NSW Resources
Resources Regulator

Consolidated report

Explosives control plan – metalliferous stage 2

September 2023 to October 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. Although these topics may also be contained within the Regulator's planned inspection programs, the aim of compliance priority programs is to gather further information and knowledge about how the industry is managing and controlling a specific issue.

The planned inspection program for the explosives control plan stage 2 targeted metalliferous sites between September 2023 and October 2024.

Unplanned detonation of explosives is a significant type of incident with the potential to cause multiple serious injuries or fatal outcomes.

As part of the planned assessment activities, Regulator inspectors attended metalliferous surface and underground sites with a focus on the critical controls including blast planning and implementation and safe blasting processes.

This planned inspection program was part of an ongoing effort by the Regulator to reduce the potential for incidents of unplanned detonation of explosives at metalliferous sites.

This report provides information on assessment findings and recommendations for metalliferous surface and underground site operators.

In summary of the 25 metalliferous sites assessed (12 surface sites and 13 underground mines) resulted in 49 compliance notices issued to all 25 sites assessed.

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

Assessment criteria for all assessments

Assessment threats, critical controls and control supports were identified by the Regulator in a bowtie to review how mine operators manage the material unwanted event (MUE) of unplanned detonation of explosives at metalliferous sites.

A tabulation of the assessment criteria for unplanned detonation of explosives at metalliferous sites is provided in Table 1.

Table 1. Threats, critical control & control supports for unplanned detonation of explosives at METEX sites

Threat	Critical control		Control support	
1. Unplanned detonation of explosives 2. Person in close proximity to a blast 3. Noxious fume airborne dust generation	PC 1.3	Blast planning and implementation	01	Blast plans are produced to guide the implementation of the blast design
			02	Blast plans contain enough information to allow drillers and shotfirers to prepare the blast.
			03	Blast holes are drilled to the specification outlined in the blast plan
			04	Blast holes are checked prior to charging.
			05	Blast holes are charged to the specification outlined in the blast plan.
			06	Blast plans are adjusted to manage inconsistencies identified during blast hole drilling and blast hole checks.
1. Unplanned detonation of explosives 2. Person in close proximity to a blast 3. Noxious fume airborne dust generation 4. Underground secondary gas or dust explosion	PC1.4	Safe blasting processes	01	Blast exclusion zones are established as required by the blast management plan or established procedures.
			02	Nominated methods of communicating upcoming blasting activities occur and are effective.
			03	Nominated methods of accounting for people leaving the blasting area are conducted and are effective.
			04	Nominated methods of preventing access to blast areas are put in place and are effective.
			05	Blast guards and sentries are familiar with their duties outlined in the explosives

Threat	Critical control	Control support	
			control plan and associated documents.
		06	Nominated warnings are given immediately prior to blasting.
		07	Required wait times are adhered to prior to entering a recently fired blast area.
		08	Blast areas are inspected and made safe prior to people entering.
		09	People can identify misfired explosives and are familiar with required actions for discovering misfired explosives.
		10	Underground metal mines - nominated sulphide explosion controls are in place prior to blasting.

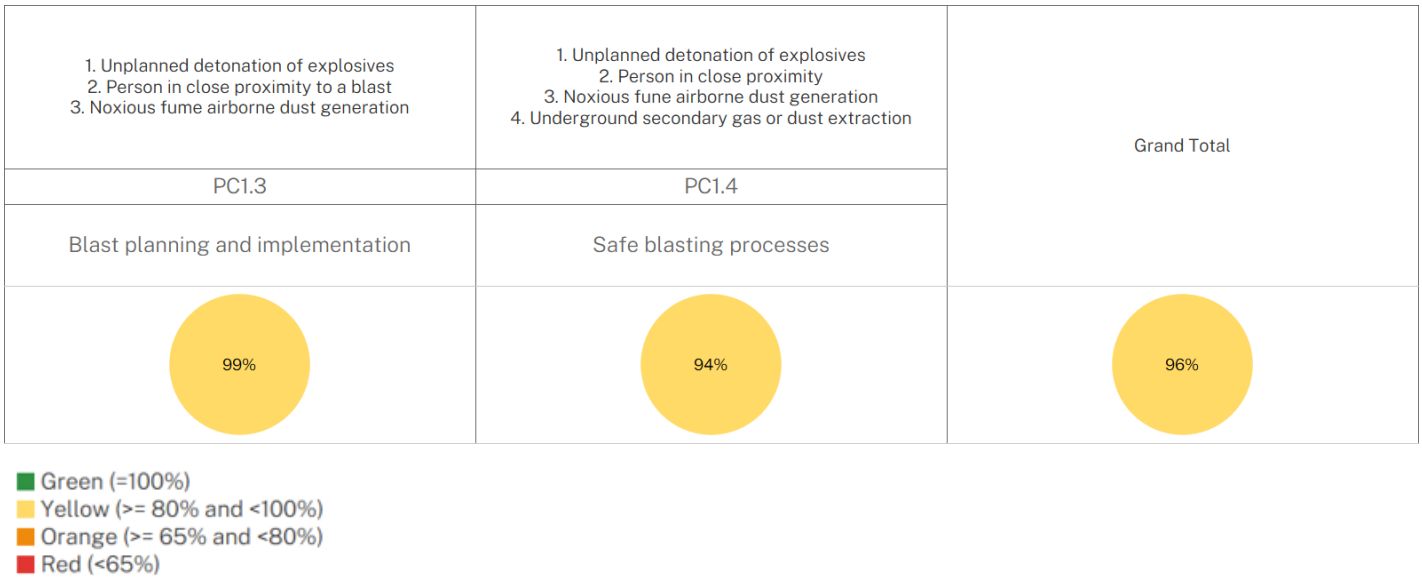
Assessment findings for metalliferous sites

Overall, the assessment findings for metalliferous sites were:

- 9 surface construction material sites were assessed
- 3 surface industrial mineral sites were assessed
- 13 underground metal mines were assessed
- 400 individual findings for the assessed criteria
- 41 assessment findings with enforcement action recorded
- 49 compliance notices were issued to all 25 metalliferous sites assessed

Figure 1 provides a summary assessment of the overall results by threat and critical control.

Figure 1. Summary assessment findings of overall results by threat and critical control



In summary, the overall assessment findings by critical control were assessed in total as 96%.

The lowest assessment finding for a critical control was 94% (yellow colour category) for PC1.4 safe blasting processes.

Figure 2 provides a summary assessment of the overall results by threat, critical control and control supports for PC1.3 – blast planning and implementation.

Figure 2. Summary assessment findings of overall results by threat, critical control and control supports for PC1.3- blast planning and implementation

Control support number	Control support description	1. Unplanned detonation of explosives 2. Person in close proximity to a blast 3. Noxious fume airborne dust generation
		PC1.3
		Blast planning and implementation
01	Blast plans are produced to guide the implementation of the blast design.	98%
02	Blast plans contain enough information to allow drillers and shotfirers to prepare the blast.	100%
03	Blast holes are drilled to the specification outlined in the blast plan.	98%
04	Blast holes are checked prior to charging.	100%
05	Blast holes are charged to the specification outlined in the blast plan.	100%
06	Blast plans are adjusted to manage inconsistencies identified during blast hole drilling and blast hole checks.	100%
Grand Total		99%

Green (=100%)
Yellow (>= 80% and <100%)
Orange (>= 65% and <80%)
Red (<65%)

The lowest assessment finding for a critical control support was 98% (yellow colour category) for PC1.3 control support numbers 01 and 03.

Figure 3 provides a summary assessment of the overall results by threat, critical control and control supports for PC1.4 – safe blasting processes.

Figure 3. Summary assessment findings of overall results by threat, critical control and control supports for PC1.4- safe blasting processes

Control support number	Control support description	1. Unplanned detonation of explosives 2. Person in close proximity 3. Noxious fune airborne dust generation 4. Underground secondary gas or dust extraction
		PC1.4
		Safe blasting processes
01	Blast exclusion zones are established as required by the blast management plan or established procedures.	92%
02	Nominated methods of communicating upcoming blasting activities occur and are effective.	95%
03	Nominated methods of accounting for people leaving the blasting area are conducted and are effective.	98%
04	Nominated methods of preventing access to blast areas are put in place and are effective.	100%
05	Blast guards and sentries are familiar with their duties outlined in the Explosives Control Plan and associated documents.	86%
06	Nominated warnings are given immediately prior to blasting.	96%
07	Required wait times are adhered to prior to entering a recently fired blast area.	82%
08	Blast areas are inspected and made safe prior to people entering.	98%
09	People can identify misfired explosives and are familiar with required actions for discovering misfired explosives.	100%
10	Underground Metal Mines. Nominated sulphide explosion controls are in place prior to blasting.	83%
Grand Total		94%

Green (=100%)
Yellow (>= 80% and <100%)
Orange (>= 65% and <80%)
Red (<65%)

The lowest assessment finding for a critical control support was 82% (yellow colour category) for PC1.4 critical control support number 07 -required wait times are adhered to prior to entering a recently fired blast area .

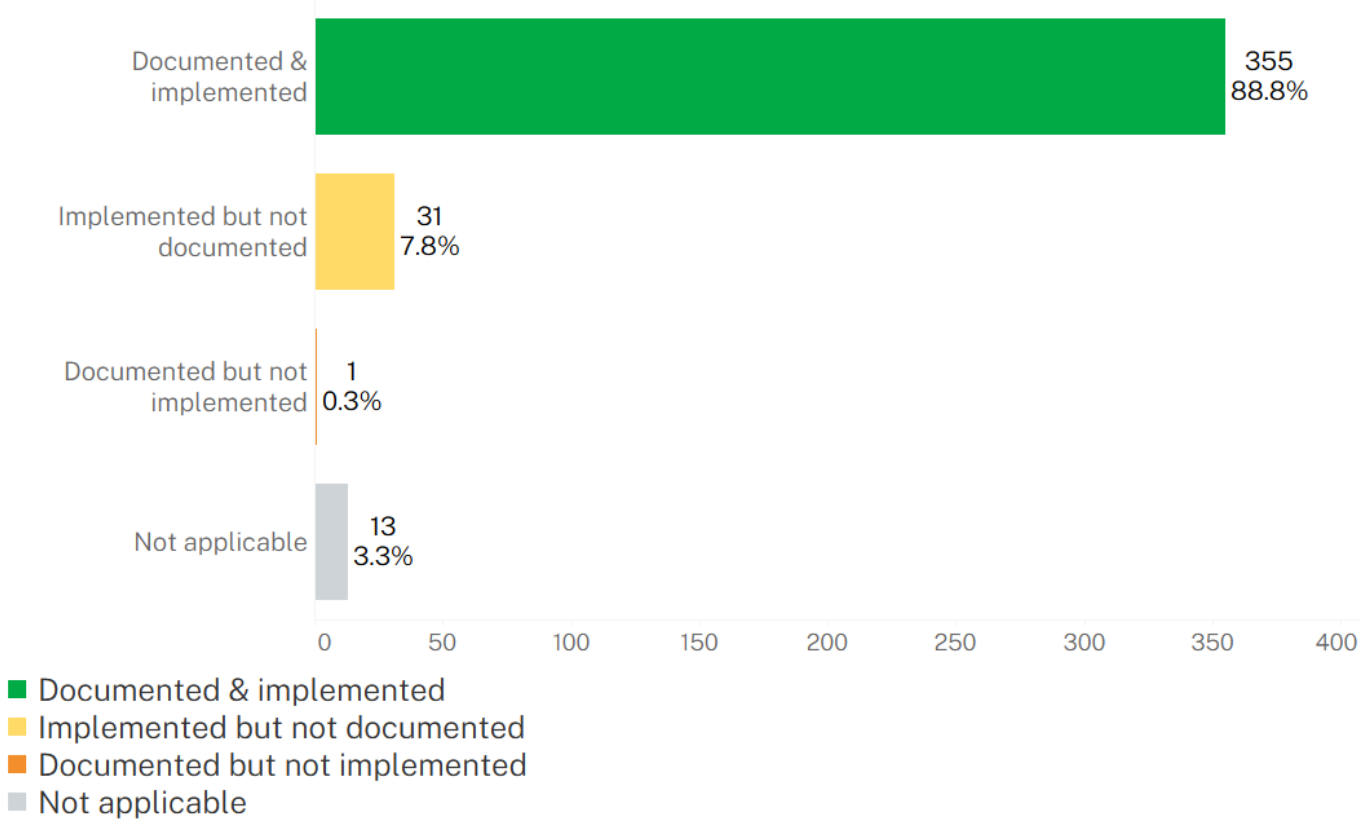
Assessment overall ratings for metalliferous sites

In summary the overall assessment ratings for assessed metalliferous sites were:

- 89% rating for documented and implemented finding,
- 8% rating for implemented but not documented finding,
- 1% rating for documented but not implemented finding,
- 3% rating for not applicable finding.

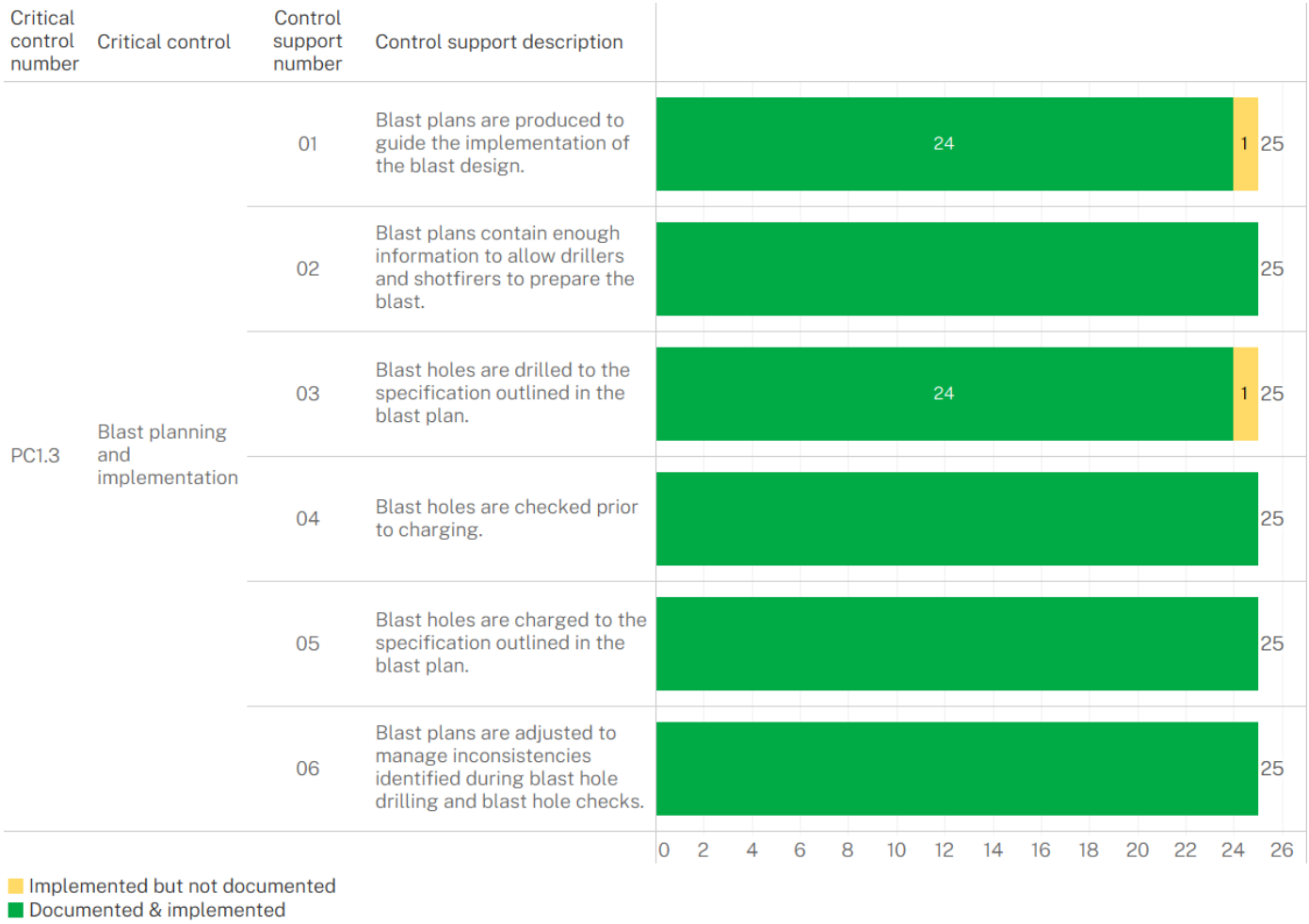
The overall assessment findings ratings for metalliferous sites is shown in Figure 4.

Figure 4. Overall assessment findings ratings for assessed metalliferous sites



The overall assessment findings ratings for PC1.3 blast planning and implementation critical control and control supports for metalliferous sites is shown in Figure 5.

Figure 5. Overall assessment findings ratings for PC1.3 blast planning and implementation critical control and control support for metalliferous sites



The overall assessment findings ratings for PC1.4 safe blasting processes critical control and control supports for metalliferous sites is shown in Figure 6.

Figure 6. Overall assessment findings ratings for PC1.4 safe blasting processes critical control and control support for metalliferous sites

Notices issued to metalliferous sites

In total, there were 25 assessments conducted at metalliferous sites.

There were 400 individual assessment findings and, of those, 41 assessment findings required enforcement action to be taken at metalliferous sites.

In summary, there were 49 compliance notices issued to all 25 assessed metalliferous sites comprising:

- 24 x section 191 improvement notices
- 25 x section 23 cause for concern notices

Note some notices issued were related to other identified non-compliance issues.

The compliance notices issued for metalliferous underground mines were reviewed and Table 2 lists the notices issued by type and number.

Table 2: Notices issued for metalliferous underground mines

NOTICE TYPE	TOTAL ISSUED	NUMBER OF SITES
s.191 improvement notice	24	17
s.23 notice of concern	25	24
Total	**49**	**25** **Note: some mine sites were issued multiple notices**

Recommendations for metalliferous sites

Based on the findings outlined in this report and with respect to the numbers and types of compliance notices issued during the assessment of unplanned detonation of explosives, it is recommended that the following topics be reviewed by operators of metalliferous sites:

Review of the metalliferous site explosives control plan, in particular:

- Explosion control zones and location of the shotfirer and sentries (including vehicle park-up locations) to reduce potential for interaction with blast flyrock, blasting fumes and dust.
- Management of mis-fired shots, sleeping shots and hot/reactive ground.
- Supervisor monitoring of compliance with designated re-entry wait times into blast areas.
- Explosives transport vehicles including correct signage decals and explosives storage systems in vehicles are maintained in a fit-for-purpose state.
- Training, competency, security clearance and licencing (BUEL requirements) of all workers undertaking blasting activities at site.
- Fire potential for overgrown vegetation surrounding explosives storage compounds.
- Explosives storage compounds are maintained and monitored to prevent un-authorised entry.
- Sulphide dust explosion controls are in place before blasting commences (underground).
- Notification to Safework NSW for loss or unaccounted explosives.

- Metalliferous surface on-bench sites and underground mines review of:

— Australasian Explosives Industry Safety Group. Code of Practice - 'Blast Guarding in an Open Cut Mining Environment' Edition 2 November 2018.

— Australasian Explosives Industry Safety Group. Code of Practice – 'On-Bench Practice for Open Cut Mines and Quarries' Edition 3 June 2019

— Australasian Explosives Industry Safety Group. Code of Practice – 'Prevention and Management of Blast Generated NOx Gasses in Surface Blasting' Edition 2 August 2011

— Resource Regulator published guidance information
https://www.resourcesregulator.nsw.gov.au/safety/licences-and-registrations/blasting-explosives-user-license

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	cau@regional.nsw.gov.au
Incident reporting	To report an incident or injury call 1300 814 609 or log in to the Regulator Portal
Website	www.resourcesregulator.nsw.gov.au
Address	Resources Regulator 516 High Street Maitland NSW 2320

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