to date. ▪ IMT asked to update members of Underground Management Room. ▪ Suggestion made to short circuit mine ventilation to take fire contaminants to return. 	Mine Manager not briefed on entering IMT.
1300	<ul style="list-style-type: none"> ▪ Mine Manager suggests to IMT that main job is to fight the fire. 	There was not enough focus put onto fighting the fire.
1304	<ul style="list-style-type: none"> ▪ SSE asks for 2 x PJBs to be made ready to go underground and asks for copies of the debrief notes from the Underground Management Room. ▪ Mine Manager asks who is missing and is told the wrong names of the two missing people. 	Wrong information coming from Underground Management Room.
1305	<ul style="list-style-type: none"> ▪ IMT preparing to send two mines rescue teams underground. ▪ IMT updated on gas readings - tailgate: 446ppm. ▪ Mine Manager again says they need to fight the fire. 	
1311	<ul style="list-style-type: none"> ▪ Acting VO comes back and says the CO levels are rising, modelled ventilation and guesses ventilation across longwall as 20 m³/sec. Further discussions about short circuiting ventilation in the mine. 	Good work to model what quantity of air would be going across the longwall face.
1315	<ul style="list-style-type: none"> ▪ IMT briefing by Underground Controller on that status of mines rescue teams and missing personnel. 	
1316	<ul style="list-style-type: none"> ▪ Mine Manager re-enters IMT. ▪ Discussion about mines rescue course of action. ▪ Discussed location of missing man 	No one sure of Mine Managers role at the moment - is he in control of the IMT or the Underground Management Room or neither?
1318	<ul style="list-style-type: none"> ▪ Mines Inspectorate arrives in IMT (District Inspector and Inspection Officer). 	Realistic travelling time from Mackay office to mine site approximately 2 ½ hours. District Inspector notification to Chief Inspector of Mines at approximately 1010 hours and to Regional Manager at 1029

		ASSESSORS COMMENTS
		hours on his way to site.
1318	<ul style="list-style-type: none"> ▪ SSE confirms they do not have resources to look for both missing men. ▪ SSE says they need to fight the fire. 	
1319	<ul style="list-style-type: none"> ▪ Briefing to IMT on current status. ▪ Mine Manager interrupts IMT and asks for a briefing as he has not been told anything. 	<ul style="list-style-type: none"> ▪ Requested by Mine Manager, recently arrived and Inspector. ▪ No procedure to brief new members to IMT.
1323	<ul style="list-style-type: none"> ▪ Update from Ventilation Officer of gas readings from Control: <ul style="list-style-type: none"> - Longwall tailgate - 440 ppm CO - Shaft bottom - 304 ppm CO ▪ IMT comment of CO levels increasing throughout the mine. 	
1328	<ul style="list-style-type: none"> ▪ Discussion of fire team capability and back-up by rescue teams. 	
1330	<ul style="list-style-type: none"> ▪ Issue raised of need to organise relief for IMT as problem will go on for some time. ▪ Mine Manager asks if mines rescue backup is available and suggest that NGC employees are rung up and asked to attend the site for duty, also suggests the Moranbah North be asked for people. ▪ SSE asked if Newlands rescue member can drive PJB and he confirms - OK. ▪ SSE tells Underground Management Room to send people to set up FAB. ▪ District Inspector asks if SIMTARS have been called and it told no - not needed. 	
1331	<ul style="list-style-type: none"> ▪ SSE checks rescue team numbers (19) and arranges for more foaming compound from Newlands / Moranbah North. 	
1335	<ul style="list-style-type: none"> ▪ IMT updated on CO levels and says they are rising around the mine. ▪ Confusion about who is the relief in the First Aid Room - given the First Aid Attendant has just been sent to the FAB. 	Gas levels should be available to IMT at all times.
1337	<ul style="list-style-type: none"> ▪ QMRS Super returns to IMT, and asks questions about gas levels etc., gets an update from Acting Ventilation Officer. Some discussions taken place with no sense of urgency shown. ▪ Mine Manager and SSE disagree about rescue teams ringing IMT phone - SSE overrules and status quo stays. ▪ SSE starts review of IMT to find out who is doing what: <ul style="list-style-type: none"> - SSE = Emergency Management Coordinator 	

		ASSESSORS COMMENTS
	<ul style="list-style-type: none"> - Coordinator :Underground Management Room - Mine Manager – Relief Underground Management Room Coordinator ▪ Mine Manager asks if GAG has been ordered. ▪ Mine Manager asks who is getting mines rescue teams away – told it is QMRS Super. ▪ IMT confirms men to be let go home and stay in the village. ▪ Requested of one IMT member to make up spreadsheet so they can track where everyone is and what duty card they have. ▪ SSE breaks up IMT, one person to stay and answer phones, people to reconvene at half hourly intervals. 	
1338	<ul style="list-style-type: none"> ▪ Ventilation briefing given to QMRS Super on latest CO levels. 	
1340	<ul style="list-style-type: none"> ▪ IMT changeover – SSE, Underground Controller and Tech Services Manager all relieved 	
1354	<ul style="list-style-type: none"> ▪ District Inspector returns to IMT. ▪ IMT told that mines rescue team ready to underground at 1:55pm. 	
1400	<ul style="list-style-type: none"> ▪ IMT told that Team 1 underground at 2:00pm. ▪ District Inspector questions planning of mines rescue operations but told it is too late to change. 	
1402	<ul style="list-style-type: none"> ▪ IMT informed that the evacuated men on the surface are a nuisance, milling around and getting in the way. ▪ Mine Manager asks if mines rescue stand-by team is to go underground or stay on the surface. SSE2 confirms stand-by team to stay on surface. 	No plans in place for managing people after evacuating from mine.
1403	<ul style="list-style-type: none"> ▪ IMT told Mines Rescue Team 2 leaving surface for tailgate. ▪ Sign on IMT door is put up. 	
1406	<ul style="list-style-type: none"> ▪ SSE2 starts discussion about short circuiting ventilation at 17 cut-through doors. Discussion held on the effect on fire contaminants but no reference made to what will happen in the rest of the mine. 	
1410	<ul style="list-style-type: none"> ▪ QMRS Super returns and tells IMT that mines rescue standby team must go to FAB. 	
1414	<ul style="list-style-type: none"> ▪ SSE2 officially takes over as IMT leader. 	
1415	<ul style="list-style-type: none"> ▪ SSE determines rescue team status – Fire 	Confusion obvious as to exact position

		ASSESSORS COMMENTS
	<p>Team 1, Team 2 at FAB and Team 3 backup. Status revised by Mines Rescue Superintendent.</p> <ul style="list-style-type: none"> ▪ IMT told Team 2 has not yet left the surface. ▪ IMT Leader not sure of who is at FAB. ▪ Conflicting information to & from IMT about who is setting up FAB. 	and capability to deploy fire team support and search teams.
1421	<ul style="list-style-type: none"> ▪ IMT told Team 2 were waiting for a PJB. 	
1422	<ul style="list-style-type: none"> ▪ SSE1 returns to IMT and requests they reunite. ▪ Team 1 phones IMT and tells them about fire and their intention to run hoses and fight it. ▪ Team 2 ask for an update on the fire. ▪ QMRS Super asks if there are any changes in gas readings. Confirms he has organised someone to relieve him. 	
1423	<ul style="list-style-type: none"> ▪ Underground Controller to SSE1 regarding the need to deploy a driver to go with vehicles to retain control and availability of fleet. 	Confusion over roles being undertaken by mine officials.
1424	<ul style="list-style-type: none"> ▪ Telephone report from Team 1 to IMT regarding the status of the fire – both ribs on fire, machine on fire (not able to see where due to heat / smoke etc, roof okay. ▪ Team Captain assesses if fire able to be tackled, Team 1 about to put on water and use foam. 	
1426	<ul style="list-style-type: none"> ▪ IMT review – including briefing to Mines Rescue Superintendent: <ul style="list-style-type: none"> - Slow increase in CO levels in the mine; - Team 1 running out hoses and starting to fight fire; - Discussion on foam quantities available; - Second Fire Team being briefed, third team on standby; 	<ul style="list-style-type: none"> ▪ Mines rescue participation in IMT provided assistance in organisation of rescue teams. ▪ Change in purpose noted from highly biased towards mine evacuation only, to action relating to removing the problem and recovering personnel. This also obviously driven by the fact that the mine had been virtually evacuated by this time.
1427	<ul style="list-style-type: none"> ▪ Telephone call from Control – two teams at FAB and Team 1 about to enter tailgate to recover person at 6 cut-through. ▪ QMRS Super going to brief Team 2 before sending them underground. 	
1432	<ul style="list-style-type: none"> ▪ Mine Manager is now the Underground Coordinator in the Underground Management Room 	<ul style="list-style-type: none"> ▪ 12 people in IMT. ▪ Changes in duty card holders not communicated.
1434	<ul style="list-style-type: none"> ▪ Mine Manger enters IMT. ▪ SSE1 asks if anyone has rung 4 North phones to see if missing man answers 	<ul style="list-style-type: none"> ▪ A number of good points were raised by District Inspector but not analysed or discussed.

		ASSESSORS COMMENTS
	<p>phones to see if missing man answers</p> <ul style="list-style-type: none"> ▪ District Inspector asks if a “what if” analysis has been done for the process of fighting the fire. ▪ Discussed alternatives for mines rescue teams, if 1st missing man is dead, search for 2nd man ▪ SSE2 starts discussion again about redirecting more ventilation down ‘F’ Heading. Technical Services Manager 1 raises issues with restriction of ventilation and effect on fans. 	
1440	<ul style="list-style-type: none"> ▪ IMT discussion on re-routing ventilation. 	
1446	<ul style="list-style-type: none"> ▪ Update from Team 1 – about to put water on fire, 4 x drums of Low Expansion foam on job. ▪ Updated from FAB – Team 2 suiting up. 	
1450	<ul style="list-style-type: none"> ▪ IMT discussion on rescue team back-up – arrangement put in place. ▪ Consideration of possibility of tailgate victim being dead – decision made to leave body as is. <i>Noted that the team would be tired after the mission.</i> ▪ IMT informed that there was sufficient rescue personnel on hand to be able to deploy a team to search for missing man – search to cover the area from where last seen to area where first noted to be missing – 12 to 17 cut-through. ▪ IMT discussion on ventilation and gas levels – increasing CO. 	Improved rescue team organisation evident as shown by the planning to conduct simultaneous activities in the mine.
1451	<ul style="list-style-type: none"> ▪ Mine Manager raises issue of organising more rescue teams. ▪ Was informed that other teams were on site now. 	
1454	<ul style="list-style-type: none"> ▪ SSE1 confirms Team 2 will return to surface after sortie into return. ▪ QMRS Super confirms that team will leave body in place if they find a person dead. ▪ Decide to deploy Team 4 to look for other missing man in 4 North. 	
1458	<ul style="list-style-type: none"> ▪ Mine Manager now organising IMT. Tells QMRS Super to get teams ready, next two teams to report to different phone number. ▪ Not sure of route of travel of 4 North men, start to check debrief notes. 	Again, confusion about who is in control of IMT.
1459	<ul style="list-style-type: none"> ▪ Underground crews still on site trying to organise mines rescue bus to take them to camp. ▪ FAB reports that Team 2 have left, gas 	IMT wasted time discussing search, this should have been done by QMRS Superintendent. IMT should have simply identified area to search.

		ASSESSORS COMMENTS
	<p>levels normal.</p> <ul style="list-style-type: none"> ▪ Teams 4 & 5 to report to Mine Manager. ▪ Discuss search pattern and route ▪ IMT spend a lot of time talking about search. 	
1500	<ul style="list-style-type: none"> ▪ Call from FAB to IMT – Team going into the tailgate; Team at FAB on standby; 20.9% O₂, nil CO, nil CH₄. 	
1501	<ul style="list-style-type: none"> ▪ IMT discusses deployment protocols for the next rescue teams. 	
1504	<ul style="list-style-type: none"> ▪ Call to IMT from Team 1 Captain – <ul style="list-style-type: none"> - Fire is almost out, need more foam to continue and people to help; - No more Low Expansion foam left on site, more on the way (an hour away); - SSE2 decides to use High Expansion foam in the meantime. - Not sure who is in control now – SSE2 or SSE1 	
1508	<ul style="list-style-type: none"> ▪ Call to IMT from Team 2 at FAB ▪ Team 1 calls and says fire is under control. 	
1510	<ul style="list-style-type: none"> ▪ IMT checking debriefing notes to attempt to check movements of missing 4 North man 	
1513	<ul style="list-style-type: none"> ▪ Mine Manager rings and tells IMT that Team 4 is going to search 4 North man and Team 5 is going to fight the fire. ▪ SSE1 decides to send NGC employees to assist with the fire, Mine Manager to organise. 	
1515	<ul style="list-style-type: none"> ▪ IMT still checking for 4 North movements. 	
1517	<ul style="list-style-type: none"> ▪ Confirmation of fire fighting back-up. 	
1519	<ul style="list-style-type: none"> ▪ Telephone call from Control – Team 1 Captain urgent request for more foam and four men. ▪ Control rings IMT and tells them that Team 1 have run out of foam, are putting water on the fire, and still have flames in the rib. ▪ Still discussing search route for 4 North 	Indicative of insufficient emphasis placed on fighting the fire!
1523	<ul style="list-style-type: none"> ▪ IMT notified that the GAG is on site. 	
1524	<ul style="list-style-type: none"> ▪ IMT told GAG on site but no instruction about what to do with it. ▪ Discussing rescue – drive or walk. ▪ District Inspector reinforces that fire is not out. ▪ Discussed search again, egress of 4 North crew, activating standby team, area of 	

		ASSESSORS COMMENTS
	search – still no decision.	
1530	<ul style="list-style-type: none"> ▪ FAB calls and updates, still got fire in rib. ▪ Team 2 at 26 cut-through, 'E - F' Heading, lots of smoke and poor visibility. 	
1532	<ul style="list-style-type: none"> ▪ Fire out, water off, fire watch in place. ▪ SSE1 instructs to keep water on, take heat out of rib. District Inspector advises to cool tyres further on Eimco. ▪ SSE1 rings FAB and tells them that the fire is out. ▪ GAG Superintendent rings asking what to do with GAG, told to go on standby at workshop. 	
1534	<ul style="list-style-type: none"> ▪ Mine Manager advises five men going down to relieve rescue team at fire, briefing notes needed. ▪ Instructed to check ribs very carefully as fire could have been deep seated. 	
1536	<ul style="list-style-type: none"> ▪ Phone call asking who is relieving Team 2. SSE1 tells them to ring Mine Manager. ▪ Started to write up briefing notes for search. 	
1538	<ul style="list-style-type: none"> ▪ SSE1 call to FAB – second team on way, conditions improving (less smoke etc.) 	
1540	<ul style="list-style-type: none"> ▪ IMT realise that plan given to team at FAB does not cover area of search. Decision made to tell them to get plan out of cache at 23 cut-through. ▪ Mistake made about information Team 2 had – thought team said they had smoke at 26 cut-through, 'E - F' Heading (did not record this phone call). 	Discussion items were well recorded but information from phone calls was missed on some occasions.
1550	<ul style="list-style-type: none"> ▪ Team 4 leaves surface ▪ Team 3 to be briefed, need 5th Team ready to go when Team 1 suits are reconditioned. 	
1552	<ul style="list-style-type: none"> ▪ IMT discusses briefing note for search team to look for 4 North man – <i>noted that the mine plan supplied to the search team did not cover enough of the intended search team.</i> Plan made for the search team to pick up a plan from an inbye cache. (Drive vehicle into 4 North to 23 cut-through for plan, then to 26 cut-through, 'F' Heading and walk from there to 12 cut-through, 4 North). 	Poor preparation for rescue team deployed – the fall back plan did not work due to multiple storage points at the cache. PLAN NOT FOUND AT CACHE
1554	<ul style="list-style-type: none"> ▪ Report from Underground Controller – Team 4 left surface at 1550, Team 5 in rescue room waiting for gear. Relief fire team on the way. 	
1556	<ul style="list-style-type: none"> ▪ Mines Rescue Superintendent briefs Team 	Some confusion possibly evident in

		ASSESSORS COMMENTS
	<p>3 Captain from IMT. Confusion / change of Team Captain. Told search area. Mistake made with location of crib room, wrong cut-through given to Captain. Completed briefing Captain at 1604.</p> <ul style="list-style-type: none"> Positive pressure borehole behind double doors at 4 cut-through, 4 North, DAC at 4 cut-through doors; visibility 'F to E' Heading poor; CO falling and fire under control. 	'mixed' rescue teams.
1557	<ul style="list-style-type: none"> Acting VO returns to IMT. 	12 people now in IMT.
1603	<ul style="list-style-type: none"> Discussion in IMT regarding the mine atmosphere. 	
1605	<ul style="list-style-type: none"> SSE1 requests gas levels at 4 North, dog let to be monitored, if fresh air send PJB's to double doors. 	No risk assessment completed for sending PJB / people inbye of fire site.
1607	<ul style="list-style-type: none"> Industry Safety and Health Representative (ISHR) arrives in IMT room. Mine Manager suggests to change sampling sequence to only main points so more information available quicker. 	<p>ISHR arrives and is not briefed by the IMT Leader. Site Safety and Health Representative (SSHR) does the briefing. ISHR delayed due to serious accident investigation at another mine.</p> <p>13 people now in IMT.</p>
1610	<ul style="list-style-type: none"> IMT discussion in which Ventilation Officer noted that goaf seal monitoring put back on line - reference to areas behind the longwall. 	
1612	<ul style="list-style-type: none"> IMT take a break again. SSHR briefing ISHR, no formal briefing for him, no recognition of him entering IMT. Mine Manager advises that fire watch applying water to fire area and rescue team are on the way out. Control rings and advises that 4 North and 3 North are zero CO. 	
1617	Underground Controller to IMT - fire watch still applying water - FIRE OUT.	
1618	Underground Controller to IMT regarding CO readings on homotropical monitoring points in 3 North and 4 North - all normal and 'minimal' and noted that the longwall tailgate was still reading high.	
1620	SSE1 to FAB - message that rescue teams can use vehicles as fresh air in the pit.	
1622	<ul style="list-style-type: none"> SSE1 to Operations Room (Underground Controller) - instruction to send the ambulance underground. FAB confirm that Team 2 have found missing man in the 3 North tailgate He is alive but unconscious. SSE1 to Operations 	No risk assessment completing for sending ambulance inbye of fire site.

		ASSESSORS COMMENTS
	<p>Room (Underground Controller) - man from 6 cut-through, longwall tailgate, has been recovered and is being stretchered out alive.</p> <ul style="list-style-type: none"> SSE1 advises Mine Manager to send ambulance underground to get him as there was fresh air all the way now. SSE1 advises FAB at 1624 that ambulance is on the way. 	
1623	SSE1 to FAB - ambulance on the way.	
1626	Ventilation Officer informed SSE1 in IMT that 4 North, maingate and dogleg were all okay in terms of atmosphere.	
1627	<ul style="list-style-type: none"> Ventilation Officer confirms that 4 North is clear. IMT reassessed sending team into search without a plan, decided not to do it if they cannot find a plan. Acting Ventilation Officer confirms that 3 North dogleg clear of smoke. SSE1 rings FAB and advises clear air in gates. 	<ul style="list-style-type: none"> Information on some whiteboards erased and not recorded. Ambulance is inbye of fire zone without breathing apparatus.
1629	SSE1 to FAB regarding Rescue Teams 3 & 4.	
1634	<ul style="list-style-type: none"> Risk assessment on perceived residual problems from a position of good air in mine and ambulance on the way for longwall, tailgate patient. 4North man not yet found. Started to review issues, called it a risk assessment but proper process was not followed. 	Listed issues and actions needed by no risk assessment done.
1637	<ul style="list-style-type: none"> Control Room to IMT - tube bundle readings all okay except for 3 North, Tailgate - 60 ppm CO. Control confirms ambulance left surface at 1635. SSHR raises the idea of using Infrared gun to check heat in ribs. FAB called up wanting ambulance. District Inspector raised issue that no one was talking to fire watch. 	No updates or briefs given to men by IMT.
1640	Control Room to IMT - ambulance left surface at 1635.	
1642	FAB contacted IMT regarding the whereabouts of the ambulance.	
1647	SSE1 contacted fire watch - reported all was okay at the fire site.	
1649	<ul style="list-style-type: none"> Report to IMT that tailgate, longwall still at 	

		ASSESSORS COMMENTS
	<p>30 ppm CO.</p> <ul style="list-style-type: none"> Ventilation Officer advises 3 North return still at 30 ppm CO, keep an eye on it. Started to discuss possible spontaneous combustion event in goaf SSE1 asks if mines rescue has been debriefed. 	
1650	<ul style="list-style-type: none"> IMT realisation that there may be a spontaneous combustion in the longwall 3 goaf. Need to establish the tailgate airflow to determine the litres per minute. 	
1654	<ul style="list-style-type: none"> FAB calls, Team 1 on way out, Team 2 on their way into 4 North. Ambulance from town confirmed as on site but no doctor called. 	IMT don't know what condition 4 North missing man is in but have decided they don't need a doctor.
1657	<ul style="list-style-type: none"> IMT start to assess heating in goaf, list current controls as PHMP tarps and gas monitoring. Thought this was enough then went straight onto strata problems at BSL. Asked if Tomlinson Boiler was checked. Mine Manager updates IMT - 3North tailgate on way out, other team still searching. 	Process started for review of spontaneous combustion issues but this is sidetracked by strata problems and not re-visited.
1659	Message to IMT from FAB via Control Room - longwall tailgate victim on way out in the ambulance - Team 3 still searching 4North	
1703	<ul style="list-style-type: none"> Identified need to assess fall - talked about sending Geotech and deputy to have a look. Talked about ventilation of longwall and spontaneous combustion. District Mines Inspector states that CO in mine could be masking a spontaneous combustion event. 	District Mines Inspector raises issues of possible spontaneous combustion event but no analysis done of tailgate gases from tube bundle.
1704	<ul style="list-style-type: none"> Inspector notes possibility of a 'masked' spontaneous combustion in the longwall goaf. FAB Controller informs IMT that the missing person has been found dead at 12 cut-through, 4 North, Captain asked what to do with the body and was told to leave it as is and come out of the mine. 	<p>The exact location of the body given by the FAB to the IMT was incorrect - never corrected!</p> <p>Body was at 14 cut-thru</p>
1705	<ul style="list-style-type: none"> Underground Controller to IMT - debriefed Team 1. Ambulance on the surface with the person recovered from the longwall, tailgate. Mine Manager calls IMT and tells them that ambulance on surface, debrief of Team 1 being done and asked if FAB can be 	Acting Ventilation Officer in IMT not monitoring gases, no move to change sequence to get more samples from problem area. No move to do CO make even though it is identified as needed to be done on whiteboard.

		ASSESSORS COMMENTS
	<p>demobilised.</p> <ul style="list-style-type: none"> SSE1 leaves IMT to talk to R Albury. Acting Ventilation Officer, sitting in IMT, not checking gases. 	
1706	SSE1 to organise 'deceased persons' protocols – body to be left at 12 cut-through, 4 North.	<i>Body is at 14C/T</i>
1708	Underground Controller to IMT regarding vehicles and deceased body.	
1715	<ul style="list-style-type: none"> SSE2 raises issue of standing down IMT and briefing workforce, raises issues of contacting family of the two men. Discussion about ongoing issues and timeline of events. Talked about issues but did not write them down – investigation, police, EAP, debrief, etc. 	Fatigue becoming noticeable – decision making processes slowing
1720	<ul style="list-style-type: none"> FAB Controller to IMT – Rescue Team at FAB coming out to surface, Team 3 out of 4 North and on the way out of the mine. FAB Controller to dismantle FAB and exit the mine. 	FAB Controller removing FAB – before longer term planning effected by IMT.
1722	<ul style="list-style-type: none"> Acting Ventilation Officer brief to IMT – CO make approximately 44 l/min. Airflow rate needed urgently in order to properly detect the potential CO make. Estimate given based on the estimated airflow remaining after the fall in the longwall maingate. Noted that the CO make at the start of the shift was approximately 22 l/min. 	Good information provided on estimated CO make – reasonably accurate based on available information.
1725	SSE2 to Underground Controller regarding Rescue Team into tailgate 3 to measure airflow and take bag samples.	
1726	Ventilation Officer regarding TARPs – 44 l/min of CO exceeds level 4 TARP (evacuation) of 25 l/mine CO make.	Conflict with mine SMS / procedures evident. Avoided at this stage due to estimate only.
1727	<ul style="list-style-type: none"> SSE2 suggests sending rescue to do bag samples and survey. Issue raised about 44 l/min being TARP level causing evacuation of mine and they have a fire team underground. SSE1 asked if we monitor inbye of fire area – told NO. SSE1 said to leave sprays on fire when fire watch team leave. 	
1729	SSE2 convenes 'grand IMT' with Mine Manager and Acting Ventilation Officer.	
1730	<ul style="list-style-type: none"> IMT discussion regarding the Level 4 TARPs. 	No firm resolution of the TARPs issue.

		ASSESSORS COMMENTS
	<ul style="list-style-type: none"> ▪ CH4 level in Tailgate 3 at 2.7%. ▪ Checking debriefing notes regarding the extent / severity of the longwall, maingate fall. ▪ Note of duration of the fire watch. 	
1734	IMT update - no one in pit except the fire watch and FAB Controller. Vehicle on the way to pick up the FAB Controller. Fire site okay.	
1735	<ul style="list-style-type: none"> ▪ Discussing team going in to do air readings, agree that can be done by anyone as air quality is not a problem. ▪ Discussed position of gas risers - 15.5 cut-through. 	<ul style="list-style-type: none"> ▪ 13 people in the IMT room. ▪ Spent a lot of time making decision on who does air readings.
1736	SSE1 to Fire Watch crew - Level 4 TARP - set up fog nozzle to spray onto vehicle tyres and then evacuate the mine.	Apparent observation of TARP by IMT.
1737	SSE1 to portal entry controller - vehicle on way into mine to pick up fire watch and FAB Controller.	
1738	SSE1 to FAB Controller - leave FAB in place. Informed that the FAB already partially packed up.	
1740	<ul style="list-style-type: none"> ▪ Underground Controller to IMT - 34 ppm CO and 27% CH₄ in Tailgate 3. ▪ Rescue Team 1 ready to go into mine for tailgate air measurements and bag samples. ▪ Team to go in 'uncoupled' and monitor - couple up if necessary. ▪ IMT discussion of the Level 4 TARP - decided that it was not a TARP until the CO make was known 'definitely'. 	
1743	IMT decides to utilise the Tomlinson Boiler and set up to pump into the goaf via the borehole at 15.5 cut-through.	
1746	ISHR and SSHR noted that there would be men going into the tailgate under unknown conditions.	
1749	Technical Services Manager to IMT - boiler coupled onto hole feeding into 19 cut-through - a short coupler would be needed underground to pipe the gas behind the seal.	
1751	<ul style="list-style-type: none"> ▪ IMT decides to send two men into the tailgate for air measurements and bag samples. Take pipe etc. If volume calculated is okay, then organise to couple up hose at 19 cut-through. ▪ IMT to disband for 15 minutes and then SSE1 to hand over to SSE2. 	
1759	<ul style="list-style-type: none"> ▪ Man ready to go underground to do 	

		ASSESSORS COMMENTS
	<p>samples and ventilation survey, told to get pressure readings at Reg., also.</p> <ul style="list-style-type: none"> ▪ Acting Ventilation Officer evaluated changing sampling sequence but decided against it. ▪ SSE1 rings his two bosses and advises of current situation. ▪ Call into IMT saying they are setting up Tomlinson Boiler and starting it to get it up to full running capacity. ▪ SSE2 is taking over incident control. 	
1805	<ul style="list-style-type: none"> ▪ Underground Controller to IMT - all out of mine except for two men on way into tailgate 3 for measurements etc. ▪ Sprays on vehicle tyres at fire site - to be checked by two man crew when on way out of mine. ▪ Technical Services Manager and Jason checking plumbing for boiler. ▪ Hallway discussion between Technical Services Manager and Ventilation Officer 1 about using GAG on borehole. 	
1819	IMT discussion on current status - including sampling points for goaf.	
1823	Two man team at double doors - confirming entry to return.	
1825	<ul style="list-style-type: none"> ▪ FAB Coordinator waking around surface but not debriefed. ▪ IMT looking for reasons for spontaneous combustion. Checking boreholes and wells that could be open, seals that could have failed. 	
1828	IMT to Control (Underground Controller?) to check surface seals on the goaf post drainage holes.	
1830	<ul style="list-style-type: none"> ▪ IMT discussion on goaf hole readings. ▪ SSE2 talking on IMT phone for quite a while, could be stopping N Stanton from getting survey results back. ▪ Ventilation Officer 1 rings SIMTARS and mobilised them. 	
1834	IMT to Underground Controller regarding bag samples from goaf drainage pipes.	
1835	IMT realise that the 2 people sent underground to get the ventilation readings are the only people who know how to get a bag sample from gas shed.	
1840	Mine Manager rings IMT and suggests he shuts down Underground Management Room and	Better decision making when Underground Management Room

		ASSESSORS COMMENTS
	people come over to IMT room.	demobilised.
1842	<ul style="list-style-type: none"> ▪ Call to IMT – Tomlinson Boiler running and venting to atmosphere. ▪ Ventilation Officer 2 confirmed no open surface goaf holes. ▪ Ventilation Officer 2 deployed to check that all wells and post drain holes are closed. 	
1845	IMT discussion on protocols for death – doctor to check body to declare life extinct, police to site to check and recover the body etc.	
1847	<ul style="list-style-type: none"> ▪ Call from two-man team in tailgate 3 – out of return. ▪ Findings as follows – Cross Section Area 17.1 m²; velocity 0.86 m/s; volume 14.63 m³/s. ▪ CO₂ – 0.02%; O₂ – 21%; CH₄ – 2.7%, 34 ppm CO ▪ Pressure across doors 633 Pa. ▪ IMT calculated CO make as 29 l/pm – slightly above the level at the start of the day. Noted as being above the Level 4 TARP. ▪ IMT discussed going to 3 North with a section of pipe and take seal bag samples. ▪ IMT discussion of where to take bag samples. ▪ IMT agreed plans to get two-man crew back into the mine to couple up hoses and take bag samples – this thought to be a better course of action rather than wait for bag sample results before doing anything. 	
1847	<ul style="list-style-type: none"> ▪ Discussed alternatives, if boiler is started on hole they will lose ability to find location of heating. ▪ Current level is above any previous level. ▪ No discussion about intake shaft or ventilation direction in goaf. 	
1900	Message to IMT from two-man crew – hoses still on at fire site.	
1907	Exercise terminated.	
1920	Senior Police Sergeant (actor) arrives in IMT and questions arrangements regarding the body, site security and scene access, etc.	Highlights the issues on preservation of accident scene, notification to relatives etc, HR background requirements, etc.

ASSESSMENT OF INCIDENT MANAGEMENT TEAM

Assessor: Wayne Hartley

At 1004 the Mine Manager and Ventilation Officer were attending a seminar in Mackay when the Mine Manager received a phone call from the Project Manager advising him that an 'emergency' had been declared at North Goonyella Mine with a fire in an Eimco at 'D' Heading, 9 cut-through.

The Project Manager advised the Mine Manager that the fire is still going and they have been unsuccessful in attempting to put the fire out. There has also been a fall on the maingate at 0930 and they are evacuating by the tailgate and mines rescue are mobilising and have yet to get everybody out of the mine.

OBSERVATIONS

The Mine Manager repeats the message to confirm his understanding. The Mine Manager asks for the gas readings and the Project Manager advises the tube bundle readings at the maingate 4 is 200ppm and maingate 3 is 100ppm. Ventilation Officer asks for the oxygen levels. Mine Manager advises that Contract Ventilation Officer is on site for a risk assessment and he would like to talk to him. Mine Manager indicates that he will be out of reach for one hour and repeats that he would like to speak to the Contract Ventilation Officer and asks the where on the maingate is the fall and is advised that it is on the longwall itself. The Project Managers phone number is 837, and he did not want to tie the phone up for too long. Phone call finished.

The discussion with the Ventilation Officer and Mine Manager covered the issue of the electrical installation (now an exposure) near the Eimco and whether the power was still on. Mine Manager phoned and asked to talk to the Contract Ventilation Officer and leaves his phone number and confirms that the Ventilation Officer is with him in Mackay and that they wanted to get the gas readings before they set off from Mackay and Development Superintendent confirms that it is difficult to evacuate the mine because of the smoke.

The Contract Ventilation Officer finally makes contact with the Mine Manager and the discussion is around the developing fire and the exposure of the transformer and the condition of the surface fans. The Mine Manager asked if there has been a change in the water gauge and what are the tube bundle readings. Further discussions on maintaining the fans at the longwall and further discussion on the power were carried out. The Mine Manager asked questions on the development of the evacuation and any men on the surface yet and what are the tailgate readings.

Ventilation Officer and Mine Manager discuss the issue of people exposure, the ventilation and the necessity to get people down to fight the fire. The Mine Manager receives a phone call from the Control Room Officer and a further phone call from the Contract Ventilation Officer and Project Manager.

Mine Manager and Ventilation Officer decide to travel together to the mine to take advantage of communications and leave Mackay at 1024, some 13 minutes after the first call. Discussions are about ventilation control and smoke management and diversion of the smoke into the returns.

They travel and arrive at Nebo at 1124 where contact is frustrating as phones are either not answered or engaged. Finally, contact is made and information on evacuation and the two miners unaccounted for and they were assembling the fire team. The Incident Management Team formed at 1130. Several calls take place and information is still sketchy and they are informed that six men are missing and the two depart Nebo at 1150 for the mine.

Incident Management Team (from 1210)

The Incident Management Team is now functioning in the conference room. It was not entirely clear what roles/authorities each of the participants has. The Project Manager for North Goonyella had assumed the Incident Manager's role and continued in this role throughout the incident and he remained calm and maintained a composed disposition. It was obvious that there was significant movement in and out of the room and it was not always clear when decisions were made. Several incidents occurred where a decision was made, someone left to enact the decision – then the IMT started to regurgitate the decision. This was most confusing to other members of the surface control with the Mines Rescue Teams at one stage receiving different briefings on their role. There was resemblance of what is referred to as 'Group Think'.

During the development of the incident there was no sense of urgency for the life risk, nor was there an obvious appreciation for the consequences of letting the fire develop unchecked. There appeared to be little reference made to the information being scribed onto the whiteboard. This was later re-written, into a detailed time scheduled information sheet. All of the information may not have been complete. Gas and ventilation information was not being posted and it was not in enough detail to be particularly applicable to the decision-making.

On arrival of the Mine Manager at 1244, his arrival in the IMT appeared to go almost unnoticed – having eventually to ask (politely) to be briefed. The Ventilation Officer, who arrived with the Mine Manager, did not enter the Incident Management Room and participated in other tasks and activities - despite his consideration of the issues with the Mine Manager during the travel time to the mine.

Communications were not managed well with a number of phone calls being answered by the Incident Manager. It was clear a number of matters were referred to the IMT which should have been managed from another area. The IMT need not be disturbed by unwanted distractions – on one occasion the office reception phoned. Often conversations were being carried out by several people at the same time, including occasions when phone calls were on speaker-phones.

There was a distinct lack of discipline in the room.

SUMMARY:

1. There was reduced information available to the Mine manager in the early stage of the incident.
2. The Mine Manager was uncontactable (limited due to geographical location and no mobile phone coverage) which reduced this capacity for communications and resulted in only sketchy information.
3. There was no structured or guided approach to gathering relevant information in these circumstances.
4. The application of the Ventilation Officers expertise into the decision process was not utilised. The failure to recognise this vital aspect did not allow full exploration of a range of possible mitigating options.
5. The Mine Manager had little input into the decision making process at the early stages and could not influence the priorities being established. The fire was clearly the Manager's key focus – and he assumed the same would be true of the IMT. The fact that it was not the case was probably the key failure in the processes of the IMT.
6. There appears to be an assumption (perhaps industry wide), that because a person holds a senior management position within an organisation, they must have the skills necessary to

act in emergency incident management. This is not necessarily the case – and a number of the key skills were not always in evidence during the exercise.

7. The development of goal setting regimes including aids to ensure a consistent focus (including communication, resource status, priorities and other vital aspects of incident management) were significantly lacking.
8. The scribing and recording in time frames of the information identifying the sequential development was comprehensive but unstructured. The incident information should be divided into the key focus areas, based on risk and the mitigating solutions. This was absent in the early period but later developed into the beginnings of a recording system. The whiteboard size was inadequate. There were no contingency plans archiving information should the incident be protracted.

FINDINGS:

1. The mine should develop and adopt a structured and disciplined approach to emergency incident management including -
 - a disciplined framework in line with a pre-determined philosophy for emergency incident management.
 - an improved incident management aids for the Incident Management Team to assist in the application of a system for information management, recording and decision-making.
 - a clearly identifiable system of information flow, management and recording.
 - a structured 'decision' (authority) delegation tool for assisting the Incident Management Team to remain strategic.
2. Emergency incident management training is to be considered for all mid- and upper- level management.
3. Exercise the mid- and senior management through desktop exercising and practice in the emergency incident environment.
4. Consider the development of computer based incident management systems and recording incident management software.
5. The creation of an additional emergency officer's position - a position specifically trained to facilitate and influence the emergency management regimes and philosophy for the mine and its management at senior level. The role is primary to facilitate management for a preventative and emergency management environment. The Health and Safety Officer has a significantly different role and if incorporated into this area would see little focus achieved. The position would have expertise in emergency management, fire fighting, chemical hazard management and emergency safety training and systems.

CONCLUSIONS:

The discipline of emergency incident management is far more rigorous and requires more structure and discipline than normal management. The application is outside the normal routines and decision making of managers. The technical skills required become all the more important when applied during an emergency – where time is always critical and stress, fatigue and personal responsibilities take their heavy toll. Such circumstances are clearly outside the day-to-day managerial environment in which people routinely operate. Their capacity to function may therefore be hampered and the expectations of their position within the organisation structure adds further pressure.

Communication structures and links always play a vital part in emergency response. The communication flow chart attached as Appendix 3 to this report could form part a review process to unlock the communications and develop a more “critical functions” focus.

Poor communications saw opportunities lost during the early stages of the incident, leaving the mine in crisis. The inability to control the fire early was significant and the inability to manage the smoke and recognise the developing conditions in the mine shows a process that is ineffective. As can be seen from a study of the Exercise Timeline, the inability of the Incident Management Team to impact on the survival rate of the persons underground resulted in the loss of at least 1 life – a most unsatisfactory result given the reasonably straightforward evacuation faced by the lost worker.

The ability of the mine to mount a first response is heavily reliant on the Mutual Assistance Scheme. The “turn-out” of the two Mutual Assistant Mines appeared to be inequitable – an issue to be addressed between the mines.

MINES RESCUE ACTIVITIES

Assessor: Murray Bird

OBSERVATIONS and FINDINGS:

1. The mine could only get five of their brigadesmen in the first hour and then, only three more in the next three hours.
2. Allocating the affected mines' brigadesmen to the initial teams needs to take a higher priority than some of the Duty Cards when rescue teams are required quickly and numbers are short.
3. Utilisation untrained men to fight a fire that has been burning for some time is fraught with danger.
4. Information recorded on paper and on whiteboards in the rescue room did not clearly indicate what had happened, what was happening, where equipment and men were.
5. Which team was which and what they were to do was confusing and varied around the different rooms on the site.
6. Mine Manager must at least be present (preferably conduct) the briefing of rescue teams or any other task that is critical to a successful outcome. Communications (as usual) are critical.
7. Method of briefing large numbers of brigadesmen needs reviewing. This can be done in two stages: a) a general briefing for a large number and b) then a detailed briefing for the team and the standby team captain and vice-captain.
8. Once again this exercise highlighted that once you bring everybody out of the mine it is difficult to get them back in. Getting the first rescue team away needs to be given greater effort. Also, if you can do something on the way out of the mine, even if it is just to look at the state of the fire it will assist the operation.

TIMELINE:

		ASSESSORS COMMENTS
0938	<ul style="list-style-type: none"> ▪ The Mines Rescue Coordinator (MR-Co) was chosen and the Duty Cards were allocated. He left the Underground Control Room to go to the mines rescue room to start making phone calls. ▪ Realised that the phone did not have direct access to an outside line – it had to pass through the Control Room. Decided not to disturb Control and moved to the second direct outside line in the Control Room. 	<ul style="list-style-type: none"> ▪ An appropriate employee was given the Duty Card. He clearly knew what was required and what was happening. ▪ Phone system could be reviewed (especially during an emergency) whereby more phones can obtain a direct outside line and as such not disturb Control during the first busy first hour.
0940	<ul style="list-style-type: none"> ▪ MR-Co contacted QMRS Superintendent (MR-Sup) using the first phone number on the Duty Card and the phone was answered promptly. ▪ Information given to MR-Sup was accurate and very detailed. Question asked by MR-Sup were answered or updated via the Control Officer (who was in the same room) – updated gas readings from all sections was also given. ▪ MR-Co confirmed that he would activate the mines rescue brigadesmen and that MR-Sup would activate the mutual assistance system and get two teams from the sister mines. ▪ MR-Co left MR-Sup a direct contact number to get him when required. 	<ul style="list-style-type: none"> ▪ Noisy in the Control Room as there was a lot of activity, alarms, information transfer and phone calls going on. ▪ Assistant Control Room person was waiting to use this phone also. ▪ Too much information given – it was down to detailed gas readings in all parts of the mine. This briefing took 10 minutes. Would suggest short and brief message to start system moving and then MR-Sup calls back once in motion for updates. ▪ No sure what happened information-wise at the Rescue Station, that is, whether a summary only was given to other employees or whether they were given all data?
0952	<ul style="list-style-type: none"> ▪ MR-Co returned to Underground Operations Room and gave an update. ▪ MR-Sup activated – ETA approximately 2 hours. 	Updated information recorded on individual recording books by ALL persons in the room. Nothing recorded on the whiteboard timeline though.
0957	<ul style="list-style-type: none"> ▪ MR-Sup found another office with a direct outside line (Ventilation Officers room?). Started to determine how many rescue brigadesmen were at the mine currently. Determined that there were two on the surface (including himself) and three underground in an unknown location and unknown physical state. ▪ MR-Co planned to have a bus organised to pick up rescue brigadesmen from Mackay airport at 10:30am and bring them to the mine. 	<ul style="list-style-type: none"> ▪ MR-Co was instructed (by assessment team) that he required 18 brigadesmen to physically arrive at the mine and that another 6 men had to be found that could be at the mine within 3 hours time.
1001	Commenced calling out own mines rescue men who were back in Mackay – working his way through the full sheet.	Could have considered getting the bus going back to Mackay to turn back. There were a number of rescue brigadesmen on the bus. They would have not been able

		ASSESSORS COMMENTS
		to be used for some hours later though.
1012	MR-Co is waiting - has confirmed that he has 5 brigadesmen at the mine. Three are still coming out. He is awaiting confirmation that there are 8 coming from Newlands and 7 from Moranbah North. Still trying to get brigadesmen from Mackay.	<ul style="list-style-type: none"> Both of mines' Brigadesmen on the surface have critical Duty Cards to do at this stage. Subsequently, the rescue room is not being prepared nor suits being tested. At this stage anybody could make the calls to the brigadesmen. It should be considered that the two brigadesmen on the surface could be better utilised preparing equipment for rescue or fire teams.
1020	Underground Operations Room have been discussing forming a fire team. Four volunteers have been found. The two brigadesmen on the surface were not including in this number / group.	Priority in the Underground Operations Room still seemed to be concentrating on self-escape with only some peripheral work or consideration on fighting the fire.
1034	MR-Co still trying to get confirmation on brigade numbers. Updated Underground Operations Room on current status and asked whether GAG is to be deployed (as a result of a question from MR-Sup) - told yes, although not sure that it will be needed.	
1040	<ul style="list-style-type: none"> One of the mines brigadesmen had come to the surface. After he was de-briefed, he was allocated to mines rescue room duties by MR-Co. Commenced testing two suits at a time - planning to do all 12 suits and 2 sets of minimum equipment at this stage. 	<ul style="list-style-type: none"> No basic details on emergency on the whiteboard or recorded anywhere in Rescue Room at this stage.
1050	MR-Co has confirmed brigadesmen status is: <ul style="list-style-type: none"> 5 at mine (2 still underground) 5 coming from Moranbah North 14 available from Newlands (12 coming) 3 only of the mines brigadesmen in Mackay would be available. 	This covered the required 18 on site and another 6 available within 3 hours.
1055	Underground Operations Room has established that there is definitely one person missing from the longwall panel.	Fire-fighting or rescue activities should have become a very high priority at this stage.
1105	Discussion on the use of the 'volunteer fire team' continued and concluded that it would not be deployed at this stage.	<ul style="list-style-type: none"> A lot of discussion but no experienced fire person designated to develop a fire-fighting plan, ie., equipment, manning and method of approach. This should have been a major priority by this time. The Duty Cards that the two rescue trained men had should have been passed onto others so that this could occur.
1123	<ul style="list-style-type: none"> Three BG-174s tested (1 failed on relief valve pressure) - still only 1 person 	

		ASSESSORS COMMENTS
	<p>testing.</p> <ul style="list-style-type: none"> Original MR-Co Duty Card holder changed over with the brigadesman testing BG-174s. Original Duty Card holder to become part of Incident Management Team which was scheduled to form at 11:30am. Volunteers for fire had been named in the Underground Operations Room but there was not any currently trained fire fighters in it. MR-Co was not going to authorise their participation. 	
1137	<ul style="list-style-type: none"> Members of the 'Fire Team' decided on in Underground Operations Room. It was known that two do not have fire-fighting experience. 	<ul style="list-style-type: none"> Utilising inexperienced personnel to fight at underground fire that has been burning for 2.3 hours in a roadway with 1:15 dip is questionable. Suggest having more employees trained in basic fire-fighting would assist in these situations.
1145	<ul style="list-style-type: none"> Incident Management Team has established the fire as the main priority and is conducting a risk assessment. Decided that inexperienced employees will not be used in this team. 	
1152	<ul style="list-style-type: none"> Mines Rescue Superintendent (MR-Sup) arrived at the mine, went straight to the rescue room for an update and then into the IMT. In his vehicle he had rescue team communication equipment and Siffor gas monitors. Once in the incident management room nobody gave him a detailed updated briefing - he had to pick up where things were via the general conversations. 	<ul style="list-style-type: none"> Nobody asked to unpack equipment but other mines rescue employees who were not far behind knew what was in the vehicle. IMT and Rescue Room need current information put onto a whiteboard giving basic information. This way as personnel arrive they can get the basic information and an idea on what has and is happening.
1200	<ul style="list-style-type: none"> Moranbah North brigadesmen arrived - 2 men. Men went and changed and started to assist with the testing of BG-174s. 	<ul style="list-style-type: none"> Mine would not release the other three from the longwall unless it was really necessary. Commitment to these exercises needs to be reviewed. If it had not been for the Newlands response with 12 men, these men would have been needed at this time.
1202	<ul style="list-style-type: none"> Second mines rescue vehicle arrived on site. Vehicle packed with 6 x BG-174s, additional minimum equipment and cylinders for FAB. Went straight to rescue room and made sure things were organised and equipment being tested. Given Mines Rescue Coordinator Duty Card (MR-Co) 	

		ASSESSORS COMMENTS
1204	Volunteer Fire Team (4 men) pack additional fire-fighting equipment onto a PJB. This included a Fire Depot, extra hoses, 2 drums of high expansion foam and 2 drums of low expansion foam. At this stage they did not load a foam branch applicator.	
1205	7 x BG-174s ready but minimum equipment not.	
1217	<ul style="list-style-type: none"> ▪ MR-Co ordered a high expansion foam generator and low expansion foam branch applicator. ▪ No team formed at this stage, ie., there were enough brigadesmen to form a team but no Captain allocated nor name put into a team. 	<ul style="list-style-type: none"> ▪ Good foresight of possible problems when fire-fighting. ▪ Whiteboard in rescue room would assist. One board showing equipment and where it is; second to show team membership; third showing team deployment, tasks, times in and due out, etc. The fourth, being an enlarged Captains sheet which gives all basic information – this would reduce team briefing times and answer most of their initial questions.
1220	<ul style="list-style-type: none"> ▪ 12 x Newlands brigadesmen arrive and get changed. ▪ There is now 19 brigademen on site and three mines rescue officials. One brigademen and one mines rescue officials is in the Incident Management Team. 	
1226	<ul style="list-style-type: none"> ▪ MR-Co in mines rescue room formally listed the Captains and members of the first two teams. These teams were comprised of Newlands brigadesmen only. ▪ 10 x BG-174s now ready. 	Started to use the whiteboard BUT information is only basic. This area can be improved although it was a good start.
1230	<ul style="list-style-type: none"> ▪ Volunteer Fire Team told to get changed as they would not be needed. 	This team had some time earlier had its membership changed. Not sure what happened with this nor when it occurred.
1237	<ul style="list-style-type: none"> ▪ Incident Management Team decided on deploying the three rescue teams. ▪ MR-Sup writing up history, background and instructions for teams. 	
1249	Rescue trained men that came out from underground waiting to be de-briefed. They were not allowed to form a rescue team nor updated until this de-brief occurred.	The de-briefing was taking precedence over fire-fighting and rescue activities. Priorities need to be established and Duty Card holders informed.
1252	Incident Management Team information Underground Operations Room that a Fire Team may be required to use the BG-174s.	It can be assumed that this was the result of the risk assessment.
1254	<ul style="list-style-type: none"> ▪ 16 x BG-174s and minimum equipment sets ready – 2 more BG-174s being tested. 	

		ASSESSORS COMMENTS
	<ul style="list-style-type: none"> Mine Ventilation Officer is rescue trained and named as Captain of the first team by Underground Operations Team and the Incident Management Team. 	<ul style="list-style-type: none"> This was not transferred to the rescue room so they knew nothing about this fire / rescue team at this stage.
1300	<ul style="list-style-type: none"> Both Newlands teams conducting pre-tests on members and equipment in preparation for being briefed and leaving surface. Nobody for FAB discussed nor planned and IMT has not spoken to the rescue room / teams at all at this stage. 	<ul style="list-style-type: none"> The mine based fire / rescue team has not been discussed with anybody in the rescue room. So the rescue personnel think that they have two teams ready when IMT has one team in mind that hasn't even got its equipment prepared. Review method of communicating between IMT and rescue room. System seemed to be IMT to Underground Operations Room to Rescue Room and this did not work at all.
1303	<ul style="list-style-type: none"> Underground Operations tells rescue room that local brigadesmen are to form the fire / rescue teams that are going to 9 cut-through, Mains, 'D' Heading to fight the fire. Rescue Room Coordinator allocates persons to this team and notifies the Captain. 	<ul style="list-style-type: none"> There still was no mention of an FAB nor who would man it. IMT had allocated the rescue trained Ventilation Officer as the Captain of this team but nobody else knew this. IMT did give him a briefing of what they required.
1307	IMT Rescue Coordinator and MR-Sup arrived at rescue room to brief teams. Local team for fire-fighting / rescue work not present - had to get them into the rescue room first.	This was the first time personnel in rescue room knew that there was a third team. There was no BG-174s nor minimum equipment prepared for them.
1310	Briefing for all three teams.	<ul style="list-style-type: none"> Mine manager not present for team briefing. It is highly recommended that this should be the manager that gives the briefing or at least be present during it. Majority of the briefing on the history and requirements of teams was done off the top of the head. Too many persons present (approximately 22) in rescue room once the background information had been completed. Should do initial briefing then and only have team present for detailed briefing with its standby Captain and Vice-Captain. No information recorded on whiteboards. Thus you either make your own notes or tried to remember the information. Briefing group did not have rescue and lamp details of missing men. FAB manning not discussed. Team names (Team 1 or Blue Team etc) was not determined and clarified.

		ASSESSORS COMMENTS
		<p>Eventually, the teams were known by three different names, eg., the first team was called 'Fire Team' and Team 1 and 3. Review system – suggest that colours based on route markers can clarify this.</p> <ul style="list-style-type: none"> ▪ NOTE: The Captain of the fire-fighting / rescue team that IMT had appointed was not present during this briefing. The rescue room whiteboard still did not have his name included.
1320	<ul style="list-style-type: none"> ▪ Confusion of who is to be Captain of the first fire team getting sorted out. Equipment for this team. ▪ Still preparing BG-174s and minimum equipment for QMRS Team 1 (fire team). ▪ Underground Operations Room having problems determining who should be FAB officials. 	<ul style="list-style-type: none"> ▪ Review communications. ▪ QMRS Team 3 equipment should have been passed over to this higher priority team. ▪ Underground Operations Room knew of QMRS Team 1 (fire team) but did not know that there was 1 other team ready and about to go underground. Communications were breaking down.
1355	<ul style="list-style-type: none"> ▪ QMRS Team 1 (fire team) equipment is fully tested and they start to don and do final checks. 	<ul style="list-style-type: none"> ▪ Team members wasting oxygen by waiting up to 15 minutes with O₂ on while waiting for Captain to do pre-test on them. This system needs review.
1359	<ul style="list-style-type: none"> ▪ QMRS Team leaves to go underground. ▪ Portal security sends them back as they do not have a signed clearance. ▪ FAB officials and equipment leave for 17 cut-through, Mains, 'F' Heading – they have portal clearance and go in. 	<ul style="list-style-type: none"> ▪ Although this seems a pain it does also show that the security personnel knew the rules and enforced them. ▪ IMT should have conducted a risk assessment on sending personnel in by of a fire that has been active for 4 ½ hours and has not been inspected even though the roadway is segregated. It appears to be wiser to have the fire inspected before taking this action.
1400	<p>QMRS Team 1 enters the mine to go to the fire at 9 to 10 cut-through, Mains, 'D' Heading. Their task was to determine what the fire is doing, how big it was and whether it can be extinguished. These activities were to be conducted on the fresh air side and the BG-174s were only as a safety back up in case of roof fall and wind blast, etc.</p>	<p>IMT should have conducted a risk assessment on:</p> <ul style="list-style-type: none"> ▪ Doing a check on the condition of the fire. ▪ Fire-fighting activities – should they take place. <p>This could and should have an impact on the number of team members needed, how they would be deployed, how communications are established and other barriers required.</p>
1405	<p>QMRS Team 2 decides to wait until QMRS Team 1 has reported on the condition of the fire.</p>	<p>This occurred as a result of the team themselves not being satisfied that what had been asked of them was safe to do.</p>

		ASSESSORS COMMENTS
1407	It is unclear whether QMRS Team 3 is to be a stand-by team on the surface or at 17 cut-through, Mains, 'D' Heading. IMT and Underground Operations Room believe that they are to be on standby on the surface and the MR-Sup believes that they are to go underground once the transported come back out.	<ul style="list-style-type: none">▪ Documented briefing notes may have clarified this situation.▪ Another problem was with the availability of transport and nobody could guarantee that QMRS Team 3 (standby team) would have one available.

FAB – MINES RESCUE TEAMS 1 & 2 INSEAM INTERVENTION

Assessors: Greg Dalliston & Peter Baker

		ASSESSORS COMMENTS
1358	FAB Controller and First Aider leave surface to set up FAB at F17 in Mains.	At this stage there was no information on whether the fire could be contained.
1410	<ul style="list-style-type: none"> ▪ First aider set up FAB at 17 cut-through, 'F' Heading. ▪ 20.9 - O₂; 0 - CH₄; 0 - H₂S; 4 ppm CO ▪ (PED message - no surface) 	
1412	<ul style="list-style-type: none"> ▪ FAB Controller called from 505 phone to IMT on 809 phone - no answer. ▪ FAB Controller called 849 phone Control - no signal. 	
1416	<ul style="list-style-type: none"> ▪ FAB Controller told phone number 505 to ▪ Readings from Control for 3 North, Tailgate: 449 CO (tube); 2.6% CH₄; 16.1% O₂; 3.8% CO₂ 	
1421	<ul style="list-style-type: none"> ▪ FAB Controller set up radio by himself. ▪ First Aider took PJB back to surface to get rescue team 	
1433	Phone call made to 505 to ask what gas instruments FAB have and has anyone told FAB any different gas readings? Was informed by FAB Controller what gas detection equipment he had and that he hadn't received any different gas readings.	
1434	QMRS Team 2 leaves surface to travel by PJB to FAB.	Team received confirmation that QMRS Team 1 had assessed the fire and believed they could extinguish.
1438	FAB Controller ran out tube 50 metres inbye 17 cut-through, 'F' Heading to FAB Mihaks.	
1444	<ul style="list-style-type: none"> ▪ QMRS Team 2 arrive at FAB and make contact with FAB Controller. ▪ Two PJB's with Newlands Team 1 (7 men) arrived. ▪ Stand-by team arrived (6 men) ▪ Briefing underground - no new news. ▪ Asked if there had been contact with the fire team? No ▪ Standby team stayed at FAB operation and checked phone 505 and call IMT on 809. ▪ No spare cap lamps available at FAB. ▪ Radio check from Team 2 and standby team checked FAB phone. 	FAB was already fully established and manned (standby team arrived at the same time).
1450	Team 2 - O ₂ check	
1454	<ul style="list-style-type: none"> ▪ FAB and Team 2 synchronised watches and set the return time for 16:55. ▪ Team 2 using SSR90's with 3 reels. 	

		ASSESSORS COMMENTS
	<ul style="list-style-type: none"> Confirmed travel route as travelling down 26 cut-through, 'F' Heading in vehicle (described on phone), go through doors to phone, give call on phone, to 6 cut-through Tailgate to recover missing person and return. 	
1456	<ul style="list-style-type: none"> Wanted to know if the back-up team was a fire team? (don't know who is was) FAB Controller gave lamp to person in Team 3 as Team 3 Member gave light to member in Team 2 whose light was flat. 	
1457	QMRS Team 2 deployed from FAB to search for missing man in longwall tailgate (last sighting - 6 cut-through).	Team used PJB to travel to 26 cut-through, 'F' Heading and ran aerial from back of machine.
1459	<ul style="list-style-type: none"> First Aider gave FAB Controller his lamp. Team 2 left in vehicle. 	
1500	<ul style="list-style-type: none"> FAB rang IMT - informed them that Team 2 has left FAB. 	
1503	Radio check - loud and clear	
1504	Radio check at 26 cut-through, 'F' Heading	
1506	FAB rang IMT to report that fire was under control. Ribs out and cooling ribs.	
1508	<ul style="list-style-type: none"> QMRS Team 2 travels through door into 'E' Heading and experiences poor visibility (almost nil visibility). Team retreats to door for discussion. 	Assessor used plastic bags over the Captains head to simulate conditions.
1510	Team 2 to FAB, 26 cut-through 600ppm CO, visibility limited and are about to use link line. Just pulled back into fresh air.	
1513	<ul style="list-style-type: none"> QMRS Team 2 again enters 'E' Heading - this time with link lines attached - full team exposed to poor visibility conditions. Team again retreats and discusses options. 	Assessor used plastic bags over heads of entire team.
1515	Substation Controller checking which team went active.	
1516	Team decides to wait until visibility improves and informs FAB of decision.	Discussion within team was excellent and the decision was explained to team by Captain - will wait until fire is out and visibility should improve rapidly.
1517	Call placed to FAB from Substation Controller to ask where Team 2 was.	
1518	Team 2 at 26 cut-through, 'E' to 'F' Heading, smoke thick, visibility nil, going to wait here beside doors to see if smoke clears.	
1522	<ul style="list-style-type: none"> Team 3 Captain informed FAB that they were on their way. Inquiry about miner missing at 16 cut-through, 4 North. Plans at FAB goes to 28 cut-through and into 8 cut-through, 3 North 	

		ASSESSORS COMMENTS
1523	Oxygen reading taken.	
1527	Due to delay – team discussed some other options. Decision made to send three men across 26 cut-through to see if visibility was any better.	Captain instructed men to wear link lines and take MARS unit with them.
1528	Linking up and will depart in a couple of minutes. If smoke is still thick inbye after walking along right hand rib a couple of pillars they will return to FAB.	
1530	Spare lamp arrives for First Aider.	
1531	<ul style="list-style-type: none"> ▪ Phone call from IMT to FAB- one rib still on fire with a lot of steamy smoke coming. ▪ Captain contacted FAB to inform them of their decision. 	FAB informed team that rib was still on fire and that there was still heavy smoke flowing inbye. FAB suggested that team stay together at this point.
1532	Team 2 called FAB to inform them of taking 3 men to see if visibility improves inbye and were taking link line, maps and radio line and would leave 4 men as a back-up team.	
1533	After further discussion with team, Captain contacted FAB to inform them the team WILL stay together and they will wait.	
1534	<ul style="list-style-type: none"> ▪ Phone call to FAB – fire is out. ▪ Team 2 called FAB to inform that they were pulling back to 26 cut-through – nil visibility. 	
1535	<ul style="list-style-type: none"> ▪ QMRS Team 2 informed by FAB that fire is out. ▪ Captain withdraws team to 'F' Heading to wait for visibility to improve. 	
1541	<ul style="list-style-type: none"> ▪ Phone call (phone outbye 9 cut-through) to say the fire was out and cooling down and smoke was dissipating. ▪ Team 2 informed FAB that they were at 26 cut-through, 'F' Heading and were going back into check visibility at 15:45. 	
1542	Oxygen reading taken.	
1543	QMRS Team 2 leaves 'F' Heading, 26 cut-through with link lines attached.	Team had now been under oxygen for 46 minutes and was only now leaving fresh air.
1544	<ul style="list-style-type: none"> ▪ QMRS Team 2 at 'E' Heading, 26 cut-through and informed of conditions. ▪ Substation Controller asking when FAB want to be changed out – two more people available on surface. 	Used "T + 10" sheet for information.
1546	Mine Manager taken over from Surface Controller and informed that Team 4 (imaginary) coming down to look for 4 North and Team 5 (imaginary) back-up were on it's way.	
1548	Team 2 back to 26 cut-through – improved visibility, low CO and proceeding inbye (Team	

		ASSESSORS COMMENTS
	3 Captain took the call)	
1549	<ul style="list-style-type: none"> ▪ Team 3 Captain reported to FAB Controller (as per above) ▪ Missed phone call. 	
1550	Phone call from IMT asking the position of Team 2.	
1553	Team 2 informed FAB they were at 26 cut-through, 'C' Heading, visibility was good, CO 30ppm. All Fenzy's accounted for at cache and are continuing inbye.	
1556	QMRS Team 2 enters longwall tailgate through double doors. Captain informed of conditions ("T + 20").	Team informed to turn lights to low beam to simulate reduced visibility.
1557	Phone call from IMT to Team 3 Captain.	
1559	Team 2 radio to FAB 400ppm CO, 2.7% CH ₄ The FAB asked for the Team to repeat message as was spoken too fast and move radio from mouth. Visibility good, proceeding into 3 North tailgate through 26ct double doors.	This had occurred a number of times during day. Issue was that the reading was recorded at FAB as 0.7% this could have been an issue if the communication was more critical.
1600	<ul style="list-style-type: none"> ▪ Radio check hard to understand. Wet and dry bulb taken W 25°C and D 25°C. ▪ FAB checked this against QMRS protocols and indicated that there was no time restrictions. 	
1604	Captain informed of improved visibility while team is searching at B26 intersection. 2.7% CH ₄ ; 20.19% O ₂ ; 34ppm CO.	Readings according to "T + 30" sheet. Lights back to high beam.
1605	<ul style="list-style-type: none"> ▪ Call from surface to FAB instructing Team 2 to get mine plan from cache at 23 cut-through. ▪ Instruction to search for missing person from 26 cut-through to 35 cut-through 'D' Heading. ▪ Standby team (imaginary Team 4) on surface preparing vehicle to come underground. ▪ Team 3 to drive vehicle to 26 cut-through, phone FAB on 505 and use radio cable to 26 cut-through, 'D' Heading. 	<ul style="list-style-type: none"> ▪ Additional plan was required as plan provided to Team 2, Team 3 and FAB only covered area to 28 cut-through Mains and 8 cut-through, 3 North, Tailgate. ▪ The problem regarding insufficient plan being supplied could have been addressed if Team 3 had been briefed on their required tasks, on the surface before departing. ▪ IMT and Mines Rescue Co-ordinator should ensure their protocols include the supply of detailed mine plans of the area to be covered by the mines rescue operation.
1609	Team 3 suits up.	
1610	Team 2 stops at 3 cut-through, longwall tailgate to conduct search, contact FAB and take oxygen reading.	Oxygen reading slightly late.
1611	<ul style="list-style-type: none"> ▪ O₂ check on Team 3. ▪ Discussion on QMRS member driving PJB without site authorisation. 	There is a need for protocols where operation of site equipment requiring authorisation maybe used in case of emergency or exercise by persons

		ASSESSORS COMMENTS
		competent from other mines.
1614	Team 3 departs FAB under O ₂ in PJB.	
1616	<ul style="list-style-type: none"> ▪ Team 2 finds survivor unconscious under air tap and treats. ▪ Team 3 arrives at 23 cut-through cache. ▪ Team 3 Captain takes gas readings with minigas: 21.4% O₂, 14ppm CO, CH₄ Nil, H₂S Nil. 	Treatment of patient was very good.
1620	Caches at 23 cut-through opened – searching for mine plan. No plan available.	To allow the team to search for the purpose of the exercise, the assessors mine plan was provided to Team 3 Captain.
1623	QMRS Team 2 informs FAB of condition of survivor.	Captain informed by assessor that atmospheric readings had not changed.
1625	Team 3 depart 23 cut-through, 'F' Heading cache in PJB with Captain in front instructing driver.	
1628	<ul style="list-style-type: none"> ▪ Team 2 stopped at 4 cut-through for rotation of stretcher carriers and oxygen reading. ▪ Team 3 drive through doors at 26 cut-through and checked for radio wire in Team 2's PJB – none left. 	Very good team rotation and monitoring of patient on the way out.
1630	Gas readings taken outside doors, 26 cut-through, 'E' to 'F' Heading (fresh air)	
1631	Team 3 radio FAB from 26 cut-through, 'D' Heading prior to proceeding down 'D' Heading to 35 cut-through, searching cut-through's from vehicle and taking gas readings every cut-through. All identified fresh air.	
1635	QMRS Team 2 reaches fresh air at C26 intersection.	
1637	QMRS Team 2 reaches PJB with patient at F26 intersection.	Is there a protocol for uncoupling inbye FAB without first contacting FAB?
1640	Team 3 reached 35 cut-through 'D' Heading turned around.	
1645	<ul style="list-style-type: none"> ▪ Ambulance arrived to take patient to surface. ▪ Returned to radio cable at 26 cut-through and radioed FAB. Reported search to 35 cut-through, 'D' Heading missing person not found. 	QMRS Team 2 were already on the way back to FAB in the PJB.
1646	Team 3 directed by FAB to search 4 North section.	
1647	Captain showed team route of travel on plan.	
1648	<ul style="list-style-type: none"> ▪ QMRS Team 2 reaches FAB and reports to FAB Controller. ▪ Team 3 to FAB – how far to search in 4 North. Response was to 4 North Face. ▪ Captain informed FAB no radio line. Will 	

		ASSESSORS COMMENTS
	use phone on route.	
1650	Team member suggested driving as they were in fresh air. This was confirmed with FAB.	Sensible use of vehicle to allow greater distance to be covered quickly in fresh air and good visibility.
1652	Team 3 headed inbye.	
1655	<ul style="list-style-type: none"> ▪ Captain used DAC from 1 cut-through, 4 North to contact Control and asked them to contact FAB. ▪ Gas readings taken every cut-through (fresh air) 	
1700	Team 3 reach 8 cut-through.	
1703	QMRS Team 2 arrives on surface.	
1704	<ul style="list-style-type: none"> ▪ Missing person found at 14 cut-through. Vitals checked – no sign of life. ▪ Team Captain used phone at 13 cut-through to call FAB – notified missing person deceased, marked on mine plan at 14 cut-through, 4 North. Stood by phone for FAB response. 	
1706	<ul style="list-style-type: none"> ▪ Captain took team O₂ readings. 	
1707	<ul style="list-style-type: none"> ▪ FAB rang phone at 13 cut-through and instructed to mark position of body on plan and cover with blanket. 	
1712	<ul style="list-style-type: none"> ▪ Team uncoupled suits and left panel in PJB to FAB. 	
1722	<ul style="list-style-type: none"> ▪ Team 3 arrive at FAB. ▪ FAB contacted Wayne Bull in IMT – notification that Team 3 at FAB and proceeding to surface. 	
1724	QMRS Team 2 debriefed.	Person conducting the debrief had no set format to follow – conditions underground (particularly the fact that 34ppm CO was constant the whole time the team was in the longwall tailgate) was missed.
1733	Team 3 arrive at surface and checked by Portal Security.	
1743	Team 3 debriefed by QMRS.	

UNDERGROUND FIRE FIGHTING

Assessor: Ken Singer

OBSERVATIONS:

1. Oily rags, loose coal, cardboard, pipe clamps / fittings and loose chains were found on top and within the engine compartment of the mobile machine. These items can increase the risk of fire.
2. The Standard Operating Procedure for Fire Prevention (TCQ0235-OHS-WP003/A1) states that mines rescue brigade members are to fight all fires beyond the capacity of individuals to extinguish using available portable fire appliances (4.1.2). Consequently, and due to decisions made on the day, the fire remained ablaze for over 5 hours. The fire was extinguished within one hour of a fire team arriving at the incident scene. The products of combustion presented no risk to mine personnel within 35 minutes of the fire being extinguished.
3. The decision to instigate a whole of mine evacuation was consistent with mine site documentation. The documentation does not allow, however, risk management principles to be used in fire scenarios.
4. A formal hazard identification and risk management document for the underground could not be sighted or linked to the Standard Operating Procedure for Fire Prevention (refer to *Coal Mining Safety and Health Act, Section 14 and 37(1)*).
5. The Standard Operating Procedure states that if you use one fire extinguisher on a fire and it fails to control it, it becomes a major emergency. The definition of major emergency is however undefined in the Standard Operating Procedure or the Principal Hazard Management Plan for emergency evacuation.
6. The Standard Operating Procedure for Self and Aided Escape and Evacuation (TCQ0235-UGM-WP39/AO) refers to minor fires as a principal hazard requiring evacuation, however, there is no documentation that allows the Incident Management Team (or other persons) to determine an appropriate course of action to apply to fires of varying risk.
7. The Emergency Preparedness Document (TCQ0235-OHS-WP30/AO) describes a fire as an emergency, however, it contains no specific decision making tools that allow person(s) to systematically analyse risks associated with fires.
8. The safety and health management system documents a tool relevant to the decision making process (ie., fire emergency control education and guides of the Principle Hazard Management Plan for Emergency Evacuation), however, it was not used during the exercise.
9. During the evacuation from underground several mines rescue trained personnel passed within close proximity to the fire site. One mines rescue trained person asked if he should inspect the fire. He was advised not to.
10. Mines Rescue Team 1 consisted of 5 people. This made it a difficult task to fight the fire. The Captain was required to split his team to collect other fire-fighting apparatus, and to set-up the available equipment.
11. Mines Rescue Team 1 did not take fire-fighting apparatus with them. Some resources were left on the surface. These resources would have been to the benefit to the fire-fighting team.
12. PED messages were ineffective at the fire site (NO SERVICE 139/ABC/75A/05).

FINDINGS:

1. Operators should maintain appropriate housekeeping standards on mobile plant. Poor housekeeping can increase risk of fire.
2. Consideration should be given to develop procedures and systems that allow:
 - a. Competent persons to use more than one fire extinguisher prior to it being classified as a *major emergency*. The SOP allows no objective way of risk assessing and managing the fire. Consequently, there is a reluctance to assess a fire and take other appropriate action. There are situations where more than one fire extinguisher is required to douse a fire. That does not necessarily increase the risk profile.
 - b. Competent persons (other than mines rescue trained teams) to be deployed in inspecting and / or fighting fires with water hoses (eg., ERZ Controllers). In some cases it is an acceptable risk to allow persons to inspect fires. The time taken to deploy mines rescue teams allows fires to increase in intensity.
 - c. Personnel that have evacuated to the outbye side of a fire (subject to appropriate health and fitness checks) to inspect or participate in fighting fires.
 - d. Information from debriefing sessions to be incorporated into the decision making process. For example, the operator of the vehicle may have provided useful information to assist that decision making process (eg., the fire was relatively small, the fire was actually at 9 cut-through + 20 metres).
 - e. Risk associated with fires to be systematically evaluated to ascertain if it is acceptable risk to allow persons to remain underground to assess and fight fires.
 - f. Resources to be used to fight fires to be identified prior to mobilising fire-fighting teams.
 - g. Personnel assigned fire-fighting duties should be competent, and adequately briefed of the risks and their duties. The fire watch team was not considered competent to perform their duties to standard.
 - h. A formal risk assessment to be conducted prior to sending the mines rescue teams to assess the fire.
 - i. Direct operators out of smoke (eg., vehicle operator went into smoke).
3. Fire fighting resources should be maintained in a state of readiness.

TIMELINE:

		ASSESSORS COMMENTS
0800	An operator was assigned work that required the use of a diesel powered mobile vehicle. The vehicle was serviced and pre-start checks were conducted. The vehicle was equipped with fire extinguishers.	The vehicle was put into service with several oily rags, chains and a piece of cardboard on top of the engine compartment. It also had some loose coal and pipe clamps / reduction pieces in the engine compartment. These items increase the risk of machine damage and fire.
0913	While operating the vehicle the operator noticed smoke coming from the engine compartment.	<ul style="list-style-type: none"> ▪ The engine compartment was on the inbye side of the operator. The forks / tynes / load were on the outbye end. The operator was not exposed to smoke at this time. ▪ Possible causes of the fire include friction from material caught in between the drive shaft and sub-frame, failure of the low water shut-down / flame arresting system, or the failure of over-temperature devices in conjunction with damage to the radiator.
0914	<ul style="list-style-type: none"> ▪ The operator vacated the vehicle by turning the wheels to the rib, chocking the wheels and shutting down the engine. He proceeded to the telephone at 9 cut-through and called the Control Room Operator (ext. 849). He advised the Control Room Operator that the machine was at 9 cut-through, and that smoke was entering the intake airways. He could see some flames in the engine compartment. He asked the Control Room Operator what he should do. ▪ The Control Room Operator asked the operator if he had attempted to fight the fire. Having ascertained that there had been not attempt to fight the fire, the Control Room Operator instructed the operator to use a fire extinguisher to fight the fire. 	<ul style="list-style-type: none"> ▪ The operator was exposed to smoke when he elected to chock the wheels. ▪ The operator did not use the fire extinguishers on the vehicle. ▪ The operator was not confident to fight the fire without the direction from others. ▪ S4.3 of the SOP states that a fire may readily be controlled by the first response concept. This involves the person discovering the fire using readily available portable fire-fighting equipment to extinguish the blaze before it begins. It is assumed that <i>portable</i> does not include fire hoses.
0917	The operator used a 9kb fire extinguisher located at the transformer to fight the fire.	The use of the extinguisher was not effective. This was a pre-determined situation created by the organising committee. It was likely however that the fire-fighting technique used would not have been effective. There was no <i>rapid sweeping motion</i> and some parts of the engine compartment would not have been effectively doused with dry chemical powder. A dry chemical powder fire extinguisher may be effective in extinguishing such a fire.
0919	After using the extinguisher the operator returned to the phone (that was ringing). He advised the Control Room Operator that his attempt to fight the fire was	The SOP for Fire Prevention (TCQ0235-OHS-WP003/ A1) specifies that " <i>if the use of one extinguisher fails, it is deemed a major emergency. Get yourself and others out of the building....</i> ".

		ASSESSORS COMMENTS
	unsuccessful.	The procedure may not be relevant to the underground.
0920	The Control Room Operator requested the vehicle operator to evacuate the mine.	The operator left the fire site and evacuated the mine (on foot). The fire was relatively small at this time. Further attack with dry chemical extinguishers and / or water and foam would have proven successful in extinguishing a fire of the type described.
		The fire was well ventilated (ie., it remained oxygen rich). Consequently it continued to burn. Fuel sources included diesel fuel (approximately 100 litres), rubber tyres (approximately 600kg each), steel, rubber hoses. Because the fire remained unchecked for many hours, it eventually spread to the ribs (ie., coal).
1310	Mines Rescue Team 1 was assigned the role of assessing if it was possible to fight the fire. Their secondary task was to fight the fire (if their assessment proved it was possible).	The Captain of this team was absent from the briefing. The Captain had previously been briefed by the Incident Management Team. Minimum equipment was prepared.
1337	The team went under oxygen, conducted their Captain checks and uncoupled.	
1347	Prior to proceeding underground, the team discussed the possible state of the fire. They had been told that the fire was at D9. They deduced that the fire would be too big for them to fight, particularly as it was a diesel machine fire and it had been burning for in excess of 4 hours.	The Captain made enquiries into what the vehicle was carrying at the time of the incident.
1357	The team boarded a vehicle in preparation to go underground. The vehicle was without fire resources on board. Another vehicle with TURBEX, low and high expansion foam and a fire depot was available, however, there was inadequate seating available for the team.	Later, the team was required to travel outbye to collect fire-fighting apparatus. A comment by one team member when setting up the fire hoses was "this gear was already available on the other vehicle".
1400	The team was prevented from going underground by the Portal Controller because they did not have written permission.	
1407	After gaining written authority, the team proceeded underground. They parked their vehicle at C5 cut-through (ie., at the bottom of the drift), and went under oxygen.	The atmosphere was fresh air.
1412	The team notified the Incident Management Team that they were proceeding to the fire via the predefined route.	
1415	The team audited the fire sub-station on	

		ASSESSORS COMMENTS
	the way to the fire site at 7 cut-through.	
1430	When arriving at the site of the fire, the team made a determination that they could fight the fire. The Captain advised the Control Room Operator of the same.	<ul style="list-style-type: none"> ▪ This is consistent with the teams briefing. The team did not have written instructions. ▪ The fire on the vehicle was intense, and the ribs were ablaze for a distance of 10 – 15 metres inbye. The team could get to within 10 – 15 metres of the fire. ▪ The situation could have been worse under different circumstances. The assessor elected to describe a situation that was recoverable within a specific time frame.
1433	The Captain made use of his 5 man team. It was necessary to send members of his team back to the sub-station to collect foam, a branch pipe, and additional hoses.	<ul style="list-style-type: none"> ▪ More people would have reduced the workload, and communication would have been more effective. ▪ The Captain was not able to direct people on the branches.
1440	Two team members were required to access the site of the fire hydrant and to collect gear from the fire depot at E9 – 10.	<ul style="list-style-type: none"> ▪ This area was very wet and muddy. The team were advised of those hazards prior to accessing the area.
1443	Two hoses from the fire depot were not able to be used. This required the Captain to send people to the outbye fire sub-station.	<ul style="list-style-type: none"> ▪ One was covered in mud (ie., stuck in the bottom of the fire depot) and the instantaneous connections of another were not operational. Overhand knots were tied in one defective hose.
1445	The Captain notified the Control Room Operator that the hoses had been run out and that they were about to put water on the fire.	The Control Room Operator asked if the team required additional foam to fight the fire. The answer was <i>no</i> . Four drums of AFFF were available.
1446	When water was turned on, two instantaneous connections came apart (ie., the dividing breeching piece and branch pipe). That situation was corrected by reconnecting the devices.	That situation was corrected by reconnecting the devices.
1451	Water was successfully applied to the fire. Water and foam were applied to the fire. One drum of foam lasted about 3 minutes.	<ul style="list-style-type: none"> ▪ The Captain elected to cool the area, and get closer to the fire by suing a branch pipe and fog nozzle. At that stage low expansion foam was used – as it was possible to apply it directly onto the vehicle. This was considered to be an appropriate response for the fire described, however, due to the slope of the roadway, the foam flowed from the incident site. ▪ One member of the fire-fighting team was wearing a short sleeved shirt, one member was wearing shorts. This may have increased the risk to those people during the fire-fighting procedures.
1501	The Team Captain phoned the Control	The auditor informed the Captain that the fire

		ASSESSORS COMMENTS
	Room Operator and stated that the fire was coming under control. He requested more personnel to assist in fighting the fire, and more fire fighting foam (as the remaining 3 drums would last approximately 10 minutes).	was coming under control, however it would require further fire-fighting. There was still visual signs of flames.
1514	The Captain informed the surface that the fire was under control, however, there was still flames present. Smoke was still entering the inbye airways.	
1518	The Captain gave the instruction to his team to uncouple (oxygen). The team continued to apply water to the fire.	The team did a commendable job. It was the auditors advice (to the Captain) that it was feasible for the team to have uncoupled earlier. The Captain's response was also appropriate.
1530	The Captain phoned the Control Room Operator and requested a team to relieve them (ie., to post a fire watch). The Control Room Operator advised the Captain to keep water on the fire.	An appropriate response.
1535	The Captain called the Control Room Operator to confirm the names of the relief (fire watch) team.	
1538	The Captain received a phone call that notified him of the names of the relief team.	
1556	The relief team arrived at D9. The Captain of Team 1 informed the team of the requirements to continue applying water to the heated areas etc.	<ul style="list-style-type: none"> ▪ The relief team travelling in a vehicle that contained the TURBEX, low and high expansion foam and a fire depot. This would have been beneficial to the previous team. ▪ There was no identified leader of the relief team and they were uncertain of their purpose. The Captain of Team 1 explained their purpose. ▪ The relief team were given the opportunity to turn on the water and to use the fire hoses and dividing breaching piece. In some cases, it was their first time.
1615	Team 1 left site and travelled to the surface.	▪
1625	Team 1 arrived on the surface.	▪ Portal Sentry confirmed names of those leaving the mine.
1634	Team 1 was debriefed.	▪ The Underground Incident Controller was advised of the hazards identified at the incident site, and of the relevant controls identified at the exercise committee risk assessment.
1348	Rescue Team 1 (fire team) getting ready on	

		ASSESSORS COMMENTS
	surface.	
1356	Fire team to drifrunner.	Two members in short sleeved shirts, one member wearing shorts.
1400	Waiting due to no authorisation for fire team to proceed underground.	
1407	5 cut-through, 'C' Heading pit bottom going under oxygen.	
1409	Captains check.	Did not check face seal (hair out of mask). Inhalation / exhalation checks around the wrong way. Did not ask if they felt alright (for every team member).
1412	Captain notified Control that the exercise was starting.	
1415	Checked out substation. Did not take any equipment with them.	
1425	Fire site inspected.	
1433	High expansion foam taken from fire depot.	
1436	Fire hose bowled.	
1440	Hose found to be U/S. Overhand knots tied in hose.	Problems encountered with hooking up muddy fitting - may have been overcome by trickling water through the hoses during connection.
1445	Captain notified Control that the hoses had been run out and that they were about to put water on the fire. Control asked if team required additional foam to fight fire. Captain declined this offer.	
1447	Branch men ready.	
1448	Dividing breach blew apart.	Team did not have spanner for breach piece.
1449	Branch blew off.	
1451	Water on.	
1458	Low expansion foam applied to fire. Foam lasted about two minutes.	
1501	Captain called Control and said the fire situation improving but requested more men and more foam.	
1515	Captain notified Control that they had ran out of low expansion foam and that the fire was not quite out.	
1530	Fire out.	
1531	Captain notified Control the fire was out and also requested men for a fire watch. Control said to keep water on the fire.	
1535	PED message received - fire out (<i>time T for</i>	

		ASSESSORS COMMENTS
	<i>purpose of exercise)</i>	
1539	Phone call from Underground Mine Manager to notify Captain that a five man (non-trained) fire watch team was leaving the surface with more fire-fighting supplies.	
1540	Captain contacted FAB and informed him that the fire was out but there was still steam going inbye.	
1556	Watch team in vehicle entered 'D' Heading. Vehicle had high and low expansion foam on back with turbex.	
1602	Rescue Team 1 and fire watch team changed out.	
1616	Rescue Team 1 left D9 to surface.	
1625	Rescue Team 1 arrived on surface.	
1634	Rescue Team 1 debrief.	Rescue Team 1 Captain and IMT were referring to the rescue teams with different numbering.
1655	Rescue Team 1 debrief finished.	

INCIDENT INITIATION / DATA SUPPLY AUDIT TOOL

Assessors: Martin Watkinson & David Cliff

				COMMENT
Emergency Control Room Operator	Assess incident as presented.	<ul style="list-style-type: none"> ▪ Open Duty Card 2B. ▪ Commence emergency response record. 	<ul style="list-style-type: none"> ▪ Open Duty Card Folder. ▪ Time exercise commenced. ▪ Time emergency response record. 	At 0915 call received in Control Room. Immediately opened Duty Card 2B and notified Undermanager.
		<ul style="list-style-type: none"> ▪ Contact with Project Manager, Underground Mine Manager and Emergency Services (if requested). 	<ul style="list-style-type: none"> ▪ Time called ▪ Actions recorded 	Control Room Operator actually notified Undermanager on shift who then initiated incident and called up other key personnel on site.
	Initiate underground evacuation.	<ul style="list-style-type: none"> ▪ Activation of evacuation – sirens, PED, DAC / telephone. 	<ul style="list-style-type: none"> ▪ 0920 – Operator of Eimco told to evacuate mine by phone. ▪ 0921 – DAC and PED message sent to evacuate mine. ▪ 0923 – siren sounded. 	
Duty Cards	Distribute duty cards to Lamproom Coordinator, Portal Security Guards and Control Room Assistant.	<ul style="list-style-type: none"> ▪ Distribution of Duty Cards. 	<ul style="list-style-type: none"> ▪ Time of distribution. 	<ul style="list-style-type: none"> ▪ Cards distributed at 0931. ▪ Control Room Operator Duty Card opened when fire alarm triggered.
	Follow Duty Card	<ul style="list-style-type: none"> ▪ Completion of actions – notification of Project Manager; notification of Underground Manager; emergency services. 	<ul style="list-style-type: none"> ▪ Actual notification of Undermanager who then activated Duty Card 1 and 2A and initiated subsequent notification process. 	

				COMMENT
	Contact and communicate clearly as required of Duty Card.	<ul style="list-style-type: none"> Proof of effective information transfer. 	<ul style="list-style-type: none"> Observation of communications techniques – verbal and written. 	Key verbal communications were clear and accuracy confirmed by getting recipient to repeat message back. Majority of telephone communications carried out by Control Room Assistant.
	Gather and record information.		<ul style="list-style-type: none"> Record of actions in emergency response record book. 	Gas data logged regularly in emergency response record book.
	Report on results of communications with underground sections.		<ul style="list-style-type: none"> Record of actions in emergency response record book. 	Intermittent recording of communications, most were recorded. The most significant issues were that the control room was not included in many communications including those going to and coming from underground.
	Gather relevant data and continue the collection and dissemination of gas readings.	<ul style="list-style-type: none"> Distribute data. 	<ul style="list-style-type: none"> Records of data communications. 	Gas data monitored regularly and all changes notified to the Incident Management Team, Ventilation Officer and Underground Management Room.

INCIDENT MANAGEMENT TEAM AUDIT TOOL

Assessor: Wayne Hartley

				COMMENT
Summary	SEMS initiation and incident management team performance are deemed to be successful.	<ul style="list-style-type: none"> ▪ Pre incident management ▪ Incident control room facilities Incident management team resources ▪ Incident management team ▪ Communication hardware ▪ Incident management team formation and management procedures ▪ Incident briefing ▪ Data collection ▪ Data verification ▪ Scenario modelling ▪ Decision making process ▪ Monitoring and review process ▪ Communication process ▪ Incident scale down 	<ul style="list-style-type: none"> ▪ N/A ▪ Adequate to task ▪ Basic resources inadequate to the task. ▪ Just functional. ▪ Inadequate to the task. ▪ Unobserved. ▪ Unobserved. ▪ Adhoc and unplanned. ▪ No evidence of data verification. ▪ None observed. ▪ Inadequate and group think in play - no challenge ▪ Reviews undertaken but failed to correct path therefore ineffective. ▪ Added to the confusion and misinformation. ▪ Adhoc and unplanned 	<ul style="list-style-type: none"> ▪ The Incident Management Team was dysfunctional and failed to address the incident. Various reasons for this occurred throughout the management of the incident, some of which will be outlined. ▪ Inability to identify the objectives. ▪ Inability to resource the plan as no plan was established. ▪ Decision-making was ineffective. ▪ The discipline needed to manage was not observed.
SEMS Initiation	Control Room Officer successfully initiates SEMS.	<ul style="list-style-type: none"> ▪ Control Room Officer receives emergency details and records the relevant details on the provided incident sheet and acknowledges receipt thereof. 	<ul style="list-style-type: none"> ▪ Unobserved ▪ Unobserved 	<ul style="list-style-type: none"> ▪

				COMMENT
		<ul style="list-style-type: none"> ▪ Control Room Officer initiates appropriate trigger in mine Hazard Management plan according to the required staged response. ▪ Control Room Officer establishes contact with the most Senior Official on site. ▪ Control Room Officer has contacted the First Aid Attendant in case first aid assistance is required. ▪ Control Room Officer is following appropriate duty card. ▪ Senior Official on site has assumed temporary role of Incident Controller. ▪ Senior Official on site follows the required responses as per the mine Hazard Management Plan. 	<ul style="list-style-type: none"> ▪ Unobserved ▪ Unobserved ▪ Unobserved ▪ Unobserved ▪ Unobserved 	
SEMS Handover	Incident Controller receives briefing of incident by Senior Official on site.	Incident Controller establishes the following: <ul style="list-style-type: none"> ▪ Update on nature of emergency. ▪ Update on status of stages response. requirements as per Hazard Management Plan. ▪ Update of presence and expected whereabouts of missing personnel. ▪ Descriptions of incident by survivors who have been debriefed on their arrival at the mine surface. 	<ul style="list-style-type: none"> ▪ Unobserved. 	<ul style="list-style-type: none"> ▪
Incident Control Room Facilities	The incident control room is ideally positioned, has a suitable layout and has	<ul style="list-style-type: none"> ▪ Incident control room is suitably located in relation to all necessary strategic functions. 	<ul style="list-style-type: none"> ▪ Appropriate to mine operations 	<ul style="list-style-type: none"> ▪ Basic facilities provided, as room is primarily used as a conference room and

				COMMENT
	adequate suitable stationary supplies.	<ul style="list-style-type: none"> ▪ Entry into the incident control room is controlled. ▪ The layout of the incident control room is adequate and suitable, with particular reference to: <ul style="list-style-type: none"> - Size, seating - Lighting and emergency backup lighting (auxiliary power) - Environment monitoring facilities - Display boards ▪ Adequate suitable stationary is available for use by the Incident Management Team and includes: <ul style="list-style-type: none"> - Incident log book - Writing pens and pencils - Erasers and correction fluid - Writing pads - Large sheets of drawing paper - Highlighting pens - Stick-it-pages - Suitable scale rules - Marker pens and erasers - Calculators 	<ul style="list-style-type: none"> ▪ No ▪ Could work ▪ No ▪ None ▪ Inadequate ▪ Yes 	<p>therefore are not easily adapted to an Incident Management Room.</p> <ul style="list-style-type: none"> ▪ A high level of discipline in a focus objective to provide facilities. ▪ No security and communications are inadequate to the task. ▪ Resources are basic.
Incident Management Team Resources	The Incident Management Team is provided with sufficient resources to adequately carry out its duties.	<p>The Incident Management Team is provided the following minimum information:</p> <ul style="list-style-type: none"> ▪ Incident background ▪ Background gas levels, including typical gas types and typical makes 	<ul style="list-style-type: none"> ▪ Unobserved. ▪ ? ▪ No ▪ Yes 	

				COMMENT
		<ul style="list-style-type: none"> ▪ Copies of Safety Management System ▪ Copies of Principal Hazard Management Plans ▪ Up-to-date underground plans showing ventilation, gas monitoring points and escape routes. ▪ Up-to-date surface plans of electrical installations including building locations, road systems and gates and location of main services isolation control equipment. ▪ Up-to-date plan for control equipment showing location of fire fighting equipment and location of rescue equipment. ▪ Up-to-date plan showing location of hazardous materials including explosives. 	<ul style="list-style-type: none"> ▪ Yes ▪ Yes ▪ Yes ▪ Yes ▪ Yes 	
Incident Management Team Communication Hardware	The Incident Management Team is provided with suitable and sufficient communication equipment to enable them to effectively carry out their duties.	<ul style="list-style-type: none"> ▪ The Incident Control Room is provided with at least two external telephones on separate lines. ▪ The Incident Control Room is provided with at least two internal telephones on separate lines. ▪ Two-way radios or alternative means are provided as back-up between Incident Control Room, Shift Controller and Mine Control Room. 	<ul style="list-style-type: none"> ▪ Only one. ▪ Yes ▪ Unobserved. 	<ul style="list-style-type: none"> ▪ Minimal and it showed. The communication was basic and proved inadequate although the Incident Management Team did not effectively function to notice.
Incident Management	The Incident Management Team rapidly responds to emergency	<ul style="list-style-type: none"> ▪ Incident Management Team members report to Incident 	<ul style="list-style-type: none"> ▪ Unable to determine who is Incident Controller. 	<ul style="list-style-type: none"> ▪ Unobserved

				COMMENT
Team Formation	rapidly responds to emergency incident.	<p>members report to Incident Controller in an acceptable timeframe.</p> <ul style="list-style-type: none"> ▪ Incident Management Team members locate themselves in the Incident Control Room. ▪ Incident Management Team members are ready and willing to assist the Incident Controller in managing the emergency incident. 	<p>is Incident Controller.</p> <ul style="list-style-type: none"> ▪ No – in the conference room. ▪ Willing perhaps. 	
Incident Management Team Procedures	The Incident Management Team is effective in the management of the complexity of the emergency incident.	<p>The Incident Management Team establishes protocols for:</p> <ul style="list-style-type: none"> ▪ Internal and external communications ▪ Inflow of information ▪ Outflow of information ▪ Use of advisory team ▪ Use of assisting team ▪ Use of support team ▪ Incident Management Team behaviour 	<ul style="list-style-type: none"> ▪ Unobserved ▪ One phone ▪ Adhoc ▪ Runner of an IMT member ▪ Unable to identify ▪ One only ‘scribe’ ▪ Unobserved 	<ul style="list-style-type: none"> ▪ Appeared to be adhoc and unplanned and certainly undisciplined.
Incident Briefing	The Incident Controller sufficiently briefs the Incident Management Team to allow them to function immediately.	<ul style="list-style-type: none"> ▪ The Incident Controller briefs the Incident Management Team. ▪ The Incident Management Team seeks clarification where necessary. ▪ The Incident Management Team reviews available existing information on: <ul style="list-style-type: none"> - Missing and unaccounted for persons - Emergency incident witness accounts 	<ul style="list-style-type: none"> ▪ Unobserved ▪ Observed but group think applied ▪ Inadequate ▪ Inadequate ▪ Debriefing was undertaken ▪ Inadequate 	<ul style="list-style-type: none"> ▪ Did not know who was in the Incident Controller and I assume it became the Project Manager.

				COMMENT
		<ul style="list-style-type: none"> - Environmental information including gas monitoring, ventilation and ventilation appliances ▪ The Incident Management Team determines the preparedness of the Emergency Response Teams. 	<ul style="list-style-type: none"> ▪ Inadequate 	
Data Collection	The Incident Management Team ensures that all data is collected and manipulated to become useable information.	<ul style="list-style-type: none"> ▪ Data capture protocol is established to ensure all generated data is made available, with particular reference to: <ul style="list-style-type: none"> - Gas analysis - Ventilation modelling - Reports - Observations ▪ Data flow protocol is established to manage distribution of information. ▪ Data is processed whenever and wherever required to ensure that it becomes useable. ▪ Information critical for decision-making is given the highest priority. ▪ Information and decisions are captured in a specific log, with particular reference to: <ul style="list-style-type: none"> - Date - Time - Decision and reasons - Person or persons taking action 	<ul style="list-style-type: none"> ▪ No done ▪ No ▪ Some but inadequate ▪ No ▪ No ▪ No ▪ No ▪ No ▪ Unobserved 	<ul style="list-style-type: none"> ▪ Not observed and therefore was part of the difficulties faced by the team.

				COMMENT
		- Person or persons to whom action is directed		
Data Verification	The Incident Management Team verifies, as far as possible, all data collected before processing and use.	<ul style="list-style-type: none"> ▪ The Incident Management Team ensures integrity of all gas-sampling points. ▪ The Incident Management Team ensures the integrity and calibration of any gas analysers used. ▪ The Incident Management Team ensures the validity of gas readings by checking both percentage and range. ▪ The Incident Management Team makes use of gas ratios before and in scenario modelling. ▪ The Incident Management Team verifies observed ventilation changes through modelling. ▪ The Incident Management Team establishes additional strategically located sample points, where possible. ▪ The Incident Management Team cross reference observations and reports to validate hearsay information. 	<ul style="list-style-type: none"> ▪ No ▪ No ▪ No ▪ No ▪ No ▪ Very late and inadequate. ▪ No 	<ul style="list-style-type: none"> ▪ Not observed although I believe the person undertook several attempts with some ventilation knowledge – it was not appreciated or was it regarded as relevant at the time nor understood.
Scenario Modelling	The Incident Management Team efficiently develop scenarios that are identical or at least closely resemble the true situation.	<ul style="list-style-type: none"> ▪ The Incident Management Team assembles relevant data in a timely manner. ▪ The validity of any relevant data is checked by the advisory team. ▪ The Incident Management Team 	<ul style="list-style-type: none"> ▪ No ▪ No ▪ No – only reactive. 	

				COMMENT
		<ul style="list-style-type: none"> develops the most likely scenario. ▪ The Advisory Team validates any scenario developed by the Incident Management Team. ▪ Both the Incident Management Team and the Advisory Team make use of all available experts. ▪ The Incident Management Team and the advisory team update the scenario as often as is necessary. 	<ul style="list-style-type: none"> ▪ No ▪ Adhoc ▪ No 	
Decision Making Process	The Incident Management Team is effective in decision-making.	<ul style="list-style-type: none"> ▪ The Incident Management Team makes decisions as a team. ▪ The Incident Management Team follows a defined process in decision making. ▪ The Incident Management Team actually uses scenario modelling. ▪ The Incident Management Team takes into account all scenarios when making decisions. ▪ The Incident Management Team is not hijacked by event spontaneity. ▪ The Incident Management Team identifies all hazards. 	<ul style="list-style-type: none"> ▪ Not always ▪ Not always ▪ Not always ▪ Not always ▪ Yes ▪ Not always 	<ul style="list-style-type: none"> ▪ more discipline needed

				COMMENT
	<p>The Incident Management Team uses risk management techniques in arriving at decisions.</p>	<ul style="list-style-type: none"> ▪ The Incident Management Team identifies the appropriate controls for each hazard. ▪ The Incident Management Team incorporates appropriate hazard controls and constraints in all operational decisions. ▪ The Incident Management Team does not invoke any action that endangers life. ▪ The Incident Management Team takes all reasonable action to rescue persons remaining underground. ▪ The Incident Management Team considers the safety of any persons in any decision to deploy such persons in underground rescue and / or recovery, including rescue teams. ▪ The Incident Management Team takes into account the fate of any missing persons in any decision to seal the mine. ▪ The Incident Management Team make provisions for recovery of deceased persons after sealing. 	<ul style="list-style-type: none"> ▪ Not always ▪ Adhoc ▪ Yes ▪ Not always ▪ Adhoc and mostly no. ▪ Sealing was not necessary, but may have eventuated. ▪ N/A 	
<p>Monitoring and Review Process</p>	<p>The Incident Management Team and Advisory Team monitor and review the emergency incident circumstances as often as is reasonably prudent.</p>	<ul style="list-style-type: none"> ▪ The Incident Management Team ensures that it receives all information likely to affect the decision making process. ▪ The Incident Management Team regularly updates the scenario model. 	<ul style="list-style-type: none"> ▪ Not always ▪ Not always 	<ul style="list-style-type: none"> ▪ Little was undertaken throughout the day although some updates were done but no checks to see if all relevant personnel were present. In fact the QMRS Officer was out briefing the team and the update was undertaken

				COMMENT
		<ul style="list-style-type: none"> ▪ The Incident Management Team reviews operational decisions in line with changes in scenario. ▪ The Incident Management Team seeks validation of changes in operational decisions by the Advisory Team. 	<ul style="list-style-type: none"> ▪ Not always ▪ Not always 	<ul style="list-style-type: none"> ▪ update was undertaken without his presence.
<p>Communication Process</p>	<p>The Incident Management Team establishes and maintains effective communication with all necessary internal emergency agencies.</p>	<ul style="list-style-type: none"> ▪ The Incident Management Team prohibits unauthorised personal contact or communications with its team members. ▪ The Incident Management Team maintains effective communications with the Control Room Officer by: <ul style="list-style-type: none"> - On-line computer communication, if available. - Telephonic communication - Back-up communication facility (eg., two-way, etc) ▪ The Incident Management Team maintains effective communication with the Advisory Team by: <ul style="list-style-type: none"> - Regular face-to-face contact - Telephonic communication ▪ The Incident Management Team maintains effective communication with the Shift Controller by telephonic communication and back-up communication facility. ▪ The Incident Management Team maintains effective communication with the Mines Rescue Team by 	<ul style="list-style-type: none"> ▪ No ▪ Adhoc ▪ No ▪ Yes ▪ No ▪ I think they were in the room with them. ▪ In the room. ▪ Yes - inadequate. ▪ Yes - inadequate. 	<ul style="list-style-type: none"> ▪ Needs improvement

				COMMENT
		<p>telephonic communication and back-up communications facility.</p> <ul style="list-style-type: none"> ▪ The Incident Management Team maintains effective communication with the assisting team by telephonic communication and back-up communications facility. ▪ The Incident Management Team maintains effective communication with the support team by telephonic communication and back-up communications facility. ▪ The Incident Management Team records information flow inwards and outwards by logging content, source, destination, date and time. 	<ul style="list-style-type: none"> ▪ No ▪ Not always ▪ inadequate 	
<p>Incident Scale Down</p>	<p>The Incident Management Team effectively wind down emergency management requirements at conclusion of emergency.</p>	<ul style="list-style-type: none"> ▪ The Incident Management Team debriefs all emergency incident participants before stand down. ▪ The Incident Management Team stands down the Mines Rescue Team as soon as they are no longer required. ▪ The Incident Management Team stands down all other persons as soon as they are no longer required. ▪ The Incident Management Team prepares a statement for release to the public. ▪ The Incident Management Team arranges security of IMT documentation before stand down. ▪ The Incident Management Team 	<ul style="list-style-type: none"> ▪ Unknown ▪ Unknown ▪ Not monitored ▪ No ▪ Unobserved ▪ Unobserved. 	<ul style="list-style-type: none"> ▪ Just before Mine Manager asked to be briefed and that was the way it stayed.

				COMMENT
		arranges an early meeting date to commence preparation of the Emergency Incident Report. <ul style="list-style-type: none"> ▪ The Incident Management Team stands down. 	<ul style="list-style-type: none"> ▪ Yes 	

INCIDENT MANAGEMENT TEAM CHANGE OVER AUDIT TOOL

Assessor: Mark McCamley

				COMMENT
IMT 1 Operating	SEMS initiation and incident management team performance are deemed to be successful.	<ul style="list-style-type: none"> ▪ Incident Management Team operating correctly. ▪ Communication hardware working. ▪ Incident Management Team formation and management procedures being followed. ▪ Incident briefings being done to outside parties. ▪ Data collection. ▪ Data verification. ▪ Data recording. ▪ Scenario modelling. ▪ Decision making process ▪ Monitoring and review process. ▪ Communication process. 	<ul style="list-style-type: none"> ▪ Team operating but a little disjointed – too many chiefs. Hierarchy of control was not well defined. ▪ Phone communications were good – good use of speaker phone. ▪ No computer linked to SAFEGAS in IMT room, no direct access to gas readings. ▪ Incident briefings to outside parties were infrequent and adhoc. ▪ Data collection was good, but a lot of information that came over the phone was not recorded. ▪ Some critical data was verified. ▪ Scenario modelling occurred but was not managed or controlled, many times the process was halted by incomers. 	<ul style="list-style-type: none"> ▪ At times there were three senior people in the room all acting in the role of IMT Controller. This led to situations where there were three groups discussing different ideas at one time. ▪ Numerous times the IMT wanted information on gas monitoring and current trends which should have been available in the room. ▪ Briefings from the IMT were done for Mines Rescue Captains, Police, inspectorate, etc, but there were none for evacuees and minesite people. A formal briefing document was not prepared. IMT members gave briefings to their relevant reports and organisations but this was not controlled. ▪ On two occasions the process of scenario modelling was hijacked by people raising other issues and it was not revisited to complete the process.
IMT Change	<ul style="list-style-type: none"> ▪ Change over is done as per 	<ul style="list-style-type: none"> ▪ Timing for change over as noted in 	<ul style="list-style-type: none"> ▪ Change over was raised by 	<ul style="list-style-type: none"> ▪ Change over was not done

				COMMENT
<p>Over</p>	<p>emergency plans.</p> <ul style="list-style-type: none"> ▪ Change over is a coordinated event. ▪ Change over does not effect the operation of the IMT while in progress. ▪ All critical information is made available to incoming members. ▪ Incoming members know where and how to access historical information. ▪ Incoming members are made aware of operating systems for IMT, i.e., decision making process, risk assessment process. ▪ Incoming IMT ensure relevant parties are aware of change over ▪ Facilitator is changed out. 	<p>plan is followed and timing is recorded.</p> <ul style="list-style-type: none"> ▪ Formal sign on and sign off for IMT members. ▪ IMT continues to operate effectively during change over of each member. Decisions are correctly made. ▪ Information flow into and out of IMT is not effected by change over. ▪ Incident Controller establishes the following: <ul style="list-style-type: none"> - Update on nature of emergency. - Update on status of stages response requirements as per Hazard Management Plan. - Update of presence and expected whereabouts of missing personnel. ▪ Descriptions of incident by survivors who have been debriefed on their arrival at the mine surface. ▪ The Incident Controller briefs the Incident Management Team. ▪ The Incident Management Team seeks clarification where necessary. ▪ The Incident Management Team reviews available existing information on: <ul style="list-style-type: none"> - Missing and unaccounted for persons - Emergency incident witness accounts - Environmental information including as monitoring, ventilation and ventilation 	<p>a member of IMT and each of the members arranged for their own relief.</p> <ul style="list-style-type: none"> ▪ No formal sign on and sign off when members changed over. ▪ No formal briefing for some members until they asked for it. ▪ Decision making was ad hoc at times with no questioning of decisions made by senior people. ▪ Incident Controller was not changed out. UMM was changed out in Underground Coordinators Room. ▪ Debriefing notes were bought to Underground Coordinators Room. ▪ IMT started some reviews but got sidelined at various times. ▪ Ventilation Officer was coming in and out of IMT with gas reading updates but no SAFEGAS screen was available in IMT. ▪ IMT checked preparedness of Rescue Teams and availability of teams. IMT had good access to historical information from whiteboards. 	<p>formally but done effectively. This was not communicated to outside parties which would have caused some confusion when changeovers commenced. This confirms the need for a formal register and sign off sheet.</p> <ul style="list-style-type: none"> ▪ The Underground Mine Manager had to ask for a formal briefing after being in IMT for some time, there was no formal process for doing this when a new members enters the IMT. ▪ Decisions were sometimes made in haste and were not scrutinised by the IMT. Three senior people made a number of decisions in isolation from the rest of IMT. ▪ IMT started to review spontaneous combustion event behind longwall but got sidelined by someone who raised the strata issues of the fall at the maingate. ▪ Risk assessment process was not used, evaluation of issues took place and issues were identified along with actions but not by risk assessment principles. ▪ IMT simply rang people when they wanted information.

				COMMENT
		<p>ventilation and ventilation appliances.</p> <ul style="list-style-type: none"> ▪ The Incident Management Team determines the preparedness of the Emergency Response Teams. ▪ New IMT members are able to access relevant information and learn a history of the event to date. ▪ New IMT members follow the same decision making protocols, risk assessment procedures as previous team. ▪ The IMT establishes protocols for internal and external communications; inflow of information; outflow of information; use of advisory team; use of assisting team; use of support team; IMT member behaviour. ▪ Names of new IMT members are communicated to all relevant parties. ▪ Assistance is provided for outgoing IMT members, transport, accommodation, messing, counselling, etc. ▪ Plans are in place for update of critical incident change for outgoing IMT members. ▪ New IMT establishes effective change back procedure. ▪ All members of IMT 1 effectively changed out within acceptable time period. 	<ul style="list-style-type: none"> ▪ Staged change over of people allowed for continuity of IMT processes. Risk assessment process was not consistent or formal. ▪ Communication flow was good. ▪ Telephone on speaker was an excellent method of communication into IMT as all members could hear phone calls. ▪ Advisory, Assisting and Support teams were not used as formal resources. ▪ Good behaviour of team members, IMT Controller was calm and relaxed. ▪ No communication of change out of members to anyone. ▪ Outgoing members had support, but nothing mentioned about counselling. ▪ No plan for update of critical information for outgoing members. ▪ Change back procedure was established – staggered. ▪ Trouble with change out of Ventilation Officer, 	<ul style="list-style-type: none"> ▪ IMT Controller stayed calm and thought through each decision. Controller process of evaluating information. ▪ Counselling of outgoing members was not mentioned. ▪ No written briefing notes issues for general information. ▪ All major players who could undertake the role of Ventilation Officer were involved in exercise.

				COMMENT
			alternate on shift also.	
IMT 2 Operating	IMT is operating effectively.	<ul style="list-style-type: none"> ▪ Incident Management Team operating correctly. ▪ Communication hardware working. ▪ Incident Management Team formation and management procedures being followed. ▪ Incident briefings being done to other parties. ▪ Data collection. ▪ Data verification. ▪ Data recording. ▪ Scenario modelling. ▪ Decision making process ▪ Monitoring and review process. ▪ Communication process. ▪ Facilitator guiding process. 	<ul style="list-style-type: none"> ▪ In general IMT operated well, but would have had trouble if critical people (3) were not available as would normally be the case. ▪ No briefings made to men on surface after escape. ▪ Data management was good. ▪ Scenario modelling done for problems. ▪ Facilitator did not guide process, used as a scribe only. 	<ul style="list-style-type: none"> ▪ Three major players used to ensure IMT operated well would not always be on site which would have increased the problems with respect to competent people for change out. ▪ Men on surface were milling around and on two occasions people made a request to IMT to remove them from area. They did not have a briefing on current situation during the event.
Incident Management Team Resources for Ongoing Operation	The Incident Management Team is provided with sufficient resources to adequately carry out its duties for an extended operation.	<ul style="list-style-type: none"> ▪ The Incident Management Team is provided with sufficient resources to carry on the operation over an extended period. ▪ Copies of Safety Management System. ▪ Copies of Principal Hazard Management Plan. ▪ Up-to-date underground plans showing ventilation, gas monitoring points and escape routes. ▪ Up-to-date surface plans of electrical installation, including building locations, road systems and gates and location of main services isolation control equipment. 	<ul style="list-style-type: none"> ▪ Safety Management System plan was on the wall of the room. ▪ No copies of the Principal Hazard Management Plan - had to ask Ventilation Officer what trigger levels were. ▪ Good supply of plans in compendium, some A3 copies to write on. ▪ No surface plans readily available, had to use person familiar with surface to find top of 	<ul style="list-style-type: none"> ▪ Lack of availability of buses made it difficult to remove crews to village.

				COMMENT
		<ul style="list-style-type: none"> ▪ Up-to-date plan for control equipment showing location of fire fighting equipment and location of rescue equipment. ▪ Up-to-date plan showing location of hazardous materials including explosives. ▪ Catering is organised for the IMT. ▪ Sufficient writing pads, stationery, batteries, tapes, etc., are on hand. 	<ul style="list-style-type: none"> ▪ boreholes for Tomlinson Boiler, no surface plan. ▪ Catering, stationary was good. ▪ Transport was a problem for crews. 	

EMERGENCY EVACUATION SYSTEM - 3 NORTH OUTBYE CREW AUDIT TOOL

Assessor: Mark McCamley

				COMMENT
Incident Identified	<ul style="list-style-type: none"> ▪ Changed conditions identified correctly. ▪ Correct assessment of problem. ▪ Emergency situation recognised. 	<ul style="list-style-type: none"> ▪ Recognition of changed circumstances. ▪ TARPs known / followed. ▪ Panic not allowed to occur. ▪ Urgency of situation understood. 	<ul style="list-style-type: none"> ▪ Men retreated when told roof was moving. ▪ Men went to crib room after fall of roof over BSL. ▪ Men tried to contact Control but phone not working. ▪ Men told that they can now see smoke at the crib room. ▪ Men told that the smoke was getting thicker. ▪ DAC message came over saying "Emergency, exit the mine". ▪ Men decided to don rescuers, put on link line and exit via 'B' Heading. 	<ul style="list-style-type: none"> ▪ Three Walters men were setting prop setter props on off walk side of BSL to support heavy roof. ▪ Two longwall associates fitters were preparing for maintenance work on the supports but were outbye of the fall area when it occurred. ▪ Three Walters men were working in 'B' Heading near the crib room and were alerted to the situation by other Walters men. ▪ Total of 8 men mustered at the crib room and discussed the situation.
Incident Response Commenced	<ul style="list-style-type: none"> ▪ All crew members accounted for. ▪ Discuss incident response amongst crew. ▪ Options considered. ▪ Partial / total evacuation. 	<ul style="list-style-type: none"> ▪ Location of all crew members known. ▪ Plan formulated and decided on. ▪ Correct option for escape identified an agreed on. ▪ Sense of urgency shown. 	<ul style="list-style-type: none"> ▪ Crew confirmed all outbye persons accounted for. ▪ Decided to evacuate via 'B' Heading, primary egress. AT no time did they discuss the use of the PJB at crib room - all men walked past it. 	<ul style="list-style-type: none"> ▪ Only a couple of men really knew what they were doing - others followed. ▪ Good sense of urgency by all team and a commitment was made early that everyone would stay together.
Incident Equipment	<ul style="list-style-type: none"> ▪ Belt worn Self Rescuers fitted. 	<ul style="list-style-type: none"> ▪ Recognition of expected duration. ▪ Location of LD SCSR units known. 	<ul style="list-style-type: none"> ▪ Men knew that belt worn units only lasted 30 minutes. 	<ul style="list-style-type: none"> ▪ Discussion made about what to do when found only 5 LD units at cache - comments

				COMMENT
	<ul style="list-style-type: none"> ▪ First aid equipment taken. ▪ EBA units taken. ▪ Tools required. 	<ul style="list-style-type: none"> ▪ Correct donning procedure known and demonstrated for belt worn units. ▪ No talking after rescuers fitted. 	<p>minutes.</p> <ul style="list-style-type: none"> ▪ Did not know about intermediate cache at 'B-A' Heading, 7 cut-through. ▪ Only 5 units at 7 cut-through, but 8 people. ▪ Decided for 5 people to take LD units and change escape route to belt road where LD units could be accessed at A6. ▪ Correct donning procedure was followed for belt worn units but some problems with head straps and nose clips, one man took 2 minutes to complete don and wear. ▪ Some talking at caches whilst wearing units but none whilst walking. 	<p>made about sharing if necessary.</p>
Escape Route	<ul style="list-style-type: none"> ▪ Escape route determined. ▪ Method of escape determined. ▪ Escape route communicated to Control Room. ▪ Number of people escaping. ▪ Rescuer / light numbers. ▪ Appropriate route taken. 	<ul style="list-style-type: none"> ▪ Recognition of deteriorating circumstances. ▪ Best option for escape identified – driving out in vehicle. ▪ Re-evaluate escape / response options as conditions effect visibility. ▪ Re-evaluate escape times and duration of SCSR's. ▪ Attempt communication (if in respirable atmosphere) – telephone used, procedure followed. 	<ul style="list-style-type: none"> ▪ Men told smoke was getting worse. ▪ Did not identify PJB as escape option. ▪ Did not have enough LD units to continue in primary egress so decided to go to second egress so all could access LD units. ▪ Did not attempt communication – emphasis was on getting out. 	<ul style="list-style-type: none"> ▪ Entered belt road at 7 cut-through and decided to follow second egress out of mine. Only one or two men knew egress routes. ▪ Talked about communicating to Control on the way out but team decided not to – keep going and don't delay for communication.

				COMMENT
		<ul style="list-style-type: none"> ▪ State name. ▪ Give location, type of incident and injured, assistance required. ▪ Have message repeated back. ▪ Non-speaking procedure known / used if wearing SCSR. 		
Travelling	<ul style="list-style-type: none"> ▪ Appropriate means decided. ▪ All crew travelled together. ▪ Pace of travel appropriate. ▪ Correct escapeway route was maintained. ▪ Escapeway was clearly marked. ▪ Duration of self-rescuers. ▪ Duration and location of LD units. ▪ Use of lifelines, etc. 	<ul style="list-style-type: none"> ▪ Drive out as far as possible. ▪ Access best option for escape route when required to walk. ▪ Reflective guide to escape route known and used. ▪ Safe walking pace used, but urgency shown. ▪ LD SCSR units found and correct change over / donning procedure followed. ▪ Check doorways (man doors). ▪ No injuries during escape. 	<ul style="list-style-type: none"> ▪ Did not drive – walked all the way. ▪ Used primary egress initially. ▪ Used reflective guide well. ▪ Safe walking used – good use of link line and walking sticks. ▪ Found LD units but no change over (exercise). ▪ No injuries during escape but one man had badly chaffed legs. 	<ul style="list-style-type: none"> ▪ Man who had chaffed legs was told to have a shower and seek first aid treatment. Lamproom Duty Card holder was made aware of the situation and told that the man could be removed from exercise to seek first aid.
Observations	<ul style="list-style-type: none"> ▪ Take note of circumstances and environment. 	<ul style="list-style-type: none"> ▪ Make observations of environmental conditions during escape. ▪ Duration times recorded. ▪ Smoke, location, density. ▪ Heat, location. ▪ Gases detected, location and concentration. ▪ Services – compressed air, water, communication, power. ▪ Ventilation status / changes. 	<ul style="list-style-type: none"> ▪ No importance put on observations. ▪ No record of duration times but this was taken into account when making decisions. ▪ No gas detection equipment with crew. 	<ul style="list-style-type: none"> ▪ Concentrated on getting out. Did not take notice of anything else. ▪ Crew had no gas detection equipment so decided they could not take risk that it was fresh air in 'F' Heading, decided to keep wearing rescuers until got to bottom of drift.
Self Rescuers	<ul style="list-style-type: none"> ▪ LD units fitted correctly, change over done correctly. 	<ul style="list-style-type: none"> ▪ LD unit donned correctly. ▪ SD unit removed without 	<ul style="list-style-type: none"> ▪ No change over done during this exercise. 	<ul style="list-style-type: none"> ▪ Decided to pass F9 cache and not take new rescuers as they

				COMMENT
	<ul style="list-style-type: none"> ▪ Fitted in sufficient time. ▪ Adequate number of LD units. ▪ LD units at station sufficient in number. ▪ Self rescuers / LD units correctly worn and used. 	<p>contamination from atmosphere.</p> <ul style="list-style-type: none"> ▪ SD unit discarded. ▪ LD unit fitted before SD unit expired. ▪ Persons aware of expiry time for SD rescuer and planned changeover or changed over at cache. 	<ul style="list-style-type: none"> ▪ LD units would have been fitted at correct time frames. ▪ Aware of duration time. 	<p>had only just changed over 10 minutes earlier.</p>
Communication with Control Room	<ul style="list-style-type: none"> ▪ Control Room informed of location? ▪ How is communication carried out? ▪ Informed on changed conditions? 	<ul style="list-style-type: none"> ▪ Where was communication attempted? ▪ As above with procedures. ▪ Was communication attempted at each opportunity? 	<ul style="list-style-type: none"> ▪ Communication attempted and done correctly at crib room before evacuating and at pit bottom – no attempt to communicate at other times, decided not to. 	<ul style="list-style-type: none"> ▪ Decided not to communicate on way out. ▪ Men stopped and waited for slow man on way out of the drift.

EMERGENCY EVACUATION SYSTEM - 4 NORTH CREW AUDIT TOOL

Assessor: Paul Beveridge

				COMMENT
Incident Received	<ul style="list-style-type: none"> ▪ Incident received ▪ Correct message received ▪ Emergency alarm recognised 	<ul style="list-style-type: none"> ▪ Recognition of changed circumstances ▪ Attempt communication ▪ TARPs consulted / followed ▪ TARPs known ▪ Communication from Senior Official 	<ul style="list-style-type: none"> ▪ Incident initiation message not received by any crew members despite assessor receiving all PED messages and DAC communications. 	<ul style="list-style-type: none"> ▪ Improved PED coverage needed.
Incident Communicated	<ul style="list-style-type: none"> ▪ All crew members accounted for ▪ All crew members notified ▪ Crew marshalled together ▪ Options considered ▪ Partial / total evacuation ▪ All contractors notified 	<ul style="list-style-type: none"> ▪ Location of outbye workers considered ▪ Plan formulated and decided on ▪ CABA response considered ▪ Emergency telephone used, procedure followed ▪ State name ▪ Give location, type of incident and injured, assistance required ▪ Have message repeated back ▪ No speaking procedure known / used ▪ ERZ Controller has list of all persons in section ▪ All non-event communications stop 	<ul style="list-style-type: none"> ▪ Once informed of incident, ERZ Controller accounted for crew and informed them of incident and instructed them to gather at SCSR cache. ▪ Phone communication with Control - received information and a detailed plan of evacuation to Controller. ▪ At cache location ERZ Controller initiated use of oxybok and explained planned route of evacuation. The location of the incident was not detailed. 	<ul style="list-style-type: none"> ▪ Crew numbers accounted for and escape route well directed to crew. ▪ Incident location not communicated to crew
Incident Equipment	<ul style="list-style-type: none"> ▪ Self rescuer fitted ▪ First aid equipment taken ▪ EBA units taken 	<ul style="list-style-type: none"> ▪ Recognition of expected duration ▪ Location of SCSR / CABA / TRAUMA kits known and within 500m and 1000m for SCSR 	<ul style="list-style-type: none"> ▪ Rescuers were easily fitted by all personnel ▪ O/B cache elsewhere located and changeover 	<ul style="list-style-type: none"> ▪ Emergency escape plans and writing materials should be available in caches.

				COMMENT
	<ul style="list-style-type: none"> Tools required CABA (if necessary) 	<ul style="list-style-type: none"> 500m and 1000m for SCSR Emergency phone taken Emergency plan taken up to date >1 month and in crib rooms and caches Writing material in SCSR cache's 	<ul style="list-style-type: none"> completed well. No plan was taken, nor found in caches. Writing materials not found in caches. 	
Escape Route	<ul style="list-style-type: none"> Escape route determined Escape route communicated to Control Room Number of people escaping Rescuer / light numbers Appropriate route taken 	<ul style="list-style-type: none"> Recognition of deteriorating circumstances Re-evaluate escape / response options Re-evaluate escape times and duration of SCSR's Primary escapeway chosen, if not, what logic used. 	<ul style="list-style-type: none"> Escape route was determined and communicated effectively to Control - conditions and names also given. Changeover at caches was performed well. 	
Travelling	<ul style="list-style-type: none"> Appropriate means decided All crew travelled together Pace of travel appropriate Correct escapeway route was maintained Escapeway was clearly marked Duration of self-rescuers Duration of EBA's Use of lifelines, etc Cut-through's numbered Guidance system Direction indication Segregation 	<ul style="list-style-type: none"> Hand rails / reflective guide to escape route known and guide effective Is route trafficable Adjust / re-set tube bundle line Check doorways (man doors) Record pressures, gas concentrations and general observations Escape plan taken Non-verbal communication set-up Tags taken off board outbye 	<ul style="list-style-type: none"> As transport u/s travel was by foot. Crew started escape in light smoke and travelled together, as smoke became thicker the crew separated into several groups. While escapeway was clearly marked, in heavy smoke signs were not available. Caches were suitably spaced. Lifelines were not available. Guidance to caches was reasonably effective. 	<ul style="list-style-type: none"> Installation of guide ropes, especially in underpasses to segregate road ('F' Heading). Heavier / large guide poles in travel road and cache locations needed.

				COMMENT
Observations	<ul style="list-style-type: none"> ▪ Take note of circumstances and environment 	<ul style="list-style-type: none"> ▪ Duration times recorded ▪ Smoke. Location, density ▪ Heat, location ▪ Gases detected, location and concentration ▪ Services - compressed air, water, communication, power ▪ Ventilation status / changes 	<ul style="list-style-type: none"> ▪ None taken. 	
Self-rescuers	<ul style="list-style-type: none"> ▪ Self rescuer fitted correctly ▪ Fitted in sufficient time ▪ EBA's fitted correctly ▪ Fitted in sufficient time ▪ Adequate number of EBA's ▪ EBA's at station sufficient in number ▪ Crew takes spare EBA's ▪ Self-rescuers / EBA's correctly worn and used ▪ CABA (if used) 	<ul style="list-style-type: none"> ▪ Crew all change to 60 minute units together ▪ Sufficient 60 minute units are available 	<ul style="list-style-type: none"> ▪ Rescuers were fitted and changed over well as a team. ▪ Numbers of units in caches were sufficient. 	<ul style="list-style-type: none"> ▪ Crew were well versed in use, changeover and location of oxybok's and Fenzy's.
Communication with Control Room	<ul style="list-style-type: none"> ▪ Control Room informed of location ▪ How is communication carried out? ▪ Informed on changed conditions? 	<ul style="list-style-type: none"> ▪ Where was communication attempted? ▪ As above with procedures. 	<ul style="list-style-type: none"> ▪ Initial contact with Control effective. ▪ On deciding fresh air, Control contact by phone and informed all relevant information. 	<ul style="list-style-type: none"> ▪ All relevant data was well communicated.
Arrival on Surface	<ul style="list-style-type: none"> ▪ Muster ▪ Report ▪ Medical aid ▪ De-brief 	<ul style="list-style-type: none"> ▪ Check off at lamp room ▪ Report to ESO and lamproom ▪ Arrange medical aid and re-hydrate ▪ De-brief observations 	<ul style="list-style-type: none"> ▪ At Portal names and tag numbers taken by Security. ▪ First aid and water available on arrival at surface. 	

				COMMENT
		<ul style="list-style-type: none">Families notified	<ul style="list-style-type: none">Men de-briefed one at a time effectively.	

DE-BRIEFING OF 4 NORTH CREW AUDIT TOOL

Assessor: Paul Beveridge

				COMMENT
How are they notified of incident?	<ul style="list-style-type: none"> ▪ Communications used for notification of incident to surface if possible. 	<ul style="list-style-type: none"> ▪ Contact with Control ▪ What time were you notified? 	<ul style="list-style-type: none"> ▪ Crew notified of incident by assessment team. ▪ No notification received by PED, DAC etc, at 9:30 am. ▪ Crew assembled at rescuer location, 16 cut-through, 'B' Heading, 4 North. 	<ul style="list-style-type: none"> ▪ After receiving this information statements were read back and clarified.
How was the incident detected?	<ul style="list-style-type: none"> ▪ Environmental damage noticed? ▪ Change in circumstances? 	<ul style="list-style-type: none"> ▪ Smoke, dust, increase in smoke, etc. 		
Did you assemble crew at place of safety?	<ul style="list-style-type: none"> ▪ Place of safety? 	<ul style="list-style-type: none"> ▪ Crib room, SCSR cache, FAB, etc. 		
Account for crew of personnel including contractors in section of pit?		<ul style="list-style-type: none"> ▪ How did you account for personnel? 	<ul style="list-style-type: none"> ▪ Numbers at 16 cut-through were asked. 	
Call to Control to confirm that personnel are accounted for?		<ul style="list-style-type: none"> ▪ Did you make contact with Control? 	<ul style="list-style-type: none"> ▪ Control contacted them at 17 cut-through – six men accounted for. 	<ul style="list-style-type: none"> ▪ Not asked directly. Information volunteered in incident recollection.
Decide intended route?		<ul style="list-style-type: none"> ▪ What route was used to exit the mine? 	<ul style="list-style-type: none"> ▪ ERZ Controller explained intended route. 	

				COMMENT
		<ul style="list-style-type: none"> Use of emergency escape plan? 		
Location of closest SCSR cache?		<ul style="list-style-type: none"> Easy to find? Presence of indication markers and effectiveness? 	<ul style="list-style-type: none"> Not asked. 	
Were there enough rescuers?		<ul style="list-style-type: none"> Were smoke goggles put on? 		
When rescuer changed over were there any difficulties?		<ul style="list-style-type: none"> Time of change-over? Was the time noted? Did all persons change over from 30 minute to 60 minute units together? Was the time noted? 	<ul style="list-style-type: none"> Two changeovers – approximate locations noted. Unsure of numbers at each changeover. 	<ul style="list-style-type: none"> Questions asked to determine where changeovers occurred and what persons were known to be there. Information passed on directly to Underground Management Room.
Problems encountered on escape route?		<ul style="list-style-type: none"> Visibility / condition of roadway? Heat? Escape route markers followed? Was the condition of the escapees monitored and rate of travel adjusted appropriately? 	<ul style="list-style-type: none"> Very heavy smoke. 	<ul style="list-style-type: none"> Information on location of heat and smoke passed directly to Underground Management Room. Information varied from different sources – possibly creating confusion in Underground Management Room.
What was seen on evacuation route?	<ul style="list-style-type: none"> Environmental? 	<ul style="list-style-type: none"> What were the changes? Was the mine atmosphere monitored continuously? 	<ul style="list-style-type: none"> Nothing seen due to limited visibility. Heat noted on turning into main headings. 	
Time taken to reach the surface?		<ul style="list-style-type: none"> Was it recorded? 	<ul style="list-style-type: none"> Not asked. 	
Were names checked off?		<ul style="list-style-type: none"> By whom and when? 		<ul style="list-style-type: none"> Recorded by Portal Sentry and relayed to Underground

				COMMENT
				Management Room and IMT.
Who approached the crew or personnel on reaching the surface?		<ul style="list-style-type: none"> Was person recognised or easily identifiable? 		<ul style="list-style-type: none"> Interviewer approached crew for debrief.
What information was given on the surface?		<ul style="list-style-type: none"> Type of information given? To whom was the information given? 	<ul style="list-style-type: none"> Not asked. 	<ul style="list-style-type: none"> No details of the incident were passed on during debrief.
How long before de-brief took place?		<ul style="list-style-type: none"> Were the crew left waiting unattended? 	<ul style="list-style-type: none"> Crew were left for approximately 15 minutes before de-brief – given water and first aid in this time. 	
Location of de-briefing room?		<ul style="list-style-type: none"> Was the room allocated an emergency plan? 	<ul style="list-style-type: none"> No plans were immediately available. 	<ul style="list-style-type: none"> Crew asked for plans so route could be described – one was obtained.
Personnel involved in de-briefing?		<ul style="list-style-type: none"> Who was involved and what did they ask and record? 	<ul style="list-style-type: none"> Debrief was one-on-one. Route taken and accountability of numbers on their way. General accounting of events. 	<ul style="list-style-type: none"> All crew members were interviewed by one man.
How was the de-briefing recorded?		<ul style="list-style-type: none"> Tape recorded / notes, etc. 	<ul style="list-style-type: none"> Notes recorded in duplicate book. 	<ul style="list-style-type: none"> Clear notes taken on duplicate and a copy was given to the Underground Management Room.
Was there a format followed for		<ul style="list-style-type: none"> Was a question list used? 	<ul style="list-style-type: none"> No actual list was used although a logical sequence and standard 	<ul style="list-style-type: none"> Sequence of questions and content covered most areas. All information was given.

				COMMENT
questions?			questions were used.	
What types of questions were asked?	<ul style="list-style-type: none"> List of questions? 	<ul style="list-style-type: none"> Relevant of questions in relation to incident? 	<ul style="list-style-type: none"> Focus on recollection of events and location of personnel. Quality of air and location of heat and other environmental changes asked. 	<ul style="list-style-type: none"> Was reconfirmed and re-read to men before signing.
Person leading the de-brief?		<ul style="list-style-type: none"> Identification of person doing the de-brief? 		
Was the person/ persons made comfortable during de-brief?	<ul style="list-style-type: none"> Re-hydration Medical aid Food and water Was the needs for voluntary counselling considered and offered if appropriate? 	<ul style="list-style-type: none"> Provision of same. 	<ul style="list-style-type: none"> Provided for prior to de-brief and offered during de-brief. 	<ul style="list-style-type: none"> Men recovered and relaxed prior to de-brief.
Time of de-briefing?		<ul style="list-style-type: none"> Length of de-brief? 	<ul style="list-style-type: none"> Lasted for approximately 5 minutes. 	<ul style="list-style-type: none"> Adequate.
Was all information gathered?		<ul style="list-style-type: none"> Anything missed? 		<ul style="list-style-type: none"> Gathering of information was well performed.
Were all possible questions asked?		<ul style="list-style-type: none"> Any questions not asked or unanswered? 		<ul style="list-style-type: none">

EMERGENCY EVACUATION SYSTEM - LONGWALL TAILGATE CREW AUDIT TOOL

Assessor: Allan Purse

				COMMENT
Incident Received	<ul style="list-style-type: none"> ▪ Incident received ▪ Correct message received ▪ Emergency alarm recognised 	<ul style="list-style-type: none"> ▪ Recognition of changed circumstances ▪ Attempt communication ▪ TARPs consulted / followed ▪ TARPs known ▪ Communication from Senior Official 	<ul style="list-style-type: none"> ▪ Maingate operator stopped. ▪ Tailgate crew mustered. ▪ TARP's not viewed. ▪ North Goonyella people aware. ▪ PED and DAC message. 	<ul style="list-style-type: none"> ▪ Commented "it was a fall". ▪ Good leadership by crew. ▪ Copy of TARP's not at maingate. ▪ These persons led retreat. ▪ DAC good, no PED at tailgate.
Incident Communicated	<ul style="list-style-type: none"> ▪ All crew members accounted for ▪ All crew members notified ▪ Crew marshalled together ▪ Options considered ▪ Partial / total evacuation ▪ All contractors notified 	<ul style="list-style-type: none"> ▪ Location of outbye workers considered ▪ Plan formulated and decided on ▪ CABA response considered ▪ Emergency telephone used, procedure followed ▪ State name ▪ Give location, type of incident and injured, assistance required ▪ Have message repeated back ▪ No speaking procedure known / used ▪ ERZ Controller has list of all persons in section ▪ ERZ Controller has PED ▪ All non-event communications stop 	<ul style="list-style-type: none"> ▪ Crew sound off at maingate. ▪ Options discussed. ▪ Crew phoned Control Room Officer. ▪ Names given to Control Room Officer. ▪ CRO and crew discussed. ▪ Messages not repeated back. ▪ No non-speaking procedure known - spoke throughout. ▪ No ERZ Controller in this team. ▪ No other communications. 	<ul style="list-style-type: none"> ▪ Crew aware -all at maingate. ▪ Excellent. ▪ Clear information given. ▪ Excellent ▪ Excellent. ▪ Procedure not followed. ▪ This was poor. ▪ This was good.
Incident Equipment	<ul style="list-style-type: none"> ▪ Self rescuer fitted ▪ First aid equipment taken 	<ul style="list-style-type: none"> ▪ Recognition of expected duration ▪ Location of SCSR / CABA / 	<ul style="list-style-type: none"> ▪ Not known. ▪ Cache at distance. 	<ul style="list-style-type: none"> ▪ Changed at all caches. ▪ Good.

				COMMENT
	<ul style="list-style-type: none"> EBA units taken Tools required CABA (if necessary) 	<ul style="list-style-type: none"> TRAUMA kits known and within 500m and 1000m for SCSR Emergency phone taken Emergency plan taken up to date >1 month and in crib rooms and caches Writing material in SCSR cache's 	<ul style="list-style-type: none"> No maps, sticks or linklines. Number of SCSRs not consistent. Donning of SCSR. No material evident. 	<ul style="list-style-type: none"> Very poor – made escape difficult. Excellent – all fitted correctly and in good time. Very poor.
Escape Route	<ul style="list-style-type: none"> Escape route determined Escape route communicated to Control Room Number of people escaping Rescuer / light numbers Appropriate route taken 	<ul style="list-style-type: none"> Recognition of deteriorating circumstances Re-evaluate escape / response options Re-evaluate escape times and duration of SCSR's Primary escapeway chosen, if not, what logic used. 	<ul style="list-style-type: none"> Crew aware of tailgate exit conditions. Note pads used by some. Primary route chosen. SCSR change at cache. 	<ul style="list-style-type: none"> Excellent knowledge of work area. Use of note pads excellent. Primary route only option available until mains reached. Followed procedures.
Travelling	<ul style="list-style-type: none"> Appropriate means decided All crew travelled together Pace of travel appropriate Correct escapeway route was maintained Escapeway was clearly marked Duration of self-rescuers Duration of EBA's Use of lifelines, etc Cut-through's numbered Guidance system Direction indication Segregation 	<ul style="list-style-type: none"> Hand rails / reflective guide to escape route known and guide effective Is route trafficable Adjust / re-set tube bundle line Check doorways (man doors) Record pressures, gas concentrations and general observations Escape plan taken Non-verbal communication set-up Tags taken off board outbye - <i>tags at maingate board</i> 	<ul style="list-style-type: none"> Cache location signs only in tailgate. Tailgate road in fair condition. In tailgate – crew together. In mains – crew spread. Tailgate road escape route "demark". Exit through tailgate drive was extremely difficult. No equipment in cache. No gas monitor in crew. Segregation in mains. 	<ul style="list-style-type: none"> No cache signs clearly marked. Several large swilly made travel difficult. Excellent. Very poor – team spread over 500 metres. Exit at this area requires improvement, possibility of injury here. Extremely poor result. This made escape more difficult. Excellent 'F' Heading escape.

				COMMENT
Observations	<ul style="list-style-type: none"> ▪ Taken note of circumstances and environment. 	<ul style="list-style-type: none"> ▪ Duration times recorded. ▪ Smoke, location, density. ▪ Heat, location. ▪ Gases detected, location and concentration. ▪ Services – compressed air, water, communication, power. ▪ Ventilation status / changes 	<ul style="list-style-type: none"> ▪ Only one real oxy used. ▪ Smoke goggles worn. ▪ No person checked. Only one call made to CRO after start of exercise. ▪ No person had a gas detector. ▪ No leaders nominated. 	<ul style="list-style-type: none"> ▪ 22 minutes – easily made cache. ▪ Crew handled easily – “assumed” smoke only. ▪ This confused CRO. ▪ Unable to detect any changes ▪ No “leader” reduced effectiveness of escape.
Self-rescuers	<ul style="list-style-type: none"> ▪ Self rescuer fitted correctly ▪ Fitted in sufficient time ▪ EBA’s fitted correctly ▪ Fitted in sufficient time ▪ Adequate number of EBA’s ▪ EBA’s at station sufficient in number ▪ Crew takes spare EBA’s ▪ Self-rescuers / EBA’s correctly worn and used ▪ CABA (if used) 	<ul style="list-style-type: none"> ▪ Crew all change to 60 minute units together ▪ Sufficient 60 minute units are available 	<ul style="list-style-type: none"> ▪ In tailgate – yes. ▪ In mains. ▪ Excellent donning ▪ Crew change out at cache. ▪ Cache’s inadequately and inconsistently stocked. ▪ Area marked for caches. 	<ul style="list-style-type: none"> ▪ Excellent. ▪ Poor as crew were spread out. ▪ Well drilled in this area. ▪ This left no spare unit for ‘man down’. ▪ This frustrated team. ▪ No clearly and consistently marked and audited.
Communication with Control Room	<ul style="list-style-type: none"> ▪ Control Room informed of location ▪ How is communication carried out? ▪ Informed on changed conditions? 	<ul style="list-style-type: none"> ▪ Where was communication attempted? ▪ As above with procedures. 	<ul style="list-style-type: none"> ▪ Maingate at incident time. ▪ In tailgate road. ▪ DAC at maingate. 	<ul style="list-style-type: none"> ▪ Excellent response. ▪ No communications available. ▪ Clear and precise – although not repeated.
Arrival on Surface	<ul style="list-style-type: none"> ▪ Muster ▪ Report 	<ul style="list-style-type: none"> ▪ Check off at lamp room ▪ Report to ESO and lamproom 	<ul style="list-style-type: none"> ▪ Duty card and names. ▪ Crew rehydrated. 	<ul style="list-style-type: none"> ▪ Excellent as per Hazard Management Plan. ▪ Excellent – one crew person

				COMMENT
	<ul style="list-style-type: none"> ▪ Medical aid ▪ De-brief 	<ul style="list-style-type: none"> ▪ Arrange medical aid and re-hydrate ▪ De-brief observations ▪ Families notified 	<ul style="list-style-type: none"> ▪ Informed CRO. ▪ Muster area congested. ▪ Rang CRO at 1038am and then hung up. 	<p>in first aid on O2.</p> <ul style="list-style-type: none"> ▪ Followed protocols. ▪ Poor organisation of fatigue persons. ▪ This caused confusion in the control room. Crew appeared to be not aware of 'non-speaking' communications.

DE-BRIEFING OF LONGWALL TAILGATE CREW AUDIT TOOL

Assessor: Allan Purse

				COMMENT
How are they notified of incident?	<ul style="list-style-type: none"> ▪ Communications used for notification of incident to surface if possible. 	<ul style="list-style-type: none"> ▪ Contact with Control ▪ What time were you notified? 	<ul style="list-style-type: none"> ▪ DAC emergency tone at 0921 and PED message at 0925. 	<ul style="list-style-type: none"> ▪ 'Clear message'. ▪ Did not work at tailgate.
How was the incident detected?	<ul style="list-style-type: none"> ▪ Environmental damage noticed? ▪ Change in circumstances? 	<ul style="list-style-type: none"> ▪ Smoke, dust, increase in smoke, etc. ▪ Fall communication passed on. 	<ul style="list-style-type: none"> ▪ No - informed by CRO. ▪ Crew member communications. 	<ul style="list-style-type: none"> ▪ Informed of smoke on its way. ▪ Informed by CRO - excellent.
Did you assemble crew at place of safety?	<ul style="list-style-type: none"> ▪ Place of safety? 	<ul style="list-style-type: none"> ▪ Crib room, SCSR cache, FAB, etc. ▪ Crew mustered at maingate. 	<ul style="list-style-type: none"> ▪ Not all team asked. 	<ul style="list-style-type: none"> ▪ No formal de-briefing list used.
Account for crew of personnel including contractors in section of pit?		<ul style="list-style-type: none"> ▪ How did you account for personnel? 	<ul style="list-style-type: none"> ▪ All debriefed persons questioned and numbers and whereabouts of persons. 	<ul style="list-style-type: none"> ▪ This question line was consistent.
Call to Control to confirm that personnel are accounted for?		<ul style="list-style-type: none"> ▪ Did you make contact with Control? ▪ Phone call at 1038 but did not talk and hung up. 	<ul style="list-style-type: none"> ▪ No - all crew were aware of contact with CRO until at pit bottom. 	<ul style="list-style-type: none"> ▪ This resulted due to crew being separated.
Decide intended route?		<ul style="list-style-type: none"> ▪ What route was used to exit the mine? ▪ Use of emergency escape plan? 	<ul style="list-style-type: none"> ▪ All team aware of route of exit. 	<ul style="list-style-type: none"> ▪ Inconsistent questioning from de-brief card holder.
Location of closest SCSR cache?		<ul style="list-style-type: none"> ▪ Easy to find? ▪ Presence of indication markers and effectiveness? 	<ul style="list-style-type: none"> ▪ Crew all aware of number of units at 6 cut-through and communicated that 	<ul style="list-style-type: none"> ▪ Consistent questioning at this point.

				COMMENT
			man down at same.	
Were there enough rescuers?		<ul style="list-style-type: none"> What was taken? Were smoke goggles put on? 	<ul style="list-style-type: none"> Team commented that insufficient rescuers were available. 	<ul style="list-style-type: none"> Auditor did not enquire at which cut-through's they changed over at.
When rescuer changed over were there any difficulties?		<ul style="list-style-type: none"> Time of change-over? Was the time noted? Did all persons change over from 30 minute to 60 minute units together? Was the time noted? 	<ul style="list-style-type: none"> All persons stated they changed - although not all did. Time not noted. Crew changed together in tailgate, but not in mains. 	<ul style="list-style-type: none"> De-brief person did not follow through in questioning. Auditor did not focus in this area.
Problems encountered on escape route?		<ul style="list-style-type: none"> Visibility / condition of roadway? Heat? Escape route markers followed? Was the condition of the escapees monitored and rate of travel adjusted appropriately? 	<ul style="list-style-type: none"> The only problem noted was an issue with SCSR at 6 North cut-through. 	<ul style="list-style-type: none"> Due to crew separation, two persons were distressed by reaching surface.
What was seen on evacuation route?	<ul style="list-style-type: none"> Environmental? 	<ul style="list-style-type: none"> What were the changes? Was the mine atmosphere monitored continuously? 	<ul style="list-style-type: none"> Swillys in tailgate road between tailgate doors. 	<ul style="list-style-type: none"> Poor emergency travel demarcation in longwall tailgate.
Time taken to reach the surface?		<ul style="list-style-type: none"> Was it recorded? 	<ul style="list-style-type: none"> No person enquired about times. 	<ul style="list-style-type: none"> This information was lost.
Were names checked off?		<ul style="list-style-type: none"> By whom and when? 	<ul style="list-style-type: none"> Duty Card 2D. 	<ul style="list-style-type: none"> Very diligent in this area.
Who approached the crew or personnel on reaching the surface?		<ul style="list-style-type: none"> Was person recognised or easily identifiable? 	<ul style="list-style-type: none"> Yes - identified himself and informed me of his duties. 	<ul style="list-style-type: none"> Only one person volunteered this information.

				COMMENT
What information was given on the surface?		<ul style="list-style-type: none"> Type of information given? To whom was the information given? 	<ul style="list-style-type: none"> Yes. 	<ul style="list-style-type: none"> People were allowed to mill around very uncoordinated.
How long before de-brief took place?		<ul style="list-style-type: none"> Were the crew left waiting unattended? 	<ul style="list-style-type: none"> No. 	<ul style="list-style-type: none"> Little importance given to this task.
Location of de-briefing room?		<ul style="list-style-type: none"> Was the room allocated an emergency plan? 	<ul style="list-style-type: none"> People were asked to "tell their story". 	<ul style="list-style-type: none"> Very unstructured manner to do a debrief.
Personnel involved in de-briefing?		<ul style="list-style-type: none"> Who was involved and what did they ask and record? 		
How was the de-briefing recorded?		<ul style="list-style-type: none"> Tape recorded / notes, etc. 	<ul style="list-style-type: none"> Handwritten notes. 	<ul style="list-style-type: none"> Tape recorder for more accurate data.
Was there a format followed for questions?		<ul style="list-style-type: none"> Was a question list used? 	<ul style="list-style-type: none"> No question list was used. 	<ul style="list-style-type: none"> Formalised question list should be generated.
What types of questions were asked?	<ul style="list-style-type: none"> List of questions. 	<ul style="list-style-type: none"> Relevance of questions in relation to incident? 	<ul style="list-style-type: none"> Person asked just to tell story of incident. 	<ul style="list-style-type: none"> Use of list would prompt people's memories.
Person leading the de-briefing?		<ul style="list-style-type: none"> Identification of person doing the de-brief? 	<ul style="list-style-type: none"> Person did not identify himself. 	<ul style="list-style-type: none"> This would make interviewee uncomfortable.
Was the person/ persons made comfortable during de-brief?	<ul style="list-style-type: none"> Re-hydration Medical aid Food and water 	<ul style="list-style-type: none"> Provision of same. 	<ul style="list-style-type: none"> Re-hydration, medical aid - yes. No food other than person's cribs. 	<ul style="list-style-type: none"> All persons left milling around the muster area.

				COMMENT
<p>Time of de-briefing?</p>		<ul style="list-style-type: none"> ▪ Length of de-brief? 	<ul style="list-style-type: none"> ▪ Times varied. ▪ 1158 - A Best ▪ 1210 - T Cortous ▪ 1215 - S Kell ▪ 1230 - M Chammer ▪ 1240 - T Verner ▪ 1245 - K Restell ▪ 1300 - D Woods 	<ul style="list-style-type: none"> ▪ De-briefer let his opinion guide his questioning.
<p>Was all information gathered?</p>		<ul style="list-style-type: none"> ▪ Anything missed? 	<ul style="list-style-type: none"> ▪ Inconsistent questioning. ▪ Very little questioning on missing person. 	<ul style="list-style-type: none"> ▪ No structure to question format - allowed many holes in the replies.

CONDUCT FIRE TEAM OPERATIONS AUDIT TOOL
(Underground Fire Fighting Effort)
Assessor: Ken Singer

				COMMENT
Plan and prepare for work	<ul style="list-style-type: none"> Access, interpret and confirm legislative and site requirements governing fire team operations. 	<ul style="list-style-type: none"> Operate to site standards and procedures. Review legitimacy of site procedures and standards. 	<ul style="list-style-type: none"> To standard. Not to standard. 	<ul style="list-style-type: none"> SOP was followed. SOP for Fire Prevention appears focussed on surface operations. A formal hazard identification and risk management document for the underground could not be sighted or linked to the SOP for Fire Prevention (refer to <i>Coal Mining Safety and Health Act, Section 14</i>).
	<ul style="list-style-type: none"> Identify and confirm personal safety requirements and the individual's role in the fire team. 	<ul style="list-style-type: none"> Applying personal and operational safety procedures. Team delegated roles. 	<ul style="list-style-type: none"> To standard. 	<ul style="list-style-type: none"> The Captain of the Mines Rescue Team adequately assigned tasks to his team. In some circumstances, the use of short sleeve shirts and shorts can increase risk to fire fighters. The operator of the vehicle passed into smoke. That may impact on his safety and health in some circumstances.

				COMMENT
	<ul style="list-style-type: none"> Identify and clarify fire risks in the mine and the likely impact and responses to site specific hazards. 	<ul style="list-style-type: none"> Interpreting and communicating information on fire fighting operations. Identifying the type and nature of the fire. 	<ul style="list-style-type: none"> Underground operations to standard. IMT - not to standard. 	<ul style="list-style-type: none"> There was no formal risk assessment conducted by the IMT prior to dispatching the mines rescue team underground. Information not adequately gleaned from operator (ie., size of fire, location of fire, etc.)
	<ul style="list-style-type: none"> Identify and confirm location and range of appliances held at relevant fire boards, depots, sub-stations and stations by site visit. 	<ul style="list-style-type: none"> Selecting the appropriate equipment for the fire type. Reporting the fire. 	<ul style="list-style-type: none"> To standard. 	<ul style="list-style-type: none"> 'C - A' fire fighting plan was available. Apparatus was in place in accordance with the plan. Mines rescue team stopped and audited the fire sub-station. Foam used.
	<ul style="list-style-type: none"> Achieve and maintain readiness for operations by participation in scheduled training and fire drills. 	<ul style="list-style-type: none"> Review legitimacy of site procedures and standards. 	<ul style="list-style-type: none"> Not assessed. 	<ul style="list-style-type: none"> Training documentation for persons deemed competent to use DCP extinguishers was not sighted.
Fight or contain fires	<ul style="list-style-type: none"> Receive notification of fire operations from the appropriate authority, clarify and confirm. 	<ul style="list-style-type: none"> Authority Operator to site standards and procedures. 	<ul style="list-style-type: none"> To standard. 	<ul style="list-style-type: none"> Mines rescue team had written permission to proceed.
	<ul style="list-style-type: none"> Move to the fire site in accordance with site procedures. 	<ul style="list-style-type: none"> Use mobile vehicles in accordance with SOPs. Follow mines rescue instructions. 	<ul style="list-style-type: none"> To standard. 	<ul style="list-style-type: none"> Team proceeded to the fire site in accordance with instructions received on the surface.

				COMMENT
	<ul style="list-style-type: none"> Identify, receive and clarify details of the type, nature, source and intensity of the fire and pass to appropriate authorities. 	<ul style="list-style-type: none"> Applying fire fighting procedures. Applying evacuation procedures. Reporting the fire. 	<ul style="list-style-type: none"> To standard. 	<ul style="list-style-type: none"> The mines rescue team passed on relevant information to the fire watch. The Captain regularly called the surface and gave an accurate update.
	<ul style="list-style-type: none"> Select appliances and equipment appropriate to the fire circumstances and apply in accordance with manufacturer's / site specifications. 	<ul style="list-style-type: none"> Completing operator maintenance on fire fighting equipment. 	<ul style="list-style-type: none"> To standard. 	<ul style="list-style-type: none"> In some circumstances, DCP extinguishers are only effective when applied in a rapid sweeping motion. The use of low expansion foam was appropriate. The turbex (high expansion foam generator) was available. Two connections came apart when water was applied. This situation was corrected by rejoining the connections to standard. In some circumstances, the mine site may not have an appropriate amount of fire fighting foam on site, or readily available.
	<ul style="list-style-type: none"> Continually monitor conditions in the fire area and modify fire fighting techniques / applications to reduce the impact of identified and potential hazards. 	<ul style="list-style-type: none"> Working co-operatively within the fire team. Applying fire fighting procedures. Applying evacuation procedures. 	<ul style="list-style-type: none"> To standard. 	<ul style="list-style-type: none"> The operator of the vehicle evacuated (as directed). There was an absence of information for 5 hours until the mines rescue team 1 arrived at the site. The mines rescue team monitored conditions and controlled risks at the fire site (eg., maintained a distance of 10 metres initially, use fog nozzle to shield from heat, worked in muddy conditions).

				COMMENT
	<ul style="list-style-type: none"> Avoid unnecessary risks to the individual and other team members and follow evacuation procedures in accordance with site rules. 	<ul style="list-style-type: none"> Avoiding panic situations. Applying fire fighting procedures. Applying evacuation procedures. Reporting the fire. 	<ul style="list-style-type: none"> To standard. 	<ul style="list-style-type: none"> The operator of the vehicle passed in front of the vehicle. During this time (approximately 4 seconds) he was in "in smoke". That may impact on his safety and health in some circumstances. This desire to do that may be due to the "simulated" nature of the exercise.
	<ul style="list-style-type: none"> Apply isolation procedures in accordance with site rules. 	<ul style="list-style-type: none"> Isolate HT cable if necessary. Restrict entry to mine. 	<ul style="list-style-type: none"> To standard. 	<ul style="list-style-type: none"> Power was isolated at the surface. In the scenario, the HT cable would have been damaged within approximately 2 hours of the fire starting.
Finalise the operation	<ul style="list-style-type: none"> Avoid fire recurrence by the appropriate processes including watering, rake down and chemical means. 	<ul style="list-style-type: none"> Applying fire fighting procedures. Assess risk. 	<ul style="list-style-type: none"> To standard. 	<ul style="list-style-type: none"> A fire watch team was deployed.
	<ul style="list-style-type: none"> Isolate, rope-off, secure and monitor in fire area in accordance with site procedures. 		<ul style="list-style-type: none"> To standard. 	<ul style="list-style-type: none"> Hazard markers were in place.
	<ul style="list-style-type: none"> Clean and inspect appliances and equipment and replace in the designated location or process for maintenance and repair. 		<ul style="list-style-type: none"> To standard. 	<ul style="list-style-type: none"> A replacement fire extinguisher was placed at 9 cut-through.

				COMMENT
	<ul style="list-style-type: none">Undertake debriefs and complete records in accordance with mine procedures.	Completing debriefing processes.	<ul style="list-style-type: none">To standard, however, there is room for improvement.	<ul style="list-style-type: none">At no time was the exact location of the fire accurately known (ie., it was actually at 9 cut-through + 20 metres). The fire was relatively simple to fight, and remained oxygen rich.

RESPOND TO LOCAL EMERGENCIES AND INCIDENTS AUDIT TOOL
(Underground Fire Fighting Effort)
Assessor: Ken Singer

				COMMENT
Prepare for emergency procedures	<ul style="list-style-type: none"> Locate and maintain emergency equipment in accordance with statutory requirements, site procedures and manufacturers specifications. 	<ul style="list-style-type: none"> Resources are in a state of readiness. Resources are located in accordance with mine site documentation. 	<ul style="list-style-type: none"> To standard. Not to standard. 	<ul style="list-style-type: none"> Fire hoses in Depot E9 - 10 were not in fit-for-purpose state. Resources were located in accordance with the mine plan.
	<ul style="list-style-type: none"> Identify and confirm nature, scope and location of the emergency or incident. 	<ul style="list-style-type: none"> Operator is aware that a fire is an emergency event. Mine rescue team is appropriately briefed of the emergency. 	<ul style="list-style-type: none"> To standard. 	<ul style="list-style-type: none"> The exact location of the fire was stated as D9. It was actually D9 + 20 metres.
	<ul style="list-style-type: none"> Assess emergency or incident and determine appropriate course of action in keeping with the requirements for personal safety. 	<ul style="list-style-type: none"> SOP is followed. Mine rescue team assess hazards and respond appropriately. 	<ul style="list-style-type: none"> Not to standard. To standard. 	<ul style="list-style-type: none"> The operator of the vehicle went into smoke in order to chock the wheels. This may have caused adverse health effects in some circumstances. He did not accurately state the location of the incident. He did not request a repeat of the messages.
	<ul style="list-style-type: none"> Notify emergency or incident in accordance with authorised procedures and methods of communication. 	<ul style="list-style-type: none"> Follow SOP. Follow Mines Rescue Protocol. 	<ul style="list-style-type: none"> Not to standard. To standard. 	<ul style="list-style-type: none"> The SOP requires the message to be repeated and if assistance is required. This did not happen during the initial notification.

				COMMENT
Respond to emergency or incident situations	<ul style="list-style-type: none"> Follow emergency evacuation procedures where appropriate and in accordance with site procedures. 	<ul style="list-style-type: none"> Follow SOP. Follow Mines Rescue Protocol. 	<ul style="list-style-type: none"> To standard. To standard. 	<ul style="list-style-type: none"> Operator evacuated.
	<ul style="list-style-type: none"> Coordinate and control response to emergency or incident to ensure continuing safety of personnel at the site. 	<ul style="list-style-type: none"> Incident Management Team procedure. Mines Rescue Team process. 	<ul style="list-style-type: none"> Not to standard. To standard. 	<ul style="list-style-type: none"> There was no risk assessment conducted prior to sending the Mines Rescue Team 1 to the fire site. Members of the team were not wearing appropriate clothing (eg., refer to mine induction regarding long sleeve shirts and pants). What is the risk associated with burning tyres?
	<ul style="list-style-type: none"> Isolate potential sources of danger and put in place warning signs / signals / barriers. 	<ul style="list-style-type: none"> HT cable identified as a risk. 	<ul style="list-style-type: none"> To standard. 	<ul style="list-style-type: none"> The machine was shut down and power was isolated through the Incident Management Team.
	<ul style="list-style-type: none"> Select emergency equipment and use it appropriately to deal with the emergency. 	<ul style="list-style-type: none"> Fight fire with appropriate apparatus. 	<ul style="list-style-type: none"> To standard. 	<ul style="list-style-type: none"> A DCP powder extinguisher was used during the initial response. Mines Rescue Team 1 used appropriate apparatus.
	<ul style="list-style-type: none"> Take local measures to reduce impact of emergency or incident. 	<ul style="list-style-type: none"> Follow SOP. Mines Rescue Team treats fire in accordance with protocol. 	<ul style="list-style-type: none"> To standard. To standard. 	

				COMMENT
	<ul style="list-style-type: none"> ▪ Continually monitor and assess emergency situation and changes in circumstances, communicate requests for further assistance or evacuation to appropriate officials. 	<ul style="list-style-type: none"> ▪ Personnel at the fire site respond in accordance with protocol. 	<ul style="list-style-type: none"> ▪ To standard, although there is room for improvement. 	<p>Mines Rescue Team 1 demonstrated competency in fighting the fire, and handed over to the fire watch crew. The fire watch crew may not have been competent in using the fire hoses. Mines Rescue Team were debriefed on their arrival on the surface.</p>

EMERGENCY EVACUATION SYSTEM - LONGWALL CREW ON FACE AUDIT TOOL

Assessor: Martin Olsen

				COMMENTS
Incident Received	<ul style="list-style-type: none"> ▪ Incident received ▪ Correct message received ▪ Emergency alarm recognised 	<ul style="list-style-type: none"> ▪ Recognition of changed circumstances ▪ Attempt communication ▪ TARPs consulted / followed ▪ TARPs known ▪ Communication from Senior Official 	<ul style="list-style-type: none"> ▪ Notified by Control of fire at D9, smoke entering workings. ▪ No TARPs available. ▪ Deputy not present in panel. ▪ Contacted Control and informed of persons on face and intended route of travel. 	<ul style="list-style-type: none"> ▪ The donning of SCSR's with impaired visibility was excellent. ▪ The assistance and cooperation amongst the crew was excellent when crossing the tailgate drive.
Incident Communicated	<ul style="list-style-type: none"> ▪ All crew members accounted for ▪ All crew members notified ▪ Crew marshalled together ▪ Options considered ▪ Partial / total evacuation ▪ All contractors notified 	<ul style="list-style-type: none"> ▪ Location of outbye workers considered ▪ Plan formulated and decided on ▪ CABA response considered ▪ Emergency telephone used, procedure followed ▪ State name ▪ Give location, type of incident and injured, assistance required ▪ Have message repeated back ▪ No speaking procedure known / used ▪ ERZ Controller has list of all persons in section ▪ ERZ Controller has PED ▪ All non-event communications stop 	<ul style="list-style-type: none"> ▪ PED message received to evacuate the pit. 	<ul style="list-style-type: none"> ▪ No repeat back on message occurred throughout the entire exercise which led to confusion at pit bottom where Control Room Officer and person at pit bottom spoke into DAC simultaneously without realising.

				COMMENTS
Incident Equipment	<ul style="list-style-type: none"> ▪ Self rescuer fitted ▪ First aid equipment taken ▪ EBA units taken ▪ Tools required ▪ CABA (if necessary) 	<ul style="list-style-type: none"> ▪ Recognition of expected duration ▪ Location of SCSR / CABA / TRAUMA kits known and within 500m and 1000m for SCSR ▪ Emergency phone taken ▪ Emergency plan taken up to date >1 month and in crib rooms and caches ▪ Writing material in SCSR cache's 	<ul style="list-style-type: none"> ▪ No writing materials in caches. 	<ul style="list-style-type: none"> ▪ Mine plans in caches in mains but not in caches in tailgate.
Escape Route	<ul style="list-style-type: none"> ▪ Escape route determined ▪ Escape route communicated to Control Room ▪ Number of people escaping ▪ Rescuer / light numbers ▪ Appropriate route taken 	<ul style="list-style-type: none"> ▪ Recognition of deteriorating circumstances ▪ Re-evaluate escape / response options ▪ Re-evaluate escape times and duration of SCSR's ▪ Primary escapeway chosen, if not, what logic used. 		
Travelling	<ul style="list-style-type: none"> ▪ Appropriate means decided ▪ All crew travelled together ▪ Pace of travel appropriate ▪ Correct escapeway route was maintained ▪ Escapeway was clearly marked ▪ Duration of self-rescuers ▪ Duration of EBA's ▪ Use of lifelines, etc ▪ Cut-through's numbered ▪ Guidance system ▪ Direction indication 	<ul style="list-style-type: none"> ▪ Hand rails / reflective guide to escape route known and guide effective ▪ Is route trafficable ▪ Adjust / re-set tube bundle line ▪ Check doorways (man doors) ▪ Record pressures, gas concentrations and general observations ▪ Escape plan taken ▪ Non-verbal communication set-up ▪ Tags taken off board outbye 	<ul style="list-style-type: none"> ▪ Non-verbal communications attempted by phoning Control and hanging up. 	<ul style="list-style-type: none"> ▪ This was done in an attempt to let Control know that persons were in 'F' Heading. No verbal communications were attempted due to uncertainty about atmosphere. ▪ A mix up occurred because Control rang the phone back and another group escaping the mine took their SCSR's off and answered the phone 4 minutes later. This group believed the phone call to be a signal from Control that they were in fresh air.

				COMMENTS
	<ul style="list-style-type: none"> ▪ Segregation 			
Casualty	<ul style="list-style-type: none"> ▪ Patient handling and care of casualty. 	<ul style="list-style-type: none"> ▪ Were the needs of the casualty catered for appropriately? 	<ul style="list-style-type: none"> ▪ Casualty placed under air pipe range. ▪ No air hose connected. ▪ Casualty told not to move. 	<ul style="list-style-type: none"> ▪ Good. ▪ Reduced effectiveness significantly. ▪ Casualty has right to try to escape if they wish.
Self-rescuers	<ul style="list-style-type: none"> ▪ Self rescuer fitted correctly ▪ Fitted in sufficient time ▪ EBA's fitted correctly ▪ Fitted in sufficient time ▪ Adequate number of EBA's ▪ EBA's at station sufficient in number ▪ Crew takes spare EBA's ▪ Self-rescuers / EBA's correctly worn and used ▪ CABA (if used) 	<ul style="list-style-type: none"> ▪ Crew all change to 60 minute units together ▪ Sufficient 60 minute units are available 	<ul style="list-style-type: none"> ▪ At the 5 cut-through cache, two team members changed over and the other six members did not. 	<ul style="list-style-type: none"> ▪ The six members who did not changeover at 25 cut-through changed over within 40 minutes of donning their units.
Communication with Control Room	<ul style="list-style-type: none"> ▪ Control Room informed of location ▪ How is communication carried out? ▪ Informed on changed conditions? 	<ul style="list-style-type: none"> ▪ Where was communication attempted? ▪ As above with procedures. 	<ul style="list-style-type: none"> ▪ Communication from P/B. Information not transferred due to person at the DAC and Control both talking simultaneously without realising. 	<ul style="list-style-type: none"> ▪ This mix up resulted in the notification to Control of the collapsed casualty in the tailgate.

QMRS - PERFORMANCE CRITERIA AUDIT TOOL

Assessor: Murray Bird

				COMMENTS
QMRS Performance Criteria	Written Mines Rescue Agreement?	<ul style="list-style-type: none"> ▪ Existence. 		
	Did corporation meet its obligations under the Agreement?	Mutual Assistance <ul style="list-style-type: none"> ▪ Superintendent ▪ 14 team members ▪ 3 GAG Operators ▪ Equipment Duty Cards Station Action Sheets / Time Logs	Yes Yes, 18 team members Yes Yes Yes	Very prompt. Nth Goonyella - 5; Moranbah Nth - 2; Newlands - 12.
	Annual exercise?	<ul style="list-style-type: none"> ▪ Participation. ▪ Emergency Exercise Committee participation? 	Yes Yes	
	Appropriate training?	Did trainees and GAG operators - <ul style="list-style-type: none"> ▪ Demonstrate ability to use BA / GAG? ▪ Demonstrate ability to use rescue equipment? ▪ Demonstrate familiarity with rescue? Procedures and protocols Demonstrate confidence in ability to render aid? Demonstrate professional conduct?	Yes Yes Yes Yes Yes	Didn't use GAG. Equipment tested efficiently. Good.

				COMMENTS
	Equipment?	<ul style="list-style-type: none"> ▪ Maintained? ▪ Available? ▪ Tested? ▪ Certified? 	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>	
	Mutual assistance?	<p>MR Call Out Procedure -</p> <ul style="list-style-type: none"> ▪ Effective? ▪ Deployment of personnel? ▪ Arrived in specified time frames? 	<p>Yes</p> <p>OK</p> <p>Yes</p>	Newlands excellent - low on trainees from others.
Operational Efficiency	Operational Mine Inertisation	<ul style="list-style-type: none"> ▪ Arrival of GAG ▪ Arrival of support vehicles / services ▪ Fabrication of GAG ▪ Hook up of GAG ▪ Operation of emergency seals ▪ Operation of GAG ▪ On-going continuous operation - operators and support services. 	<p>Yes</p> <p>N/A</p> <p>N/A</p> <p>N/A</p> <p>N/A</p> <p>N/A</p> <p>N/A</p>	Promptly.
	Duty Card Holders	<p>Mines Rescue Superintendent</p> <ul style="list-style-type: none"> ▪ Receives call from non-affected mine. ▪ Issues Duty Cards. ▪ Participates in Incident Control. <p>Fresh Air Base Controller</p> <ul style="list-style-type: none"> ▪ Links to FAB to Superintendent <p>MR Surface Controller</p> <ul style="list-style-type: none"> ▪ Surface facilities 	<p>Yes</p> <p>Not witnessed</p> <p>Yes</p> <p>None</p> <p>Yes</p>	<p>Answered first call.</p> <p>Very quiet.</p> <p>Later in exercise Rescue Room contact FAB for information as they were not getting updated.</p> <p>Good effort and good change-over.</p>

				COMMENTS
	<p>Active Team Deployment</p> <ul style="list-style-type: none"> ▪ Briefing understood ▪ Route identified ▪ Standby team briefed ▪ Team briefed ▪ Suite and equipment checks ▪ Captains card ▪ Procedures and time taken ▪ Radio communication 	<ul style="list-style-type: none"> ▪ Relevant questions? ▪ Plan marked? ▪ Plan and intentions made known? ▪ Observation and paperwork? ▪ Left with Controller? ▪ Observation 	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Good</p> <p>Yes</p> <p>Good</p>	<p>Briefing continually changed / updated. Few notes from Incident Management Team used – mainly done off the top of the head.</p>

QMRS - RESPONSE AUDIT TOOL

Assessor: Murray Bird

				COMMENTS
<p>Stations <i>(Initiate emergency call out procedure)</i></p>	<ul style="list-style-type: none"> ▪ A call for assistance is received. ▪ Validity of call for assistance is verified. ▪ Details of the call area recorded. ▪ Telephone calls to initiate call out are made. ▪ Availability of sufficient rescue personnel is verified. ▪ Mutual response call out is extended if required. ▪ Station duty card procedures are implemented. ▪ Any required equipment is loaded for transport. ▪ Person in charge proceeds to Colliery. 	<ul style="list-style-type: none"> ▪ Required call out documents are located? ▪ Procedures are followed and information recorded? ▪ Contingency arrangements are made in the event of failure of prepared procedures to deliver expected outcomes? ▪ Delivery of information via the telephone is concise and clear? ▪ Delegation is authoritative? ▪ Time management is efficient and effective? 	<ul style="list-style-type: none"> ▪ Yes ▪ Yes ▪ Backup's - yes ▪ Yes ▪ Yes ▪ Yes 	<ul style="list-style-type: none"> ▪ If anything too much information sent and recorded. ▪ Arrived at mine with appropriate equipment as expected.

				COMMENTS
<p>Mine Site</p>	<ul style="list-style-type: none"> ▪ Official in charge at mine is identified. ▪ Current information is obtained. ▪ Sister station is advised of situation. ▪ Location of rescue team preparation area is verified. ▪ Relevant duty card authority for this area is delegated. ▪ Incident Management Team personnel are identified and liased with. ▪ Control strategies are developed. ▪ Briefing for rescue team is prepared and recorded. ▪ Rescue teams are briefed. ▪ Active team operations are monitored. 	<ul style="list-style-type: none"> ▪ Procedures are followed and information recorded. Contingency arrangements are made in the event of failure of prepared procedures to deliver expected outcomes. ▪ Delivery of information via the telephone is concise and clear. ▪ Delegation is authoritative. ▪ Time management is efficient and effective. 	<p>Yes</p> <p>Partially</p> <p>Good</p> <p>Good</p> <p>Not really</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Sometimes</p>	<p>Identification jackets would help.</p> <p>No clear briefing - had to gain knowledge over a period of time.</p> <p>Yes - in rescue room, not IMT.</p> <p>Poorly</p> <p>Too much of the top of the head. Mines rescue taken out of the information loop. Tried to get information.</p>

				COMMENTS
	<ul style="list-style-type: none"> ▪ Rescue teams are debriefed. ▪ Access to building is available. ▪ BG-174's, RZ-25 test minimum instruments, team minimum equipment and spare operational equipment is located. ▪ Above equipment is loaded for transport to North Goonyella. ▪ Sub-station is prepared for on-going operations. ▪ Equipment is unloaded at designated area. ▪ Prescribed checks and tests on equipment are carried out and results recorded. 	<ul style="list-style-type: none"> ▪ Identification of rescue personnel to Gatehouse. ▪ Utilisation of available vehicles for equipment transport. ▪ Knowledge of equipment location. ▪ All required equipment is taken. ▪ Due care in relation to equipment handling is exercised. ▪ Time management is efficient and effective. ▪ In the absence of a Rescue Station Official, control and authority is exercised. ▪ Communication is made to advise of ETA of teams and equipment. ▪ Due care of equipment when unloading. ▪ Prescribed checks and tests are completely and confidently carried out and recorded. 	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Most of the time.</p> <p>Yes – once men available.</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>	<p>No prompt sheet. Team debrief did not get all information.</p> <p>3 teams gear okay.</p> <p>Were not told what to prepare for and how many teams to prepare for.</p>
	<ul style="list-style-type: none"> ▪ Teams of required numbers are formed. ▪ Team Captains and Vice Captains are appointed. ▪ Team briefings are received and understood. ▪ Extra equipment, if required, is identified and prepared for use. 	<ul style="list-style-type: none"> ▪ In an absence of a Rescue Station Official, control and authority is exercised. ▪ Input and receipt of information at the team briefing is relevant and positive. ▪ Time management is efficient. 	<p>Yes – once men were available.</p> <p>Yes</p> <p>Generally</p>	<p>This was confused and not managed well in that the Rescue Room had different captains to that of IMT. Suggest that Mines Rescue Superintendent to establish teams membership and communicate to all.</p>

SITE RESCUE COORDINATORS EFFECTIVENESS AUDIT TOOL

Assessor: Murray Bird

				COMMENTS
Protecting and assisting persons involved in First Response First Aid	The Site Rescue Coordinator maximises the safety of personnel in coordinating any first aid response.	<ul style="list-style-type: none"> ▪ Assess any risk in any first response. ▪ Minimise exposure to risk. 	<ul style="list-style-type: none"> ▪ Yes ▪ Yes 	<ul style="list-style-type: none"> ▪ Had a good grasp on what was happening and what was needed.
Protecting and assisting persons involved in aided escape	The Site Rescue Coordinator maximises the safety of personnel in coordinating any aided escape response.	<ul style="list-style-type: none"> ▪ Initiates QMRS call out if necessary. ▪ In conjunction with Site Emergency Controller and QMRS assess risk of any rescue team deployment. 	<ul style="list-style-type: none"> ▪ Yes ▪ Yes 	
Provision of the necessary emergency equipment and services	The Site Rescue Coordinator ensures that sufficient rescue equipment and medical services is available and in readiness on site during an emergency.	<ul style="list-style-type: none"> ▪ Sufficient serviceable rescue equipment is available on site. ▪ Sufficient emergency medical treatment capability is available on site. 	<ul style="list-style-type: none"> ▪ Yes ▪ Yes 	<ul style="list-style-type: none"> ▪ Delegated to Brigade on site. ▪ A bit light on Brigade's from North Goonyella and Moranbah North.
Planning to provide for any escalation of the emergency	The Site Rescue Coordinator ensures that a suitable response can be implemented for any escalation of the emergency through proper planning.	<ul style="list-style-type: none"> ▪ Liaises with Incident Control Committee. ▪ Liaises with QMRS. ▪ Liaises with external assistance agencies. 	<ul style="list-style-type: none"> ▪ Yes ▪ Yes ▪ Yes 	Well done.

SURFACE COMMUNICATIONS AUDIT TOOL

Assessor: Murray Bird

				COMMENTS
Data gathered and disseminated	Incident Management Team Does everybody in the Incident Management Team know what happened and what is now occurring?	<ul style="list-style-type: none"> ▪ Information from initial incident? ▪ Additional data wanted / requested? ▪ Witnesses interviewed? 	Yes Yes Yes	Still need to use whiteboards better. Very well done.
	Technical Support Team Do they know basically what happened, what information is now required, what to look for and why?	<ul style="list-style-type: none"> ▪ Information from initial incident. ▪ Additional data wanted / requested. ▪ Frequency of updates. ▪ Appropriate personnel and equipment prepared. 	Yes Yes Good Yes	Pre-set meeting / updated times.
	Mines Rescue Teams Do they know basically what happened, what information is now required and preparing for what they may need to do?	<ul style="list-style-type: none"> ▪ Information from initial incident. ▪ Additional data wanted / requested. ▪ Frequency of updates. ▪ Appropriate personnel and equipment prepared. 	Yes Yes Yes Yes	Not recorded well in rescue room Not often enough. Well done.
Priorities established	Incident Management Team Does everybody in the Incident Management Team know what the group's priorities are and clear on why?	<ul style="list-style-type: none"> ▪ Discussion of priorities. ▪ Documented or on whiteboard. ▪ Planning done inline with them. ▪ Periodic review of them to determine that they are still appropriate and are being achieved. 	Yes Sometimes Yes Yes	Did this work verbally? Not always clear and updated. Good discussion. Not always documented on whiteboard BUT was in their own notes.

				COMMENTS
	<p>Technical Support Team Does everybody in the Technical Support Team know what the group's priorities area?</p>	<ul style="list-style-type: none"> Discussions on priorities. Information dispatched and reacted to inline with them. Periodic review of them to determine that they are being achieved. 	<p>Good and clear. Yes Yes</p>	
	<p>Mines Rescue Teams Does everybody in the rescue teams know what the Incident Management Team's and mines rescue priorities are and clear on why?</p>	<ul style="list-style-type: none"> Discussion on priorities. Documented or on whiteboard. Planning done inline with them. Periodic review of them to determine that they are still appropriate and they are being achieved. 	<p>No No Limited No</p>	<p>Not clearly communicated Not on boards Not always</p>
Group Dynamics	<p>Incident Management Team How does the Incident Management Team function as a group?</p>	<ul style="list-style-type: none"> Interpretation of new or ongoing information and how it is used? Decision making methods used in determining action plans? How is consensus achieved? Interaction of team members? 	<p>Good Good Through general discussion and risk assessment. Very good.</p>	<p>Good verbal communication. Well done but kept changing plans.</p>
	<p>Technical Support Team How does the Technical Support Team function as a group?</p>	<ul style="list-style-type: none"> Interpretation of new or ongoing information and how it is used? Decision making methods used in determining action plans? How is consensus achieved? Interaction of team members? 	<p>Good General discussion. General discussion / more data. Good</p>	

				COMMENTS
	<p>Mines Rescue Teams How does the Mines Rescue Team function as a group?</p>	<ul style="list-style-type: none"> ▪ Method of updating personnel. ▪ Interpretation of new or ongoing information and how it changes current arrangements. ▪ Decision making methods used in determining how, who, what and when teams and equipment are required and dispatched. ▪ How is this consensus achieved? ▪ Interaction of team members from total group, not just a single mines rescue team. 	<p>Verbal Okay</p> <p>Tough</p> <p>Okay within rescue room. Not with Incident Management Team.</p>	<p>Not often enough. Not active enough.</p> <p>Had little information to work with. Thought they were helping but sometimes going different directions to IMT.</p>
<p>Interaction between groups</p>	<p>How well do the three groups interact and communicate with each other?</p>	<ul style="list-style-type: none"> ▪ Method of communication – verbal, written, etc. ▪ Frequency of communication. ▪ Are communications one-way or two-three ways? ▪ Is the critical information being clearly communicated? ▪ Is there too much ‘nice to know’ information being communicated? 	<p>Lot of written and verbal – lacking detail. On an ‘as needed’ basis. Mostly one-way, but if very important – two-way. Not always – a lot of misinformation.</p> <p>No</p>	
<p>Recording of information</p>	<p>How well do the groups record critical data and events?</p>	<ul style="list-style-type: none"> ▪ Who recorded the information? ▪ Methods of recording? ▪ Is it easily reviewed by group members? ▪ Does it fulfil the needs of the exercise? ▪ Would it fulfil the needs of an 	<ul style="list-style-type: none"> ▪ Everybody had their own report books. Not enough whiteboard information for everyone. ▪ Personal books and some preferred papers. ▪ No ▪ Historically yes – for current use – no. ▪ Yes 	

				COMMENTS
		inquest?		
Reality of exercise and roles filled	Incident Management Team Do participants react to the exercise the same way that they would in reality?	<ul style="list-style-type: none"> ▪ Do participants clearly understand the dangers and priorities? ▪ Are participants just following prompt cards? ▪ Are decisions and actions being implemented in a timely manner? ▪ Are participants more worried about making a mistake rather than solving the problem? 	<ul style="list-style-type: none"> ▪ Yes ▪ Sometimes ▪ Sometimes ▪ Yes - early on. 	Overall - the exercise was taken seriously. Early on 'Duty Cards' took priority over what was needed to be done.
	Technical Support Team Do participants react to the exercise the same way that they would in reality?	<ul style="list-style-type: none"> ▪ Do participants clearly understand the dangers and priorities? ▪ Are participants just following prompt cards? ▪ Are decisions and actions being implemented in a timely manner? ▪ Are participants more worried about making a mistake rather than solving the problem? 	<ul style="list-style-type: none"> ▪ Yes ▪ Early on only. ▪ Yes - usually. ▪ Sometimes 	
	Mines Rescue Teams Do participants react to the exercise the same way that they would in reality?	<ul style="list-style-type: none"> ▪ Do participants clearly understand the dangers and priorities? ▪ Are participants just following prompt cards? ▪ Are decisions and actions being implemented in a timely manner? ▪ Are participants more worried about making a mistake rather than solving the problem? 	<ul style="list-style-type: none"> ▪ Sometimes ▪ Sometimes ▪ Mostly - IMT's decision. ▪ Yes 	Too much time on doing paperwork rather than actually participating in process (IMT area).

APPENDIX 1 – REVIEW OF AN INCIDENT AT AVON COLLIERY

Paper IV

REVIEW OF AN INCIDENT AT AVON COLLIERY AND DANGERS ASSOCIATED WITH FIRES OF MACHINERY UNDERGROUND

J. Hetherington*

Introduction

For convenience, the treatment of the subject of this paper is divided into two parts.

The major part of the paper is devoted to a description of the detection, location and extinguishing of a fire at Avon Colliery which was initiated by a transport vehicle and which spread to roof supports, then inevitably, to a fall of top coal when the roof supports failed.

The latter part of the paper discusses the dangers associated with fires on machinery underground with particular reference to the dangers to mine personnel. To illustrate these dangers, information is given on some previous fires around the world since 1950.

PART I – REVIEW OF AN INCIDENT AT AVON COLLIERY

Description of Avon Colliery

Before describing the fire at Avon it is appropriate to give a brief description of the mine and its operation.

Location

The mine is located on the Illawarra Escarpment some 5 kilometres west of Dapto, NSW.

Seam Worked

The basal 3 metres of the 10 metres thick Wongawilli Seam is mined. The seam is a low volatile coal not liable to spontaneous combustion. Methane has not been found in the workings in detectable quantities either in first or pillar workings using oil flame safety lamps and methanometers. The seam dips at 1 in 50 to the north-west.

Production

Coal is won from three continuous miner and shuttle car production units to produce approximately one million tonnes of coal per annum.

System of Mining

The bord and pillar system of mining is employed in first workings and a variation of the Wongawilli system is used in pillar extraction. Headings and cut-throughs are normally set out at 40 metre centres.

Manning

The mine is organised on a three shifts per day basis and employs 127 men.

Physical Conditions and Roof support

The immediate coal roof is generally weak, requiring heavy flatted baulk cross timbers set on legs for support. Carriers of timber or steel and roof bolts are installed at intersections. (Fig. 1). The coal as mined is normally damp but dries out readily in standing pillars. Water of nuisance value only is countered in the mine workings.

Underground Transport

Coal is transported from the mine on 1.067 metre wide, 182.9 metres (42 inch wide, 600 feet) per minute conveyor belts. Materials are transported on rubber tyred Rhino transporters.

At the time of the fire men were transported underground on the Rhino transporters enclosed in a sheet steel canopy in which seats were fitted. Cushions of sheet dunlopillow covered by vinyl were fitted to these seats. Subsequent to the fire, men were transported on a Domino P.E.T but this has now been phased out in favour of an articulated Myne Truk transporter. The main reason for the change in mode of transport is to increase speeds up to 24 km.p.h, and reduce maintenance costs.

Ventilation

The mine is ventilated by a 2.8 metre axial flow Richardson fan which normally produces 85 m³/sec of air at a pressure of 1.24 kilopascals (5 inches of water gauge). Approximately 21 m³/sec flows in the face cut-through of each of the three working sections which were 30's, 24's and 27's at the time of the fire. (Fig. 2)

Fire Fighting Equipment

This is maintained to at least the standards required by the Coal Mines Regulation Act including provision of the following:-

- 227,000 litres concrete water tanks capable of automatic replenishment from the 227 megalitre underground storage or the 68 megalitre surface storage dam by a 30 litre per second pump.
- A 100 millimetre diameter steel victaulic pipe main in the Main Headings, Sub-Main Headings and Pillar Extraction Panels. (Fig. 3)
- A Guldner type LK diesel engine powered National DP70 foam generator capable of producing 3.3m³/sec of foam at up to 0.62 kilopascals.

Organisation in Case of Disaster

This is set up along the general lines suggested in the Mines Department publication of the same name. Additionally, Avon Colliery is part of the South Coast Rescue Station Mutual Assistance Plan as shown on Figure 4.

Further still, trained rescue personnel are employed on each shift, a total of 13 trained personnel being available altogether. Five sets of breathing apparatus are maintained ready for use at all times.

Detection of a Condition of Danger and Withdrawal of Men

On Friday, 29th August 1976, the dayshift at Avon, consisting of 32 men, proceeded underground as normal at 6 a.m. on the Rhino man transport. The men arrived at their working places in 30's Section at approximately 6.40 a.m. (Fig. 5)

At 8.15 a.m. a workman discovered light blue smoke at the conveyor tail end. The events which followed are best described in the words of this man, another workman and the Section Deputy.

Statement by Machineman....¹

"I am employed as a machineman at Avon Colliery. On the Friday, 29th August I travelled into the section in the Rhino transport vehicle. I got out with the rest of the men at about 6.40 a.m. near the section transformer. "I went straight up to the face area, as I am the miner driver." "About 8.15 a.m. I went back to the crib area which is a pillar length back from the face in B heading.

"I went to the telephone at the boot end to make a call and I discovered light white / blue smoke near the boot end. As we had been cutting a stone roll, I thought it might have been a piece of stone caught in the boot end. "After a quick inspection I discovered the smoke was coming from further outbye towards the drive head.

"I asked several of the men to come with me from the crib area to make a further inspection. The Deputy was at the face. The electrician and two machinemen, came back with me. Four men were left in the section. We then proceeded up the belt road, B heading, and got within 9 metres of the drivehead, cut-through, and crossed the belt and went into A heading of 30's Section. We proceeded into the belt road, B heading, of 15's Section and turned the belt off with a switch at 22 C.T.

"At that stage I sent ... back into the Section to get the rest of the men out. There was thick smoke inbye of where we were in 15 Section. The smoke had taken on a darker colour. "Myself and ... proceeded down the belt road and smoke appeared to be coming out of the cut-through to the left where the transformer was - 23 C.T.

"We went back outbye to the next cut-through and down inbye in C heading. We stayed at that position, about 22 C.T., until the rest of the men came out of the Section. We could see their lights as they came out. We could hear sounds like muffled bangs or small explosions.

"We presumed the transformer was on fire at that stage. From then on we were under the direct instructions of the Deputy".

Statement by Deputy

"I am employed as a Deputy at Avon Colliery. On Friday, 29th August, we proceeded into the section on the Rhino transport vehicle. I disembarked at 34 C.T. then I went and started No. 12 drivehead and walked into the section along the belt road. I went to 15 and 30 driveheads and then up to the face. I was at 30 drivehead at about 7 a.m. The miner was in B heading.

" came up to me at the face and told me there appeared to be a fire at the section drivehead. This was about 8.20 a.m.

¹ Names deleted throughout

"I turned the power off at the load centre in C heading, No. 3 C.T. and I could smell smoke when I got up to the belt road. The smell was acrid and was stinging my eyes. It was near the roof, and a light blue colour. and I proceeded outbye along A heading after calling two men at the miner to come outbye also. They called back that they would follow. We met ... on the way out.

"I doubled back, rang the undermanager and took the phone with me. We joined into the phone line at 20 C.T. in the belt road. We all grouped together, and I was advised the electrician had gone outbye and switched off the 11 K.V. isolator for the area. The electrician came back in later. I made inspections in B, C, and A headings and there was thick grey smoke in each heading. It was down as far as 21 C.T. in A and B headings and 20 C.T. in C heading. The smoke was very hot, and right down to the floor.

"I sent three men out to fetch a fire depot in from further outbye. There were several muffled explosions during the period. I rang the Under-Manager for the third time and recommended that rescue teams be called in. We were forced outbye due to the smoke, a pillar length at a time until we were back at 17 C.T. The Under-Manager arrived and we formed a rescue team to make an inspection as best we could. We went down C heading, but we did not have smoke goggles and we could only get about 2 ½ pillar lengths inbye. It was extremely hot.

"Then we went down B heading using the belt structure to guide us. We found it was hottest at 22 C.T. Visibility was zero from 18 C.T. inbye. At 23 C.T. we held hands and tried to see if there was a glow at the transformer where we still thought the fire might be. When we got back to 17 C.T. work commenced to erect brattice screens across A and B headings. This was about 11 a.m. I was in a fourth team which found the transformer was not on fire, and we found the fall in C heading at 24 C.T.

"We then went around the pillar via 23 C.T. and breached the stopping at the bottom of B heading (between 24 and 25 C.T.) and opened the trap door behind the fire and came out. The ventilation improved and it was fairly clear down to 23 C.T. I was then advised to take my rescue suit off and proceed out of the mine by the Under-Manager."

Statement by Rhino Transport Driver

"My name is I am employed as a machineman at Avon Colliery. On Friday, 29th August at about 6 a.m. I picked up the Rhino transport vehicle from the surface. I filled the radiator and water tank at the back and the men got into the transport.

"I stopped at the No. 1 C.T. just inbye the pit mouth to pick up another couple of men. I then proceeded down to No. 34 C.T. Main Headings where I let a Deputy and two Allied Construction men out. I then proceeded down to the transformer at 15 section where the electrician tests the earth leakage on the transformer and all the men disembarked. I then turned the machine around, parked it, and proceeded into the face area after turning the machine off and applying the parking brake.

"The time was about 6.40 a.m.

"I was working at the face helping put hydraulic oil in the miner. The Deputy called out for use to leave and I left via B heading and up A heading of the main headings., the section fitter, travelled with me. We met the other men from the panel at C heading, No. 20 C.T., having seen their lights. The Deputy instructed us to stop there together and we moved back as the smoke increased.

"I could hear several popping sounds inbye like small explosions after the rescue team arrived. There were a couple before that. I did stop long enough to turn off the water supply to the miner, which took about a minute, before I left the section. The smoke did not thicken up during that time. There appeared to be slight dust and smoke in the area. I thought it was dust from a jammed stone in the feeder as we had been loading stone.

"There was definitely no defect apparent in the car while I was driving it."

Important Actions by Deputy

Deputy himself a trained rescue team member, carried out three important actions before retreating, and is to be commended for these actions.

Firstly, on being satisfied that a condition of danger existed, he withdrew the men under his charge.

Secondly, he informed the Under-Manager of the situation by ringing the emergency number 01.

Thirdly, he cut the telephone loose from its connecting wires at the conveyor tail end and took it outbye where he reconnected it to the telephone line at 20 cut-through and again rang the Under-Manager to advise of the situation.

As the smoke drove the men further outbye, the telephone was again taken outbye and reconnected each time so that contact was maintained with the Under-Manager on the surface.

Notification of Relevant Personnel and Institution of Disaster Procedure

On being contacted by the Deputy from 20 cut-through of 15's Section, the Under-Manager instructed him to survey the three intake headings to ascertain the extent to which smoke had extended outbye from the fire.

At 8.45 a.m., the Deputy advised that heavy, hot, grey smoke filled all three headings from floor to ceiling inbye 21 cut-through in A and B headings and inbye 20 cut-through in C heading.

At this time the Manager and Under-Manager decided to notify the Rescue Station, Mines Inspector, Check Inspector and Company Officials of the serious position at the mine and also to invoke the pre-arranged organisation in case of disaster as set out by the Mines Department pamphlet on this subject.

All relevant personnel were contacted by 9.30 a.m. including the Surveyor, and the main gate to the mine was manned to prevent the hampering of rescue operations by the intrusion of unauthorised persons.

Instructions were given for the withdrawal of all workmen from the mine except those engaged in rescue and recovery work.

The withdrawal of employees was complete by 9.30 a.m. – all persons being accounted for.

The normal record of all persons entering and leaving the mine was double checked by a Senior Staff member from this point in time.

The Chairman of the Rescue Station Committee, the Senior Mines Inspector, Acting District Inspector, Special Duties Inspector, Electrical Inspector and the Check Inspector, arrived by 9.30

a.m. and undertook the important tasks of recording messages to and from the fresh air base, keeping an external telephone line to the mine open at all times, liaising with the rescue teams on the surface and generally offering advice on the situation.

The mine Engineers and Surface Foreman were notified of the position and were instructed to standby to receive requests for materials or supervise activities on the surface.

Initial Exploration to Locate the Source of the Fire

At 9 a.m. the Manager and Under-Manager decided that the Avon Rescue Team would proceed underground forthwith to ascertain the possibility of carrying out an exploration in the smoke filled workings in order to discover the exact source and location of the fire, believing at this time that the muffled explosions reported by the face crew were associated with a fire on the Section Transformer which was located in 23 cut-through of 15's Section opposite the 30's section conveyor drivehead.

At 9.24 a.m. the Avon Team proceeded underground in the charge of the Under-Manager who is a regular rescue trainee. A fresh air base was established at 17 cut-through on C heading.

At 9.40 a.m., Permanent Rescue Corps men went underground under the charge of the Rescue Station Superintendent, Assistant Superintendent and the Colliery Manager.

Prior to leaving the surface, the Station Superintendent was contacted by the Under-Manager and informed of the first proposed exploration into the smoke filled workings by the Colliery Team and that the Station Team was to act as a standby team.

First Exploration

At 9.45 a.m. the Colliery Team attempted to proceed inbye along C heading from 17 cut-through.

The team succeeded in advancing inbye to 19 cut-through but were then forced to retire to the fresh air base due to the lack of smoke goggles and difficulty in travelling forward without guidance aids.

Second Exploration

On returning to the fresh air base the Avon Team conferred with the Station Superintendent who had arrived by that time. It was decided that the Team would proceed inbye along B heading using the conveyor structure as a guideline.

Travelling inbye, the Team encountered zero visibility conditions from 18 cut-through but carried on down to 23 cut-through where they were forced to retire due to termination of the belt structure (which was being used as a lifeline), excessive heat and what they believed to be an impending roof fall as evidenced by coal flakes falling from the roof.

Subsequently, it was believed these falling coal flakes were caused by the excessive heat which also melted the plastic cover over a fluorescent light located above the transformer.

Recover of Smoke Filled Workings

At this point Management and Rescue Corps were confronted with the problem that they had a major fire to deal with but could not locate or approach the fire due to the thick smoke and intense heat. Obviously, with the passage of time, the fire was extending inbye along the coal ribs and was

reaching an intensity where large quantities of methane could be liberated with consequent risk of an explosion.

Reappraisal of the Problem

A reappraisal of the problem was undertaken and it was decided that the fire had reached the stage where it could only be successfully fought under fresh air conditions.

To achieve fresh air conditions at the fire source, it was decided that the following well proven recovery method should be used:-*

1. Seal off the A and B headings of 15's Section between 17 and 18 cut-throughs, using brattice stoppings.
2. Concentrate all available air in the mine to the C heading of 15's Section by bratticing off the other two working sections of the mine.
3. Force the smoke inbye along C heading using brattice sail. The effect of the sail being to increase the air velocity and quantity around the periphery of the sail thus forcing back the smoke which was moving outbye against the ventilation due to the intense heat produced and the fact that a rising grade of 1 in 30 existed outbye.

Sufficient 50mm x 25mm battens to construct a 4m x 2.4m rectangle with diagonal braces were obtained from the surface for some of the Section crew to construct a light-weight sail which would suitably fit into the C heading roadway. Meanwhile the brattice stoppings were built in fresh air in the A and B headings by the remainder of the face crew, the A heading stopping being completed at 11.15 a.m. and B heading soon after.

Other employees from the surface under the charge of a Deputy were detailed to cut off the ventilation to the remaining two working sections by erecting brattice stoppings across their intakes.

Using the sail constructed by attaching brattice to the above framework, the face crew were able to force the smoke in C heading inbye of 17 cut-through. As each cut-through was reached, Rescue Team members erected brattice stoppings under oxygen until 23 cut-through was reached.

The concentration of all available ventilation in C heading had a clearing effect on the smoke and heat in the area generally so that while one rescue team was erecting stoppings between C and B headings, another had penetrated the smoke filled workings past the transformer in 23 cut-through to B heading, thence down B heading to a partly constructed stopping between 24 and 25 cut-throughs.

This stopping was breached to promote clearing of the smoke in the area and immediately had a very beneficial effect in that it was possible to travel down C heading in fresh air to 24 cut-through where a large fall was discovered at 12.25 p.m.

The Fresh Air base was progressively move forward as on Figure 5.

Further Exploration and Location of the Fire

At this point it seemed that the fire blackened transformer had ceased burning and it was falsely assumed that the fire had gone out. Needless to say, this led to jubilation by all concerned.

As the smoke cleared it was soon discovered, however, that an active open fire existed on the inbye side of the fall at 24 cut-through, C heading, and a check by the Under-Manager with driver

.... confirmed that the Rhino transport vehicle had been parked on the inbye side of the fallen intersection almost up against a brick stopping containing a steel trap door.

It was now apparent that the source of the fire was in fact the Rhino transport vehicle and that the muffled explosions heard earlier had been the tyres or fuel exploding on this machine.

Apparently the fire on the vehicle burned away the cross timber supports and allowed the roof to collapse up to a height of approximately 6 metres, thus adding a combustible top coal to the fire but at the same time blanketing the fire to some extent and preventing a rapid spread of the fire to the coal ribs.

By 12.50 p.m. a rescue team management to penetrate to the inbye side of the steel trap door in the stopping inbye the Rhino. This door was opened and it was possible to observe flames along the rib sides and on top of the fall.

It was decided to partly prop open this trap door to promote flow of heat and smoke away from the fall.

The trap door measuring 91cm x 61cm was hinged at the top and propped open at an angle of 45(. Immediately this was done, dense black smoke gushed through the opening.

Preparation for Sealing Off

At this stage the Company decided to prepare for sealing off the 15's Section Headings in case the fire could not be extinguished or the fire moved inbye as a result of the failure of the trap door stopping in C heading between 24 and 25 cut-throughs.

Initially, the sites chosen for these proposed seals were inbye 16 cut-through in each of the four Headings and spare mine employees were directed to commence excavation of the sites for these seals in the three intake roadways.

Further consideration was then given to the location of the seals and it was decided that the final location of these seals would need to be decided on the gas analysis of the products of combustion in the return and also the size of the fire at the time of sealing.

Further, if sealing of all or part of the mine was thought to be the only way to extinguish the fire, then the type of seal installed would probably require far more materials for construction of the seals than was readily available.

For example, an appropriate pressure and gas seal 5 metres in length would require 4,000 bags of sand or stone dust in each roadway.*

Accordingly, preparation of the seal sites inbye 16 cut-through was discontinued.

Sufficient bricks, mortar and cement were delivered to the mine surface to erect the necessary inbye face of four seals together with bagged stone to distribute inbye the site of these seals.

Fighting the Fire

Following discovery of the open fire in the fallen top coal and ribs at C 24 intersection, it was decided to immediately attack the fire in C heading under oxygen with two hoses run from the main in B heading. This was achieved by 1.45 p.m.

At this time also it became obvious that the fall had extended to the 6 metre (20") parting and that an opening 2 metres (6') high existed above the fallen top coal.

At 2 p.m. the smoke in C heading had cleared to the extent that further rescue personnel under oxygen could approach the outbye lip of the fall to erect centre legs to secure this lip.

Securing the lip allowed the hoses to be directed higher up the fall and, in fact, over the fall to some extent by deflecting the water jets off the exposed roof above the fall.

By 3.00 p.m. it was found possible to commence erecting baulks to the outbye lip of the fall in C heading under fresh air conditions. This was commenced so that the fall could be loaded out using a Mines-mobile as soon as the previously erected centre legs were replaced by baulks.

It was also decided that rescue teams should erect brattice through 23 cut-through, down B heading and along 24 cut-through to allow further hoses to be used from the B heading side of C24 intersection in fresh air.

This work was achieved by 5.00 p.m. and two hoses were immediately brought to bear on the fire, particularly the open flames which had developed on the B heading side inbye corner of the fallen intersection.

At 4.25 p.m. it was decided to increase the size of the opening in the previously breached stopping on B heading between 24 and 25 cut-throughs using rescue personnel. At the same time it was decided to remove the brattice stoppings across B heading between 17 and 18 cut-throughs to clear the smoke from B heading. This was done and proved immediately effective.

At 5.05 p.m. it was suggested that the trap door in C heading inbye the fire be opened further to assist with smoke clearance but it was decided against this action because of the danger of the danger passing through the trap door due to the increased flow of air and hot products of combustion.

A further investigation of the situation at the trap door at 5.50 p.m. showed that the door had almost closed. The door was then opened full at 6.05 p.m. on a trial basis. Subsequently, it was again closed at 7.40 p.m. when a further investigation showed open flame on the fall up to the door.

Initial Loading Out

By 5.30 p.m. loading out of the fall from C heading had commenced, the smouldering material being quenched with water and dumped in cut-throughs outbye the fall between C and D heading. One brick was knocked out of the stoppings to allow a flow of air to carry away the steam and products of combustion which might be given off.

Arrangements for Final Loading Out

By 6.00 p.m. it was obvious that the minesmobile was inadequate for the task of uncovering the seat of the fire due to the high ambient temperature and the constant nature of the work which was causing the machine to overheat.

Furthermore, dumping space would soon have become a problem.

Once again Management was faced with a dilemma.

Firstly, it was obvious that the fire could only be put out by quenching with water as it was loaded out or by flooding of the area.

Flooding of the area was impossible in a reasonable time due to the slight gradient and huge quantity of water needed which would then have to be pumped out.

Secondly, the Minesmobile could not be used for reasons mentioned above.

Thirdly, the loading out had to be done reasonably quickly to prevent the fire spreading to the coal pillars which would weaken the roof in the area and cause further falls.

Fourthly, it was obvious that the fallen top coal was preventing the water from four hoses in use from reaching the burning material in sufficient quantity to extinguish the fire.

It was therefore decided that the continuous miner and shuttle cars in the face of 30's Section would need to be used to load the burning material on to the belt system after suitable quenching.

Further Rearrangement of Ventilation

To allow use of the miner and cars for final loading out, smoke and products of combustion would need to be removed from the 30's Section face area.

At 6.38 p.m. the management decided that this could only be done by again rearranging the ventilation.

Accordingly, it was decided to breach the brick stopping between C and D heading at 24 cut-through in 15's Section sufficiently to allow all products of combustion to be drawn through this opening in preference to moving through 24 cut-through to B heading from which it was proposed to load out the burning materials.

This action was not considered to present any risk to containing the fire as massive quantities of water could be brought to bear on the fire from the secured outbye lip in C heading should the fire move toward D heading. In any event, the hole was to be made so that it could quickly be closed off using a flat steel sheet.

After this was done it was then proposed to re-establish the stopping in B heading inbye 24 cut-through.

It was anticipated that any air travelling into 30's Section would be fresh air which had travelled down A or B heading of 15's Section and that not a great deal of air would travel this way due to the restriction caused by the brattice in B heading at the face of 30's Section.

The work above was carried out by rescue personnel at 8.00 p.m. and proved immediately successful though the opening in the stopping to D heading at 24 cut-through had to be enlarged to 2 meters x 1.2 metres (6' x 4') to give the desired result.

The effect of opening this stopping was to allow full opening of the trap door behind the Rhino and consequently the use of an additional fire hose manned by rescue personnel.

This hose was installed at 9.25 p.m.

Final Loading Out

Within one hour of the installation of a fire hose through the trap door all visible flames had been extinguished and personnel were able to stand on top of the fall in fresh air and direct fire hoses vertically downward onto the smouldering material.

At 9.30 p.m. a reconnaissance was made into 30's Section in fresh air and from this time onwards work proceeded to bring the miner and shuttle cars outbye along C heading to load out the fall after quenching with water.

Loading out was commenced at 1.00 a.m. on the following morning, Saturday, 30th August 1976. Approximately 700 tonnes of burning coal were loaded out after quenching with water.

The last incandescent coke was finally excavated from around the Rhino wheel hubs at 2.00 p.m. the same day.

Role Played by Rescue Station and Mines Department

The Rescue Station Superintendent and Assistant Superintendent proceeded underground on arriving at the mine and remained in the fire area till a plan of attack on the problem of locating and approaching the fire had been implemented.

A permanent rescue corpsman was maintained on the surface at all times except during the initial explorations. This man was required to:-

- Call for additional rescue teams from the station as necessary.
- Send in spare oxygen bottles as necessary.

Two teams were in use continuously from the time of implementation of the plan of attack to locate and approach the fire.

These teams were supported by two other teams on standby at the fresh air base.

The teams at the fresh air base were supported by two others on the surface and a further two teams at the Station.

A total of 112 men divided into 16 teams were utilised in the recovery operations.

The teams were used for exploration, timbering, breaching and erecting stoppings, erecting brattice curtain along roadways and fire fighting, all under oxygen.

Management have no hesitation in stating that the successful recovery of the mine could not have been accomplished without the services of the Rescue Teams.

Mine Department Officers provided practical and moral support to recovery operations.

The Acting District Inspector proceeded underground to the fire on arrival and remained there till recovery operations were well advanced.

The Senior District Inspector, Electrical Inspector and Special Duties Inspector manned the surface control office as part of the team recording the log of telephone conversations to the fresh air base, passing on instructions from the fresh air base, maintaining an outside telephone line at all times and giving counsel to Management as problems in the recovery operations arose.

Department Officers also monitored and recorded smoke emission from the fan and were the first to realise that though the fire was alleged to be out, at one stage, smoke emission continued at the same intensity.

The Senior Inspector offered to make available the Department's Mobile Testing Van if required to give continuous return air gas analysis. In the event it was not required.

Supervision at the Fire

From the first report of smoke at 8.20 a.m., a Deputy was in charge in the fire area until the arrival of the Under-manager at 9.35 a.m.

The Colliery Manager, Acting Mines Inspector, Rescue Station Superintendent and Assistant Station Superintendent arrived in the fire area at 10.00 a.m.

The Under-Manager, Rescue Station Superintendent and Assistant Superintendent remained at the fire until 2.18 p.m.

The Colliery Manager remained at the fire area until relieved by the Operations Manager at 5.00 p.m.

The Operations Manager remained at the fire area until 11.00 p.m. when the miner and cars to be used for loading out the fall were ready to be move outbye.

Supervision at the Surface

The Manager and Under-Manager were in charge of surface operations from 8.20 a.m. until they proceeded underground at 9.40 a.m. and 9.24 a.m. respectively.

Avon Staff Engineers, Mines Department Officers, Miner's Check Inspector, Rescue Station Committee Chairman, and Rescue Station Permanent Corpsman directed surface operations until they were joined by the Company Operations Manager and Manager of Yellow Rock Colliery at 11.50 a.m.

Cause of Fire on Rhino Transporter

When the Rhino was uncovered from under the fall the machine was jacked up and inspected by Mines Department and Colliery Engineers and officials. The result of this inspection was as follows:-

- The engine controls indicated that the machine had been correctly shut down.
- The low water and over temperature cut out was in the normal position.
- An accumulation of cindered coal around the disc brake under the deck in the centre of the machine indicated that this was a possible source for ignition.

Modifications were subsequently made to the platework around the disc brake assembly on other Rhinos to limit accumulation of coaly material caused by roadway water splashing up on the brake or by dust collecting on oil leaks. Modifications were also made to permit the flushing out of the disc brake area using water connected to a fitting on the side of the machine.

Appreciation by Company Insurers

It is worthy of note that the Company Insurers presented the Management and employees at Avon with a commendation for the efficient manner in which the recovery operations were carried out.

This was done as well as providing sufficient money within four weeks for the Company to purchase a replacement machine for that lost in the fire.

Conclusions

The treatment of this subject would not be complete without mention of conclusions reached as a result of experience gained in dealing with this incident. These are as follows:-

- The standard procedures taught at our rescue stations for gaining access to a fire which cannot be located or approached due to thick hot smoke can be very effective. Specifically, reference is made to the procedure of concentrating ventilation on the one roadway and forcing back the smoke using a "sail".
- The employment of trained rescue personnel in production craws at Avon proved very effective in dealing with the original emergency and resulted in efficient withdrawal of men without loss of life. The action of the Deputy in taking the 'phone outbye' as he retreated so that continuous contact could be maintained with the Under-Manager is to be highly commended.
- The parking of the unattended diesel Rhino in a position against a fireproof brick stopping contained the fire to a large extent.
- The fall of top coal onto the burning Rhino blanketed the fire to a large extent and contained the fire until its location was established and fire fighting could be instituted by conventional means.
- Regular cleaning of diesel vehicles using high pressure cleaners is necessary to minimise the risk of fire on the machine.
- The design of diesel machines should be closely examined to ensure that accumulations of combustible material are minimised on body work.
- To prevent a large fire underground from spreading into coal pillars, it is necessary to load out the burning material if flooding with water is impractical.
- The use of multiple intake airways into the fire area contributed to the safe withdrawal of workmen from inbye the fire and if an additional row of stoppings had been provided between the intakes A and B headings of 15's and 30's Sections, the men at the face could have been withdrawn in absolute safety.

SCHEDULE OF EVENTS IN AVON FIRE

Friday, 29th August, 1975

6.40 a.m.	Men arrived at coal face.
8.15 a.m.	Workman discovered smoke at conveyor tail end.
8.20 a.m.	Deputy notified of apparent fire on conveyor drivehead.
8.45 a.m.	Institution of disaster procedure and notification of all relevant personnel.
9.24 a.m.	Avon Rescue Team proceeded underground.
9.40 a.m.	Rescue Station Teams and Superintendent went underground with Colliery Manager.
9.45 a.m.	First exploration by Avon Rescue Team.
10.15 a.m.	Second exploration by Avon Team and Rescue Station personnel.
11.15 a.m.	Completion of brattice stoppings in A and B headings 15's Section.
12.15 p.m.	Fall discovered at 24 cut-through, C heading.
12.50 p.m.	Rescue Team penetrated to inbye side of fall.
1.45 p.m.	Hoses directed on to fire at fall in C heading.
3.00 p.m.	Timbering lip of fall commenced in C heading in fresh air.
4.25 p.m.	Opening increased in stopping on B heading inbye 24 cut-through.
5.00 p.m.	Hoses directed on to open flames at fall from cut-through on B heading side of C24 intersection.
6.05 p.m.	Trap door inbye fall fully opened on trial basis.
6.38 p.m.	Decision taken to rearrange ventilation to allow use of miner and cars to load out fall from B heading side of C24 intersection.
7.40 p.m.	Trap door inbye fall closed due to danger of fire moving inbye.
8.00 p.m.	Opening 2m x 1.2m (6' x 4') made in stopping between C and D headings on 24 cut-through.
9.25 p.m.	Hose directed to fire through trap door inbye fall.
9.30 p.m.	Reconnaissance into 30's Section in fresh air and miner and cars began moving outbye to fall.
10.25 p.m.	All flames extinguished and personnel in fresh air able to direct water into smouldering material by standing on top of fall.
1.00 a.m.	Loading out of smouldering material commenced using miner and cars.
2.00 p.m.	First incandescent material quenched and sent out of mine on belt system.

PART II - DANGERS ASSOCIATED WITH FIRES ON MACHINERY UNDERGROUND

In this section of the paper comment is made on the dangers to personnel and property resulting from fires on machinery and further, these dangers are illustrated by reference to some fires which have occurred around the world since 1950.

Some observations are then made on means to minimise these dangers.

Dangers from fires on machinery underground may be divided into two categories:-

- Dangers to personnel.
- Danger to property.

Dangers to Personnel

These are as follows:-

- Danger from smoke emission.
- Danger of carbon monoxide poisoning.
- Danger of production of explosive gases.
- Danger from open flames and hot surfaces.

Danger from Smoke Emission

These may be summarised as the effect on visibility and physiological effects.

As already stated in the foregoing paper, the fact that rescue teams were unable to locate this source of the fire at Avon Colliery due to floor to roof dense smoke, was a major problem to recovery operations.

The problem of personnel being unable to find their way through smoke filled workings is readily appreciated and the frustration of otherwise physically fit persons trapped in dense smoke unable to find their way can well be imagined.

Physiological effects from smoke can be summarised as follows and need no further comment:-

- Stinging of the eyes.
- Annoyance to the respiratory system through smoke inhalation.

Danger of Carbon Monoxide Poisoning

The danger in this case stems from the spread of machinery fire to combustible substances.

A conveyor fire at Cresswell Colliery in England in 1950 led to the death of 80 men from carbon monoxide poisoning.

A fire on a hydraulic balancing platform at the bottom of a downcast shaft led to the death from carbon monoxide poisoning of 261 at Marcinelle Colliery in Belgium in 1956.

A fire on a booster fan at Auchengeich Colliery in Scotland in 1959 resulted in the death of 47 men from carbon monoxide poisoning.

A fire on a shuttle car disc brake at Bulli Colliery, NSW led to the death of 3 men from asphyxiation and one from carbon monoxide poisoning in 1965.

Danger of Production of Methane

As a fire on machinery spreads to the coal underground, methane is given off and in some instances, builds up to explosive concentrations which if ignited, present an extreme danger to personnel as follows:-

- Physical violence
- Production of carbon monoxide and a suffocating atmosphere.
- Initiation of a coal dust explosion which again causes massive physical violence and production of carbon monoxide and suffocating atmospheres.

Danger from Open Flames and Hot Surfaces

The danger here is obvious and requires no further comment.

Dangers to Property

These are obvious to a large extent and range from the individual item of machinery affected to jeopardy of a Company's complete investment in a mine.

Minimisation of Dangers from Fires on Machinery

The incident at Avon Colliery had simulated Colliery and Company Management's thinking on minimising the dangers from fires on machinery as follows:-

Early Detection of Fires

The need for a device to give warning of the presence of combustion before the onset of an open fire was recognised.

At the present time the Company is seeking approval of carbon monoxide and smoke detectors from the Mines Department Testing Station at Londonderry. These devices are from the Wormald, Minerva range of detectors.

It is anticipated that the operation of those detectors will be monitored in the mine workshop which is manned at all times at Avon. A condition of danger could be signalled by a flashing light or other alarm.

It is anticipated the control, from surface to detectors located on the conveyor system initially, will be through the multiple pair telephone cable in use at the mine.

A carbon monoxide detector which will detect minute quantities of gas in the very early incipient stage of combustion is felt to have the most promise.

Brief details of the Minerva detector which may satisfy this need and which is under Mines Department test are as follows:-

- Operating on a patented ionisation principle, the Minerva Combustion Detector reacts to the gases of combustion, whether from clear flame, smouldering or visible smoke.

- The ionising force is Americium 241m, a member of the transuranium group, with a half life of approximately 450 years. It is produced by the beta decay of plutonium 241, which is the result of alpha bombardment of uranium. As Americium 241 is principally a short range alpha emitter, it is a "clean" isotope when used in this application and detectors can be handled with absolute safety.
- Unlike the operation of a thermal detector or of an optical smoke detector, Minerva's operation is not restricted by generation of dangerously high temperatures or heavy smoke and can therefore operate long before a dangerous situation exists.
- The advantages of this early warning may be appreciated by consideration of the fire graph shown in Figure 6.
- Minerva Combustion Detectors require very little maintenance or supervision and there are no moving parts to burn or wear out and the detector, once fitted, may be relied upon to last almost indefinitely under reasonable conditions.

The greatest application for this type of detector is felt to be in those circumstances where physical conditions dictate that a maximum of two roadways be driven into an extraction area and multiple or separate intakes cannot be provided.

Benefits from the Use of Detectors

Indications to the author at this stage are that a saving in insurance premiums of many thousands of dollars per annum will be available if efficient detectors are installed and when this is multiplied by the number of years of life of the mine this becomes a very substantial figure.

It is anticipated that the cost of the detectors will be recoverable in the savings on one year's premiums.

Provision of Multiple Intakes

As mentioned earlier, the provision of multiple intakes proved beneficial in the safe withdrawal of men from 30's Section on detection of a condition of danger.

The provision of multiple intakes has been company policy for some time and is being further improved by provision of stoppings between intakes to guarantee a fresh air retreat for workmen as far as possible.

The provision is, however, a cure for the complaint and hopefully, early detection of fires by detectors will not only guarantee the safety of workmen, but also the safety of the Company's investment in the mine.

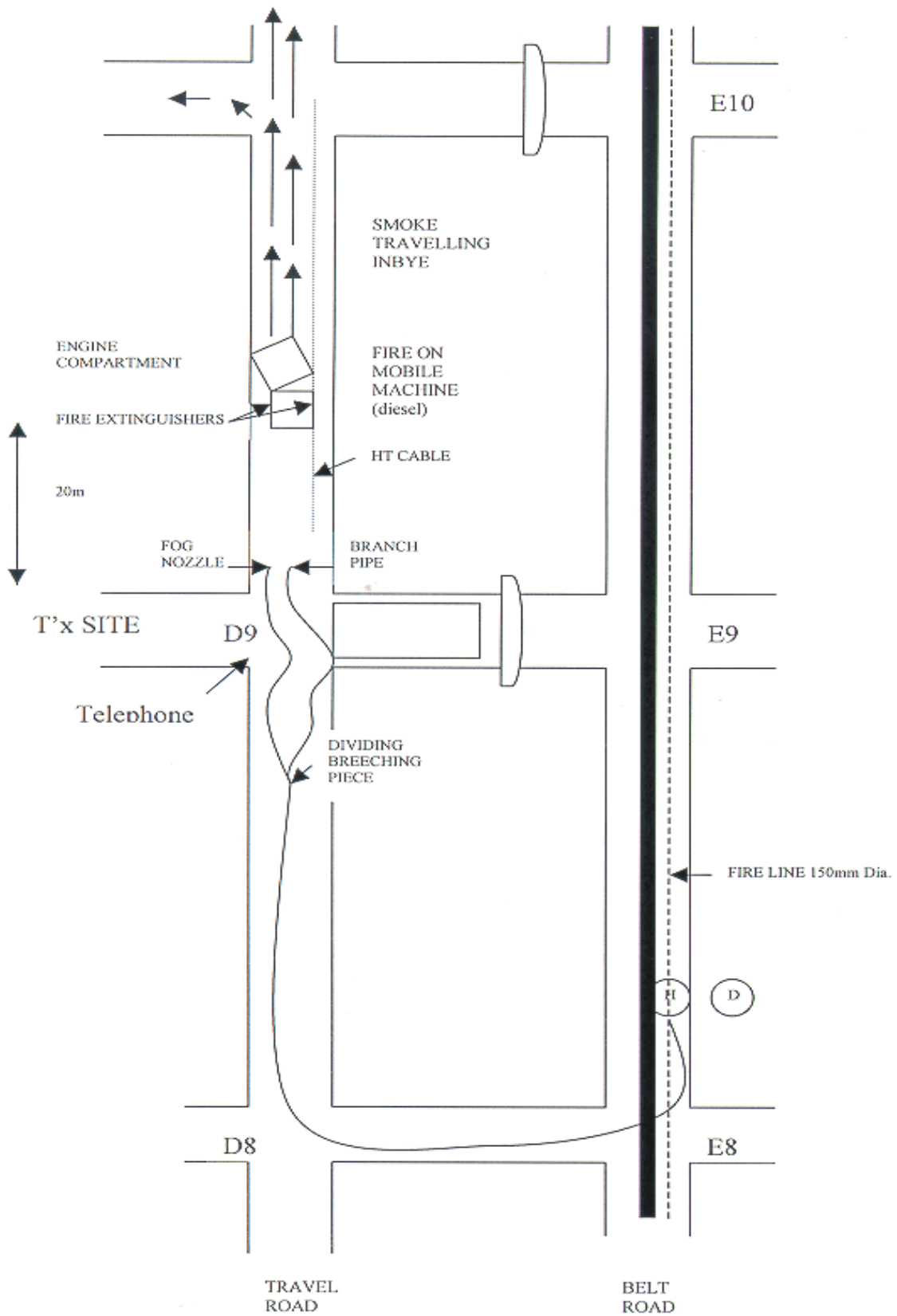
Note for Students

The author is indebted to Dr. H. L. Willett for material for this paper concerning fires on machinery and the building of seals.

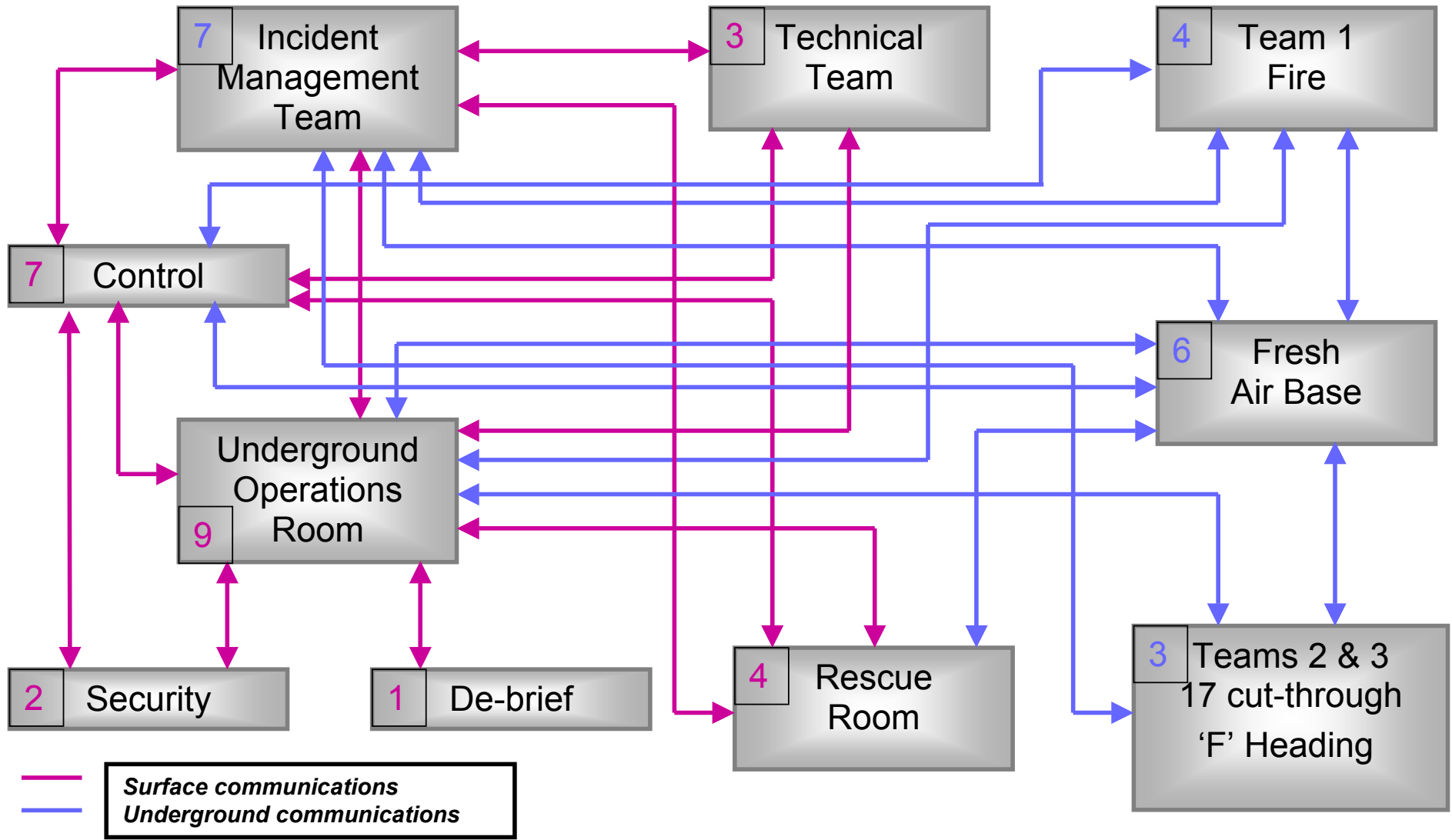
The author commends to all students an address by Dr. Willett at the Seminar on Mine Fires on 12th November 1973, at Brisbane, Queensland.

Copies of this address and proceedings of the Seminar are published by the Australian Institute of Mining and Metallurgy, Clunies Ross House, 191 Royal Parade, Parkville, Victoria, 3052.

APPENDIX 2 - SCHEMATIC OF FIRE INCIDENT SITE (MAIN HEADINGS)



APPENDIX 3 - COMMUNICATIONS FLOWCHART



APPENDIX 4 - THE EXERCISE MANAGEMENT COMMITTEE

GREG ROWAN

Entered the Queensland coal mining industry in 1978, gained his *First Class Coal Mine Managers Certificate* in 1981 and is a 20 year veteran of the Qld Mines Rescue Service.

Greg has over 24 years experience in Coal Mine Management, Project Management and consultancy in the Queensland and Western Australian mining industry and until recently was acting in the position of Chief Inspector of Coal Mines in Queensland.

Chairman of the Queensland Emergency Exercise Management Committee since its inception in 1998, Greg has planned and executed all five Level 1 Emergency Exercises conducted in that state to date.

Greg holds an MBA from the University of Queensland and post-graduate qualifications in Management, is a Fellow of the Australian Institute of Mining and Metallurgy, was awarded the NEDO International Scholarship in 1999 and in 2001 won the Boston Consulting Strategic Challenge.

With international experience in Japan, India and the United States, Greg is currently operating as a private consultant to corporate industry in emergency preparedness and response systems, project management, venture creation and business planning.

GREG DALLISTON

Greg has been involved in the mining industry for 27 years, and has gained experience in numerous areas. He started his career as a Cadet Mine Manager with the Queensland Coal Association, before working in a variety of positions within the industry, including 8 years as a mine Deputy.

Greg is employed as an Industry Safety and Health Representative with the CFMEU, a position which he has held for the last 8 years.

Some of the roles pertaining to this position have included:

- Participating in tripartite industry committees to develop new Safety and Health legislation for the Queensland Coal Industry; Member of State and National training committees for the mining industry;
- Perform safety audits and inspections at mines throughout Queensland;
- Investigating serious and fatal mining accidents, assisting the Mining Warden as a reviewer into mining accidents;
- Member of Incident Management Teams at significant incidents, including the 1994 Moura No. 2 disaster; Performing debriefs after incidents and providing critical incident management services; and
- Development of Manager, Undermanager and Deputy Statutory National Competency Standards, including Risk Management and Emergency Response.

MURRAY BIRD

Murray joined the underground coal mining industry in 1974 as a Trainee Mining Engineer in the BHP Southern NSW Coal Division. After obtaining Statutory Underground Coal Mining Certificates, he was appointed as a Deputy at Corrimal Colliery, Undermanager and Undermanager-In-Charge at Nebo Colliery, Deputy Manager at Old Bulli Colliery and Group Relieving Manager for the BHP Southern Coal Division.

Murray was appointed as Superintendent at Hunter Valley Mines Rescue Station in 1986 and was appointed Manager of the Newcastle Mines Rescue Station in 1994. Currently he holds the position of General Manager, NSW Mines Rescue Pty Limited which he has held since 1998.

Rescue based qualifications include Underground Mines Rescue, Open-cut Mines Rescue, Coal Mine Fire Officer, Police Rescue Operator, Vertical Rope Instructor, PADI Open Water Instructor, Class 3 Commercial Diver and NATA Auditor.

PETER BAKER

Peter is currently employed by the NSW Mines Rescue Pty Limited as Manager - Southern Mines Rescue Station. He commenced working in the mining industry in 1980 and has held various positions, including Undermanager in Charge and Relief Manager. He assisted in the development of emergency procedures at Appin and Tahmoor Collieries and audits mine site emergency plans in his current role.

He has been in Mines Rescue since 1986 and was appointed Captain in 1988. Whilst a trainee, he represented the station as Competition Team Captain at the Australian Underground Championships. Peter holds a Master of Business and Technology Degree, a Mining Engineering Degree, Coal Mining Third, Second and First Class Ticket, Underground Mines Rescue Certificate, Train the Trainer Certificate and has completed the CMQB Emergency Preparedness Course.

MIKE DOWNS

Mike graduated from the Royal School of Mines, Imperial College, London in 1974 and commenced work with the National Coal Board in the northeast area. After gaining a First Class Certificate of Competency in 1976, Mike worked as a deputy, overman, fore-overman and acting undermanager in various mines in Durham that employed a range of mining techniques, until emigrating to Australia in 1977.

Mike commenced as a deputy in the western district of New South Wales and progressed through line management positions to be Colliery Manager at the Invincible Colliery during its period of longwall operations. After completing an MBA at Cranfield University in 1988, Mike then joined Thyssen as Operations Manager for the UK (south), before returning to Australia as Mine Manager at Oaky Creek No. 1 Coal Mine.

Mike later joined BHP Coal as Principal Development Engineer - Underground Coal, and then a period of mine work contracting activities for Barclay Mowlem, before recently accepting the position as Manager, Safety and Health, Central Region with the Department of Natural Resources and Mines based in Rockhampton and is responsible for the co-ordinated service delivery for Mining, Explosives and Petroleum and Gas Inspectorates.

MARK McCAMLEY

Mark has been working in the Queensland underground mining industry for 24 years in various positions from shiftman miner, Deputy, Undermanager and Manager, and is currently the Underground Mine Manager at Crinum Colliery.

Mark has served 21 years in active service in Queensland mines rescue, holds a Queensland First Class Mine Managers Certificate of Competency, Diploma in Business (Management), FAIM and is a qualified internal auditor of quality systems.

MARTIN WATKINSON

Martin Watkinson is currently the Principal Mining Engineer at SIMTARS. Martin is involved in spontaneous combustion training, testing and research, mining research and consultancy and was responsible for the modelling of the scenario and running of the gas simulation program.

Martin was employed as Technical Services Manager at North Goonyella Coal Mine, Senior Mining Engineer and Ventilation Officer at Moranbah North during the initial mine development and longwall installation. Prior to taking his appointment at Moranbah North, Martin worked for International Mining Consultants for 7 years undertaking assignments in China, India, Iran, Siberia, Tanzania and Vietnam.

DAVID CLIFF

Associate Professor David Cliff is currently Director of Research for the Minerals Industry Safety and Health Centre. Prior to that he spent eighteen months as Health and Safety Advisor to the Queensland Mining Council and over 10 years at SIMTARS, the last three as Manager, Mining Research Centre where he was responsible for directing the research effort of SIMTARS. He is actively involved in promoting the awareness of hazards in the mining industry, principally focussing on the prevention of fires and explosions and health and safety promotion. He has been actively involved in spontaneous combustion research since 1989 and has investigated a number of mine fires and spontaneous combustion episodes.

David's qualifications include: a Bachelor of Science Degree (Honours) from the Monash University, a Doctor of Philosophy in Physical Chemistry from Cambridge University and post-graduate studies in Environmental Studies, Outdoor Education and Business Administration. He is a member and chartered Chemist of the Royal Australian Chemical Institute, Environmental Chemistry Section, a Member of the Combustion Institute, Member of the Safety Institute of Australia, Past President of the Queensland Branch of the Clean Air Society and a Member of the Australasian Institute of Mining and Metallurgy.

KEN SINGER

Ken has worked at various Queensland and New South Wales coalmines including 6 years at Cook Colliery, 1 year at Gibson's Colliery and 2 years as a mining consultant in North Sydney and for the Dartbrook Colliery Hunter Tunnel Project. Ken has worked at Kestrel Coal Mine for the past 6 years and is currently the Manager (Statutory and Engineering) for Kestrel Coal Mine.

Ken holds a Mining Engineering Degree from Ballarat, Second Class Certificate of Competency, First Class Certificate of Competency, Mine Rescue Proficiency, and was an assessor for the Kenmare Level 1 Emergency Exercise.

MARTIN OLSEN

Martin is employed as the Senior Mine Planning Engineer at Kestrel Coal. He has been in this position for 13 months. Prior to this he worked as a Mining Engineer at Southern Colliery and as a coal miner at Moranbah North.

Martin is an active Mines Rescue Member since January 2000 and has competed in several competitions. Martin has a Bachelor of Engineering (Mining) with honours and Graduate Diploma of Management (Technology Management).

He is currently studying for the Ventilation Officer's competency, Second Class Certificate and a Masters of Business Administration.

PAUL BEVERIDGE

Paul has worked in the mining industry for 13 years as a underground mine surveyor. He is currently employed by Thiess as a Mine Surveyor for North Goonyella Coal Mine. Paul has previously worked as a surveyor and contract surveyor for numerous mines throughout New South Wales and central Queensland and has worked as a surveyor and shift superintendent on the Brisbane S1 tunnel project.

ALLAN PURSE

Allan is currently the Underground Operation's Superintendent at Newlands Mine. He has some 27 years coal industry experience, starting his career as a Fitter and Turner for Clutha in the Southern New South Wales coalfields.

After completing his apprenticeship he has worked at Clarence, Baal Bone Collieries (NSW) and Newlands Colliery (Qld). During this time, some roles performed have included Mechanical Engineer in Charge, Longwall Mechanical Engineer, Development Mechanical Engineer and Development Superintendent.

Qualifications include Mechanical Engineering and Third Class Certificate of Competency and was also involved in the development of the Manager and Undermanager Statutory National Competency Standards.

WAYNE HARTLEY

Wayne is the State Manager for the Queensland Mines Rescue Service, a position which he took up earlier this year. Wayne has an extensive background in emergency services and his earlier career in the coal industry was at Peak Downs and Goonyella Riverside. His experience from his fire service role as Chief Executive in Queensland, National Council membership and his role at the National Community Safety as chair included influencing the establishment of Australia's response to urban search and rescue.

Wayne has presented at all levels and included studies in the USA. His five years as CEO included the state executive management team and on the Board of the state's fire service and ambulance service. Wayne has been Chairman of the Fire Protection Contractors Registration Board and steered the states emergency communication systems. Wayne's role in restructuring the state's fire services was recognised and regarded as significant in the history of emergency services.

Wayne's early career in the fire service was as a fire-fighter and involved many emergency rescues in industrial, rail, shipping and motor vehicle extraction. Extensive experience in emergency

management and largescale incidents involving significant logistics and planning has been a passion for some time.

NEIL RANDOLPH

Neil joined the mining industry in 1980 and spent 7 years working at M. W. Haenke Coal Mine in the Ipswich coalfields. Neil volunteered for the mines rescue service at the Booval Rescue Station and spent four years in service.

In 1988 Neil commenced working as a Deputy at German Creek Southern Colliery working on longwall production and taking an active role in mines rescue. In 1996 he commenced working at Cook Colliery as a Deputy and was involved in an inertisation program for the southern panels. Neils holds a Third Class Certificate of Competency and in 2001 he commenced working as a Training Officer for SIMTARS.