PLANNED INSPECTION PROGRAM

CONSOLIDATED REPORT: AIR QUALITY OR DUST OR OTHER AIRBORNE CONTAMINANTS – UNDERGROUND COAL

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Contents

Executive summary

A crucial part of the NSW Resources Regulator's Incident Prevention Strategy involves targeted assessment and planned inspection programs for mines and petroleum sites. This focusses on assessing an operation's control of critical risks through evaluating the effectiveness of control measures in the mine's safety management system.

We have developed a bowtie hazard management framework and standardised assessment checklist for each program plan. Under each program plan, the effectiveness of the safety management system at each mine site is assessed against a standard set of control supports and critical controls.

Due to the various controls that were derived from the bowtie analysis for the principal hazard of air quality or dust or other airborne contaminants within the underground coal industry, the overall program plan was split into two stages. This report summarises the assessment findings from stage one of the program, which covered 17 mines during the period from September 2020 to May 2021.

For stage one of the program, the threats and critical controls assessed for the material unwanted event (exposure to hazardous atmosphere) are shown in Table 1. Stage two of the program will cover the remaining controls derived from the bowtie.

Table 1: Threats, consequence and critical controls for the material unwanted event – exposure to hazardous atmosphere – below surface coal mines

	THREAT OR CONSEQUENCE	CRITICAL CONTROL
Threat	1. Low oxygen environment 2. Dust raised into suspension 3. Hazardous chemicals in the atmosphere 4. Carcinogens in the atmosphere	PC 1.3 – Ventilate workplace
Consequence	One or more fatalities	MC 1.2 – Hygiene monitoring
		MC 1.3 – Health monitoring

Legislative requirements and published guidance relating to the principal hazard of air quality or dust or other airborne contaminants are listed in Appendix A. Figure 1 presents safety compliance findings for each de-identified mine and critical control assessed for the material unwanted event of exposure to hazardous atmosphere. Explanatory notes on the assessment system are also listed in Appendix B.

Key Findings

Throughout stage 1 of the program, the results were generally very good in relation to the controls specified from the bowtie. Some of the key findings are listed below:

- Health monitoring was widely implemented, with COVID-19 related delays being addressed in a timely manner.

- Some mines had instituted comprehensive Similar Exposure Group (SEGs) monitoring for airborne contaminants, including welding fume and diesel particulate matter.

- Several mines had engaged external providers to deliver training on airborne contaminants and their health effects. Workers at those sites had detailed knowledge of the hazards in their workplace, the health effects of those contaminants and the major controls for the hazard.

- Several mines appear to have issues with maintaining the currency of risk assessments, management plans and the associated procedures. There is a legal requirement to review these documents every three years to ensure that they continue to adequately control the hazards at the mine.

- Several mines had identified hazards in the workplace that were not covered by the safety management system. Conversely, some mines had controls in the safety management system for hazards that were not identified in the risk assessment.

- Many mines had carried out static and real time dust monitoring to validate go/no-go zones in relation to dust exposure.

- Several mines had a review process for all failures that included either the WHS committee or a dust committee.

- Most mines investigated results that exceeded 50% of the occupational exposure level, with some mines reporting the findings internally.

- At most mines, workers could discuss exceedances of the occupational exposure level for airborne contaminants and were familiar with the actions taken.

Recommendations

Following completion of stage one of the program, there are some key recommendations which are described below. Mine operators should review the adequacy of the controls at their mine in relation to these recommendations to ensure a proactive approach for managing potential issues.

- Mine operators should manage their Safety Management System so that a full review of the system occurs every three years.

- Mine operators should implement controls for identified hazards or, in the principal hazard management plan set out the reason for rejecting a control measure as per WHS (M&PS) Regulation, Clause 24 (3) (i).

- Mine operators should identify SEGs (Similar Exposure Groups) for workers who may be exposed to airborne contaminants.

- Mine operators should carry out base-line monitoring for those SEGs.

- Mine operators should develop, in conjunction with an occupational hygienist, an appropriate monitoring program for those SEGs.

Introduction

The NSW Resources Regulator's planned assessment programs provide a planned, risk-based and proactive approach to assessing how effective an operation is when it comes to controlling critical risk. These programs apply the following principles:

- a focus on managing prescribed 'principal hazards' from the Work Health and Safety (Mines & Petroleum Sites) Regulation 2014

- evaluation of the effectiveness of control measures implemented through an organisation's safety management system

- consideration of the operation's risk profile.

The objective of risk profiling is to identify the inherent hazards and the hazard burden that exist at individual operations in each mining sector in NSW. The information is then used to develop the operational assessment and inspection plans that inform the program.

Scope

Planned inspection programs include two assessment types:

- targeted assessments, incorporating:
  - desktop assessment of:
    - compliance against legislation with respect to the management of health and safety risks associated with air quality or dust or other airborne contaminants – see Appendix A for details
    - the definition of the controls the mine utilises to prevent and mitigate the risks to health and safety associated with air quality or dust or other airborne contaminants.
  - a workplace assessment of the implementation of those controls through the inspection of plant and worker interviews.
- planned assessments, which involve a workplace assessment of the implementation of controls through workplace interviews and the inspection of plant.

The process

The process for undertaking an assessment under a planned inspection program generally involves the following stages:

- preliminary team meetings, preparation and review of documents

- execution of an on-site assessment involving:

  - an on-site desktop assessment of relevant plans and processes measuring legislative compliance of the relevant plans (targeted assessments only)

  - the inspection of relevant site operations (both targeted assessments and planned inspections).

- discussion and feedback to the mine management team on the findings and actions that need to be taken by the mine operators in response.

Assessment findings

Threats/Consequences and Controls assessed

Threats:

- low oxygen environment

- dust raised into suspension

- hazardous chemicals in the atmosphere

- carcinogens in the atmosphere.

Critical control: PC 1.3 – Ventilate workplace

- ☐ Control objective: Dilute airborne contaminant levels to as low as reasonably practicable or direct them away from the breathing zone of people in the workplace

- ☐ Performance requirement:

  - Ventilation is identified as a means of reducing the risk of people being exposed to poor air quality, dust or other airborne contaminants.

  - The nominated ventilation systems effectively maintain air quality or reduce dust and airborne contaminants exposure to as low as reasonably practicable.

With regards to this critical control, specific findings included:

- Ventilation standards were strong at all of the mines inspected. There were comprehensive inspection programs for ventilation control devices as well as for dust suppression equipment.

- Many mines had carried out static and real time dust testing to validate go/no-go zones in relation to dust exposure.

- Ventilation quantities were routinely checked at specified locations, commonly at panel entry and at the longwall face or behind the continuous miner.

- Workers generally had good knowledge of the controls and hazards and many could identify recent improvements in dust control measures.

Consequence:

- One or more fatalities.

Critical control: MC1.2 – Hygiene monitoring

- ☐ Control objective: Worker exposure to airborne contaminants is monitored to confirm control effectiveness and to gather data to drive improvement activity

- ☐ Performance requirement:

  - Hygiene monitoring is identified as a means of monitoring worker exposure to poor air quality, dust or other airborne contaminants

  - Worker exposure to poor air quality, dust or airborne contaminant is monitored.

With regards to this critical control, specific findings included:

- All mines had the Coal Services Order 42 monitoring in place.

- Some mines had gone beyond this with a site-specific, risk-based monitoring program with designated SEGs. In most cases where SEGs were identified, the hygiene monitoring went beyond just dust and included contaminants such as welding fumes and diesel particulates. SEG's also included cable grouting personnel, boilermakers, workshop fitters and exploration drillers.

- Many mines had carried out static and real time dust testing to validate go/no-go zones in relation to dust exposure.

- Most mines investigated results that exceeded 50% of the occupational exposure level with some mines reporting the findings within their organisation.

Critical control: MC1.3 – Health monitoring

- ☐ Control objective: Early indication of health impacts caused by exposure to poor air quality, dust or airborne contaminants are identified

- ☐ Performance requirement:

  - Health monitoring is identified as a means of detecting early changes to workers' health as a result of exposure to poor air quality, dust or other airborne contaminants.

- Workers participate in a health monitoring program.

With regards to this critical control, specific findings included:

- All mines relied on Coal Services Order 43 for health monitoring.

- Some mines, at the time of assessment, were slightly behind in health monitoring due to restrictions imposed because of COVID-19. Mines that were affected by this could provide evidence of a strategy to rectify the issue and ensure they were compliant moving forward.

Findings by mine

Figure 1 presents aggregate assessment findings by critical control, providing a summary view of the status of each mine's hazard management processes. Importantly, the system recognises the value of fully implemented and documented controls by awarding an additional point if both elements were assessed as present. More details explaining the assessment system are found at Appendix B.

Figure 1: Assessment findings for the planned inspection program – Air quality or Dust or Other Airborne contaminants – below surface coal mines

	Threat	Consequence	
	1. Low oxygen environment 2. Dust raised into suspension 3. Hazardous chemicals in the atmosphere 4. Carcinogens in the atmosphere	One or more fatalities	
	PC1.3	MC1.2	MC1.3
	Ventilate workplace	Hygiene monitoring	Health monitoring
Mine A	🟡	🟢	🟢
Mine B	🟡	🟡	🟢
Mine C	🟢	🟢	🟢
Mine D	🟢	🟢	🟢
Mine E	🟢	🟢	🟢
Mine F	🟢	🟢	🟢
Mine G	🟢	🟢	🟢
Mine H	🟢	🟢	🟢
Mine I	🟢	🟢	🟢
Mine J	🟢	🟢	🟢
Mine K	🟢	🟢	🟢
Mine L	🟢	🟢	🟢
Mine M	🟢	🟢	🟢
Mine N	🟢	🟢	🟢
Mine O	🟢	🟢	🟢
Mine P	🟢	🟢	🟢
Mine Q	🟢	🟢	🟢

🟩 Green (=100%)
🟨 Yellow (>= 80% and <100%)
🟧 Orange (>= 65% and <80%)
🟥 Red (<65%)

Notices issued

Of the 17 sites assessed under the inspection program, nine separate mines received notices relating to the principal hazard of air quality or dust or other airborne contaminants, while some mines received notices in relation to other matters. For the purposes of this report, contraventions related to other matters have been removed from the analysis. The notices issued for air quality or dust or other airborne contaminants were examined in detail and Table 2 below lists the notices issued by type and details.

Table 2: Notices issued for the planned inspection program – Air quality or Dust or Other Airborne contaminants – below surface coal mines

NOTICE TYPE	TOTAL ISSUED	NUMBER OF MINES
s.195 prohibition notice	1	1
s.191 improvement notice	1	1
s.23 notice of concerns	14	9
Total	16	9

Of the combined 16 notices issued, there were some common themes which were apparent throughout the program plan. Table 3 summarises the type of contraventions encountered. These themes can be related back to the critical controls outlined earlier and identify some trends which are of concern.

Table 3: Notices issued - prevalence of categories of concern

IDENTIFIED CONCERN CATEGORIES
Documentation relating to controls for airborne containments (Risk Assessment, PHMP, TARPs etc.) not relevant, current, or readily available
Low oxygen levels not identified as a hazard
Workers not familiar with exposure standards or risk to health
Workers/work groups not identified for monitoring in relation to the hazard
Missed opportunity to analyse monitoring results
Workers observed to be non-compliant with the nominated controls on site
Workers not familiar with sources of hazard or what controls to use
Lack of controls to eliminate or minimise airborne containments while testing for airborne contaminants (diesel particulates)
Equipment used to remove airborne containments is not readily available, maintained appropriately or inadequate
Missed opportunity to use health monitoring as indicator to the implementation of airborne containment controls

Further information

For more information on safety assessment programs, the findings outlined in this report, or other mine safety information, please contact the NSW Resources Regulator:

CONTACT TYPE	CONTACT DETAILS
Email	cau@planning.nsw.gov.au
Incident reporting	To report an incident or injury call 1300 814 609 or log in to the Regulator Portal
Website	https://www.resourcesregulator.nsw.gov.au/
Address	NSW Resources Regulator 516 High Street Maitland NSW 2320

Appendix A. Legislative requirements and published guidance relating to the principal hazard air quality or dust or other airborne contaminants

The following is a list of certain legislative requirements for the management of air quality or dust or other airborne contaminants risks referred to in this report, as provided by the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 and Work Health and Safety Regulation 2017.

Work Health and Safety Regulation 2017:

- Clause 36 - Hierarchy of control measures
- Clause 49 - Ensuring exposure standards for substances and mixtures not exceeded
- Clause 50 - Monitoring airborne contaminants levels
- Clause 51 - Managing risks to health and safety (Safe oxygen level).

Work Health and Safety (Mines and Petroleum Sites) Regulation 2014:

- Clause 9 - Management of risks to health and safety
- Clause 26 (3) - Health control plan
- Clause 39 - Ensuring exposure standards for dust not exceeded
- Clause 86 - Sampling and analysis of airborne dust (Coal mines)
- Clause 103-108 - Information, training and instruction.

Schedule 1, Clause 5 - Air quality or dust or other airborne contaminants.

Schedule 2, Clause 1 - Health control plan.

Safe Work Australia - Hazardous chemicals requiring health monitoring.

Learning from disasters event: Re-emergence of dust diseases including coal miner's pneumoconiosis and silicosis in the mining industry.

Appendix B. Assessment system explained

We use a bowtie framework to proactively assess how mine sites manage their principal hazards. Bowties are a widely used risk management tool that integrates preventative and mitigating controls onto threat lines that relate to a material unwanted event.

As part of program planning, controls were categorised in accordance with the ICMM handbook. Only controls deemed critical[1] are assessed under a planned inspection program. For a control to be assessed as effective, each of its control supports must be in place and operational.

Assessment findings results calculation

During the program, each control support assessed at each mine was rated and the findings recorded. Points were awarded depending on whether there was evidence that the control support had been documented and / or implemented. Importantly, the system recognises the value of fully implemented and documented controls by allocating four points if both these elements were present.

For finding outcomes, points were awarded for each control support identified within a critical control. An overall assessment result for the critical control was then calculated as a proportion of the maximum possible points for that critical control. For example, if a critical control comprises ten control supports and five were assessed as fully implemented ('documented and implemented') and five were found to be 'not documented and not implemented' then the overall assessment result for that critical control would be 50%.

Table 3: Finding outcome and points

FINDING OUTCOME	POINTS
Documented and implemented	4
Implemented but not documented	2
Documented but not implemented	1
Not documented and not implemented	0

Critical control calculations also took into account instances where control supports were not applicable to the mine being assessed or when control supports were not able to be assessed during a site visit.

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[1] Critical Control Management Implementation Guide, International Council on Mining and Metals (ICMM), 2015.

The overall assessment result for each critical control has been assigned a colour based on the assessment bands presented in the table below. The colour band results are then used to identify industry focus areas requiring improvement.

Table 4: Assessment results and colour code

CRITERIA	COLOUR
An assessment result of 100% of possible points	Green
An assessment result of > 80% but < 100% of possible points	Yellow
An assessment result of > 65% but < 80% of possible points	Orange
An assessment result of < 65% of possible points	Red