NSW Resources
Resources Regulator

Consolidated report

Slope stability – stage 1 – surface coal mines

July 2023 to December 2024

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Executive summary

A crucial part of the Resources Regulator's incident prevention strategy for mines and petroleum sites involves:

- targeted assessments and planned inspection programs – focusing on assessing an operation's control of critical risks by evaluating the effectiveness of control measures in the mine's safety management system
- priority programs – proactively assessing a topic that is an emerging risk throughout the industry, which is determined primarily from incident data as well as evolving industry trends.

The planned inspection program in surface coal mines for the principal hazard of ground or strata failure – slope stability stage 1 was conducted between July 2023 and December 2024.

A bowtie identified for the threat of strata failure- slope stability two critical controls – drilling and blasting practices and dump to design for the material unwanted event (MUE) of human exposure to strata slope failure.

As part of the planned assessment activities, Regulator inspectors attended 20 surface coal mines with a focus on the assessment of the identified critical control supports for the critical control.

This planned inspection program was part of an ongoing effort by the Regulator to reduce the potential risks associated with human exposure to strata slope failure.

This report provides information on assessment findings and recommendations for surface coal mine operators.

In summary, of the 20 surface coal mines assessed, 4 compliance notices were issued to 4 of the 20 surface coal mines.

Three of the 4 compliance notices issued related specifically to the assessment of human exposure to strata slope failure.

One of the 4 compliance notices issued related to other types of non-compliance issues.

Explanatory notes on the assessment system are listed in Appendix A.

Assessment criteria for all assessments

The Regulator's bowtie (assessed critical controls PC 1.4 & PC 3.4) reviewed 4 threats for strata slope failure and 2 critical controls and identified 17 control supports that were the criteria to assess how surface coal mine operators manage the material unwanted events (MUE) of human exposure to strata slope failure.

A tabulation of the threat and critical control for the MUE is provided in Table 1.

Table 1. Threat and critical control for the MUE human exposure to strata slope failure

Threats	Critical controls
Ground conditions Natural or induced seismic event	Drilling and blasting practices (PC 1.4)
Unconsolidated material Natural or induced seismic event	Dump to design (PC 3.4)

A tabulation of the critical controls and control supports for the MUE human exposure to strata slope failure is provided in Table 2.

Table 2. Critical controls and control supports for the MUE human exposure to strata slope failure

Critical controls	Control supports	
Drilling and blasting practices (PC 1.4)	01	Verify that drill operators have access to a plan with information on hole and pattern design.
	02	Confirm that drill operators can explain the key features of the drill plan. Key features of the drill plan should include wall angle and height indicated by hole angle and depth, and may include: • pre-splitting or trim shot detail • formation of benches.
	03	Confirm that drill operators can explain how to drill the hole in the correct location and at the correct angle.
	04 & 05	Confirm with drill operators that they have been able to drill the pattern to the requirements of the plan.
	06 & 07	Verify that drill operators maintain and record drill hole log information that is relevant to the blast design. Relevant information may include: • deviation from planned hole location or angle • holes drilled short of planned length • broken ground or voids encountered.
	08	Confirm that drill operators can explain the action required when experiencing difficulties in achieving the drill plan.
	09	Confirm that shotfirers dip blast holes prior to loading for anomalies such as water in the holes, collapsed or blocked holes.
	10	Verify that shotfirers have access to an information pack that includes design features of the blast. Key features may include: • type of explosive used • explosive charge • method of priming • delay timing and sequencing • stemming height.
	11	Confirm the shotfirer can explain the key features of the blast plan.

Critical controls		Control supports
Dump to design (PC 3.4)	01	Verify that the supervisor can explain the dump limits.
	02	Confirm with the supervisor that dump limit guidance is provided to the equipment operators. Examples may be GPS guidance or survey pegs.
	03	Confirm that supervisor shift inspection reports include verifying dump integrity and conformance to design.
	04	Confirm that dump operator understands the requirements if a dump or tip head is not up to standard.
	05	Verify that dump operator can identify the relevant hazards associated with the dump. Examples may be cracking on dumps, poor material consistency, height of dump, pooling water etc.
	06	Confirm dump operator can explain how to recover or repair the dump if it is not up to standard.

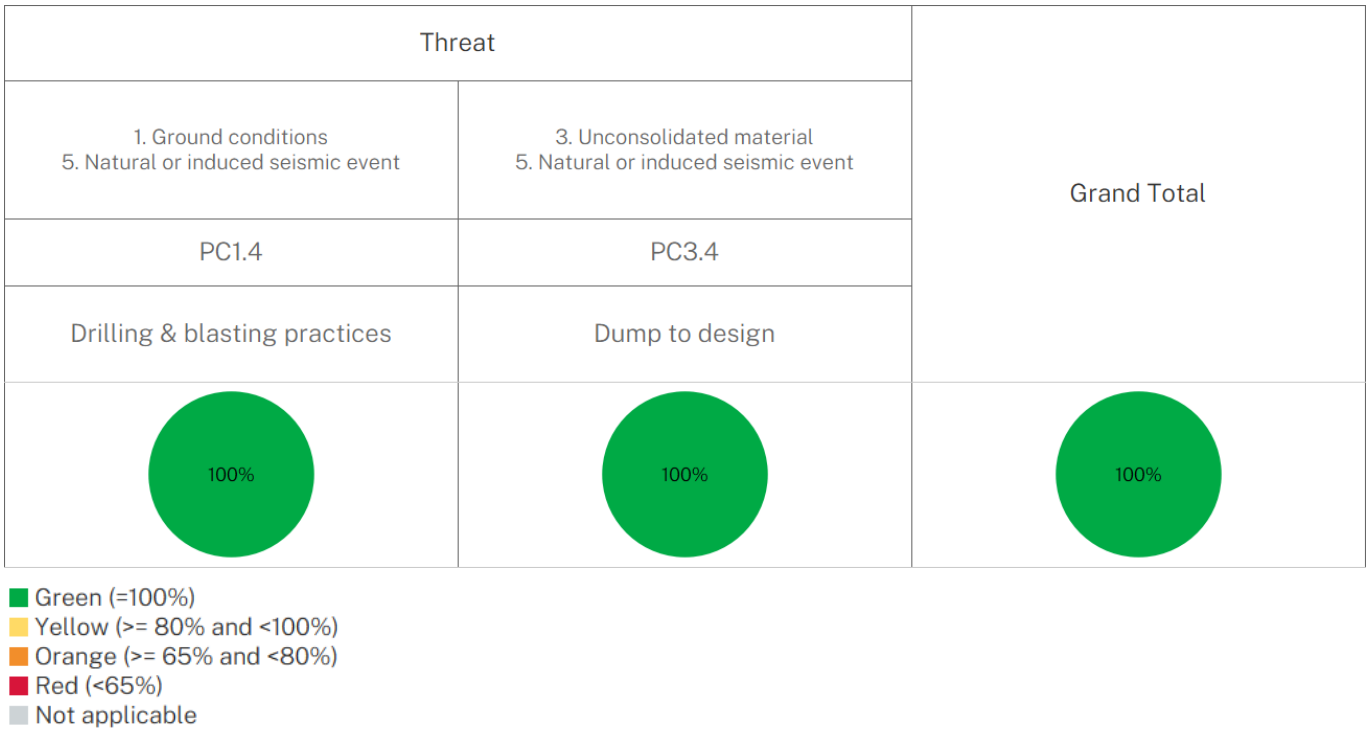
Assessment findings for surface coal mines

Overall, the assessment findings for surface coal mines were:

- 20 surface coal mines were assessed
- 300 individual findings for the assessed criteria,
- 3 assessment findings with enforcement action recorded,
- 4 compliance notices were issued to 4 of the 20 surface coal mines assessed

Figure 1 provides a summary assessment of the overall result for the critical control.

Figure 1. Summary assessment findings of overall result for the threats and critical controls



In summary, the overall assessment finding for the 2 critical controls assessed – drilling and blasting practices and dump to design were both assessed as 100%.

Assessment overall ratings for surface coal mines

In summary the overall assessment ratings for surface coal mines were:

- 97.0% rating for documented and implemented finding
- 3.0 % rating of not applicable

The overall assessment findings ratings by critical control and control support for surface coal mines is shown in Figure 2.

Figure 2. Overall assessment findings ratings by critical control and control support for surface coal mines

Critical control number	Critical control	Control support number	Criteria Text
PC1.4	Drilling & blasting practices	01	Verify that drill operators have access to a plan with information on hole and pattern design
		02	Confirm that drill operators can explain the key features of the drill plan. Key features of the drill plan should include wall angle and height indicated by hole angle and dep..
		03	Confirm that drill operators can explain how to drill the hole in the correct location and at the correct angle
		04 & 05	Confirm with drill operators that they have been able to drill the pattern to the requirements of the plan.
		06 & 07	Verify that drill operators maintain and record drill hole log information that is relevant to the blast design...
		08	Confirm that drill operators can explain the action required when experiencing difficulties in achieving the drill plan
		09	Confirm that shotfirers dip blast holes prior to loading for anomalies such as water in the holes, collapsed or blocked holes.
		10	Verify that shotfirers have access to an information pack which includes design features of the blast. Key features may include:..
		11	Confirm the shotfirer can explain the key features of the blast plan.
PC3.4	Dump to design	01	Verify that the supervisor can explain the dump limits
		02	Confirm with the supervisor that dump limit guidance is provided to the equipment operators. Examples may be GPS guidance or survey pegs
		03	Confirm that supervisor shift inspection reports include verifying dump integrity and conformance to design
		04	Confirm that dump operator understands the requirements if a dump or tiphead is not up to standard.
		05	Verify that dump operator can identify the relevant hazards associated with the dump Examples may be cracking on dumps, poor mater..
		06	Confirm dump operator can explain how to recover or repair the dump if it is not up to standard.

Notices issued to surface coal mines

In total, 20 assessments were conducted at surface coal mines.

In summary, there were 4 compliance notices issued to 4 of the 20 surface coal mines assessed comprising:

- one x section 191 improvement notices
- 3 x section 23 cause for concern notices.

Note: Three of the 4 compliance notices issued related specifically to human exposure to strata slope failure.

One of the 4 compliance notices issued related to other types of non-compliance issues.

The compliance notices issued for surface coal mines were reviewed and Table 3 lists the notices issued by type and number.

Table 3: Notices issued for surface coal mines

NOTICE TYPE	TOTAL ISSUED	NUMBER OF SITES
s.191 improvement notice	1	1
s.23 notice of concern	3	3
Total	**4**	**4**

Recommendations for surface coal mines

Based on the findings outlined in this report and in relation to the numbers and types of compliance notices issued during the assessment of human exposures to strata slope failures in surface coal mines, it is recommended that the following topics should be reviewed by operators of surface coal mines:

Review of the site principal hazard management plan for ground or strata failure, in particular:

- strata slopes, roadway widths/gradients and bund-walls constructed and maintained to site design standards
- management of spontaneous combustion events degrading slope stability
- over-burden and inter-burden slope batter angles constructed and maintained compliant with site design standards
- dumped waste material piles blocking water drainage channels and creating water ponding accumulations during wet weather events degrading slope stability
- open cut examiner (OCE) sign-off required on work permits when workers are required to work within 10 metres of high-walls and low-walls
- OCE ground and strata inspections to monitor and report non-compliant strata slopes and roadway widths/gradients and bund walls not built and maintained to site design standards
- ground and strata non-conformance resolution actions to be reported to and monitored by site senior management and regularly reviewed by the site WHS committee.

Further information

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

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Appendix A – Assessment criteria rating

Each assessed criteria is rated from one to 4 based on evidence supporting the expected control supports identified at the mine site.

Evidence supporting expected control supports

Expected control supports	Rating	Evidence supporting rating / comments
	4 3 2 1	

Assessment findings results are calculated based on the total points allocated to the assessed ratings as a percentage of the maximum possible points for each criteria group, and any findings rated as 'Not applicable' were excluded from the calculation.

Criteria assessed ratings and points

Assessed as	Rating	Points
Documented & implemented **Compliant**	4	4
Implemented but not documented **Improvement needed**	3	2
Documented but not implemented **Significant improvement needed**	2	1
Not documented and not implemented **Non compliant**	1	0
Not applicable (N/A)		

Findings results (points) with colours assigned as follows:

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