Rasp Mine

Zinc – Lead – Silver Project
Project Approval No. 07-0018
January 2011

Noise and Blast Management Plan

BHO-PLN-ENV-009

Contents

1. Purpose

The purpose of this Noise and Blast Management Plan (NBMP) is to define the standards and strategy for the effective management and control of blasting vibration, overpressure and noise at the Rasp Mine. It has been developed in accordance with the Project Approval 07-0018 Conditions. The Noise and Blast Management Plan satisfies Schedule 3, condition 20 of the Project Approval. The breakdown of the sections between each Plan is outlined in the **Table 1**.

Table 1 BHOP Noise Management Obligations

<table>
<tr><th>Condition</th><th>Obligations</th><th>Section</th></tr>
<tr><td colspan="3">Project Approval 07_0018 (MOD)10</td></tr>
<tr><td>Sch3, 15</td><td>Hours of Operation
Unless the Secretary agrees otherwise, the Proponent must comply with the operating hours in Table 6.1.
Table 6.1: Operating Hours
<table>
<tr><th>Activity</th><th>Hours</th></tr>
<tr><td>MOD6 construction activities excluding new decline underground activities, and TSF3 tailing preparation works.</td><td>7am to 6pm, Monday to Saturday
No activities on Sundays or public holidays</td></tr>
<tr><td>Construction, excluding construction of the EEL and MOD6 construction activities</td><td rowspan="2">7am to 6pm, Monday to Friday
8am to 1pm, Saturday
No activities on Sundays or public holidays</td></tr>
<tr><td>Capping and rehabilitation of TSF2</td></tr>
<tr><td>Shunting of concentrate wagons</td><td>7 am and 6 pm on any day</td></tr>
<tr><td>Production rock blasting</td><td>6:45am and 7:15pm on any day</td></tr>
<tr><td>Transporting cement to the cement silo</td><td rowspan="2">7 am to 7 pm on any day</td></tr>
<tr><td>Loading the cement silo</td></tr>
<tr><td>Tailings harvesting in TSF2, including emplacement of the Temporary Tailings Stockpile</td><td>7 am to 7 pm on any day</td></tr>
<tr><td>All other activities, including construction of the EEL, construction of the new decline (underground activities) and TSF3 tailings preparation works</td><td>24 hours a day, 7 days a week</td></tr>
</table></td><td>Section 2, 6.2, 8.1, 8.2, 10.2</td></tr>
<tr><td>Sch3, 17</td><td>Noise Limits
The Proponent shall ensure that the noise generated by the project does not exceed the criteria in Table 7.
Table 7: Operational Noise Criteria
<table>
<tr><th>Location</th><th>[a] Day (dB(A))</th><th>[b] Evening (dB(A))</th><th>[c] Night (dB(A))</th></tr>
</table></td><td>Section 7.1, Table 2</td></tr>
</table>

Condition	Obligations	Section

A1 – Piper Street North	*40*	*37*	*35*
A2 – Piper Street Central	*40*	*37*	*35*
A3 – Eyre Street North	*44*	*41*	*39*
A4 – Eyre Street Central	*44*	*41*	*39*
A5 – Eyre Street South	*44*	*41*	*39*
A6 – Bonanza and Gypsum Streets	*48*	*41*	*39*
A7 – Carbon Street	*45*	*42*	*36*
A8 – South Road	*48*	*39*	*39*
A9 – Crystal Street	*46*	*39*	*39*
A10 Barnet and Blende Streets	*42*	*41*	*35*
A11 – Crystal Street	*46*	*39*	*39*
A12 – Crystal Street	*46*	*39*	*39*
A13 – Eyre Street North 2	*40*	*35*	*35*
A14 – Piper Street North	*40*	*35*	*35*

Notes to Condition 17:

- *Receiver locations area as identified in the noise assessments presented in the EA and PPR;*
- *Noise limits are to be measured in accordance with the Noise Policy for Industry (NSW EPA, 2017), or its latest version;*
- *[a] Day is defined as 7 am to 6 pm Mondays to Saturdays and 8 am to 6 pm on Sundays and public holidays;*
- *[b] Evening is defined as 6 pm to 10 pm on any day; and*
- *[c] Night is defined as 10 pm to 7 am Mondays to Saturdays and 10 pm to 8 am on Sundays and public holidays.*

Sch3, 17A

Noise Limits

The daytime criteria in Table 7 of this approval do not apply when the following activities are being carried out:

a) construction of the concrete batching plant and associated noise bund;

b) construction of TSF2, including:
- embankment 2;
- the spillway;
- embankment 3;
- embankment 1;

c) capping and rehabilitation of TSF2; and

d) construction of the cement silo and warehouse extension; and

e) crushing and screening activities associated with construction of TSF2 embankments.

Section 6.2

Sch3, 17B

Noise Limits

With regard to the activities specified in condition 17A(a) – (e) of this approval, the Proponent must:

a) notify the Department prior to commencement and upon completion of each activity;

b) minimise the noise generated by these activities in accordance with the best practice requirements outlined in the Interim Construction Noise Guideline (DECC, 2009), or its latest version; and

Section 6.2, 7

<table>
<tr><th>Condition</th><th>Obligations</th><th>Section</th></tr>
<tr><td></td><td>c) ensure that the noise generated by the project does not cause exceedances of the amenity criteria of 65 dB LAeq,(day) specified for an urban/industrial interface area under the NSW Industrial Noise Policy.</td><td></td></tr>
<tr><td>Sch3, 17C</td><td>Noise Limits
The Proponent must not carry out any of the activities specified in condition 17A(a)-(c) concurrently.</td><td>Section 6.2</td></tr>
<tr><td>Sch3, 17D</td><td>Noise Limits
The noise criteria in Table 7 of this approval apply for construction of Stages 1 and 2 of the boxcut, excluding daytime criteria for receivers in Table 7a. The proponent must ensure that the noise generated by the project does not exceed the criteria in Table 7a during standard construction hours – defined as Monday to Friday 7am to 6pm and Saturday 8am to 1pm and no time on Sundays and public holidays.

Table 7a: Additional Construction Noise criteria for the Boxcut Construction
<table>
<tr><th>Location</th><th>Day (dB(A))</th></tr>
<tr><td>A1 – Piper Street North</td><td>43</td></tr>
<tr><td>A2 – Piper Street Central</td><td>45</td></tr>
<tr><td>A3 – Eyre Street North</td><td>47</td></tr>
<tr><td>A13 – Eyre Street North 2</td><td>48</td></tr>
<tr><td>A14 – Piper Street North</td><td>47</td></tr>
</table>
Notes to Condition 17D:
• Receiver locations are as identified in the noise assessments presented in the Appendix 3; and
• Noise limits are to be measured in accordance with the Noise Policy for Industry (NSW EPA, 2017), or its latest version.</td><td>Section 7.1</td></tr>
<tr><td>Sch3, 18</td><td>Blasting Limits
The Proponent shall ensure that blasting on the site does not cause exceedances of the criteria in Tables 8 and 9.

Table 8: Blasting Criteria (excluding Block 7)
<table>
<tr><th>Location</th><th>Airblast Overpressure (dB(Lin Peak))</th><th>Ground Vibration (mm/s)</th><th>[a] Allowable Exceedance</th></tr>
<tr><td rowspan="2">Residence on privately owned land</td><td>115</td><td>5</td><td>[b] 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>
<tr><td>Public Infrastructure</td><td>-</td><td>100</td><td>0%</td></tr>
</table>
Table 9: Blasting Criteria (Block 7)
<table>
<tr><th>Location</th><th>Airblast Overpressure (dB(Lin Peak))</th><th>Ground Vibration (mm/s)</th><th>[a] Allowable Exceedance</th></tr>
<tr><td>Residence on privately owned land</td><td>115</td><td>[c] 3 (interim)</td><td>5% of the total number of blasts over a 12-month period</td></tr>
</table></td><td>Section 8.1</td></tr>
</table>

Condition	Obligations	Section

	120	10	0%
Broken Hill Bowling Club, Italo (Bocce) Club, Heritage Items within CML7	-	50	0%
Perilya Southern Operations	-	100	0%
Public Infrastructure	-	100	0%

These criteria do not apply if the Proponent 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.

Notes to Tables 8 and 9:

- *[a] The allowable exceedance must be calculated separately for development blasts and production blasts;*
- *[b] The 5% allowable exceedance does not apply to production blasts until the Proponent has successfully completed a Pollution Reduction Program aimed at achieving this goal, as required by the EPA under the Proponent's EPL (No. 12559), or as otherwise agreed with the EPA;*
- *[c] The interim criteria applies unless and until such time that the Proponent has written consent from the Secretary to apply site specific criteria in accordance with condition 19 of this approval; and*
- *[d] The Proponent must close South Road to pedestrians if blasts are expected to exceed a peak particle velocity ground vibration of 65 mm/s at the road reserve surface, while the blast firing occurs.*

Sch3, 19	The Proponent may establish site specific ground vibration criteria for residential receivers that may be affected by blasting operations in Block 7, to the satisfaction of the Secretary. These criteria must: a) be prepared by a suitably qualified mining engineer; b) be prepared in consultation with the EPA; c) protect the amenity of all residences on privately owned land; and d) be based on blast monitoring data for the Block 7 mining area.	Section 8
Sch3, 19A	**Blast Frequency** The Proponent may carry out a maximum of: (a) 1 production blast a day and 6 production blasts a week, averaged over a calendar year; and (b) 6 development blasts a day and 42 development blasts a week, averaged over a calendar year.	Section 8.2
Sch3, 19B	**Operating Conditions** The Proponent must: (a) implement best management practice to: • protect the safety of people in the surrounding area; and • protect public or private infrastructure/property in the surrounding area 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; (c) use reasonable endeavours to co-ordinate blasting at the site: • to minimise cumulative blasting impacts associated with the operation of nearby mines; and • to avoid disturbing users of nearby recreational facilities, including the Broken Hill Bowling Club and the Italio (Bocce)	Section 6, 8.2

Condition	Obligations	Section
	Club; (d) minimise the noise impacts of the project during adverse meteorological conditions (stability category F temperature inversion conditions and wind speeds greater than 2 m/s at 10 m above ground level); (e) carry out regular monitoring to determine whether the project is complying with the relevant conditions of this approval; and (f) regularly assess noise monitoring data and modify and/or stop operations on site to ensure compliance with the relevant conditions of this approval; to the satisfaction of the Secretary.	
Sch3, 20	**Noise and Blast Management Plan** The Proponent shall prepare and implement a Noise and Blast Management Plan for the project to the satisfaction of the Secretary. This plan must: (a) be prepared in consultation with EPA, and submitted to the Secretary for approval by the end of June 2011; (b) describe the noise mitigation measures that would be implemented to: • ensure compliance with the relevant conditions of this approval, including a real-time noise management system that employs both reactive and proactive mitigation measures; • address activities associated with the construction of the concrete batching plant and TSF2, and the capping and rehabilitation of TSF2; and • address activities associated with the construction of the boxcut, TSF3 and tailings harvesting routes as described in Modification 6; (c) include a noise monitoring program that: • uses a combination of real-time and supplementary attended monitoring to evaluate the performance of the project; and • includes a protocol for determining exceedances of the relevant conditions of this approval; (d) describe the blast management measures that would be implemented to ensure compliance with the blast criteria and operating conditions of this approval; and (e) include a blast monitoring program that: • evaluates the performance of the project, including compliance with the applicable criteria; • uses a combination of roving blast monitors (at least 1) and fixed blast monitors (at least 6); and • includes a protocol for determining and responding to exceedances of the relevant conditions of this approval; and • (f) detail notification requirements to relevant government agencies.	Section 11 Sections 6.2 Section 6.2 Section 6.2 Sections 7 Section 8 Section 8
Sch3, 20	The Proponent shall ensure that there are no measurable subsidence impacts caused by underground mining beneath South Road and other public infrastructure.	
Sch 4, 2	**Management Plan Requirements** The Proponent shall ensure that the management plans required under this approval are prepared in accordance with relevant guidelines,and include: (a) detailed baseline data; (b) a description of: • the relevant statutory requirements(including any relevant approval, licence or lease conditions); • any relevant limits or performancemeasures/criteria; and • the specific performance indicatorsthat are proposed to be used to judge the performance of, or guide the implementation of, the project	Section 7.1, 8.1 Section 7, 8

Condition	Obligations	Section
	orany management measures; (c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria; (d) a program to monitor and reporton the: • impacts and environmental performance of the project; and • effectiveness of any management measures (see (c) above); (e) a contingency plan to manage any unpredicted impacts and their consequences; (f) a program to investigate and implement ways to improve the environmental performance of theproject over time; (g) a protocol for managing and reporting any: • incidents; • complaints; • non-compliances with the conditions of this approval and statutory requirements; and • exceedances of the impact assessment criteria and/or performance criteria; and (h) a protocol for periodic review of the plan.	Sections 6, 8 Section 7, 8 Sections 7.4, 8.2, 8.3, 9 Sections 7.4, 8.3, 9 Section 9, 10 Section 10
Sch 4, 3	**Annual Review** By the end of 31 March 2023, and annually thereafter, the Proponent must submit a report reviewing the environmental performance of the project to the satisfaction of the Secretary. This review must: (a) describe the project (including any rehabilitation) that was carried out in the past calendar year, and the project that is proposed to be carried out over the next year; (b) include a comprehensive review of the monitoring results and complaints records of the project 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 documents referred to in Conditions 2 of Schedule 2; and • requirements of any plan or program required under this approval. (c) identify any non-compliance over the past year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence; (d) identify any trends in the monitoring data over the life of the project; (e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; (f) describe what measure will be implemented over the next year to improve the environmental performance of the project; and **(g)** evaluate and report on compliance with the performance measures, criteria and operating conditions of this approval.	Section 10
Sch 4, 4	**Revision of Strategies, Plans and Programs** Within three months of:	Section 10

Condition	Obligations	Section
	(a) the submission of an annual review under Condition 3 above; (b) the submission of an incident report under Condition 5 below; (c) the submission of an audit report under Condition 7 – 8A below ; (d) any modification of the conditions of this approval (unless the conditions require otherwise), or (e) a direction of the Secretary under Condition 2 of Schedule 2. the Proponent shall review, and if necessary revise, the strategies, plans, and programs required under this approval to the satisfaction of the Secretary. Where this review leads to revisions in any such document, then within 4 weeks of the review the revised document must be submitted to the Secretary for approval, unless otherwise agreed with the Secretary. *Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.*	
Sch 4, 5	**Incident Reporting** The Secretary must be notified in writing via the Major Projects website immediately after the Proponent becomes aware of an incident. The notification must identify the project (including the development application number and the name of the development if it has one) and set out the location and nature of the incident. Subsequent notification requirements must be given, and reports submitted in accordance with the requirements set out in Appendix 5	Section 9
Sch 4, 5A	**Non-compliance Notification** The Secretary must be notified in writing via the Major Projects website within seven days after the Proponent becomes aware of any non-compliance. A non-compliance notification must identify the project and the application number for it, set out the condition of approval that the project is non-compliant with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. *Note: A non-compliance which has been notified as an incident does not need to also be notified as a noncompliance.*	Section 9
Sch 4, 6	**Regular Reporting** The Proponent shall provide regularreporting on the environmental performance of the project on its website, in accordance with the reporting arrangements in any approved plans or programs of the conditions of this approval.	Section 10
Sch 4, 7	**Independent Environmental Audit** Within one year of the date of physical commencement of development under Modification 6, and every three years after, unless the Secretary directs otherwise, the Proponent must commission and pay the full cost of an Independent Environmental Audit of the project. The audit must: (a) be prepared in accordance with the Independent Audit Post Approval Requirements (NSW Government 2020); and (b) be submitted, to the satisfaction of the Secretary, within two months of undertaking the independent audit site inspection, unless otherwise agreed by the Secretary.	Section 10
Sch 4, 8	**Independent Environmental Audit** In accordance with the specific requirements of the Independent Audit Post Approval Requirements (NSW Government 2020), the Proponent must:	Section 10

Condition	Obligations	Section
	(a) review and respond to each Independent Audit Report prepared under Condition 7 above; (b) submit a response to the Secretary and any other NSW agency that requests it, together with a timetable for the implementation of the recommendations of the Independent Audit Report; (c) implement the recommendations to the satisfaction of the Secretary; and (d) make each Independent Audit Report and response to it publicly available no later than 60 days after submission to the Secretary	

2. Scope

This Management Plan applies to Broken Hill Operations Pty Ltd (BHOP) and the activities at its Rasp Mine for the duration of the mining operations to 31 December 2026, including extraction, production, transport of extracted material, the construction of the new boxcut and portal, tails harvesting, establishing Kintore Pit as TSF3 and progressive placement of inert waste rock as capping. The conditions of approval provided in Table 1 are applicable to this management plan.

3. Definitions

Action Limit	Is a limit set by BHOP to assist in the management of noise levels and provide an opportunity to take action to prevent the level exceeding regulated limits.
BATEA	Best Available Technology Economically Achievable.
BHOP	Broken Hill Operations Pty Ltd
Blasting	Blasting is the use of explosives to fracture rock, coal and other minerals for later recovery.
CBP	Concrete Batching Plant
dB(A)	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
DPE	Department of Planning and Environment, NSW
EPA	Environment Protection Authority, NSW
HSET	Health, Safety, Environment & Training
NPfI	Noise Policy for Industry (NSW EPA, 2017)
L_1	The noise level exceeded for 1 % of a measurement period.
L_{10}	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
L_{90}	Commonly referred to as the background noise, this is the level exceeded 90%of the time.
L_{eq}	It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period. The $L_{eq,15min}$ descriptor refers to an Leq noise level measured over a contiguous 15 minute period.
L_{max}	The maximum root mean squared sound pressure level received at the microphone during a measuring interval.

MIC	Maximum instantaneous charge (MIC) is the maximum amount of explosives designed to initiate on any specific delay timing.
Overpressure	The airblast pressure wave associated with blasting. It is measured in dBL peak and is a measurement of noise.
PPV	The peak particle velocity (PPV) is a measure of ground vibration magnitude and is the maximum instantaneous particle velocity at a point during a given time interval in mm/s.
RBL	The Rating Background Level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
SI	SI ("Still Isothermal") refers to calm weather conditions (ie The absence of any wind or temperature gradients).
Sound Power Level	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental property of the source and is independent of the surrounding environment.
Temperature Inversion	A positive temperature gradient. A meteorological condition where atmospheric temperature increases with altitude.
Vibration	The oscillating movement of the ground due to blasting.
(σθ) sigma-theta	The standard deviation of horizontal wind fluctuation.

It is useful also to have some appreciation of the scale of decibels, the unit of noise measurement. The following gives some practical indication as to what an average person perceives about changes in noise levels:

- Differences of less than approximately 2dB are imperceptible in general, ie. most people would find it difficult to discern which is the louder of two noise sources having levels within 2dB of each other; and
- A difference in noise levels of around 10dB appears as either doubling or halving of loudness.

4. References Documents

- Project Approval 07_0018
- BHO-PRO-TEC-015 Envirohub Monitor Call Home Procedure
- BHO-PRO-TEC-013 Ring Design Procedure
- BHO-PRO-TEC-009 Production Charge Design Procedure
- BHO-PRO-TEC-007 Stope Authority Procedure
- BHO-PRO-ENV-029 Public Complaints and Dispute Resolution
- Australian Standard 1055.1-1997: Acoustics – A description and measurement of environmental noise
- NSW EPA Noise Policy for Industry 2017
- NSW Interim Construction Noise Guideline, DECC 2009.
- BHO-PLN-ENV-008Environmental Management Strategy
- Environmental Protection Licence 12559

- BHO-PRO-ENV-012 Quarterly Real Time Residential Noise Monitoring Procedure

5. Responsibilities

General Manager

The following actions are the responsibility of the General Manager or delegate:

- Provide required resources and support to implement this Plan;
- Authorise the implementation of this Plan;
- Participate in annual reviews of this Plan;
- Signoff exclusion zone for South Road when PPV exceeds 65mm/s;
- Approve or delegate all blast plans where the PPV is predicted to exceed 5mm/s, prior to issuing; and
- Approve or delegate blast plans that cannot be sequenced in less than 10 seconds, prior to issuing

Department Managers

The following actions are the responsibility of the Department Managers or delegates:

- Provide resources required to implement the actions from this Plan and associated procedures.
- Allocate responsibilities within their department for the implementation of this Plan.
- Ensure all personnel undertaking works in relation to this Plan are trained and competent;
- Implement air emission abatement and control measures as required.
- Participate in annual reviews of this Plan.

Mining Manager

The following actions are the responsibility of the Mining Manager or delegate:

- Check that arrangements are in place for all personnel involved in blasting activities to have the appropriate licences for the activities they are required to perform;
- Check that arrangements are in place for personnel engaged in blasting activities to receive the appropriate training and authorisations;
- Review data to identify any requirement for additional management actions in relation to control of blast limit exceedances;
- Assist in investigations and provide support for the implementation of agreed actions to prevent exceedance of blasting limits;
- Make reports as per the BHOP incident reporting standards; and
- Undertake annual reviews of this NBMP.

Technical Services Superintendent/Senior Mining Engineer

The following actions are the responsibility of the Technical Services Superintendent or delegate:

- Supervise production engineers;
- Check post blast analysis is being completed by the production engineers;
- Check that the most up to date information is being used for future blast planning;
- Check all personnel designing, reviewing and implementing blast plans have been trained and competent;
- Conduct a quarterly review of the implementation of this NBMP taking action as appropriate; and
- Notify the HSE department of any production blast that will occur at End of Shift by midday so relevant receptor notifications can be completed.

Production Engineer

The following actions are the responsibility of the Production Engineers:

- Design and sequence blasts in such a way as to prevent the risk of exceeding blasting vibration or overpressure criteria and minimise the number of blasts that exceed the allowable PPV criteria;
- Check blast vibration monitors are working prior to blasting as per Envirohub Monitor Call Home Procedure (BHO-PRO-TEC-015);
- Design and issue drill plans according to BHOP guidelines Ring Design Procedure(BHO-PRO-TEC-013);
- Design and issue all blast designs according to BHOP guidelines Production Charge Design Procedure (BHO-PRO-TEC-009) and Stope Authority Procedure (BHO-PRO-TEC – 007);
- Update Blasthub with information on a daily basis.
- Audit the drill and blast process, ring design procedure, charge design procedure and this NBMP;
- Participate in investigations resulting from an incident relating to blasting activities at BHOP; and
- Notify all stakeholders and identified members of the public of any production firings that will occur at the end of shift by 4:30pm.

Mining Superintendent

The following actions are the responsibility of the Mining Superintendent or delegate:

- Check that all personnel required to handle or use explosives hold the required licence or certificate;
- Check that all personnel required to handle or use explosives are competent to follow charge plans; and
- Check that correct supervision is occurring on the charge crew to ensure adherence to

blast plans.

Blasting Crew

The following actions are the responsibility of the blasting crew:

- Communicate all variations or anomalies to the blast plan prior to initiating the blast to their immediate supervisor or Production Engineer;
- Follow all information on the approved blast plan;
- Record the specifics of all Zinc Lodes blasts and forward this information to the Production Engineers
- Follow all reasonable instructions from the Production Engineer or immediate supervisor; and
- Participate in investigations resulting from an incident relating to blasting activities at BHOP, as required.

Environmental Department

The Environmental Department has responsibility to:

- Ensure mobile monitoring equipment is operational;
- Organise maintenance and calibration of equipment as required to ensure equipment reliability;
- Undertake noise monitoring and reporting;
- File all electronic results from noise monitoring and store information on file for a period of not less than 4 years;
- Report monitoring results to the HSET Manager and General Manager;
- Provide adequate and timely response to community complaints and that requirements of the Environmental Issue Complaints Procedure BHO-PRO-ENV-029 (Public Complaints and Dispute Resolution) are completed;
- Review data and determine management actions as appropriate;
- Ensure actions are taken to prevent exceedance of Project Approval conditions and actions are implemented;
- In the case of an exceedance, complete an incident report, instigate an investigation and undertake mitigation actions as required and report to the HSET Manager and the General Manager; and
- Make reports available to the EPA as required;

BHOP Personnel and Contractors

All employees and contractors have a responsibility to:

- Ensure you have the training and competencies to implement the standards and procedures for noise and blast management.
- Implement the controls listed in procedures referenced in the Noise and Blast Management Plan.

6. Standards and Policies

Noise Management

The noise monitoring and management at Rasp Mine must be undertaken in accordance with all relevant Australian Standards and EPA policies. At the time of writing this document these include:

- Australian Standard AS 1055.1-1997: Acoustics – A description and measurement of environmental noise;
- Noise Policy for Industry (NSW EPA, 2017); and
- NSW Interim Construction Noise Guideline, DECC 2009.

Legislation and Policy

The General Manager has ultimate control and management of mining operations at the Rasp Mine and requires all operating units to adhere to the relevant legislative requirements.

This NBMP has been developed in accordance with the following legislation:

- Mining Regulation 2017, NSW
- Mining Act 2011, NSW
- Work Health and Safety (Mines and Petroleum) Act 2013, NSW
- Work Health and Safety (Mines and Petroleum) Regulation 2022, NSW
- Explosives Act 2003, NSW
- Explosives Regulation 2013, NSW
- New South Wales Mine Design Guidelines - MDG 1000 Series

It is the aim of BHOP to minimise blasting vibrations in all areas of the mining operations to prevent damage to public property and maintain public amenity which is a high priority.

Technical Services Documentation

All Technical Services Team members who are required to design, approve or issue a blast plan must be familiar with this NBMP and all of the procedures and documents listed below:

- Production Charge Design Procedure (BHO-PRO-TEC-009 V1)
- Stope Mine Shape Design Procedure (BHO-PRO-TEC-008 V1)
- Envirohub Monitor Call Home Procedure (BHO-PRO-TEC-015)

A copy of these documents can be obtained from the Company Intranet.

Environmental Documentation

The HSET Department has developed the following documents related to blasting management controls, monitoring and monitoring equipment:

- BHO-PLN-ENV-008 - Environmental Management Strategy

- BHO-PRO-ENV-029 - Public Complaints and Dispute Resolution

A copy of these documents can be obtained from the Company Intranet.

7. Noise Level Management

7.1 New Purchases

Noise levels shall be considered as part of the selection criteria for new plant and equipment to ensure the best available technology economically achievable (BATEA) is applied to reduce and or minimise noise levels at the operation

7.2 Noise Mitigation Measures

The following best management practices are used to minimise noise levels:

- Independent noise audits will be undertaken as required by the EPA.
- Noise awareness information is provided in employee and contractor inductions.
- The crusher has been located behind the ore stockpile and behind a earth protected wall to minimise noise levels.
- Construction of noise barriers with 4m high bunding along the southern side of the haul road and the southern perimeter of the ROM pad mine truck haul route.
- Re-locating the processing plant to the north-eastern end of the site, away from residential dwellings to the south.
- Cladding of the primary crusher and installing noise abatement bunding to the north and south of the crusher.
- Enclosed conveyors and transfer stations prior to the grinding circuit.
- Installation of two overlapping bunds at the northern side of the wagon stockpile area to shield Crystal Street residences.
- Silencers installed on haul trucks and noise suppression kits on the loaders used on the ROM pad, container stockpile and rail loading areas;
- Properly maintained plant to ensure rated noise emission levels are not exceeded.
- Mining ore transport trucks, once loaded, shall follow the designated heavy vehicle route through Broken Hill.
- Operational restrictions to minimise noise, including:
    - Crushing activities to occur 24 hours (on any day);
    - Shunting of concentrate wagons to occur only between 7am and 6pm (on any day); and
    - Production rock blasting to occur only between 6:45am and 7:15pm (on any day).
- Batching and slumping to occur in a concrete enclosure.
- Cover the conveyor at the CBP used for transport of aggregate to the hopper;
- A small size front-end loader will be used at the CBP (SPL 102 dB(A)).

- A 6 m high noise abatement bund will be constructed at the perimeter of the CBP to the north-west and south-west.
- Prior to construction of the CBP incorporate into the Construction Environment Management Plan MOD 6 Construction Boxcut, Portal, TSF3 and Tails Harvesting (BHO-PLN-ENV-012) all identified reasonable and feasible measures to minimise noise during construction.
- Construction work will only be undertaken during Monday to Friday from 7 am to 6 pm, Saturdays from 8 am to 1 pm, and no work on Sundays or public holidays.
- Use of 'squawker' type reverse alarms on vehicles used on site.
- Loading of the silo to occur during dayshift only (7 am to 7 pm).
- Transport of cement to the silo to occur during dayshift only (7 am to 7 pm).
- Current noise abatement bund (6m) surrounding the city side of the proposed cement silo.
- Enclosure of motors for the loading of cement into the silo (blower) and into the mixing hopper (screw conveyor).
- Machinery shall not be permitted to 'warm-up' before the nominated working hours.

The daytime criteria in Table 7 of PA 07_0018 do not apply when the following activities (Schedule 3 Condition 17A) are being carried out:

a) construction of the concrete batching plant and associated noise bund;

b) construction of TSF2, including:
   - embankment 2;
   - the spillway;
   - embankment 3;
   - embankment 1;

c) capping and rehabilitation of TSF2; and

d) construction of the cement silo and warehouse extension; and

e) crushing and screening activities associated with construction of TSF2 embankments.

With regard to the activities specified in condition 17A(a) – (e) of this approval, the Proponent must:

a) notify the Department prior to commencement and upon completion of each activity;

b) minimise the noise generated by these activities in accordance with the best practice requirements outlined in the Interim Construction Noise Guideline (DECC, 2009), or its latest version; and

c) ensure that the noise generated by the project does not cause exceedances of the amenity criteria of 65 dB LAeq,(day) specified for an urban/industrial interface area under the NSW Industrial Noise Policy.

The Proponent must not carry out any of the activities specified in condition 17A(a)-(c) concurrently.

7.2.1 Construction of Boxcut and new Haul Road

Construction of the boxcut and new decline surface trucking will occur only between 7am and 6pm Monday to Friday and 8am to 1pm Saturdays, with no work occurring on Sundays and public holidays. Furthermore noise bunding will be installed around the west side of the boxcut where the new decline road is to meet the existing Mine Haul Road. All additional vehicles permitted on site during construction will be required to be fitted with squawker reversing beepers. A majority of blasts in the new decline will be consumed from underground to avoid adverse impacts on the surface from overpressure. It is anticipated that given the reduction in the ore haulage route there will also be a reduction in noise generated as a result of these works.

7.2.2 TSF2 Harvesting Preparation

Harvesting and transfer of tailings to Kintore Pit (TSF3) will only occur between 7am and 7pm on any day.

7.2.3 Redevelopment of Kintore Pit (TSF3)

Work to backfill the MLD and Portal drive will occur underground and will be able to occur 24 hours a day. Given the depth of Kintore Pit, it will be possible for this work to also occur 24 hours a day without generating excess noise at nearby sensitive locations.

7.2.4 Construction of TSF2 Embankments

There will be an increase in vehicle movements during construction of the TSF2 embankments, retaining wall and spillway, primarily transporting waste rock materials from Kintore Pit to each area averaging an additional 23 truck movements per day or 2 per hour.

Other vehicle movements would include the water truck operating at all times during the construction works and Agi-truck deliveries of concrete from the CBP (approximately 115 deliveries over the total construction period).

The main noise mitigation measures for the TSF2 embankments include the existing noise abatement bunding along the haul road, restriction of operating hours for construction activities and use of squawker reversing beepers. All noise mitigation measures will be outlined in the CEMP.

7.2.5 Capping and Rehabilitation of TSF2

There will be an increase in vehicle movements during construction of the TSF2 embankments, retaining wall and spillway, primarily transporting waste rock materials from Kintore Pit to each area averaging an additional 23 truck movements per day or 2 per hour.

7.3 Best Available Technology Economically Achievable (BATEA)

Where an Action Limit is exceeded and it is attributed to truck haulage operations (trucks in and out of Kintore Pit or processing plant), investigations shall be undertaken to identify ways to reduce noise levels by way of best management practices as detailed in Section 8.2.

Where best management practices are unable to minimise noise emissions sufficiently, the BATEA methods such as those listed below should be considered:

- Adjustment of reverse alarms to reduce acoustic range and or tone.
- Use of acoustically efficient muffler design.
- Substitution of louder engines.
- Enclosing noise sources.
- Increasing surface roughness.
- Use of alternative methods to pneumatic/hydraulic rock hammers.
- Maintaining levels in ore bins to minimise impact when filling.

8. Noise Monitoring

8.1 Background Monitoring and Criteria

Background noise levels were measured at sensitive receptors (Figure 1) and the criteria are shown in Table 2. Daytime criteria in brackets are additional construction noise criteria for the boxcut construction. Additional details of the modelled results are available in the Environment Assessment – Modification 6 – New Tailings Storage Facility March 2022.

Prevailing conditions based on the detailed analysis of meteorological data recorded between January 2014 and September 2016 by the Bureau of Meteorology Automatic Weather Station (BoM AWS) located at the Broken Hill Airport were adopted in accordance with the methods outlined in the NPfI (NSW EPA 2017). It was identified that no prevailing wind conditions were a 'feature' of the area during the day, evening or night period. Therefore calm meteorological conditions were adopted for all assessment periods. It was also identified that temperature inversions (F or G class temperature inversion) are infrequent and found not to be feature of the area (<30%). Notwithstanding, the assessment adopted the F class temperature inversion parameter for the purpose of the assessment during the night period, and is considered to be worst case.

Table 2 Rasp Mine Noise Criteria

Location	Day (dB(A))	Evening (dB(A))	Night (dB(A))
A1 – Piper Street North	40 (43)	37	35
A2 – Piper Street Central	40 (45)	37	35
A3 – Eyre Street North	44 (47)	41	39
A4 – Eyre Street Central	44	41	39
A5 – Eyre Street South	44	41	39
A6 – Bonanza and Gypsum Streets	48	41	39
A7 – Carbon Street	45	42	36
A8 – South Road	48	39	39
A9 – Crystal Street	46	39	39

A10 – Barney and Blende Streets	42	41	35
A11 – Crystal Street	46	39	39
A12 – Crystal Street	46	39	39
A13 – Eyre Street North 2	40 (48)	35	35
A14 – Piper Street North	40 (47)	35	35

8.2 Compliance Monitoring

To check compliance with noise limits outlined in the Project Approval the following monitoring shall be undertaken:

BHOP undertakes random or complaints or as requested attended short term noise readings which include one representative 15-minute sample at each nominated location for each of the day, evening and night periods as undertaken. The instrument will include third-octave band centre frequency filters to aid in removing non-site related noise. The attendant will be a suitably trained person in the practice of compliance noise monitoring. The attendant will document and quantify the site's contribution to noise levels at the monitoring location. Where this is not deemed possible, an adequate data set will be captured to allow determination of whether compliance is achieved through the observations documented by the attendant. The instrument will meet Australian Standard Type 1 class sound meter specifications.

Attended noise monitoring is conducted on an annual basis with the results reported to the DPE and EPA for review. The data measurements are validated and reported by an acoustic consultant.

Weather conditions including wind speed at the microphone position will be quantified and any data collected during wind speeds above 3m/s at the microphone will be deemed unsuitable. Similarly, 10m elevation wind speed, wind direction and temperature gradient data will be reported for the duration of monitoring using the site's automatic weather station (AWS). The weather data will be used to assess compliance in accordance with consent conditions.

In addition to the noise parameters listed in Table 3, the monitoring will also capture background noise levels including L90,15minute and over time establish trends in the rating background level (RBL) and whether this is influenced by site noise or not.

Two permanent real-time noise monitors will be employed on site as a reference point to aid in identifying potential exceedances to noise limits. The location selected is on the southern edge of TSF1 during MOD6 works. This location has been chosen in consultation with acoustic consultants to monitor the potential impact of traffic using the Haul Road and of construction of the boxcut on Receptors A13 and A14 (identified as a potential issue during annual noise monitoring in November 2017).

Placement of instruments will consider extraneous sources such as roads and be positioned on the site side of these sources where practicable. The instrument will include low-pass frequency filters to exclude insect and other natural sounds above 1000Hz. The instrument will meet Australian Standard Type 1 class sound meter specifications.

Refer to the Quarterly Real Time Residential Noise Monitoring Procedure (BHO-PRO-ENV-012) for the detailed method for Noise Monitoring.

8.3 Noise Monitoring Locations

Annual attended residential noise monitoring locations and the noise parameters to be collected are shown in Table 3.

Monitoring points for recording noise emissions are at the closest boundary to the site or otherwise as per the INP and Project Approval.

The real-time or continuous noise monitors are located on site and are shown as R1 and R2 in Figure 1 and in Table 3.

The number and locations for real-time monitors may change in the event of on-going community complaints regarding noise levels emanating from Rasp Mine activities. If this was to occur BHOP will engage a noise specialist to advise on the number and location of monitoring units in consultation with the EPA.

Figure 1 Noise Monitoring Locations

Table 3 Attended Short Term Noise Monitoring Locations, Parameters and Frequency

Area	Name/Address	Period	Parameters	Frequency
R1	On-site TSF1	Day/Evening/Night	Leq,15min/Period	Continuous
R2	On-site TSF1	Day/Evening/Night	Leq,15min/Period	Continuous
A1	Piper Street North	Day/Evening/Night	Leq,15min/Day Leq,15min/Evening Leq,15min&Lmax/Night	Annual
A2	Piper Street Central	Day/Evening/Night	Leq,15min/Day Leq,15min/Evening Leq,15min&Lmax/Night	Annual
A3	Eyre Street North	Day/Evening/Night	Leq,15min/ Leq,15min/ Leq,15min&Lmax	Annual
A4	Eyre Street Central	Day/Evening/Night	Leq,15min/Day Leq,15min/Evening Leq,15min&Lmax/Night	Annual
A5	Eyre Street South	Day/Evening/Night	Leq,15min/Day Leq,15min/Evening Leq,15min&Lmax/Night	Annual
A6	Bonanza and Gypsum Streets	Day/Evening/Night	Leq,15min/Day Leq,15min/Evening Leq,15min&Lmax/Night	Annual
A7	Carbon Street	Day/Evening/Night	Leq,15min/Day Leq,15min/Evening Leq,15min&Lmax/Night	Annual
A8	South Road	Day/Evening/Night	Leq,15min/Day Leq,15min/Evening Leq,15min&Lmax/Night	Annual
A9	Crystal Street	Day/Evening/Night	Leq,15min/Day Leq,15min/Evening Leq,15min&Lmax/Night	Annual
A10	Barnet and Blende Streets	Day/Evening/Night	Leq,15min/Day Leq,15min/Evening Leq,15min&Lmax/Night	Annual
A11	Crystal Street	Day/Evening/Night	Leq,15min/Day Leq,15min/Evening Leq,15min&Lmax/Night	Annual
A12	Crystal Street	Day/Evening/Night	Leq,15min/Day Leq,15min/Evening Leq,15min&Lmax/Night	Annual
A13	Eyre Street North 2	Day/Evening/Night	Leq,15min/Day Leq,15min/Evening Leq,15min&Lmax/Night	Annual
A14	Piper Street North 2	Day/Evening/Night	Leq,15min/Day Leq,15min/Evening Leq,15min&Lmax/Night	Annual

8.4 Action Limits

When conducting any attended noise monitoring or when a real-time noise monitor is in use the following will apply:

- Where the site's contribution is 2dB below the operational license limits for two consecutive 15-minute periods at a given receiver, the main contributing source(s) will be noted;
- Where the site's contribution is between the operational license limit and +2db for two consecutive 15-minute periods at a given receiver, the main contributing source(s) will be identified and investigations undertaken to determine reasonable and feasible mitigation.
- Where the site's contribution is between 2dB and 5dB of the operational license limits for a given receiver, the main contributing source(s) will be identified and investigations undertaken to determine reasonable and feasible mitigation. Where this cannot be resolved, replacement of the offending item will be considered.
- Where the site's contribution is more than 5dB above the operational license limits for a given receiver, the main contributing source(s) will be identified and its operations will cease until such time as suitable mitigation can be adopted to ensure noise levels are reduced.

8.5 Noise Monitoring Records

The Environmental Advisor shall record the following information during attended monitoring:

- The type of meter and settings used (unless otherwise specified the following settings should be used 'fast' time weighting, 'A' frequency weighting and LAeq, 15min).
- Wind speed and direction at the microphone and at 10m elevation.
- Sky cloud cover.
- The type of monitoring being undertaken.
- The monitoring location.
- The time and duration of monitoring for each location.
- Licence limits, where appropriate.
- Action Limits and reasons for any exceedance. Where this exceedance is found to be from the operation, details of actions taken to reduce noise levels.
- Reasons for any exceedance and where this exceedance is found to be from the operation details of actions taken to reduce noise levels.

9. Blast Monitoring

9.1 Blast Vibration and Airblast Overpressure Limits

The Rasp Mine Project Approval 07_0018 MOD10 and the Environment Protection Licence 12559 outline the blasting vibration and air overpressure criteria that apply to the Rasp Mine. Tables 4, 5 and 6 detail the applicable criteria as at December 2022.

Table 4 Airblast Overpressure Criteria

Applicable Times	Airblast Overpressure (dB(Lin) Peak)	Allowable Exceedance
7am to 7pm	115	5% of the total number of blasts over a 12-month period[1]
7pm to 10pm	105	5% of the total number of blasts over a 12-month period[1]
10pm to 7am	95	5% of the total number of blasts over a 12-month period[1]
At any time	120	Never

Table 5 Vibration Peak Particle Velocity Criteria (excluding Block 7)

Peak Particle Velocity (mms^{-1})	Allowable Exceedance
5	5% of the total number of blasts over a 12-month period[1]
10	Never

Table 6 Vibration Peak Particle Velocity Criteria Block 7

Location	Peak Particle Velocity (mms^{-1})	Allowable Exceedance
Residence on privately owned land	3 ([2]Interim)	5% of the total number of blasts over a 12-month period[3]
Residence on privately owned land	10	Never
Public Infrastructure	100	Never
Perilya Southern Operations	100	Never
Bowling Club, Italio (Bocce) Club[(3)], Heritage Items within CML7	50	Never

Note 1 to Tables 4 and 5 – Currently all blasts (production and development) are included in the calculation for allowable exceedance. BHOP will complete a PRP with the EPA aimed at separating development blasts from this calculation and achieving 5% allowable exceedance for production blasts only or as otherwise agreed with the EPA.
Note 2 to Table 6 – The interim criteria applies unless and until such time that BHOP have written consent from DPE to apply site specific criteria in accordance with MOD3 Approval Conditions.
Note 3 to Table 6 – Only production blasts are to be used for calculating the 5% allowable exceedance.
Note 3 to Table 6 – Italio (Bocce Club) now Southern Cross Care (Broken Hill).

9.2 Blasting Restrictions and BHOP Requirements

9.2.1 Blasting Restrictions

BHOP also have the following restrictions:

- Production rock blasting shall only occur between 6.45 am to 7.15 pm, 7 days per week.
- The number of blasts can only be a maximum of:
  - 1 production blast a day and 6 production blasts a week, averaged over a calendar year; and
  - 6 development blasts a day and 42 development blasts a week, averaged over a calendar year.

BHOP will implement best management practice to:

- Protect the safety of people in the surrounding area; and
- Protect public or private infrastructure/property in the surrounding area from any damage.

BHOP will post details of planned blasting events on the company website to enable the public to get up-to-date information on the proposed blasting schedule on site.

BHOP will use reasonable endeavors to co-ordinate blasting at the site to:

- minimise cumulative blasting impacts associated with the operation of the nearby mine; and
- avoid disturbing users of nearby recreational facilities, including the Broken Hill Bowling Club and the Italio International (Bocce) Club (now Southern Cross Care (BH)).

BHOP has entered into a Deed of Agreement with the RMS for the protection and management of South Road, to the satisfaction of the RMS. This Agreement was in place prior to the commencement of production blasting in Block 7.

BHOP will maintain a 60m crown pillar above the bench stoping mining area and 10m spans under South Road.

BHOP will conduct a structural assessment of the South Road property against the predicted vibration levels for this area.

9.2.2 BHOP Requirements

In addition BHOP requires that:

- Development blasting does not occur concurrently with production blasting. This is to separate production blast results from development blasts enabling calculation of the 5% allowable exceedance.
- Independent development firing below the 10 level may occur at any time, 7 days per week.
- Firings will only occur at designated firing times, with the exception of the point above.
- If the predicted PPV is calculated to be higher than 5mm/s, signoff by the General Manager or delegate is required prior to issuing of the plan.
- Any blast plan that cannot be sequenced in less than 10 seconds must be approved by the General Manager or delegate prior to issuing.

When in Zinc Lodes:

- Use of 76mm or 64mm diameter blast holes for long hole production stoping;
- BHOP shall aim to have development blasting limited to no more than 6 holes per delay (and possibly fewer) when blasting at the closest proximity to residential locations;
- Each development blast that exceeds 2.4 mm/s PPV will be reviewed and changes made to the development blast timing to reduce the MIC;
- A further reduction in stope size to 10 m spans when mining beneath the South Road; and

- Deck charging will be considered and employed where required – Tables 7 and 8 outline recommended decking to achieve a PPV less than criteria and must be used in determining amount of decking required for production blasting. With this in mind every effort should be made to ensure a conservative approach to blast design is taken. Results shaded in blue indicate trigger levels and results shaded in red must be avoided.

Table 7 Estimated Ranges for Peak Ground Vibration at Residences

Blast Type	Blast Location	Location	Mining Distance (m)	Charge Configuration	Max Charge (kg)	Scaled Distance	Expected Peak Vibration Range (mm/s)		
							500[1] -1.6[2]	1500[1] -1.6[2]	2500[1] -1.6[2]
Development Blasting (Also used in cut & fill mining for Zinc Lodes) (45 mm diameter blastholes)	Main Lode	Nearest Eyre Street Residence	269	1 hole/delay	4	129.7	0.2	0.6	1.0
			269	6 hole/delay	26	52.9	0.9	2.6	4.4
			269	12 hole/delay	52	37.4	1.5	4.6	7.6
	Zinc Lode	Nearest Eyre Street Residence	184	1 hole/delay	4	88.7	0.4	1.1	1.9
			184	6 hole/delay	26	36.2	1.6	4.8	8.0
			184	12 hole/delay	52	25.6	2.8	8.4	14.0
		South Road Residence[5]	78	1 hole/delay	4	NA	NA	5.4[4]	NA
			78	6 hole/delay	26	NA	NA	22.6[4]	NA
			78	12 hole/delay	52	NA	NA	39.3[4]	NA
Production Benching (76 mm diameter blastholes)	Main Lode	Nearest Eyre Street Residence	340	3 decks/hole	12	98.1	0.3	1.0	1.6
			340	2 decks/hole	31	61.1	0.7	2.1	3.5
			340	FCC[3]/hole	45	50.7	0.9	2.8	4.7
	Zinc Lode	Nearest Eyre Street Residence	281	3 decks/hole	12	81.1	0.4	1.3	2.2
			281	2 decks/hole	31	50.5	0.9	2.8	4.7
			281	FCC[3]/hole	45	41.9	1.3	3.8	6.3
		South Road Residence[5]	78	3 decks/hole	12	NA	NA	11.2[4]	17.6
			78	2 decks/hole	31	NA	NA	23.4[4]	36.6
			78	FCC[3]/hole	45	NA	NA	31.8[4]	49.7

Notes:

1 = k factor

2 = a, exponent based on best-fit trends of historic data at the Rasp Mine

3 = FCC - Full Column Charge

4 = 1600 k factor

5 = PPV provided by BHOP

= PPVs over criteria = exceeds PPV trigger level houses

Table 8 Estimated Ranges for Peak Ground Vibration at the Road, Buildings and Underground Workings

Blast Type	Blast Location	Location	Mining Distance (m)	Charge Configuration	Max Charge (kg)	Scaled Distance	Expected Peak Vibration Range (mm/s)		
							500[1] -1.6[2]	1500[1] -1.6[2]	2500[1] -1.6[2]
Development Blasting (Also used in cut & fill mining for Zinc Lodes) (45 mm diameter blastholes)	Main Lode	Bowling Club	202	1 hole/delay	4	97.4	0.3	1.0	1.6
			202	6 hole/delay	26	39.7	1.4	4.2	6.9
			202	12 hole/delay	52	28.1	2.4	7.2	12.0
	Zinc Lode	Southern Cross Care Broken Hill (formerly Italio Bocce Club)	112	1 hole/delay	4	54.0	0.8	2.5	4.2
			112	6 hole/delay	26	22.0	3.6	10.7	17.8
			112	12 hole/delay	52	15.6	6.2	18.6	30.9
		Perilya Southern Operations[4]	40	1 hole/delay	4	NA	NA	14.1[5]	NA
			40	6 hole/delay	26	NA	NA	59.1[5]	NA
			40	12 hole/delay	52	NA	NA	102.9[5]	NA
		South Road[4]	60	1 hole/delay	4	NA	NA	7.4[5]	NA
			60	6 hole/delay	26	NA	NA	30.9[5]	NA
			60	12 hole/delay	52	NA	NA	53.8[5]	NA
Production Benching (76 mm diameter blastholes)	Main Lode	Bowling Club	311	3 decks/hole	12	89.8	0.4	1.1	1.9
			311	2 decks/hole	31	55.9	0.8	2.4	4.0
			311	FCC[3]/hole	45	46.4	1.1	3.2	5.4
	Zinc Lode	Southern Cross Care Broken Hill (formerly Italio Bocce Club)	191	3 decks/hole	12	55.1	0.8	2.5	4.1
			191	2 decks/hole	31	34.3	1.7	5.2	8.7
			191	FCC[3]/hole	45	28.5	2.4	7.1	11.8
		Perilya Southern Operations[4]	40	3 decks/hole	12	NA	NA	32.7[5]	51.2
			40	2 decks/hole	31	NA	NA	68.2[5]	106.5
			40	FCC[3]/hole	45	NA	NA	92.6[5]	144.7
		South Road[4]	60	3 decks/hole	12	NA	NA	17.1[5]	26.7
			60	2 decks/hole	31	NA	NA	35.6[5]	55.7
			60	FCC[3]/hole	45	NA	NA	48.4[5]	75.6

Notes:

1 = k factor

2 = a, exponent based on best-fit trends of historic data at the Rasp Mine

3 = FCC - Full Column Charge

4 = South Road and Perilya Southern Operations PPV predictions provided by BHOP

5 = 1600k factor

= PPVs over criteria *= exceeds PPV trigger level houses*

9.2.3 Factors Influencing Blasting Results

There are several influencing factors that affect blast vibration and overpressure levels. These include the following factors that must be addressed for every blast plan issued at BHOP:

- K-factor
- Maximum instantaneous charge (MIC);
- Blast duration;
- Exclusion zones;
- Location of known geological structures;
- Distance to monitor;
- Deck charging; and
- Blast hole size.

BHOP has adopted a conservative approach to determining blasting parameters and engaged M Humphries, blasting vibration consultant, to assist in predicting blasting results. These have been completed for Block 7 Main Lodes and Zinc Lodes and are detailed in Tables 7 and 8.

9.2.4 K - Factor

Parameter

K factor is the measured transmissivity or conductivity of the ground. This represents a constant used in predictive blast calculations. This factor is initially estimated and then later determined once blast data has been received and analysed.

Control

After the blast the actual K- factor must be calculated for each blast to collate information that can be used in future blasts. The k factor is back calculated from the actual PPV of the blast. Once this figure has been established it is then used for blast prediction calculations in the future.

9.2.5 Maximum Instantaneous Charge

Parameter

The maximum instantaneous charge (MIC) consists of two different calculations to determine:

- MIC allowable; and
- MIC per delay.

MIC allowable is directly proportional to the allowable PPV limits. The target PPV limit and other site variable coefficients are used to determine the MIC allowable for each blast.

Control

MIC per delay determines the quantity of explosive initiated at any specific point in time. If the MIC per delay is greater than the MIC allowable, the blast design should be modified to comply with the limits or the Mine Manager or delegate must

approve the exceedance prior to issuing the plan.

9.2.6 Blast Duration

Parameter

The longer the blast the greater the time that the vibration will be experienced by the receptor. BHOP has established that a maximum blast duration for all blasts should not exceed 10 seconds. This is to minimise vibration annoyance.

Control

Every effort should be made to reduce total blast duration where possible. Where duration exceeds 10 seconds, approval from General Manager or delegate is required.

9.2.7 Exclusion Zones

Parameter

Temporary exclusion zones will be utilised in areas on the surface where vibration levels are expected to exceed 65mm/sec.

Control

When blasting activities for the Zinc Lodes occur near South Road the PPV should not exceed 65mm/sec. This is the trigger level for blocking pedestrian access 200m either side of the blast for pedestrians using South Road. In this circumstance signoff for blasting to occur must be approved by the General Manager or delegate. This will limit and prevent any incidents in relation to high surface vibration.

9.2.8 Location of Geological Structure

Parameter

According to the blast vibration review completed by Humphreys, M (2014) there is anecdotal evidence that known geological structures such as dolerite dykes have an impact on actual recorded PPV levels. The report concluded that there is currently insufficient data to provide a correlation between these geological zones and the k-factor, however geological surface mapping would indicate a strong probability.

Control

BHOP utilizes the blast reporting software, Blast Hub, to record details of every blast. Recording of blast locations in relation to these zones will be completed for each blast to allow this data to be captured and analysed.

BHOP will continue to review k-factor estimation methods, define and refine appropriate ranges to be used within these geological zones to improve accuracy. This will be done in consultations with the blasting consultant.

9.2.9 Distance to Monitor

Parameter

The distance to monitor is an important variable in the PPV calculation, (see 8.5.2 below).

Control

The smaller the distance to monitor generally dictates a smaller MIC that is allowed to maintain PPV values that are in line with vibration criteria. Essentially charge sizes are reduced the closer they are too sensitive receptors.

9.2.10 Deck Charging

Parameter

Deck charging is a technique employed in Production firings to reduce the MIC per detonator, (this is the timing delay for each detonator).

Control

Generally if the MIC for an entire hole is predicted to generate higher than acceptable PPV values, the hole is separated mid hole by stemming, usually 1.5 meters, and the top of the blasthole is initiated on a different timing to the bottom section of the blasthole section is fired off at a different time to the bottom section of the hole. This produces a lower PPV value but can have a risk of failing to fire through dislocation.

9.2.11 Blast Hole Size

Parameter

Blast hole diameter has a direct influence on MIC. A smaller diameter hole will have a lower MIC for the same charge length than a larger diameter hole with the same charge length.

Control

Generally 89mm holes are used for long hole production in deeper sections of the mine in the Western Mineralisation and Main Lode areas. In the shallow Zinc Lode 76mm holes are used to reduce the MIC as this mining area is closer to sensitive receptors. Development headings are all 45mm.

9.3 Blast Plan Inclusions

BHOP requires that a blast plan must be issued for every blast.

Blasts are to be designed by a qualified and experienced blast engineer. All blasts must be designed such that overpressure and ground vibration measurements do not exceed the prescribed limits detailed above in section 9.19.2.1.

Each blast plan created at Rasp must have specific information included to ensure all checks have been completed and relevant information has been delivered to operators. Detailed information relating to the compilation of the blast plans can be found in BHO-PRO-TEC-009 Production Charge Design Procedure.

As a minimum each blast plan produced must include:

- Brief blast summary;
- Location of blast;
- Stope location;
- Location of closest structure/residential house (sensitive receptors);

- Blast design/ Blast layout plan;
- Explosives to be used;
- Quantity and type of explosive;
- Permitted blast hole size;
- Number of blast holes;
- Powder factor for the blast;
- Maximum instantaneous charge weight;
- Maximum predicted Peak particle velocity;
- K - factor used;
- Blast risk management – list hazards;
- Comment on geological structures;
- Security and warning details;
- Exclusion zone information;
- Environmental monitoring equipment requirements;
- Blast Plan Checklist; and
- Blast Plan Approvals.

9.4 Post Blast Analysis

Upon completion of the blast, data analysis must be completed for all production blasts, and all development blasts in Block 7, to collate information that can be used in future blasts and check if any exceedances were recorded.

Post blast analysis should consist of the following:

1. Review actual recorded data in the Blasthub;
2. Analyse wave forms obtained from each sensitive receptor and correlate data with designed blast timing and MIC per delay;
3. Check for any blast limit exceedances;
4. Calculate actual k-factor using recorded PPV level;
5. Download iKon blast logger/s and check for any variances to the designed blast sequence; and

9.5 Blast Environmental Monitoring Requirements

The following provides a summary of monitoring activities and requirements at the Rasp Mine and are the responsibility of the Environmental Department.

9.5.1 Post Blast Analysis

BHOP is required in its Project Approval to have six compliance and at least one blast vibration monitors in the field:

- Three fixed monitors located for determining Western Mineralisation results, to assess levels at residential houses;
- Two fixed monitors located in Broken Hill South at Eyre Street to assess levels at residential houses;
- One fixed vibration monitor located at the South Road gate entry into the Rasp Mine for assessing results for the road; and
- At least one roving monitor will be utilised for gathering additional data and for placement to address community complaints when required.

These monitoring locations (Table 9) are agreed with the EPA and are included on the BHOP EP licence. They cannot be moved from these locations without approval from the EPA.

Instrumentation and procedures will comply with AS 2187.2-2006. Monitoring shall capture all blast events and electronic records shall be filed in Blast Hub.

Table 9 - Airblast Overpressure and Ground Vibration Monitoring Locations

Area	Name/Address	Type	Period	Duration	Frequency
V1	543606 easting and 6462498 northing Silver Tank	AirBlast Overpressure & Ground Vibration	Anytime	Continuous	Ongoing
V2	543124 easting and 6463161 northing Broken Hill Hire Yard	AirBlast Overpressure & Ground Vibration	Anytime	Continuous	Ongoing
V3	543454 easting and 6463614 northing Air Express Yard	AirBlast Overpressure & Ground Vibration	Anytime	Continuous	Ongoing
V4	543270 easting and 6461956 northing Bowls Club/Residence (1)	AirBlast Overpressure & Ground Vibration	Anytime	Continuous	Ongoing
V5	543059 easting and 6461843 northing Eyre Street Residence (2)	AirBlast Overpressure & Ground Vibration	Anytime	Continuous	Ongoing
V6	542955 easting and 6462008 northing Core Shed South Rd	AirBlast Overpressure & Ground Vibration	Anytime	Continuous	Ongoing

9.5.2 Pre-blast monitor checks

The vibration monitors are maintained by the Environmental Department. Production Engineers should liaise with the Environmental Department at regular intervals to ensure sensors have been calibrated, are operational and are located in the positions as agreed upon with the EPA for current blasting activities.

It is the duty of the Production Engineer to check the status of monitors in Blasthub to ensure that they are in working order. If the monitors have not “called in” the Production Engineer is to contact the Environmental Department, Mining Manager and Technical Services Superintendent to inform them of this.

The vibration monitor that is relevant to the receptors for the area being mined must be in operational order prior to blasting.

BLASTING IS NOT TO OCCUR UNTIL THE V1-V6 COMPLIANCE MONITOR'S "DIAL IN" INDICATES THAT THEY ARE OPERATIONAL.

The Environmental Department or trained operator is responsible for going to check the monitors and getting them operational and / or installing a roving monitor to enable the blast to occur.

9.5.3 Blasting Notification

BHOP will maintain the notification system for identified community stakeholders who will be notified of blasting times via internal email and texts to their mobile telephones. The Environmental Department will be notified of a blast on the day of firing by the Production Engineer, after confirmation by the Underground Shift Supervisor. It is then the responsibility of the Mine Planning department to notify the community stakeholders no less than 1 hour before the blast time.

Blasting time details shall be placed on the BHOP public web site. BHOP maintains a 24 hour, 7 day a week community and employee information telephone line that can be used to enquire about firing times. The contact number is available on the website (08) 8088 1211.

9.5.4 Roving Monitors

Roving monitors are to be used to capture blasting vibrations at various locations and in particular can be used for placement at residential locations or at the recreational facilities to assist in verifying vibration predictions at these sensitive locations.

The Environmental Department will install these monitors liaising with receptor / community stakeholders to gain their agreement prior to placement.

If at any time complaints are received from the community a roving monitor can be placed, given availability, as close as possible to that area to collect PPV data to assist investigations.

9.5.5 Blast Monitoring Records

The following information is to be recorded for all permanently fixed ground vibration monitors:

- Type of instrumentation used ensuring that microphones for airblast overpressures monitoring have a lower cut-off frequency of 2Hz or less
- Blast noise overpressure (dBL peak) and peak particle velocity (PPV, mm/s) in a radial, vertical and transverse direction.
- Wind speed and direction.
- The type of monitoring being undertaken.
- The monitoring location.
- The time and duration for each location.
- Action limits (1PPV < criteria) and reasons for any exceedance. Where this exceedance is found to be from the operation, details of actions taken to reduce levels.

- Reasons for any exceedance and where this exceedance is found to be from the operation details of actions taken to reduce levels.

The following information is to be recorded for roving monitors:

- Installed location providing a description of the location with easting and northings coordinates.
- Purpose, objective and plan for installing the roving monitor at the location.
- Date installed and removed.
- All data results relating to BHOP Rasp Mine blasting
- Details for removing the roving monitor and whether requirements for its location have been met.

10. Incident and Complaint Management

The Environmental personnel shall report monitoring exceedances to the HSET Manager.

The Noise Monitoring reports shall be made available to an Officer of the EPA upon request.

10.1 Incidents

Where an operational noise criterion has been exceeded the Senior Environment Advisor shall:

- Immediately undertake an investigation to determine the noise source responsible and complete an action plan indicating:
    - Actions to be taken
    - Persons responsible for action
    - Completion date
- Identify and agree with the HSET Manager action to be taken to reduce the noise to below the Action Limit and prevent the exceedance reoccurring.
- Record the incident in INX (Incident Reporting System).

Actions will be determined dependent on the noise generating activity and will follow, wherever possible, the noise control hierarchy:

- Elimination by using a new design, plant or equipment
- Isolation by distance or barriers.
- Enclosure by enveloping the noise source or those exposed.

Environmental incidents (refer Project Approval Schedule 4 Condition 5 and Appendix 5 and the EP Licence) which cause or threaten to cause harm to the environment or breaches limits or performance measures in the approval are also required to be reported to:

- NSW Department of Planning and Environment
- NSW Environment Protection Authority,
- NSW Resources Regulator

BHOP will provide a written notification immediately on becoming aware of the incident. A full report will then be submitted within 30 days of the incident.

Environmental non-compliances (refer Project Approval Schedule 4 Condition 5A and the EP Licence) are also required to be reported to:

- NSW Department of Planning and Environment

BHOP will provide a written notification, as required, within seven days of the date of the incident

The Senior Environmental Advisor is responsible for preparing reports to government agencies which are signed off by the General Manager prior to submission.

10.2 Complaints

Where there has been a complaint from the community Environmental personnel shall:

- Notify the HSE&T Manager (and Mining Manager in the event of blast related complaints);
- The complaint is recorded as per the Public Complaints and Dispute Resolution (BHO-PRO-ENV-029) and in INX and that the responsible manager is notified;
- Take immediate actions to address the issue, depending on the seriousness of the issue this may include:
    - Modifying procedures,
    - Installing mitigation, and/or
    - Stopping directly related activities.
- Check immediate actions are recorded and the complaint is correctly recorded; and
- Undertake an investigation (refer Public Complaints and Dispute Resolution Procedure) and take action to prevent a recurrence.

BHO Environmental personnel shall monitor the implementation of these actions until their completion and then close out any pending incident reports.

The Senior Environmental Advisor shall notify the DPE and any other relevant agencies, of any incident or non-compliance associated with the Project in accordance with Schedule 4, Condition 5 of the Project Approval.

11. Review

11.1 Audit

An independent audit of the project will be conducted every three years with the first review undertaken in December 2011 and additional audit one year after commencement of MOD6 works. Arrangement for the independent audit to be conducted will be the responsibility of the Senior Environmental Advisor. Within six weeks of the completing of this audit, or as otherwise agreed by the Secretary, a copy of the audit report will be submitted to the Secretary, together with its response to any recommendations contained in the audit report.

11.2 Independent Review

If an owner of privately-owned land considers the development to be exceeding the criteria in Schedule 3 at his/her land, then he/she may ask the Secretary in writing for an independent review of the impactions of the developments on his/her land.

If the Secretary is satisfied that an independent review is warranted, then BHOP shall:

(a) Commission a suitably qualified, experienced and independent expert, whose appointment has been approved by the Secretary, to:

- Consult with the landowner to determine his/her concerns;
- Conduct monitoring to determine whether the development is complying with the relevant impact assessment criteria in Schedule 3; and
- If the development is not complying with these criteria then identify the measures that could be implemented to ensure compliance with the relevant criteria; and

(b) Give the Secretary and landowner a copy of the independent review within 2 months of the Secretary's decision, unless the Secretary agrees otherwise.

11.3 Noise and Blast Management Plan review

The NBMP shall be reviewed, and if necessary revised, within three months of:

- the submission of an annual review;
- the submission of an incident report;
- the submission of an audit report, or
- any modification of the conditions of this approval (unless the conditions require otherwise)
- a direction of the Secretary under Condition 2 of Schedule 2.

The Proponent shall review, and if necessary revise, the strategies, plans, and programs required under this approval to the satisfaction of the Secretary.

Where this review leads to revisions in any such document, then within 4 weeks of the review the revised document must be submitted to the Secretary for approval, unless otherwise agreed with the Secretary.

Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.

11.4 Reports

BHOP will submit the following reports:

Monthly Management Report

- Summary of incidents, including cause and actions taken (or to be taken) to prevent a recurrence.

CBH Website

- Summary of monitoring results, updated monthly.

- Summary of community complaints.

Annual Reports for Government Agencies

Noise monitoring results and compliance with consent and licence conditions will be reported in the Annual Return (EPA) and the Annual Review (DPE).

12. Document Consultation

Consultation shall occur with the EPA prior to finalising changes and re-submitting the document to the DPE.

In updating this management plan the EPA were consulted and Tansley Hill, Operations Officer, commented on 17 August 2022 that attention should be given towards recent noise limit increases made in the licence variation as well as a focus on all construction noise and any associated amenity impacts, etc. Tansley also asked that overpressure from blasting be reviewed.

The EPA encourage the development of management plans but will not review or comment on management plans, as confirmed by Jason Price, Unit Head, by email on 14 June 2023.

13. Revision History

Version: 1.0	***Revised** by:*	***Reviewed by:***	***Date:*** March 2012
Revision Details	New Document		
Authorised By:	***Name***	***Position***	***Date:*** *March 2012*
Version: 2.0	***Revised** by:* Gwen Wilson	***Reviewed by:*** Leonard Sharp	***Date:*** December 2015
Revision Details	Updated for MOD3 – Underground Mining Expansion		
Authorised By:	***Name***	***Position***	***Date:*** *December 2015*
Version: 3.0	***Revised** by:*	***Reviewed by:***	***Date:*** June 2018
Revision Details			
Authorised By:	***Name***	***Position***	***Date:*** *June 2018*
Version: 4.0	***Revised** by:* Georgina Seward, Devon Roberts	***Reviewed by:*** Joel Sulicich	***Date:*** June 2019
Revision Details	Updated for MOD5 – Cement Delivery and Silo		
Authorised By:	***Name*** *Giorgio Dall'Armi*	***Position*** *General Manager*	***Date:*** *June 2019*
Version: 5.0	***Revised** by:* Jacinta Clark, Devon Roberts	***Reviewed by:*** Joel Sulicich	***Date:*** April 2023
Revision Details	Updated for MOD 6 – New Tailings Storage Facility & MOD 10 – Temporary tailings placement in TSF2		
Authorised By:	***Name*** *Giorgio Dall'Armi*	***Position*** *General Manager*	***Date:*** *April 2023*
Version: 6.0	***Revised by:*** Devon Roberts	***Reviewed by:*** Jacinta Clark, Eamonn Dare, Joel Sulicich	***Date:*** October 2023
Revision Details	Updated to be *Noise and Blast Management Plan* - inclusion of section 8 detailing management of blasting in consultation with DPE.		
Authorised By:	***Name*** *Giorgio Dall'Armi*	***Position*** *General Manager*	***Date:*** *October 2023*