



ABN: 46 099 761 289



Blast Management Plan

for the

Broken Hill North Mine



Prepared by:

RWCorkery&co

November 2025

TITLE BLOCK

Name of Mine:	Broken Hill North Mine
Development Application Number	SSD 7538
Applicant	Perilya Broken Hill Limited
Development Consent Date	22 December 2017, Last Modified 9 December 2021
Development Consent Condition Number	Condition 22 of Schedule 3

VERSION CONTROL

Summary of Document Revisions				
Rev. No.	Date Revised	Section Revised	Revision Description	Revision Authority
A	04/10/18	ALL	Issued for INTERNAL Review	M. Bland, B. Bussell, M. Humphreys
B	04/10/18	ALL	Issued for Agency Review	G. Hender
C	12/11/18	3, 11, 13	Issued for SECRETARY'S Approval	G. Hender
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1 Introduction and Scope

This *Blast Management Plan* is one of several required by the Development Consent Conditions of SSD 7538. These plans are listed in Section 4. The overarching document in this list is the *Environmental Management Strategy* for the Broken Hill North Mine which contextualises each of the subordinate management plans and includes generic systems-based details that are common to all plans.

This document describes the management of blasting and blasting-related impacts associated with the operational phase of the Broken Hill North Mine (the North Mine). This document specifically addresses the requirements of Condition 22 of Schedule 3 of SSD7538. This document does not address matters related to occupational health and safety associated with blasting.

Responsibility for preparation of the document has been as follows.

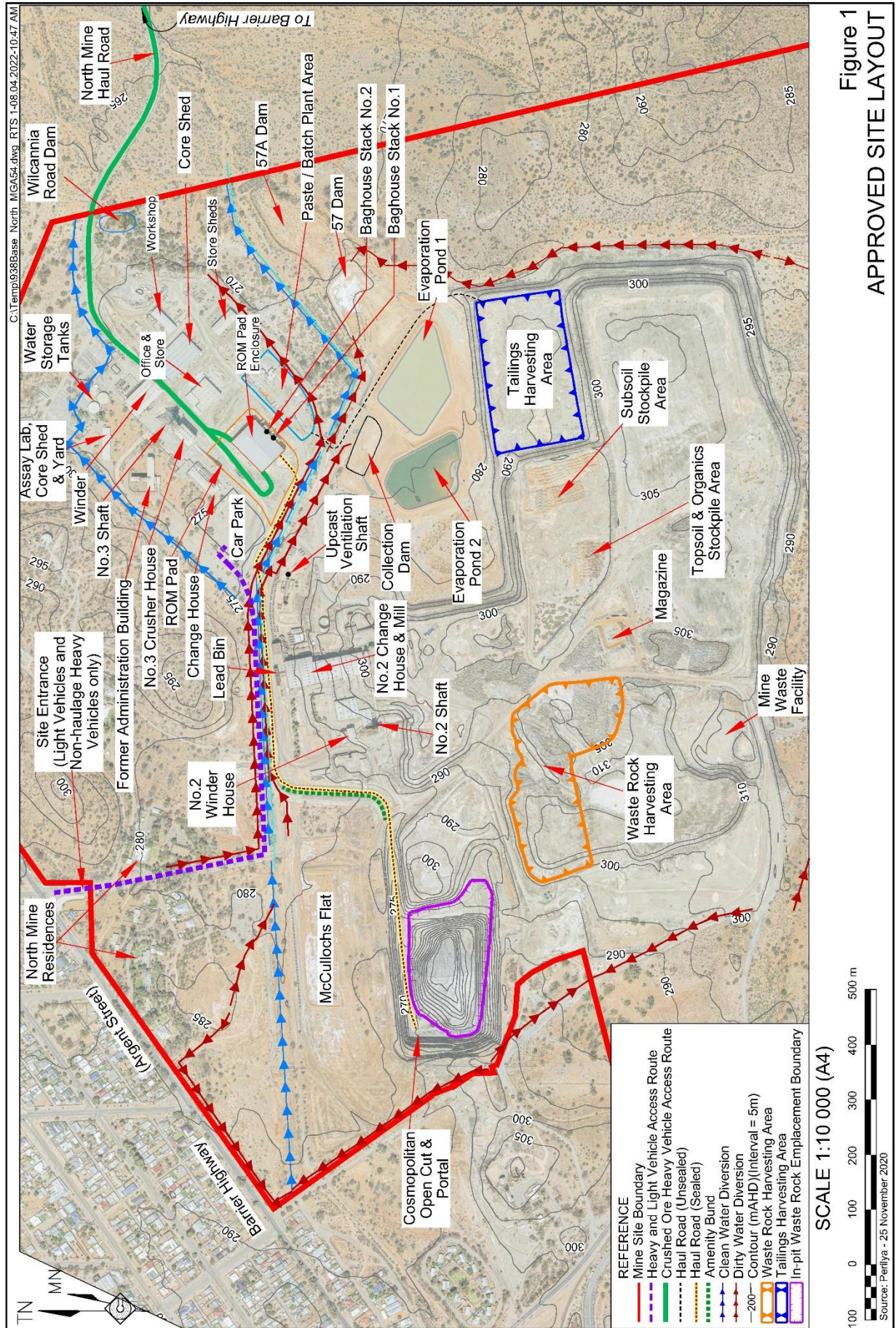
- R.W. Corkery & Co. Pty Limited (RWC) – prepared the initial draft of this Plan, ensuring consistency between this document and the commitments made throughout the development application process. In particular, RWC relied heavily on a letter report entitled *Review of Blasting Impacts from the Proposed Perilya Broken Hill North Mine (Overpressure and Ground Vibration)* prepared by Mr Mike Humphreys of Prism Mining Pty Ltd (Prism, 2017). RWC also provided administrative assistance in the finalisation of this report.
- Prism Mining Pty Ltd (Prism) – Mr D. Duke and Mr M. Humphreys reviewed the draft document and provided additional input to the proposed management and monitoring measures.
- Perilya Broken Hill Limited (Perilya) – reviewed and completed the draft document and approved the document for release.

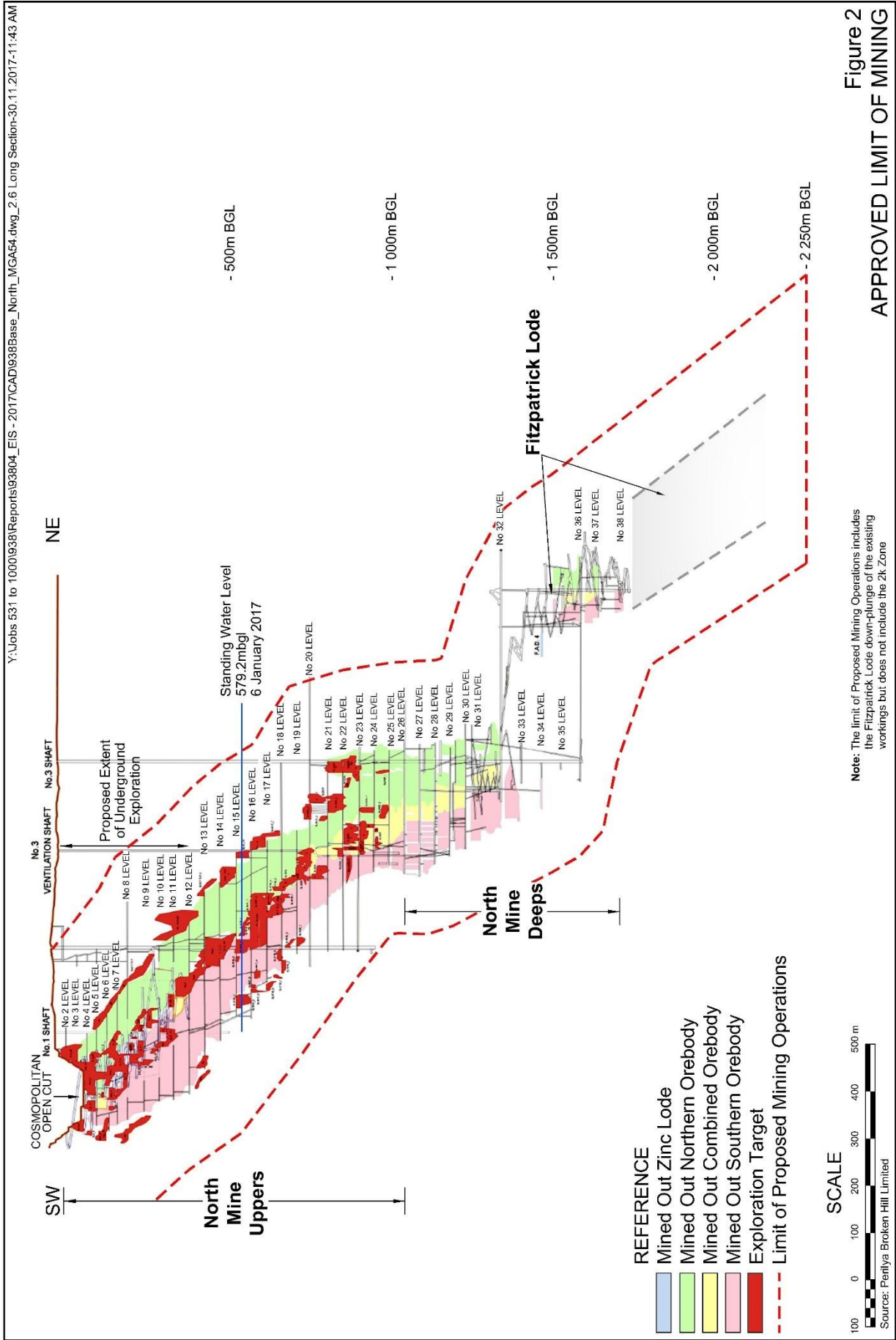
2 Project Description

The North Mine first started operations in 1883. Perilya Broken Hill Limited (Perilya) acquired assets of Pasminco Ltd in Broken Hill, including the North and South Mines, in 2002. Operations recommenced at the North Mine in 2003, with ore crushed from the North Mine and transported to PBHL Southern Operations (Southern Ops) for processing. The North Mine was placed under care and maintenance in August 2008. Underground exploration and maintenance re-commenced in April 2017, and continued operations until May 2023, when the North Mine was placed under care and maintenance again.

Development Consent SSD7538 for the recommencement of mining operations was granted under Section 89E of the *Environmental Planning and Assessment Act 1979* on the 22 December 2017 and subsequently modified on 7 September 2018, 31 July 2019 and 9 December 2021. The approved activities include the following (**Figures 1 and 2**).

- Remediate the existing Cosmopolitan access ramp, portal and decline to the 12 Level (the limit of the existing decline) to facilitate safe and efficient access to the underground workings
- Restore and upgrade existing electrical, ventilation, air and water services, including on surface and within the decline, No. 2 and No. 3 Shafts, No. 3 Vent Rise.
- Extend the existing decline from the 12 Level to link with the existing decline between the 32 Level and the 38 Level.
- Undertake exploration drilling from underground to further define remnant ore and identify additional ore lenses and lodes.
- Develop access drives to permit access by modern mining equipment.
- Extract up to 400 000 tonnes per annum of remnant ore and ore below the base of previous mining operations, including within the Fitzpatrick Area.
- Transport extracted ore to the surface ROM Pad enclosure, a sealed, negative pressure building equipped with a dust collection system, using underground haul trucks, including establishment of a haulage route.
- Transport extracted waste rock for placement either within completed stopes underground or within the in-pit waste rock emplacement in the Cosmopolitan Open Cut.
- Extract waste rock from the existing surface waste rock emplacement for transportation back underground as required.
- Extract tailings from a former Tailings Storage Facility for mixing with water and cement in a pastefill plant for use backfilling completed stopes.
- Re-establish surface infrastructure required to support the mining operation, including a ROM pad, office and store, workshop and fuel store, change house and car park, services (power, water, air and communications), surface magazine and ancillary infrastructure.
- Crush stockpiled ore within the ROM Pad enclosure using a mobile crusher.
- Load and transport up to 400 000 tonnes per annum of crushed ore to the Southern Operations using A-double road trains via the approved transport route, namely the Potosi Mine Haul Road, Barrier Highway, Iodide Street, Crystal Street and Gypsum Street.





- Generate up to:
 - 32 ore laden truck movements per day;
 - 4 ore laden truck movements per hour;
 - 21 ore laden truck movements per day when averaged over a calendar year; and
 - 42 ore laden truck movements per day from the North Mine and the Potosi Mine when averaged over a calendar year.
- Process the transported ore within the Southern Operations Concentrator under the continuing use rights held for that operation.
- Dewater the existing workings and transfer that water to on-site evaporation ponds or the Southern Operations.

3 Consultation

All previous Revisions of this Management Plan have been prepared in consultation with all relevant agencies in accordance with Development Consent SSD7538 or as directed by the Department of Planning, Housing and Infrastructure.

The following consultation related to the preparation of the current version of this Plan (Revision G) was undertaken, with the following responses received.

- Environment Protection Authority (EPA)

A request for comments or requirements for this Plan was provided to the EPA in August 2024. A response was received on 6 September 2024 stating the following.

“We acknowledge previous comments made by the EPA in 2018 that are reflected in the plan; however, the EPA no longer approves or endorses these plans as our role is to set environmental objectives for environmental management, not to be involved in developing strategies such as this plan to achieve those objectives. As such, we have no further comments on the plan.”

3.1 Previous Consultation

The following consultation related to the preparation of previous revisions of this Management Plan was undertaken.

- Environment Protection Authority

An email requesting requirements for this Plan was provided to the Environment and Protection Authority on 23 January 2018. A response was received on 1 February 2018 stating that “EPA’s response to the project generally contains our main requirements for the management plans.”

A draft of this *Blast Management Plan* was provided to the EPA on 5 October 2018, with a response received on 9 November 2018. **Table 1** presents an overview of the comments received and where/how each comment has been addressed.

Table 1 EPA Feedback on Draft Blast Management Plan

<i>Comment Received</i>	<i>How/where addressed</i>
There is no TARP No 3. Perhaps TARP No’s 4 & 5 should be numbered 3 & 4.	TARPs 4 and 5 have been renumbered as TARPs 3 and 4
At the nominated TARP No 5 where there is no exceedance of the blast criteria it should have an alert level colour coded green (it’s coloured red) and where there is an exceedance >115dB(Lin Peak) the alert level colour coding should be red, or an additional row should be inserted with an alert level colour coded red with actions and responses nominated for a blast that is recorded exceeding >120dB(Lin Peak). easily done for the latter	“Green” TARP B4 has been coloured appropriately. A new “Red” TARP4 has been added referencing an air blast overpressure of 120dB (Lin Peak) consistent with “Red” TARP B2
At Section 13.1 (Incident and non-compliance reporting) it should be stated that non-compliances or exceedances of limit criteria with EPL 2683 will be reported to the EPA (consistent with condition R2 of the EPL).	Section 13 has been amended to provide additional guidance on the definition and management of incidents, non-compliances, emergencies and complaints.

4 Environmental Management System

The Environmental Management System for the North Mine comprises the following principal documents.

- *Environmental Management Strategy (EMS)*
- *Air Quality Management Plan*
- *Noise Management Plan*
- *Blast Management Plan*
- *Transportation Management Plan*
- *Water Management Plan*
- *Operational Historic Heritage Management Plan*
- *Strategic Historic Heritage Management Plan*
- *Aboriginal Cultural Heritage Chance Finds Protocol*
- *Lead Monitoring & Education Program*
- *Rehabilitation Management Plan*

A range of Standard Operating Procedures (SOPs) are in place to manage implementation of the above Management Strategy and Management Plans. These SOPs provide operational personnel with a detailed description of how each of the identified measures is to be implemented. These SOPs are live documents and are introduced, amended, removed and replaced as required.

5 Legal and Other Requirements

A range of approvals, licenses and consents exist for the North Mine, each of which include conditional requirements. The following subsections present the statutory commitments relevant to this *Blast Management Plan*.

5.1 Legislative Requirements

The following sections of the *Protection of the Environment Operations Act 1997* (POEO Act) are relevant to this Plan.

- Section 139 makes it an offence to operate any plant at a premises in such a manner as to cause the emission of noise if the noise, or any part of it, is caused by the occupier's failure to maintain the plant in an efficient condition, or to operate the plant in a proper and efficient manner.
- Section 140 makes it an offence to fail to deal with "materials" in a proper and efficient manner that results in noise.

The POEO Act defines "noise" as including sound and vibration.

5.2 Conditions of Consent

Conditional requirements identified in SSD7538 that are relevant to this *Blast Management Plan* are reproduced in **Table 2** with a reference provided to the section(s) of this document where each conditional requirement is addressed.

Table 2 Conditions of Consent associated with the Blast Management Plan

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Cond. No.	Conditions of Consent	Document Reference											
2(9)	Unless the Secretary agrees otherwise, the Applicant must comply with the operating hours in Table 1; Production blasting - 6:45 am to 7:15 pm, 7 days a week	Sect 9.1											
3(19)	The Applicant must ensure that blasting on the site does not cause exceedances of the criteria in Table 4. <table><tr><th>Location</th><th>^a Airblast Overpressure (dB(Lin Peak))</th><th>Ground Vibration (mm/s)</th><th>^b Allowable Exceedance</th></tr><tr><td rowspan="2">Residence on privately owned land</td><td>115</td><td>5</td><td>5% of the total number of blasts over a 12-month period</td></tr><tr><td>120</td><td>10</td><td>0%</td></tr></table> These criteria do not apply if the Applicant has a written agreement with the relevant owner to exceed these criteria, and has advised the Department in writing of the terms of this agreement. <i>Notes to Table 4:</i> <i>a</i> The monitoring of airblast overpressure is only required until such time that the EPA is satisfied that it is no longer required. <i>b</i> The allowable exceedance must be calculated separately for production blasts, development blasts and cut and fill blasts.	Location	^a Airblast Overpressure (dB(Lin Peak))	Ground Vibration (mm/s)	^b Allowable Exceedance	Residence on privately owned land	115	5	5% of the total number of blasts over a 12-month period	120	10	0%	Sect 8
Location	^a Airblast Overpressure (dB(Lin Peak))	Ground Vibration (mm/s)	^b Allowable Exceedance										
Residence on privately owned land	115	5	5% of the total number of blasts over a 12-month period										
	120	10	0%										

Table 2 Conditions of Consent associated with the Blast Management Plan (Cont'd)

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Cond. No.	Conditions of Consent	Document Reference
3(20)	The Applicant must not carry out more than: (a) 1 production blast per day; and (b) 6 production blasts per week, averaged over a calendar year. This condition does not apply to blasts that generate ground vibration of 0.75mm/s or less at any residence on privately-owned land, blast misfires or blasts required to ensure the safety of the mine or its workers. <i>Notes:</i> <i>For the purposes of this condition, a blast refers to a single blast event, which may involve a number of individual blasts fired in quick succession in a discrete area of the mine.</i> <i>For the avoidance of doubt, should an additional blast be required after a blast misfire, this additional blast and the blast misfire are counted as a single blast</i>	Sect 9.1
3(21)	<i>The Applicant must:</i> (a) implement best management practice to protect: - the amenity and safety of people in the surrounding area; and - public or private infrastructure/property and heritage items on, or surrounding the site from any damage; (b) operate a suitable system to enable the public to get up-to-date information on the proposed blasting schedule on site; and (c) use reasonable endeavours to co-ordinate blasting at the site to minimise cumulative blasting impacts associated with the operation of nearby mines.	Sects 9 to 11 Sect 9.1 Sect 9.1
3(22)	Prior to commencing mining operations, unless the Secretary agrees otherwise, the Applicant must prepare a Blast Management Plan for the development to the satisfaction of the Secretary. This plan must: (a) be prepared in consultation with EPA; (b) describe the blast management measures that would be implemented to ensure compliance with the blast criteria and operating conditions of this consent; (c) include a blast monitoring program that: - monitors vibration and overpressure at the nearest and/or most affected receptors; - evaluates the performance of the development, including compliance with the applicable criteria; - uses a combination of roving and fixed blast monitors; and (d) defines what constitutes a blasting incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any incidents; (e) includes a review mechanism and contingency measures if production blasting causes amenity impacts at levels below the relevant criteria; and (f) outlines procedures to manage responses to any complaints or issues raised by the owners of affected residences.	Sect 3 Sect 9 Sect 10 Sect 13 Sect 11 13.3
3(23)	The Applicant must implement the approved Blast Management Plan for the development.	Noted
4(4)	The Applicant must ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, and include: (a) detailed baseline data;	Sect 7

Table 2 Conditions of Consent associated with the Blast Management Plan (Cont'd)

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Cond. No.	Conditions of Consent	Document Reference	
4(4) (Cont'd)	(b) a description of: - the relevant statutory requirements (including any relevant approval, licence or lease conditions); - any relevant limits or performance measures/criteria; - the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	Sect 5 Sect 8 Sects 8 and 11	
	(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	Sect 10	
	(d) a program to monitor and report on the: - impacts and environmental performance of the development; - effectiveness of any management measures (see c above);	Sect 12	
	(e) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	Sect 12.2	
	(f) a program to investigate and implement ways to improve the environmental performance of the development over time;	Sect 12.2	
	(g) a protocol for managing and reporting any: - incidents; - complaints; - non-compliances with statutory requirements; and - exceedances of the impact assessment criteria and/or performance criteria; and	Sect 13.1 Sect 13.3 Sect 13.1 Sect 13.1	
	(h) a protocol for periodic review of the plan.	Sect 16	

5.3 Environment Protection License

A variation to Environment Protection License (EPL) 2683 was issued 10 June 2020. The licence currently applies to both the North Mine and Potosi Mine sites. Conditional requirements identified in EPL 2683 that are relevant to this *Blast Management Plan* are reproduced in **Table 3** with a reference provided to the section(s) of this document where each conditional requirement is addressed. **Figure 3** presents the locations of each of the identified EPA monitoring locations.

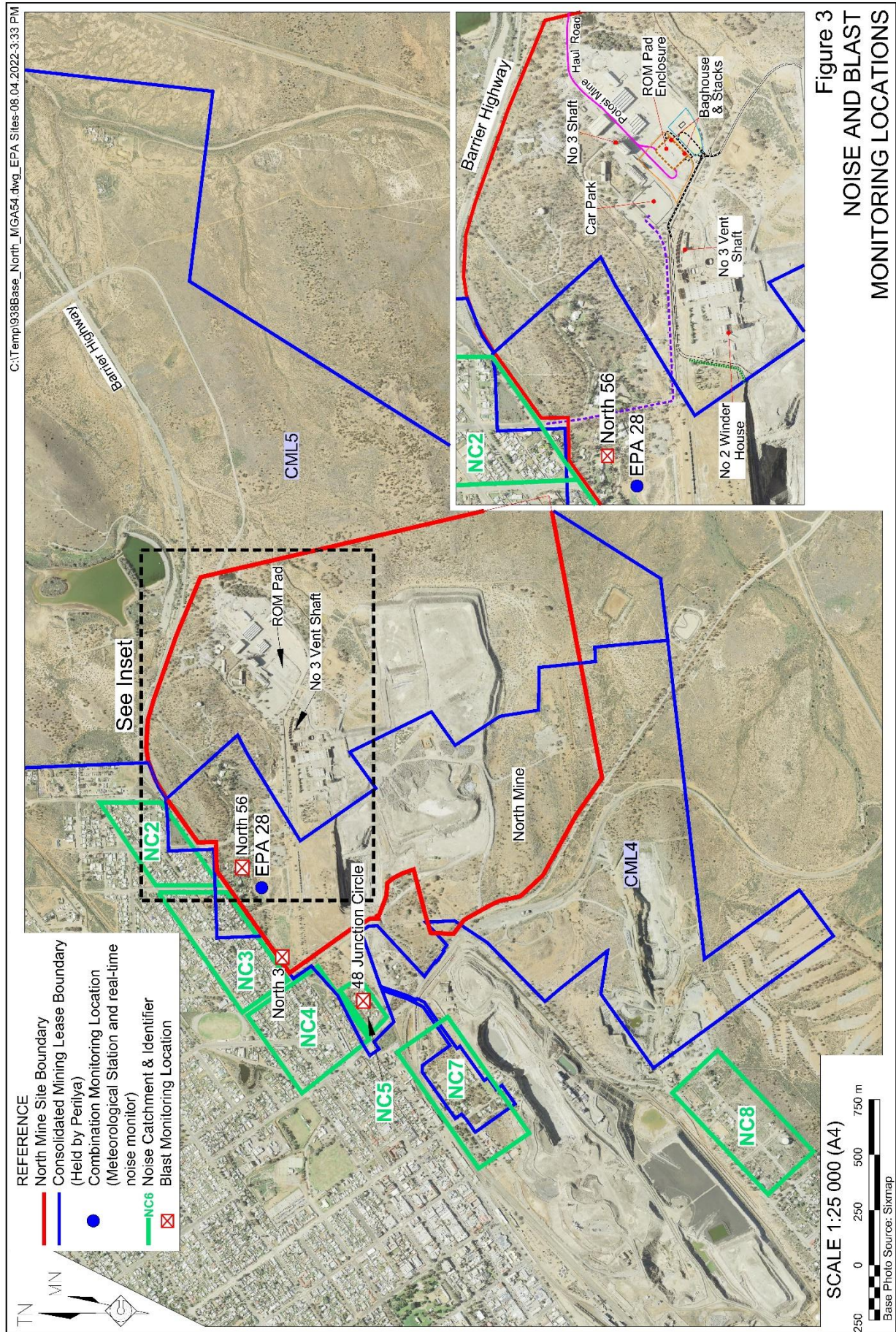


Table 3 EPL 2683 Licence Conditions – Blast-related

Cond. No.	Conditions of Consent	Document Reference
L4.1	Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 5 millimetres per second at any noise sensitive locations for more than 5% of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	Sect 8
L4.2	Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 10 millimetres per second at any time at any noise sensitive locations. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	Sect 8
L4.3	The airblast overpressure level from blasting operations at the premises, not including the Potosi Mine, must not exceed 115db (Lin Peak) for the period 6:45am to 7:15pm at any noise sensitive locations for more than 5% of the total number of blasts over the 12 months reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	Sect 8
L4.4	The airblast overpressure level from blasting operations at the premises, not including the Potosi Mine, must not exceed 120db (Lin Peak) for the period 6:45am to 7:15pm at any noise sensitive locations. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	Sect 8
L4.5	The airblast overpressure level from blasting operations at the premises, not including the Potosi Mine, must not exceed 95dB (Lin Peak) for the period 7:15pm to 6:45am at any noise sensitive locations. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	Sect 8
L4.6	Conditions L4.1, L4.2, L4.3, L4.4 and L4.5 apply at any point within 1 metre of any noise sensitive location including residential premises, school, hospital or blast monitoring locations referred to in condition L4.10 of this licence (see Figure 3).	Noted
L4.10	To determine compliance with condition(s) L4.1, L4.2, L4.3, L4.4 and L4.5: a) Airblast overpressure and ground vibration levels must be measured and recorded at: Blast Monitor 56 North mine and Blast Monitor Junction Circle for all blasts carried out in or on the premises; and b) Instrumentation used to measure the airblast overpressure and ground vibration levels must meet the requirements of Australian Standard AS 2187.2-2006.	Noted Sect 10

5.4 Mining Leases

Consolidated Mining Leases (CMLs) 4 and 5 have been renewed until 23 June 2024 and 6 June 2038. Conditional requirements identified in CML4 and 5 that are relevant to this CMP are reproduced in **Table 4** with a reference provided to the section(s) of this document where each conditional requirement is addressed.

Table 4 Mining Lease Conditions – Blast-related

Cond. No.	Conditions of Consent	Document Reference
2	<i>The proponent shall implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation or rehabilitation of the development.</i>	Entire document

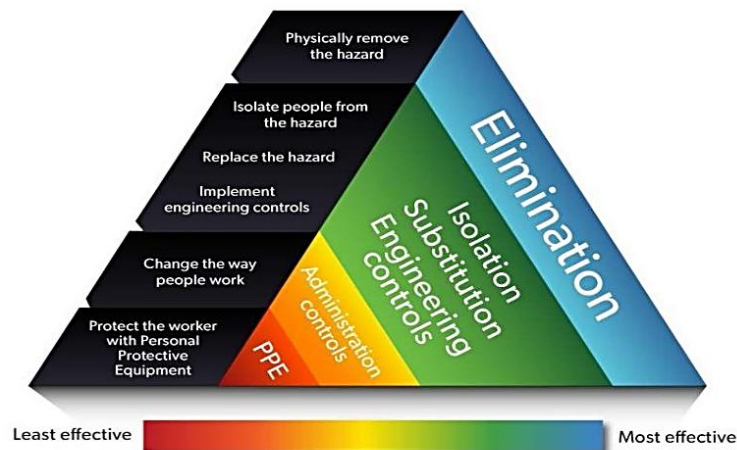
5.5 Guidelines, Policies and Standards

Other documents relevant to this management plan include the following.

- *NSW Work Health and Safety (mines and petroleum sites) Act 2013*
- *NSW Work Health and Safety Regulations (mines and petroleum sites) Regulation 2014*
- *NSW Explosives Act 2003*
- *NSW Explosives Regulation 2013*
- *AS 2187.2-2006 - Explosives—Storage and use*
- *ANZEC 1990 Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZEC, 1990)*
- *DECC 2009 Interim Construction Noise Guideline (DECC, 2009)*
- Perilya – Mine Design Notes MDN007
- Perilya – Explosives Control Plan and associated documents

6 Environmental Risk

Tables 5 and **6** presents the risk rating matrix and risk assessment specific to blasting during the operational phase of the North Mine. The risk rankings and control measures identified in **Table 6** have informed the management and mitigation measures identified in Section 9.

Table 5 Risk Rating Matrix

Consequence	Negligible	Minor	Moderate	Major	Catastrophic
People	Minor injury First aid treatment	Medical treatment injury Restricted work injury	Serious injury Lost time injury (LTI)	Multiple LTIs Permanent disabling injury	Fatality Multiple fatalities
Environment	Little or no environmental harm. Not required to inform EPA/Government.	Minor transient environmental harm. Transient release of pollutants. Required to inform EPA/Government	Measurable environmental harm with mid-term recovery. Significant release of pollutants.	Long term environmental harm. Major contamination, unapproved clearance of native vegetation, damage to heritage site.	Serious impacts, long term environmental damage. Dislocation of people, significant breach of tailings storage, contamination of potable water
Reputation	No measurable impact	Minor or moderate impact. Local media coverage, public complaints	Short term measurable but recoverable impact. (recovery <6 months) Averse capital city media coverage	Medium term impact (recovery < 12 months). National adverse mainstream media, loss of investor confidence, possible staff losses or moral issues	Serious, permanent or irrecoverable damage. Forced shutdown of major installation, extended national adverse media campaign, parliamentary enquiry
Financial & Commercial	No measurable loss, no measurable impact on customers	Loss \$50-500K Minimal business interruption.	Loss \$0.5-5M Business impact, service interruption, loss of market share	Loss \$5-10M Business interruption, major equipment failure, major loss of market share	Loss >\$10M Major business interruption, significant loss of market share, plant catastrophe.
Legal Liability	Little or no liability	Third part claims <\$500K	Corporate fine <\$1M, multiple third part claims \$0.5-2M	Corporate fine \$1-5M, personal fine, multiple third part claims \$2-10M	Corporate fine >\$5M, Officer goaled, multiple third part claims >\$10M
Risk Level					
Likelihood	A	B	C	D	E
Almost certain: < 1 in 100 expected to occur within 1 yr	16	10	8	3	1
Likely: 1 in 100 - 1000 probably occur within 3 yrs	18	14	9	5	2
Possible: 1 in 1000 - 10,000 may occur in within 10 yrs	20	17	11	7	4
Unlikely: in normal situations 1 in 10,000 - 1M, >10 yrs	23	21	15	12	6
Rare: >1 in 1M theoretically possible	25	24	22	19	13

Table 6 Risk Assessment - Blasting

Risk Description	Unmitigated Risk Level	Current Controls	Additional Controls Required	Residual Risk Level	Accept Y/N
Ground vibration results in perceived amenity impacts and associated complaints	Moderate (14)	- Maintain an open dialogue with the surrounding community and neighbours to ensure any concerns over noise or vibration are addressed. - Monitor ground vibration at the Environment Protection Licence nominated monitoring locations.	- Establish an additional fixed blast monitoring location on Perilya-controlled land adjacent to the residence at 617 Argent Street. - Ensure that all close proximity blasts, namely blasts within 700m of the closest privately-owned residence, are treated as critical and that a commensurate level of design and quality control is implemented. - Limit the use of multi-blast or long duration blasts. - Recommence blasting operations at locations least likely to result in exceedances of the relevant criterion, namely at distances greater than 700m from the closest privately-owned residence, before progressively moving closer to residences once blast impacts and control measures are well understood. - Undertake initial detailed monitoring of all blasts using a mobile blast monitor, at point-to-point distances to the closest non-Project related residence of between 344m to 700m, to replicate the impacts of close proximity blasting to test proposed control measures. - Undertake detailed review of all blast monitoring results and compare the actual monitoring results with those predicted at the design stage for each blast. Where discrepancies are identified, review assumptions used within the site model and implement an adaptive management process to modify future blast practices.	Low (21)	Yes
Ground vibration exceeds the amenity criteria, resulting in non-compliance with conditional requirements at non-Perilya residences	Moderate (11)			Low (22)	Yes
Ground vibration results in structural damage to non-Perilya residences or infrastructure	Moderate (19)			Not Applicable	Yes
Airblast overpressure results in perceived amenity impacts and associated complaints	Low (21)			Low (21)	Yes
Airblast overpressure exceeds the amenity criteria, resulting in non-compliance with conditional requirements at non-PBHL residences	Low (22)			Low (22)	Yes
Ground vibration results in structural damage to PBHL infrastructure	Low (24)			Low (24)	Yes

7 Existing Environment

Blasting operations associated with the existing Perilya-operated Southern Operations and Potosi Mines and CBH-operated Rasp Mine are a daily occurrence and residents of Broken Hill are familiar with the vibrations associated with those blasting operations. In addition, PBHL has undertaken underground exploration operations, including development blasting, within the North Mine.

Blasting operations at all currently operating underground mines in Broken Hill typically involve three classes of blasting. The maximum instantaneous charge (MIC) for each class of blasting that will typically be used at the North Mine is also presented.

- Development blasting – MIC = approximately 48kg.
- Cut and fill blasting – MIC = approximately 48kg.
- Long-hole open stope (production) blasting – MIC = approximately 105kg.

As blasting impacts are typically controlled by the MIC, management of production blasting is critical to ensure ongoing compliance with blasting criteria presented in Section 8.

As all current blasting within Broken Hill is underground, air blast overpressure is unlikely to occur as there are limited pathways for pressure waves to exit the underground workings. Notwithstanding this, the community and EPA have previously expressed concern in relation to air blast overpressure and SSD7538 and EPL2683 require monitoring of airblast overpressure. This matter is addressed in Section 9.1.

Finally, blasting at both the Perilya-operated Southern Operations and the CBH-operated Rasp Mine have historically resulted community complaints. As a result, measures to respond to ensure compliance during close-proximity blasting are described in Section 9 and to measures respond to complaints related to blasting operations have been included in the TARPs in Section 10.

8 Compliance Criteria

Blasting compliance criteria for the North Mine are set out in Condition 15 of Schedule 3 of SSD7538 and Conditions L4.1 to L4.5 of EPL2683. **Table 7** reproduces the identified criteria.

Table 7 Compliance Criteria – Blasting

Blasting Impacts			
Location	Airblast Overpressure ¹ (dB(Lin Peak))	Ground Vibration (mm/s)	Allowable Exceedance ²
Residence on privately owned land	115	5	5% of the total number of blasts over a 12--month period
	120	10	0%
Blasting Frequency			
Production blasts	(a) 1 per day; and (b) 6 per week (averaged over a calendar month)		
Other blasts ³	No limit		
Blasting Timing			
Production Blasts / Rehabilitation	All blasts must occur between 6:45am to 7:15pm, 7 days a week unless for emergency or safety reasons		
Note 1: The monitoring of airblast overpressure is only required until such time that the EPA is satisfied that it is no longer required			
Note 2: The allowable exceedance must be calculated separately for production blasts, development blasts and cut and fill blasts.			
Note 3: “Other blasts” are defined as production blasts that generate ground vibration of 0.75mm/s or less at any residence on privately-owned land, blast misfires or blasts required to ensure the safety of the mine or its workers.			

9 Management and Mitigation Measures

9.1 Standard Blasting Operations

Table 8 presents the management and mitigation measures required to manage standard blasting operations.

Table 8 Management and Mitigation Measures – Standard Blasting Operations

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<i>Mitigation Measure</i>	<i>Timing</i>	<i>Source</i>	<i>Responsibility</i>	<i>Evidence for compliance</i>
Implement close proximity blasting management and mitigation measures (see Section 9.2) when the point-to-point distance between the blast and the closest privately-owned residence is less than 700m.	Throughout the life of the North Mine	RTS – Section 3.5.5	North Mine Manager or their delegate	Blast records Mine record book
Limit the use of multi-blast (concurrently fired production blasts) or long duration production blasts.	Throughout the life of the North Mine	RTS – Section 3.5.5	North Mine Manager or their delegate	Blast records Mine record book
Recommence blasting operations at point-to-point distances greater than 700m from the closest privately-owned residence and develop, in conjunction with a suitably qualified blasting engineer, blasting site laws and procedures to ensure compliance prior to undertaking blasts at progressively closer distances.	During initial mining operations	RTS – Section 3.5.5	North Mine Manager or their delegate	Blast records Mine record book Blast monitoring records
Undertake initial detailed monitoring of all blasts using a mobile blast monitor located at distances less than 700m to replicate the impacts of close proximity blasting to test proposed control measures and establish a robust blasting site law to predict anticipated blast-related impacts. Review and revise the site blast law at least quarterly.	Quarterly	RTS – Section 3.5.5	North Mine Manager or their delegate	Blast records Mine record book Blast design form Blast monitoring records
Develop standard blast design forms taking into account the revised site blast law and revise those forms as the site blast law is revised.	Throughout the life of the North Mine	RTS – Section 3.5.5	North Mine Manager or their delegate	Blast records Mine record book Blast monitoring records
Ensure that no more than - one production blast is undertaken each day; and 6 production blasts are undertaken each week.	Throughout the life of the North Mine	SSD7538 – Condition 20 of Schedule 3	North Mine Manager or their delegate	Blast records Mine record book Blast monitoring records

Table 8 Management and Mitigation Measures – Standard Blasting Operations (Cont'd)

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Mitigation Measure	Timing	Source	Responsibility	Evidence for compliance
Once operations recommence at the Mine, blasting operations will be strictly limited to the approved hours (i.e. 6:45am to 7:15pm, 7 days a week) except where blasting is required for emergency/safety reasons.	Once operations recommence, throughout the life of the North Mine	SSD7538 – Condition 9 of Schedule 2	North Mine Manager or their delegate	Blast records Mine record book Blast monitoring records
Ensure, where practicable, that production blasts are undertaken at shift-change times, namely between 6:45am and 7:00am and 6:45pm and 7:00pm.	Throughout the life of the North Mine	SSD7538 – Condition 21 of Schedule 3	North Mine Manager or their delegate	Blast records Mine record book Blast monitoring records
Undertake detailed review of all blast monitoring results and compare the actual monitoring results with those predicted at the design stage for each blast. Where discrepancies are identified, review assumptions used within the site model and implement an adaptive management process to modify future blast practices.	Throughout the life of the North Mine	RTS – Section 3.5.5	North Mine Manager or their delegate	Blast records Mine record book Blast monitoring records
Provide public notification of potential significant blast events including a review of the most appropriate time slot for a potential significant blast event. This notification will be made via the Perilya website, a noticeboard at the North Mine Site entrance, public notices in the newspaper, newsletter or letter box drops.	Throughout the life of the North Mine	RTS – Section 3.5.5	Environmental Superintendent or their delegate	Mine record book Communication log
Publish the results of blast monitoring at least quarterly on Perilya's website.	Throughout the life of the North Mine	RTS – Section 3.5.5	Environmental Superintendent or their delegate	Website
Engage with the Community Consultative Committee, Council and surrounding residents, particularly those located to the west of the Mine Site, to determine whether blasting operations at the Rasp and North Mines are having an unreasonable cumulative amenity impact and, if so, liaise with the operators of Rasp Mine to manage those impacts.	Within 6 months of the start of mining operations and annually thereafter	SSD7538 – Condition 21 of Schedule 3	North Mine Manager or their delegate	Consultation records
Consult with CBH (operator of the Rasp Mine) in relation to standard timing of blasting operations to minimise impact on surrounding residents.	Throughout the life of the North Mine	SSD7538 – Condition 21 of Schedule 3	North Mine Manager or their delegate	Consultation records

9.2 Close Proximity Blasting Operations

Prism (2017) undertook a detailed review of blasting records from 2007 and 2008 when the North Mine was last operational. Based on that assessment, Prism (2017) established a preliminary site blasting formula and determined anticipated ground vibration levels at a range of offset distances. **Table 9** presents the results of that assessment. In summary,

- “standard” production blasts (MIC = 105kg) will comply with the 5mm/s ground vibration criterion at point-to-point distances greater than 500m; and
- “close proximity” production blasts (MIC = 50kg) will comply with the 5mm/s ground vibration criterion at point-to-point distances greater than 344m, the distance that the closest proposed stope will be to a privately-owned residence.

Table 9 Ground Vibration Assessment

k	2500		
a	-1.6	PVS1	PVS2
MIC	105	5	3
Distance to Sensitive Receptor (m)	pvs (mm/s)	MIC Limit (kg) for 5mm/s	MIC Limit (kg) for 3mm/s
344.0	9.04	50.1	26.4
400.0	7.11	67.7	35.7
450.0	5.89	85.6	45.2
500.0	4.97		55.8
550.0	4.27		67.6
600.0	3.71		80.4
650.0	3.27		94.4
700.0	2.90		
750.0	2.60		
800.0	2.34		
850.0	2.13		
900.0	1.94		
950.0	1.78		
1000.0	1.64		
1050.0	1.52		
1100.0	1.41		
1150.0	1.31		
1200.0	1.23		
1250.0	1.15		
1300.0	1.08		
1350.0	1.01		
1400.0	0.96		
1450.0	0.91		
1500.0	0.86		
1550.0	0.81		
1600.0	0.77		
1650.0	0.74		
1700.0	0.70		
1750.0	0.67		
Max charge = 105kg (ANFO) at length=21m, diameter=76mm)			
K-factor=2500	Exponent a=-1.6		
Min distance = 344m			
PVS greater than 5mm/s			
PVS between 3mm/s and 5mm/s			
Max charge between 105kg and 50kg			
Max charge less than 50kg			

Source: Prism (2017) – Table 3.2

Based on the above, and allowing for a 200m “factor of safety”, all blasts within 700m point-to-point of the closest privately-owned residence are be classified as close proximity blasts.

Table 10 presents the additional management and mitigation measures required to manage close proximity blasting operations.

Table 10 Management and Mitigation Measures – Close Proximity Blasting Operations

<i>Mitigation Measure</i>	<i>Timing</i>	<i>Source</i>	<i>Responsibility</i>	<i>Evidence for compliance</i>
Undertake close proximity blasting operations only once a robust site blasting law has been established.	Throughout the life of the North Mine	Prism (2017)	North Mine Manager or their delegate	Blast records Mine record book Blast monitoring records
Reduce MIC for all close proximity blasts to ensure compliance with the 5mm/s ground vibration criterion. Use this data in conjunction with comparison of predicted vs actual vibration data to confirm the site blasting calculations.	Throughout the life of the North Mine	SSD7538 – Condition 19 of Schedule 3.	North Mine Manager or their delegate	Blast records Mine record book Blast monitoring records
Provide advanced notice to the closest residences, where practicable; of “close proximity” blasts.	Throughout the life of the North Mine	RTS – Section 3.5.5	Environmental Superintendent or their delegate	Mine record book Communication log
Ensure that a mobile blast monitor is placed in the vicinity of items of heritage significance when blasting operations are being undertaken within 700m of those structures.	When blasting operations within 700m of heritage structures	Not Applicable	North Mine Manager or their delegate	Blast records Blast monitoring records

10 Monitoring Program

EPL2683 requires all blasts be monitored at two locations, namely:

- 56 North Mine (56 North)
- Junction Circle

In addition, Perilya will establish a third fixed monitoring location on the Mine Site adjacent to the closest residence to shallow blasting operations, namely 617 Argent St. That monitoring location is referred to as North 3. **Figure 3** shows the location of each of the fixed blast monitors.

All blast monitors will be compliant with *AS 2187.2—2006 - Explosives—Storage and use - Part 2: Use of explosives* and will be maintained and calibrated in accordance with the manufacturer's specifications.

In addition, Perilya will, prior to the commencement of close proximity blasting, monitor all blasts using one or more roving blast monitors. The location of these monitors will vary, with the intention that the point-to-point distance between the blast will be between 344m (the closest distance between a planned stope and the residence at 617 Argent Street) and 700m (the limit of close proximity blasting).

Finally, a roving blast monitor will be located in proximity to heritage infrastructure during all blasts within 700m of those structures. This monitor may form a component of the close proximity monitoring and verification program discussed in the previous paragraph.

All blast monitors will meet the requirements of Australian Standard AS 2187.2-2006 and will carry current NATA or manufacturer calibration certificates. Each instrument will be triggered to record any blast event (ground vibration and airblast overpressure) with a ground vibration level greater than 0.2mm/s. The fixed monitors will automatically transmit blast data to the Mine Control Centre. The roving monitor will be downloaded manually and the data recorded along with the location and other relevant data of a data record sheet for later entering into the blast monitoring database.

11 Trigger Action Response Plans

Table 11 presents the Trigger Action Response Plans (TARPs) for blast-related impacts. The order that the TARPs are presented correspond with the order in which risks are presented in the Risk Assessment presented in Section 6.

Table 11 Trigger Action Response Plan

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TARP No	Issue	Trigger Level	Alert Level	Action	Response
B1	Ground vibration results in perceived amenity impacts and associated complaints.	No Complaint received	Green	Nil	Nil
		Complaint received	Red	Personnel who receives the complaint records the required information in accordance with the procedures identified in the EMS and notifies the relevant North Mine Personnel.	Complaint is investigated, and remedial action implemented as required in accordance with the procedures identified in the EMS. The results of the investigation and any remedial action is communicated to the complainant.
B2	Ground vibration exceeds the amenity criteria, resulting in non-compliance with conditional requirements at non-PBHL residences.	No exceedance	Green	Review blast monitoring data and upload results to relevant database for routine reporting.	Nil
		Ground vibration >4mm/s OR >10% differential between predicted and actual ground vibration	Yellow	Review blast design and parameters and determine cause of ground vibration level or variance. Upload results to relevant database for routine reporting.	Amend blast design forms to take into account the determined cause of the ground vibration level or variance. Prepare report outlining the results of the investigation, design modification implemented and file for subsequent reference. Amend the blast design forms to take into account the results of the investigation.
		Ground vibration >5mm/s and this level exceeded for less than 5% of blasts in last 12 months	Amber	Immediately review blast design and parameters and determine cause of ground vibration level or variance from predicted results.	Amend blast design forms to take into account the determined cause of the ground vibration level or variance and have the investigation and amended blast designs peer reviewed by external blast expert. Prepare report outlining the results of the investigation, design modification implemented and file for subsequent reference.
		Ground vibration >10mm/s OR Ground vibration >5mm/s and this level exceeded for more than 5% of blasts in last 12 months	Red	Engage external blast expert to review all blast design parameters and monitoring, determine cause of exceedance and provide recommendations for remedial actions. Report non-compliance in accordance with the procedures identified in Section 13.	Implement recommendations of external blast expert and continue to monitor and manage all blasting operations closely to ensure ongoing operations do not exceed the relevant blast criteria.

Table 11 Trigger Action Response Plan (Cont'd)

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TARP No	Issue	Trigger Level	Alert Level	Action	Response
B3	Airblast overpressure results in in perceived amenity impacts and associated complaints.	No Complaint received	Green	Nil	Nil
		Complaint received	Amber	Personnel who receives the complaint records the required information in accordance with the procedures identified in the EMS and notifies the relevant North Mine Personnel.	Complaint is investigated, and remedial action implemented as required in accordance with the procedures identified in the EMS. The results of the investigation and any remedial action is communicated to the complainant.
B4	Airblast overpressure exceeds the amenity criteria, resulting in non-compliance with conditional requirements at non-PBHL residences.	No exceedance	Green	Review blast monitoring data and upload results to relevant database for routine reporting.	Nil
		Airblast overpressure >115dB (Lin Peak)	Amber	Immediately review monitoring data, including control data identified in Section 10.3. Determine if the recorded result is instrumentation-related, weather related (e.g. wind), or direct impacts associated with blasting operations.	If the investigation determines that the airblast overpressure results is associated with blasting operations, engage external blast expert to review all blast design parameters and monitoring, determine cause of exceedance and provide recommendations for remedial actions. Implement recommendations of external blast expert and continue to monitor and manage all blasting operations closely to ensure ongoing operations do not exceed the relevant blast criteria.
		Airblast overpressure >120dB (Lin Peak) OR airblast overpressure >115dB (Lin Peak) and this level exceeded for more than 5% of blasts in last 12 months	Red	Engage external blast expert to review all blast design parameters and monitoring, determine cause of exceedance and provide recommendations for remedial actions. Report non-compliance in accordance with the procedures identified in Section 13.	Implement recommendations of external blast expert and continue to monitor and manage all blasting operations closely to ensure ongoing operations do not exceed the relevant blast criteria.

12 Compliance Review and Reporting

12.1 Data Validation

Following each blast, data from each of the fixed and roving blast monitors will be downloaded and reviewed against predicted ground vibration levels. The performance of each monitor will be reviewed and any failure to record or erroneous data will be investigated, and remedial action implemented if required.

All blast monitors will be calibrated in accordance with the manufacture's recommendations.

12.2 Adaptive Management and Reporting

Immediately following each production blast the monitoring results will be reviewed against predicted results using the Blastware software package, or similar. Where actual ground vibration is >10% higher than predicted or where peak ground vibration levels are <4mm/s, a review of the reasons for the variance will be undertaken and, if required, blast design standards will be adjusted.

The Environmental Superintendent or their delegate will prepare the following statutory and publicly available reports, including an analysis of all monitoring results.

- Monthly summary reports (PBHL website).
- Quarterly reports (NSW EPA).
- Community Consultative Committee Reports (CCC meeting schedule).
- Annual Return (NSW EPA).
- Annual Review (NSW DPE).
- Annual Rehabilitation Report and Forward Program for large mines, in accordance with Clauses 9 and 13 of Schedule 8A of the Mining Regulation 2016 by 31 March each year.

12.3 Information regarding the operations and environmental performance

Refer to the *Environmental Management Strategy* for details of the issuance of information regarding operations progress and environmental performance.

13 Incident and Non-compliance Reporting

13.1 Incident and Non-compliance Management

An incident is defined as:

1. An event that causes, or threatens to cause, material environmental harm
2. Breaches or exceeds the limit or performance measure or criteria associated with the Conditions of Consent or Environmental Protection License.

A non-compliance is defined as any event which is not in conformance with threshold levels as determined within the conditions of consent or an exceedance of any criteria under other approval or legislation, including EPL 2683.

Sections 8.1 and 8.2 of the *Environmental Management Strategy* describe the procedures to be implemented in the event of an incident or non-compliance. In summary, Perilya will:

- Implement measures to control and/or manage the incident or non-compliance;
- Immediately report the incident or non-compliance to the Environment Protection Authority, Resources Regulator and Department of Planning and Environment;
- Prepare a written notification report within 7 days and provide a copy of that report to the above agencies; and
- Prepare in the event of an incident a follow-up report within 30 days and provide that report to the above agencies.

13.2 Annual Review

As required under Condition 5 of Schedule 4, an Annual Review is required to be prepared on an annual basis, which is to be submitted by the end of March. The Annual Review will involve a review of the operations environmental and statutory compliance performance for the previous calendar year to the satisfaction of the Secretary. As per Condition 5 Schedule 4, the Annual Review will include the following:

- a) *Describe the development (including any rehabilitation) that was carried out in the past calendar year, and the development that is proposed to be carried out over the current calendar year;*
- b) *Include a comprehensive review of the monitoring results and complaints records of the development over the past year, which includes a comparison of these results against the:*
 - *Relevant statutory requirements, limits or performance measures/criteria;*
 - *Monitoring results of previous years; and*
 - *Relevant predictions in the EIS;*
- c) *Identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;*
- d) *Identify any trends in the monitoring data over the life of the development;*

-
- e) *Identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and*
 - f) *Describe what measures will be implemented over the next year to improve the environmental performance of the development.*

13.3 Emergency Management Process

The Perilya *Emergency Response and Crisis Management Procedure* is the prevailing document that governs emergency response actions. That document incorporates the *Pollution Incident Response Management Plan* required under EPL2683. In summary, in an emergency situation, one or more crisis management teams are convened and those teams coordinate emergency response, including interactions with external agencies, including emergency services.

13.4 Complaints Management Process

Section 7.1 of the *Environmental Management Strategy* describes the procedures to be implemented in the event of a complaint. In summary, complaints may be received directly via telephone, email or web form from Perilya's website, or indirectly via relevant government agencies. Upon receipt, the name and contact details of the complainant and the nature of the complaint are recorded. Perilya will then investigate the complaint and implement system improvements if required. The results of the investigation are communicated back to the complainant.

14 Training and awareness

The environmental risk management process and the broader environmental risks for Perilya are communicated to all site personnel via the Perilya general induction.

Site specific risks are associated with site specific inductions (for example Broken Hill North Mine). Training for relevant personnel in relation to the Standard Operating Procedures will be implemented as required. In particular, site personnel responsible for blasting will receive training in potential impacts associated with blast emissions for surrounding residences and the need to consider ground vibration when undertaking activities, particularly for close proximity blasting.

Job hazard analysis and 'take-time take-charge' are site-wide risk assessment tools used to identify health, safety and environment related risks and are used by operators and supervisors.

15 Roles and Responsibilities

Table 12 represents the roles and responsibilities specifically for the implementation of this Plan.

Table 12 Roles and Responsibilities

Role	Responsibility
General Manager	Ensure adequate resources are available to enable implementation of the Plan.
North Mine Manager	- Accountable for the overall environmental performance of the North Mine, including the outcomes of this Plan. - Responsible for ensuring the correct implementation of provided designs to ensure compliance to required Vibration and Noise levels. Ensure all modification to blast engineer provided designs are documented and approved prior to blasting.
Technical Services Manager	Responsible for ensuring systems of blast design include review for blast vibration estimation and a controlled design process to meet licence conditions.
Health, Environment, Safety and Training Manager	Ensure adequate resources are available to enable implementation of the Plan.
Environmental Superintendent	Accountable for the implementation of this Plan, including all management and mitigation measures, monitoring and reporting.
Environmental Advisor	Accountable for the day-to-day implementation of this Plan, including ensuring standard operating procedures re complied with and all monitoring data is collected and stored appropriately.
All other employees and contractors	Responsible for following directions and instructions from site management and supervisors.

16 Review and revision Process

16.1 SSD 7538 Schedule 4 Condition 6

In accordance with the requirements of Condition 6 of Schedule 4, this Plan will be reviewed within 3 months of:

- a) the submission of an annual review;
- b) the submission of an incident report;
- c) the submission of an audit;
- d) any modification to the conditions of this consent, (unless the conditions require otherwise); and/or
- e) a direction from the Secretary.

16.2 SSD 7538 Schedule 4 Condition 7

In accordance with Schedule 4 Condition 7, PBHL may submit the plan to the Secretary where there are revisions of the plan as a result of the review of Section 16.1. With agreement of the Secretary, PBHL may also submit the revised plan required by this consent on a staged basis.

The Secretary may approve a revised plan required under this consent at any time. With the agreement of the Secretary, PBHL may prepare the revised plan without undertaking consultation with all parties nominated under the condition in the consent.

17 References

Prism Mining Pty Ltd (Prism) (2017). Review of Blasting Impacts from the Proposed Perilya Broken Hill North Mine (Overpressure and Ground Vibration), presented as Appendix 4 of Response to Submissions.

Australian and New Zealand Environment Council (ANZEC) (1990). *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration.*

Department of Environment & Climate Change (DECC) (2009). *Interim Construction Noise Guideline.*