



**NSW  
Resources  
Regulator**

**PLANNED INSPECTION PROGRAM**

**CONSOLIDATED REPORT:  
AIR QUALITY OR DUST OR  
OTHER AIRBORNE  
CONTAMINANTS – STAGE 2  
– COAL MINES BELOW  
SURFACE**

January 2021 – February 2022

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## Executive summary

A crucial part of the NSW Resources Regulator’s Incident Prevention Strategy involves targeted assessment and planned inspection programs for mine and petroleum sites. This is a focus on assessing an operation’s control of critical risks through evaluating how effective control measures are in a mine’s safety management system. To determine this, the Regulator 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.

Because of the various controls 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 two of the program, which covered 19 mines between January 2021 and February 2022. For stage 2 of the program, the threats and critical controls assessed for the material unwanted event (exposure to hazardous atmosphere) are shown in Table 1.

*Table 1: Threats and critical controls assessed for the material unwanted event - exposure to hazardous atmosphere.*

THREAT/CONSEQUENCE		CRITICAL CONTROL
Threat	<ol style="list-style-type: none"> <li>1. Low oxygen environment</li> <li>2. Dust raised into suspension</li> <li>3. Hazardous chemicals in the atmosphere</li> <li>4. Carcinogens in the atmosphere</li> <li>5. Conditions conducive to biological agents</li> </ol>	PC 1.1 – Minimise airborne contaminants
Threat	<ol style="list-style-type: none"> <li>1. Low oxygen environment</li> <li>2. Dust raised into suspension</li> <li>3. Hazardous chemicals in the atmosphere</li> <li>4. Carcinogens in the atmosphere</li> </ol>	PC 1.4 – Separate workers
Threat	<ol style="list-style-type: none"> <li>1. Dust raised into suspension</li> </ol>	PC 2.3 – Dust containment and extraction

Legislative requirements and published guidance about the principal hazard of air quality or dust or other airborne contaminants are in Appendix A. Figure 1 presents safety compliance findings for each

de-identified mine and the critical control assessed for the material unwanted event – exposure to hazardous atmosphere. Explanatory notes on the assessment system are also in Appendix B.

## Key findings

Some of the key findings for this planned inspection program of air quality or dust or other airborne contaminants included:

- The majority of mines had a comprehensive suite of controls that were implemented, monitored and understood
- Most mine workers had a very high level of knowledge about the health effects of airborne contaminants, the controls for those contaminants and the actions to take if a control was ineffective
- Most mines had reacted to the reduction in the workplace expose standards for respirable dust and respirable crystalline silica and introduced additional baseline testing, controls and training
- Mines had production no-go zones that considered the location, type and load of airborne contamination. This included not being on the return side of advancing supports
- There was a large uptake in longwall automation reducing face exposure for longwall operators
- The majority of mines had formally implemented task rotation on jobs where exposure was highest for airborne contamination.

## Recommendations

The following recommendations are made:

- Mines should carry out baseline monitoring to determine the types of airborne contaminants and the levels of those contaminants for the various processes undertaken at the mine
- Low oxygen environments should be considered as a potential hazard in the risk assessment for airborne contamination
- Consideration should be given to providing no-go zones for workers who are in proximity to hot work
- Used diesel particulate filters can present a hazard to workers and must be disposed of correctly.

## Introduction

The Regulator’s planned assessment programs provide a 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 that:

- focus on managing prescribed principal hazards from the Work Health and Safety (Mines and Petroleum Sites) Regulation 2014
- evaluate the effectiveness of control measures implemented through an organisation’s safety management system
- consider 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 the inspection of plant and worker interviews only.

## The process

The process for undertaking an assessment under a planned inspection program generally involves several stages that include:

- 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 operator in response.

## Assessment findings

### Controls assessed

#### Threats for critical control PC1.1

1. Low oxygen environment
  2. Dust raised into suspension
  3. Hazardous chemicals in the atmosphere
  4. Carcinogens in the atmosphere
  5. Conditions conducive to biological agents
- **Critical control:** PC 1.1 – Minimise airborne contaminants
  - **Control objective:** Limit the creation of airborne contaminants at the source
  - **Performance requirement**
    1. Contaminants capable of posing an airborne exposure hazard are identified
    2. Controls are implemented to minimise the creation of contaminants capable of posing an exposure hazard

Regarding this critical control, specific findings included:

- Most mines had considered the full suite of airborne contaminants that could be present at the mine. Some mines had not considered low oxygen as a potential hazard
- Mines that frequently cut stone selected picks that were suitable for the task
- Chemical databases were used to select chemicals that minimised the risk of airborne contamination
- Most mines had carried out baseline monitoring using a mix of static and real time monitors to determine the location, types and loads of airborne contamination
- Most mines had programs to treat roads to prevent dust being raised into suspension. In several cases this included fixed sprays at strategic locations – e.g. drifts
- Most mines had cleaning programs to prevent dust accumulations that may later be raised into the air flow

Regarding this critical control, specific recommendations included:

- Mines should carry out baseline monitoring to determine the types of airborne contaminants and the levels of those contaminants for the various processes undertaken at the mine
- Low oxygen environments should be considered as a potential hazard in the risk assessment proves for airborne contamination.

## Threats for critical controls PC1.4

1. Low oxygen environment
  2. Dust raised into suspension
  3. Hazardous chemicals in the atmosphere
  4. Carcinogens in the atmosphere
- **Critical control:** PC1.4 – Separate workers
  - **Control objective:** Physical barriers protect people from being exposed to airborne contaminants or air quality that exceeds exposure limits
  - **Performance requirement**
    1. Physical barriers are identified as a means of separating people from poor air quality, dust or other airborne contaminants
    2. Installed physical barriers effectively separate people from poor air quality, dust or other airborne contaminants



With regards to this critical control, specific findings included:

- Most mines had sealing plans that incorporated fixed barriers to prevent access to low oxygen atmospheres
- Most mines had continuous miner operators on the off-ventilation tube side of the CM to minimise exposure to silica dust
- Mines had production no-go zones that considered the location, type and load of airborne contamination. This included not being on the return side of advancing supports
- There has been a large uptake in longwall automation reducing face exposure for LW operators
- The majority of mines had formally implemented task rotation on jobs where exposure is highest for airborne contamination
- Very few mines had considered the potential for non-involved workers to be exposed to fumes from hot work and appropriate exclusion zones
- The use of slider tubes for the ventilation ducting and curtains on the CM helped to reduce operator exposure to airborne dusts

With regards to this critical control, it is recommended that consideration be given to providing no-go zones for workers who are in proximity to hot work.

## Threat for critical control PC2.3

### 1. Dust raised into suspension

- **Critical control:** PC 2.3 – Dust containment and extraction
- **Control objective:** Airborne dust is contained within a process or extracted and collected to prevent people being exposed
- **Performance requirement**
  1. Dust containment and extraction is identified as a means of protecting people from airborne dust
  2. Dust containment and extraction controls are implemented to minimise airborne dust
  3. Contained or extracted dust is disposed of in a manner that minimises release into the atmosphere.

Regarding this critical control, specific findings included:

- Most longwall mines had scrubber systems on the BSL crusher area with the scrubber dumping wet product onto the conveyor. One mine had the scrubber interlocked to the face so the face could not operate without the scrubber operating
- Reports indicated there was a high level of compliance with scrubber servicing and maintenance
- Several mines had enclosed belt transfers to prevent dust being entrained into the airflow
- Most dedicated hot work bays had fume extraction or filtration
- Mines that used wide side return were aware of the importance of recirculation for scrubber fan performance
- All mines used diesel particulate filters to minimise the airborne contaminant load. Some filters were seen to be incorrectly handled after removal from the machine

## **Findings by mine**

Figure 1 presents aggregate assessment findings by critical control, providing a summary 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. Details explaining the assessment system are at Appendix B.

# PLANNED INSPECTION PROGRAM – CONSOLIDATED REPORT

Air quality or dust or other airborne contaminants – stage 2  
Coal mines below surface

Figure 1: Assessment findings for the planned inspection program air quality or dust or other airborne contaminants – stage 2 – coal mines below surface – overall results.

Mine	Threat		
	1. Low oxygen, 2. Dust, 3. Toxic or corrosive chemicals, 4. Carcinogens, 5. Biological agents	1. Low oxygen, 2. Dust, 3. Toxic or corrosive chemicals, 4. Carcinogens	Dust raised into suspension
	PC1.1	PC1.4	PC2.3
	Minimise airborne contaminants	Separate workers	Dust containment and extraction
Mine A	Red	Red	Red
Mine B	Orange	Green	Yellow
Mine C	Green	Green	Green
Mine D	Green	Green	Green
Mine E	Green	Green	Green
Mine F	Green	Green	Green
Mine G	Green	Green	Green
Mine H	Green	Green	Green
Mine I	Green	Green	Green
Mine J	Green	Green	Green
Mine K	Green	Green	Green
Mine L	Green	Green	Green
Mine M	Green	Green	Green
Mine N	Green	Green	Green
Mine O	Green	Green	Green
Mine P	Green	Green	Green
Mine Q	Green	Green	Green
Mine R	Green	Green	Green
Mine S	Green	Green	Green

- Green (=100%)
- Yellow (>= 80% and <100%)
- Orange (>= 65% and <80%)
- Red (<65%)
- Not applicable

## Notices issued

Of the 19 sites assessed under the inspection program, 6 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 were 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 by type and details.

*Table 2: Notices issued for the planned inspection program for air quality or dust or other airborne contaminants – stage 2 – coal mines below surface.*

NOTICE TYPE	TOTAL ISSUED	NUMBER OF MINES
s.195 prohibition notice	-	-
s.191 improvement notice	4	3
s.23 notice of concerns	4	4
<b>Total</b>	<b>8</b>	<b>7</b>

Of the combined 8 notices issued, there were some common themes that were apparent throughout the program plan. Table 3 summarises the type of contraventions encountered. These themes can be related to the critical controls outlined earlier and identify some trends that were of concern.

*Table 3: Notices issued - prevalence of categories of concern.*

**IDENTIFIED CONCERN CATEGORY**

Low oxygen not considered in the risk assessment.

CM sprays working ineffectively.

Mining supervisors being unfamiliar with measuring air quantity and the requirements of the ventilation control plan.

Inadequate understanding of the operation and maintenance of an air filtration device in the surface workshop.

Missing ventilation tube rubbers.

Inadequate baseline monitoring.

A minor change to the documentation triggered a restart of the review date.

Incorrect disposal of diesel particulate filters.

Development panel operating on minimum ventilation quantity.

## Further information

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

CONTACT TYPE	CONTACT DETAILS
Email	<a href="mailto:cau@planning.nsw.gov.au">cau@planning.nsw.gov.au</a>
Incident reporting	To report an incident or injury call 1300 814 609 or log in to the <a href="#">Regulator Portal</a>
Website	<a href="http://www.resourcesregulator.nsw.gov.au/">www.resourcesregulator.nsw.gov.au/</a>
Address	516 High Street Maitland NSW 2320

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

The following is 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 International Council on Mining and Metals handbook. Only controls deemed critical<sup>1</sup> 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 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 comprised 10 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 4: 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 considered 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.

<sup>1</sup> Critical Control Management Implementation Guide, International Council on Mining and Metals (ICMM), 2015.

The overall assessment result for each critical control was 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 5: Assessment results and colour code*

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