EAST ARM ROAD QUARRY

BLAST MANAGEMENT PLAN

Version 2.0

November 2024

DOCUMENT CONTROL

Version	Description	Prepared By	Date
1	Draft 1	EAR with assistance from Van Diemen Consulting Pty Ltd	30-3-2024
1		EPA comments	
2	Draft 1	EAR with assistance from Van Diemen Consulting Pty Ltd	10-11-2024
2		EPA comments	

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TABLES

ACRONYMS	
ABO	means air blast overpressure
BMP	Blast Management Plan
EAR	East Arm Resources Pty Ltd
EMPCA	*Environmental Management and Pollution Control Act 1994*
EPA	Environment Protection Authority
JSA	means Job Safety Assessment which is used as a risk and hazard assessment and mitigation tool.
ML	Mining Lease
MRT	Mineral Resources Tasmania
PPV	means Peak Particle Velocity which is the maximum velocity of a particle at a point where vibration is being measured
QCP	Tasmanian *Quarry Code of Practice 2017*
TE	means Tarkarri Engineering Pty Ltd

TERMS	
Blast Area	means the area immediately adjacent and surrounding the charging operations. Only personnel involved with firing, charging and tie-up are permitted in this area.
Blast Day	means the day that a blast is scheduled to occur.
Blast Contractor	means the person/entity engaged by EAR to do blasting.
Blast Exclusion Zone	means the area to be evacuated of personnel not involved with the blasting activity, during blasting times. The area will be change subject to the location of the blast and physical conditions.
Council	George Town Council
Record	means to write an observation. All records will be handed to the Quarry Manager and will be kept on file. All records are to be clearly legible.
Quarry	means East Arm Road Quarry

SECTION 1 - INTRODUCTION

1.1 EAST ARM ROAD QUARRY

The East Arm Road Quarry is located at East Arm Road, north of Hillwood in the George Town municipality.

The resource being extracted occurs in low-relief terrain southwards of Fourteen Mile Creek. The activity is located within Consolidated Mining Lease 2135P/M.

Up to 2,500,000 cubic metres per annum (approximately 4,000,000 tonnes of product at a conversion factor of 1.5) is extracted per annum.

The Quarry includes the following activities:

- surface site preparation by tree-felling and stockpiling/mulching;
- soil and overburden removal and stockpiling;
- excavation and ripping of material;
- drilling and blasting by a licensed contractor;
- crushing and/or screening of material;
- stockpiling of material (processed and unprocessed);
- the loading of trucks with processed material from the stockpile area;
- rehabilitation of worked out areas;
- management of stormwater in and external to the Quarry; and
- installation and maintenance of drainage systems.

Drilling and blasting are carried out by qualified contractors in consultation with EAR to ensure the following:

- drilling is carried out to the specified design pattern;
- noise and vibration standards are met (both drilling and blasting activities);
- blasting activities are safe and meet workplace health and safety requirements; and
- blasting is adequate to achieve rock fracturing/fragmentation for both extraction by excavator and crushing.

1.2 SCOPE AND OBJECTIVES

The BMP is a practical tool for the management of blast-related risks for Quarry. It has been prepared for a mixed audience of authorities, environmental regulators, and site personnel; the latter of which are responsible for implementing this plan as part of day-to-day operations.

The Scope of the BMP is to broadly provide information on the following:

1. Blast management objectives, roles, and responsibilities;
2. Competence training and awareness;
3. The blast management context including the existing conditions for the operation;

4. The legal and other requirements associated with management of blast-related issues;
5. Blast management measures that would be implemented during the life of the Quarry;
6. Incident reporting and compliance management; and
7. Document review.

The BMP provides the framework and guidance for the Quarry activities to be conducted in a manner whereby appropriate control measures are implemented to minimise the potential for adverse impacts on environment and to meet compliance requirements. Accordingly, the specific management objective sand performance criteria for the BMP are provided in **Table 1.**

This plan will be implemented once approved by the EPA.

Table 1. Blast management objectives and performance criteria

Objectives	Key Performance Outcomes	BMP Section
To ensure compliance with all relevant approval criteria and reasonable community expectations.	Compliance is achieved with all relevant criteria and reasonable community expectations.	2
To implement appropriate blast management and mitigation measures during all stages of the Quarry.	All identified blast management and mitigation measures are implemented to the extent required.	4
To implement an appropriate monitoring program to establish compliance or otherwise with relevant criteria during all stages of the Project.	All identified monitoring is undertaken in accordance with the relevant procedures and at the relevant intervals, and the results of which are reported as required.	5, 6
To implement an appropriate complaint handling and response protocol.	Complaints (if any) are handled and responded to in an appropriate and timely manner.	6
To implement continual improvement for investigating, implementing, and reporting on reasonable and feasible measures to reduce blasting impacts.	An appropriate continual improvement program has been implemented.	7
To implement an appropriate incident reporting program, if required.	Incidents (if any) are reported in an appropriate and timely manner.	6

1.3 PLAN STRUCTURE

The structure of the Management Plan is outlined in **Table 2.**

Table 2. Structure of the Management Plan

Section	Content
1	Provides an overview of the Quarry, and objectives of the plan including roles, and responsibilities
2	Details the statutory requirements and permit conditions
3	Describes the existing environment and predictive modelling for blast related impacts
4	Describes the blast management actions in place and to be implemented at the quarry
5	Blast monitoring protocols and compliance assessment criteria
6	Outlines incident planning and responses
7	Outlines the reporting and review requirements
8	Lists references and attachments

1.4 PLAN MANAGEMENT TEAM

The BMP is to be implemented by a team comprised of Quarry management and personnel, the Blast Contractor, and consultant(s).

1.4.1 EAST ARM RESOURCES PTY LTD

The East Arm Road Quarry is owned and operated by East Arm Resources Pty Ltd which is a company in the VSA Roads Group which includes Inroads, Centre State Asphalting, Western Quarries, Topcoat Asphalt and Primal Surfacing – see **Table 3**.

The Quarry employs a team of machinery/equipment operators, HSEQ officers, and administration staff.

Table 3. Details for East Arm Resources Pty Ltd and the Quarry

Item	Details
Legal entity Name	East Arm Resources Pty Ltd

Trading Name	East Arm Resources Pty Ltd
ACN	636 993 783
ABN	41 636 993 783
Registered Address	Unit 2, 3-5 Gibbon Road, Winston Hills NSW 2153
Postal Address	9 Weddel Court, Laverton North VIC 3026
Contact Persons	Name – John Bell Andrews, General Manager, East Arm Road Quarry Email – jba@eastarmresources.com Mobile – 0427 709 762
	Name – Rachel Andrews, Quarry Manager, East Arm Road Quarry Email – andrewsr@eastarmresources.com Mobile – 0460 309 720

The following roles in East Arm Resources Pty Ltd are to perform their required described tasks.

General Manager	Must ensure adequate resources are available to enable implementation of the BMP.
Quarry Manager	Accountable for the overall environmental performance of the Quarry operations, including the implementation of (or the overseeing of others implementing) the following components of the BMP: • Implementation of the blast awareness part of the induction as outlined in Section 4.2.2. • Blast monitoring as outlined in Section 5. • Complaints handling and response as outlined in Section 3.3.2. • Evaluation of compliance as outlined in Section 5 and related follow-up actions. • Incident reporting as outlined in Section 6. • Review of this Plan as outlined in Section 7. Reports to General Manager.
All personnel	Ensure training and awareness induction has been undertaken. Compliance with this Plan. Report to Quarry Manager.

1.4.2 BLAST CONTRACTOR

EAR will engage a suitably qualified, insured, and licenced Blast Contractor to design, manage, implement, and report on each blast, and a drilling contractor. EAR will manage the Blast Contractor and drilling contractor.

The following roles are to be broadly performed by the Blast Contractor in consultation with the Quarry Manager.

Area Manager	The person who has overall responsibility and control over handling, and use of explosives when the Blast Contractor is on site. The Area Manager is also responsible for the scheduling of blast days and compliance related issues regarding blasting operations.
Technical Services Officer	The technical specialists responsible for design and monitoring of blasting operations for the site. Reports to the Area Manager.
Drill and Blast Supervisor	The Supervisor responsible for the day-to-day operations and management of loading and firing operations. Reports to the Area Manager.
Blast Controller	The person given responsibility, control and authority for the safety and coordination of each blast when initiated. Will generally be the Site Manager or site appointed person. Can be the shotfirer if the task is appointed to them.
Shotfirer	The person in charge of the security, loading and firing of the blast. The Blast Controller and Shotfirer should not be the same person unless the site can be adequately cleared, and the blast exclusion zone maintained concurrently. Reports to the Drill and Blast Supervisor.
Blast Guard(s)	The individual(s) supporting the Blast Controller in ensuring clearance distances are observed and the blast exclusion zone is secure. Generally, will be a site familiar person who reports to the Quarry Manager.
Drill Rig Operator	Responsible for carrying out the drilling of the designed blast pattern. Reports to Quarry Manager.

1.4.3 ENVIRONMENTAL ASSISTANCE AND ADVICE

Van Diemen Consulting Pty Ltd is engaged to provide on-site assistance and advice with the preparation of the BMP. Other specific services may be accessed from other consultants such as an acoustic engineer from time to time including noise and vibration monitoring, and geotechnical advice.

SECTION 2 – LEGISLATIVE AND RELEVANT MANAGEMENT PLAN CONTEXT

2.1 CONTEXT OF BLASTING AND DRILLING MANAGEMENT

2.1.1 QUARRY CODE OF PRACTICE

7.3 Drilling

7.3.1 Principle

Accurate blast hole drilling is essential for good blasting performance. If drill hole position and alignments are not properly controlled, the subsequent blast may cause uncontrolled fly-rock, high levels of ground vibration and air-blast noise, unsafe bench faces and quarry floors.

The immediate impact of drilling may be generation of undue noise and dust during the drilling process.

7.3.2 Acceptable standard

All drilling for quarry blasts should follow a pre-determined blast design plan, which includes relevant drilling prescriptions.

Deviations from the design of drill holes should be identified prior to blasting and corrective measures should be taken. Such measures may include re-drilling the holes and/or adjusting explosive loading. All relevant details of corrective measures should be incorporated in the Blast Report.

7.3.3 Suggested measures

Each blast should be planned in advance with the drill pattern marked out on the quarry bench by an appropriately competent person. The design should define; drill hole diameters, drill hole depth, drill hole inclination and drill hole direction (azimuth).

The drill plan should form part of the Blast Report. Each drilling operation should be executed in accordance with the drilling plan, and proposed modifications should be evaluated and approved by the responsible person prior to implementation.

Drill holes identified as being outside design tolerances should either be discarded and re-drilled or explosive masses should be adjusted.

Drilling equipment should be of appropriate capacity to drill the required holes to specified diameters, depth and true to line. Drilling machines should be provided with appropriate measuring tools to set and maintain booms to specified inclination and azimuth.

Dust extraction and collection equipment should be provided to minimise dust escaping to the atmosphere.

Noise suppression on drill hammers and/or engines may be required in exposed drilling situations. If noise emission remains high, drilling hours may need to be restricted to coincide with times of day when background noise masks the noise emanating from the drilling operation (see section 7.2).

Drilling tasks should be performed and overseen by personnel possessing relevant proven competencies.

7.4 Blasting control

7.4.1 Principle

Blasting is necessary at some operations. Operators should be aware that blasting may be distressing to the public. Blasting produces ground vibration and low frequency air blast, both of which should be minimised.

7.4.2 Acceptable standard

Blasting must not take place unless specifically authorised in the Permit issued by the planning authority, and carried out in accordance with any conditions imposed therein. Secondary breaking with explosives should not take place unless specifically authorised in a Permit issued by the planning authority.

Blasting must take place during the specified blasting hours within the Permit.

Blasting must be carried out such that, when measured at the curtilage of the nearest residence (or sensitive use) in other occupation or ownership, air blast and ground vibration comply with the following:

a) for 95% of blasts, air blast overpressure must not exceed 115 dB (Lin Peak);

b) air blast overpressure must not exceed 120 dB (Lin Peak) at all;

c) for 95% of blasts, ground vibration must not exceed 5 mm/s peak particle velocity; and

d) ground vibration must not exceed 10 mm/s peak particle velocity at all.

The ground vibration level at heritage buildings and structures of significant intrinsic value should not exceed 3 mm/s peak particle velocity. It has been recommended that the long term regulatory goal for ground vibration should be 2 mm/s peak particle velocity and, where possible, this may be a suitable design target. See the ANZEC Guidelines (1990) for further information.

Ground vibration from blasting can damage karst features. In the absence of technical assessment, the level of ground vibration must not exceed 7.5 mm/s at any karst feature.

Vibration and air blast overpressure must be monitored at all blasts within 1km of a sensitive use or a known karst feature. All measurements of air blast overpressure and peak particle velocity must be carried out in accordance with the methods set down in Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration, Australian and New Zealand Environment Council, September 1990 and Australian Standard AS 2187.2 Explosives-Storage and use Part 2: Use of explosives.

7.4.3 Suggested measures

Hydraulic rock breakers produce less noise than secondary blasting with explosives. The approval authority should be advised in advance of any blast on the premises. In general, operators should avoid using surface detonating cord for charge initiation.

Where there is a history of complaints about blasting, it is recommended that nearby residences be informed in advance of blasts.

Sufficient stemming and appropriate delays between shot holes should always be used. Use of non-electric detonators has won widespread approval as the quietest delay system for initiating blasts.

Avoid blasting in overcast and other adverse weather conditions as this may result in amplification of the airblast overpressure, even at significant distances. Where blasting times are not specified in the Permit (e.g. between 1000 hours and 1400 hours weekdays), a regular blasting time should be adhered to.

7.4.4 Safety

The holder of an appropriate shotfirer's permit must be responsible for loading and firing shots. All persons handling explosives must be under the control of the holder of a shotfirer's permit.

Storage of explosives must be in licensed magazines, and must comply with AS 2187.1-1998. AS 2187.2-2006 provides requirements, information, and guidance for the use of explosives. Blasts must be designed to prevent fly-rock from leaving the site.

The site must be evacuated, and all approaches guarded before shots are fired. If required, roads surrounding the Quarry will be temporarily closed prior to and during the blast using standard traffic management measures.

A distinctive, audible warning signal must be given before firing, and at the all-clear. Transport of explosives on public roads must comply with the ATE code (the Australian Code for the Transport of Explosives by Road and Rail).

2.1.2 BLAST VIBRATION AND AIR OVERPRESSURE LIMITS

All designs shall plan for the vibration and air overpressure levels to be no more than the thresholds listed below. Methods of blasting shall be altered if thresholds are exceeded, or the risk of exceeding thresholds for a blast require a reconsideration of the blast design and pattern. The Blast Contractor will be responsible for monitoring blast vibration and overpressure limits which will be in accordance with the methodology and equipment specifications outlined in AS2187.2.

2.2 PERMIT REQUIREMENTS

The permit requirements are below.

Permit Conditions	
TBC	

2.3 OTHER RELEVANT PLANS

The following relevant plans need to be read and considered in the implementation of the BMP.

Plans
Noise Management Plan TBC
Dust Management Plan TBC
TBC

2.4 OTHER REPORTS PLANS

The following relevant documents have been considered in the development of the BMP.

Other Reports
East Arm Road Quarry. Environmental noise, ground vibration and air blast overpressure assessment. November 2024. Prepared by Tarkarri Engineering Pty Ltd
East Arm Road Quarry. Air Quality Assessment. February 2025. Prepared by Tarkarri Engineering Pty Ltd

SECTION 3 – EXISTING CONDITIONS AND PREDICTIVE MODELLING

3.1 EXISTING CONDITIONS

3.1.1 EXTERNAL NOISE SOURCES

Noise sources in the landscape surrounding the Quarry include: -

- farm machinery operating on adjacent properties;
- vehicles and trucks using the East Tamar Highway and Batman Highway, smaller public roads (e.g., East Arm Road) and private roads;
- train use of the nearby rail network;
- wind in shelterbelts, plantation, native forest, and remnant trees;
- timber harvesting operations, reforestation activities, and forest management activities (e.g., fertiliser application, vermin control, tree pruning and thinning); and
- bird and insect life.

3.1.2 QUARRY GENERATED NOISE SOURCES

Operations at the existing Quarry include the following: -

- drill rig operation and associated blasting operations;
- harvesting of trees and clearing of vegetation;
- stockpiling of soil into bunds;
- establishment of roads, tracks, sediment ponds and drains and associated Quarry drainage network;
- crushing, and screening of material; and
- use of ancillary equipment; excavators, crushers, screens (vibratory/mechanised), hydromulching machinery/equipment, loader and truck movements.

3.2 PREDICTIVE MODELLING

3.2.1 SPECIALIST REPORT

Tarkarri Engineering (TE) conducted an environmental noise, ground vibration and air blast overpressure assessment for the Quarry (**Attachment 3**). Specifically, the potential impacts of haulage, drilling and blasting, and crushing/screening, were considered in the assessment and mitigation measures recommended.

The assessment report prepared by TE formed part of this EIS.

3.2.2 GROUND VIBRATION

Ground vibration and air blast overpressure prediction is typically conducted using site specific scaled regression equations developed from monitored data from multiple blasts measured at multiple locations.

Such data are not available and given this TE sourced regression equations developed by the *Office of Surface Mining Reclamation and Enforcement*[1] in the USA from their extensive data sets.

Blast monitoring data from blasts at the existing Quarry were analysed with the ground vibration results slightly higher than predicted by the 'average' OSMRE regression and well below the 'upper bound' regression. This suggests that the 'upper bound' regression is overly conservative for this site while the average regression under predicts (from Tarkarri Engineering report; **East Arm Road Quarry. Environmental noise, ground vibration and air blast overpressure assessment. November 2024**).

Predicted ground vibration contours projected on to an aerial view are presented in Figures 5-1 to 5-8 of **Attachment 3** (all reproduced below) for representative blasts centred at approx. MGA coordinate locations as follows (based on distances shown in Table 5-1 of **Attachment 3**):

- For R1: 499129, 5439093
- For R2: 499234, 5439662
- For R3: 498611, 5439099
- For R4: 497682, 5439855

Contours for the 'average' OSMRE regression and for the 'upper bound' regression are provided. Contour levels, in mm/s, are provided as a white number on back background with the QCP criteria levels presented in turquoise. Receiver locations are also shown.

The predicted ground vibration levels from the 'average' OSMRE regression are below the 5 mm/s limit under the average and 'upper bound' OSMRE regression.

[1] Office of Surface Mining Reclamation and Enforcement (https://www.osmre.gov/).

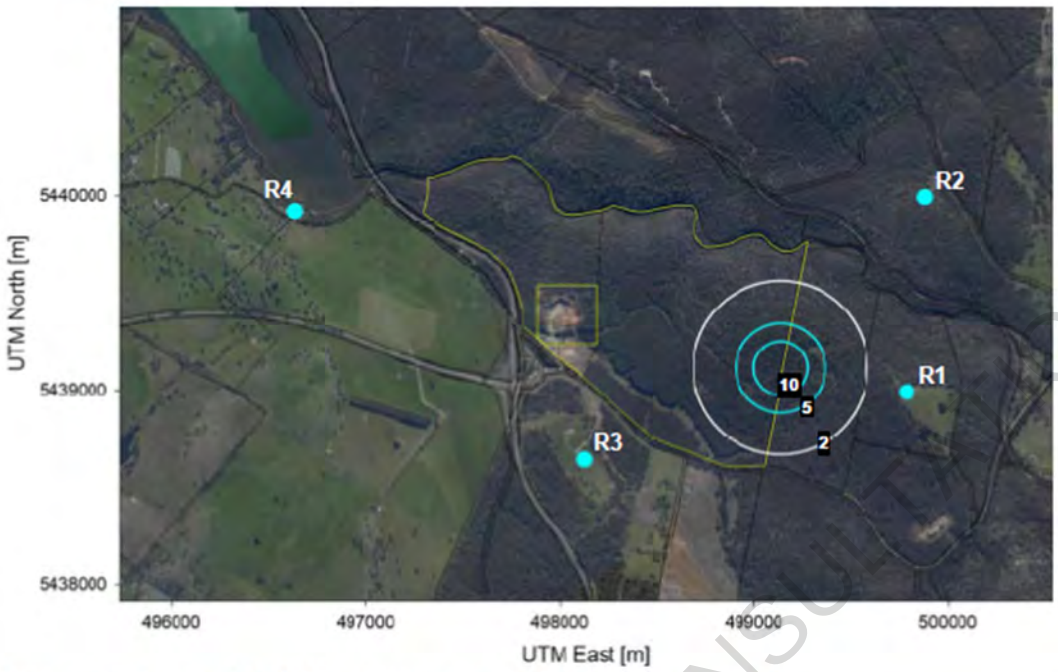

Figure 5-1: 'Average' OSMRE regression ground vibration contours, R1.

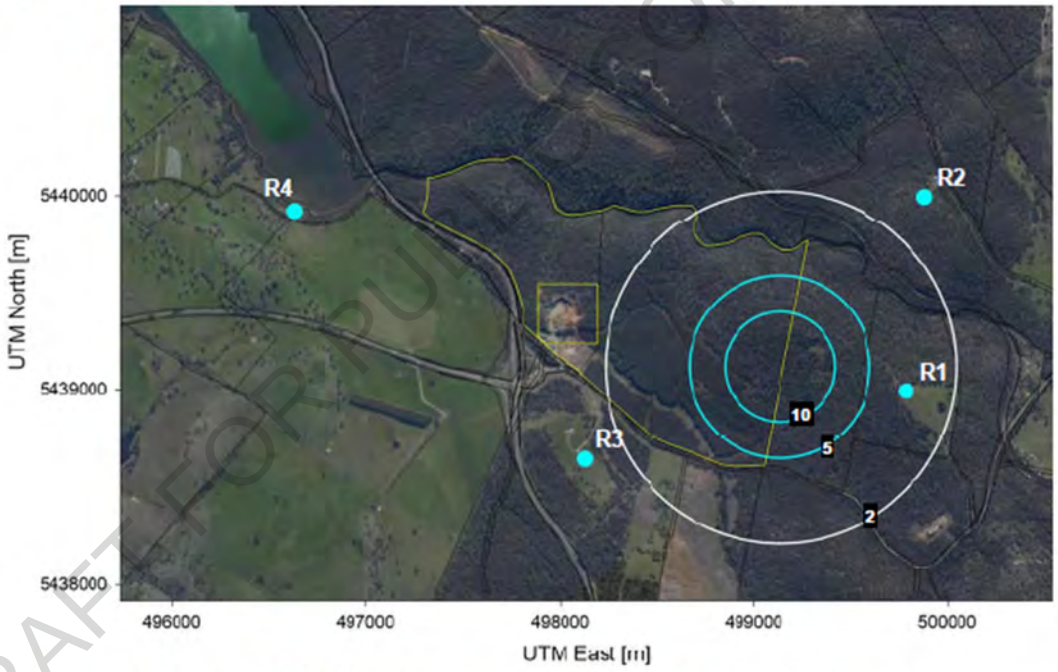

Figure 5-2: 'Upper bound' OSMRE regression ground vibration contours, R1.

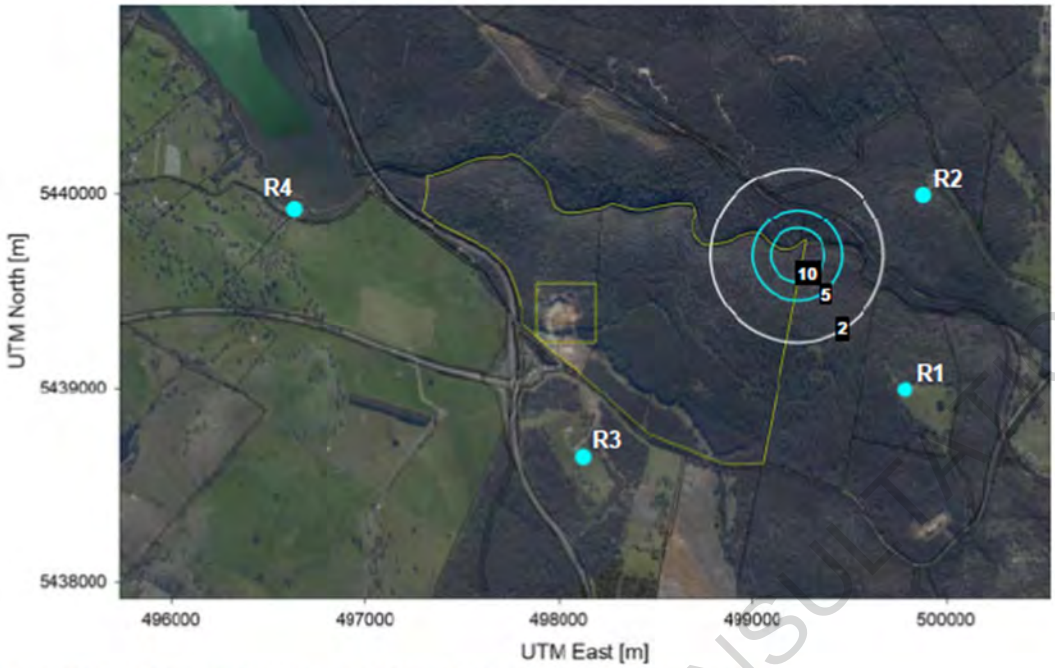

Figure 5-3: 'Average' OSMRE regression ground vibration contours, R2.

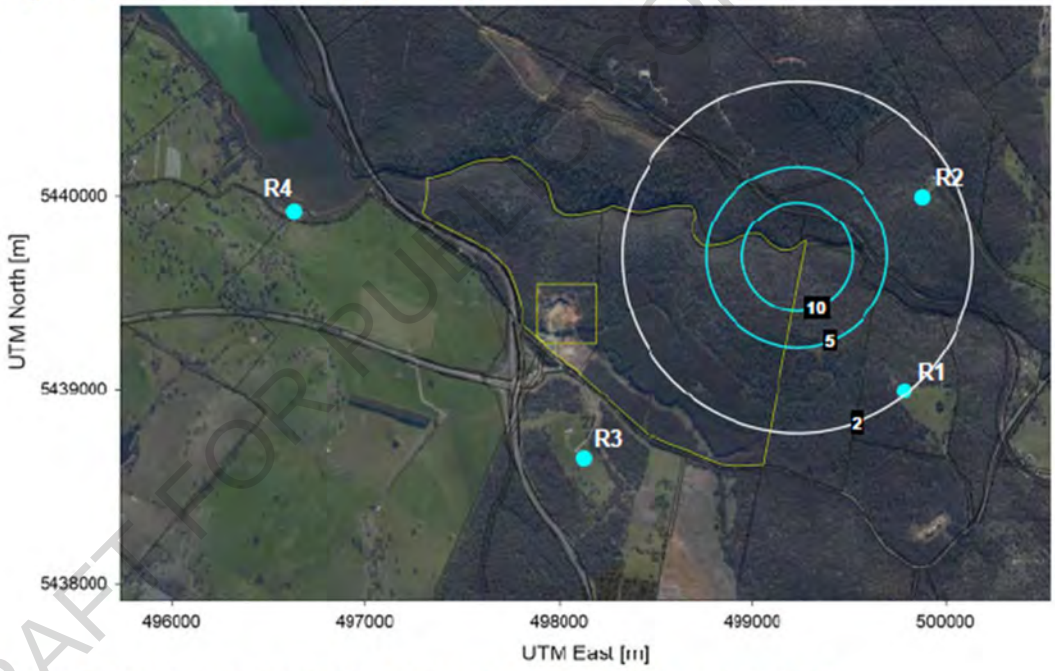

Figure 5-4: 'Upper bound' OSMRE regression ground vibration contours, R2.

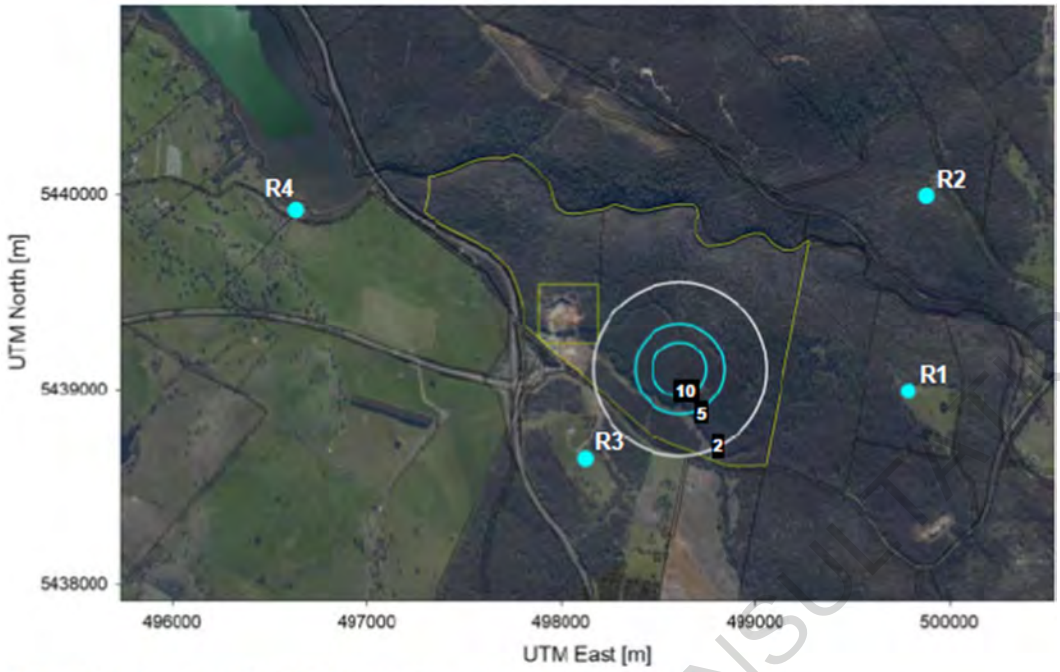

Figure 5-5: 'Average' OSMRE regression ground vibration contours, R3.

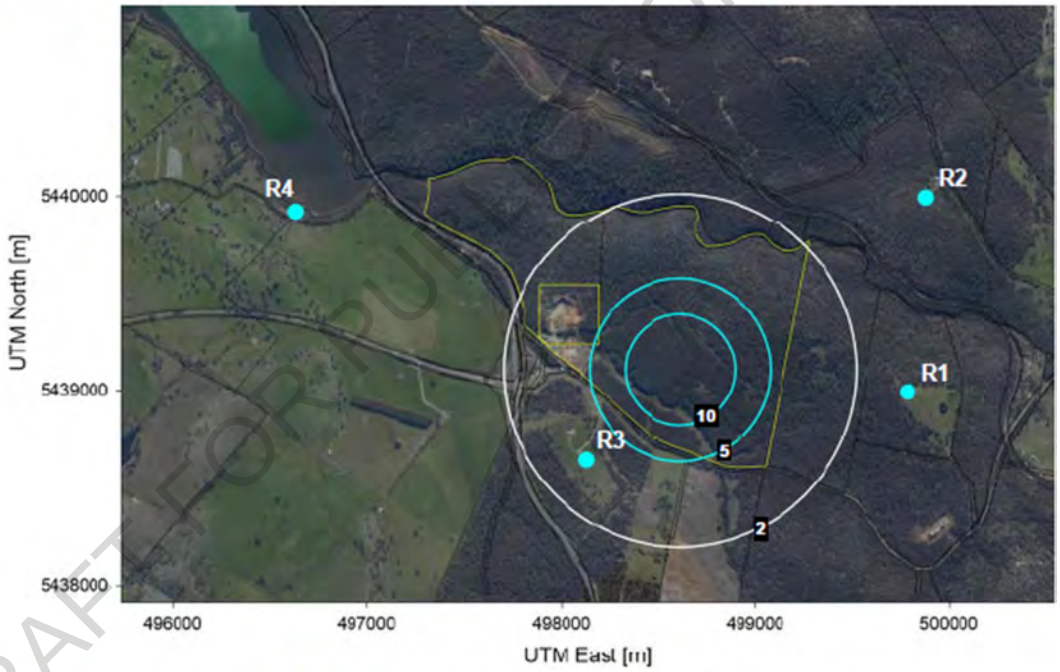

Figure 5-6: 'Upper bound' OSMRE regression ground vibration contours, R3.

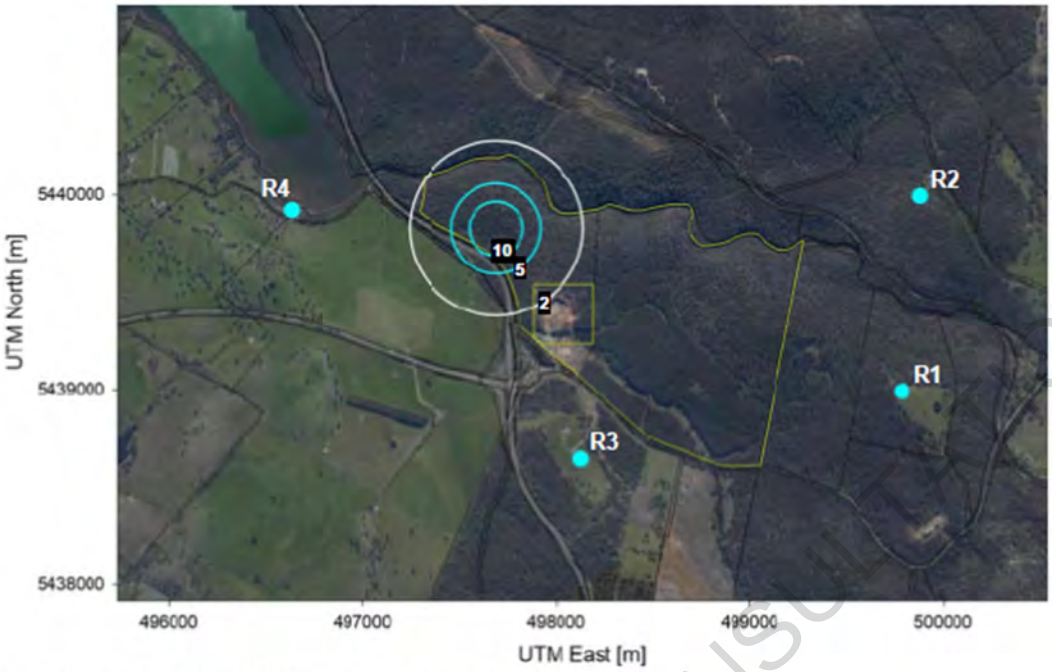

Figure 5-7: 'Average' OSMRE regression ground vibration contours, R4.

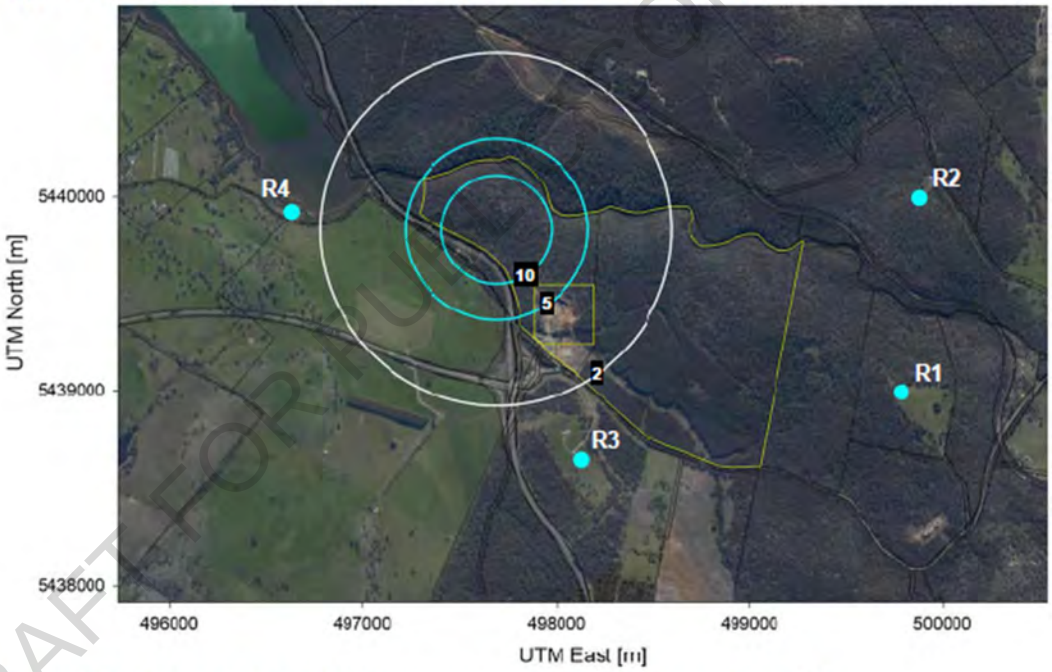

Figure 5-8: 'Upper bound' OSMRE regression ground vibration contours, R4.

3.2.3 AIR BLAST OVERPRESSURE

Table 5-2 of **Attachment 3** (reproduced below) presents the predicted air blast overpressure levels with a charge mass/delay of 80 kg.

Predicted air blast overpressure (dB, Lin Peak) for 80 kg charge mass/delay			
Receiver	Regression constant	Min distance to receiver	Predicted ABO
R1	Highwall	660	113.9
R2		700	113.5
R3		640	114.1
R4		1045	110.7

exceeds 115 dB, exceeds 120 dB.

Table 5-2: Predicted air blast overpressure.

The predicted air blast overpressure levels don't exceed either 115 dB or 120 dB (Lin Peak) at any receiver.

Blast monitoring data from blasts at the existing Quarry were analysed with the ABO results well below the levels predicted 'highwall' OSMRE regression suggesting that the predictions presented above are likely to be very conservative (from Tarkarri Engineering report; East Arm Road Quarry. Environmental noise, ground vibration and air blast overpressure assessment. November 2024).

Predicted ABO contours projected on to an aerial view are presented in Figures 5-9 to 5-12 (reproduced below) for representative blasts centred at approx. MGA coordinate locations as follows (based on distances shown in Table 5-2 of **Attachment 3**):

- For R1: 499129, 5439093
- For R2: 499234, 5439662
- For R3: 498611, 5439099
- For R4: 497682, 5439855

Contours for the 'highwall' OSMRE regression are provided. Contour levels, in dB (Lin Peak), are provided as a white number on back background with the QCP criteria levels presented in turquoise. Receiver locations are also shown.

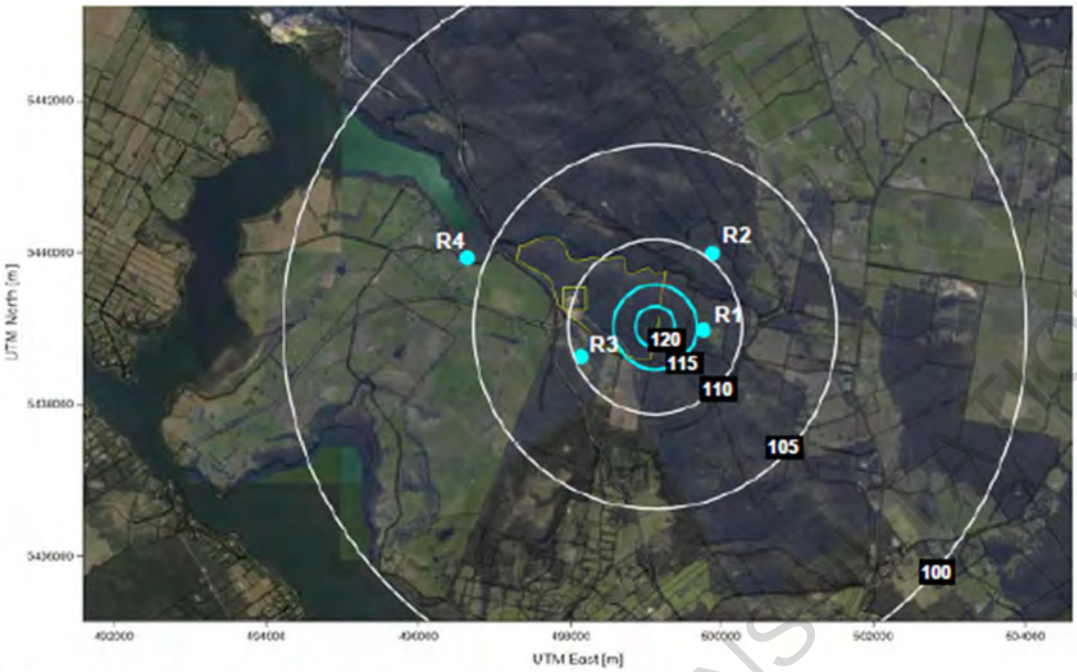

Figure 5-9: 'Highwall' OSMRE regression ABO contours, R1.

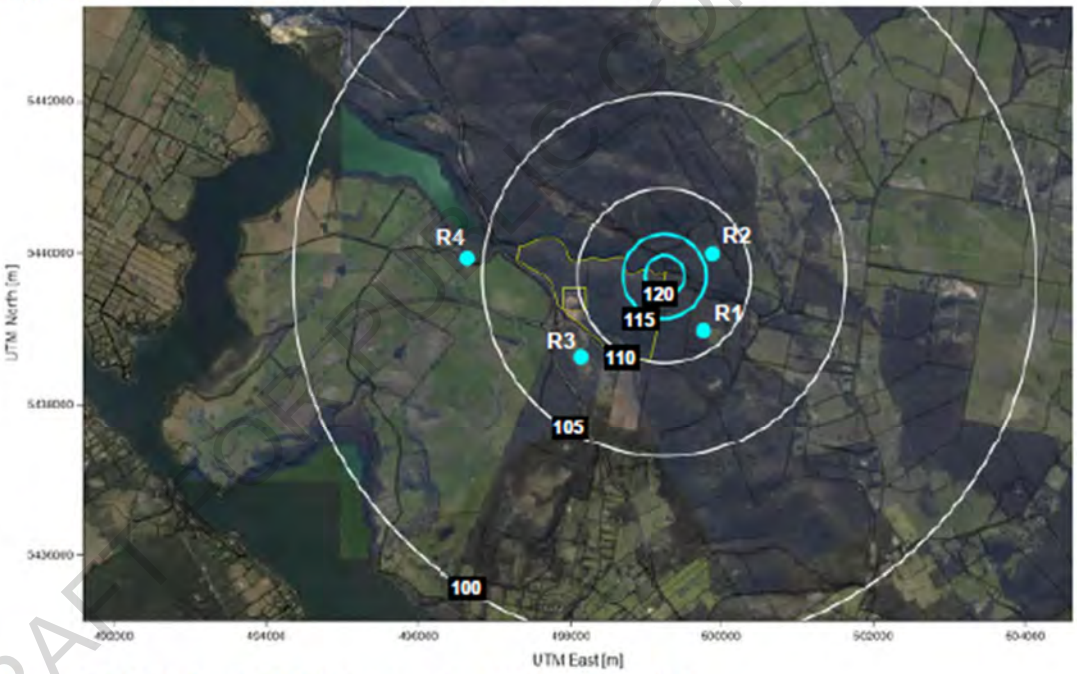

Figure 5-10: 'Highwall' OSMRE regression ABO contours, R2.

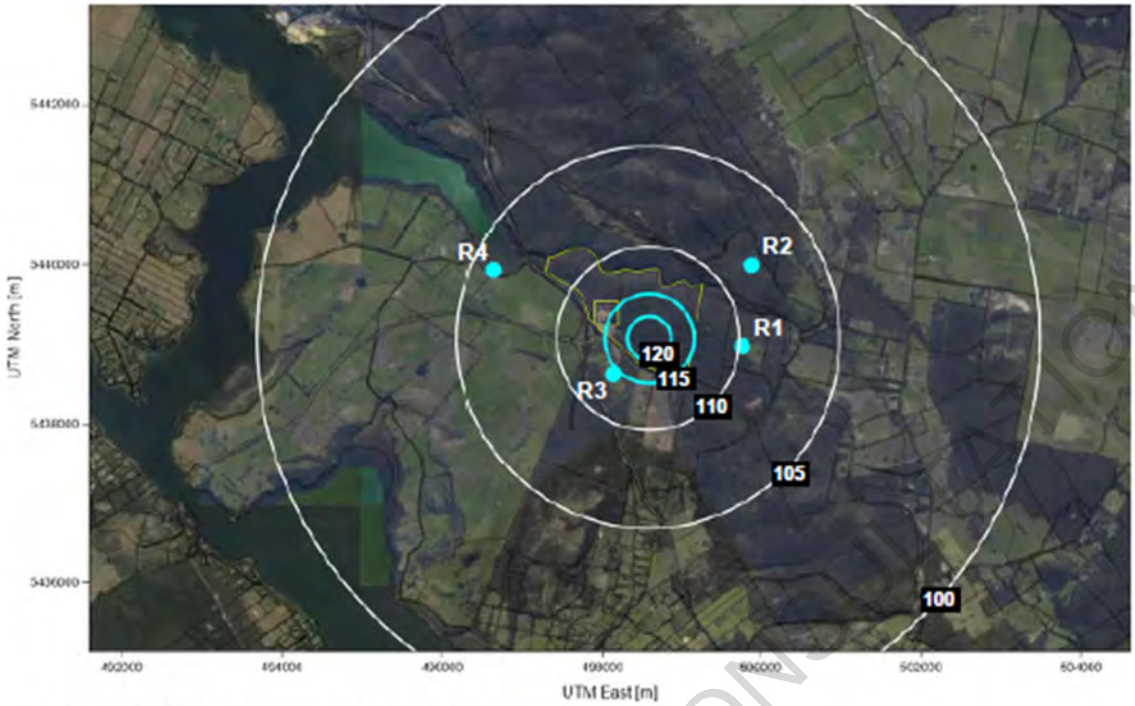

Figure 5-11: 'Highwall' OSMRE regression ABO contours, R3.

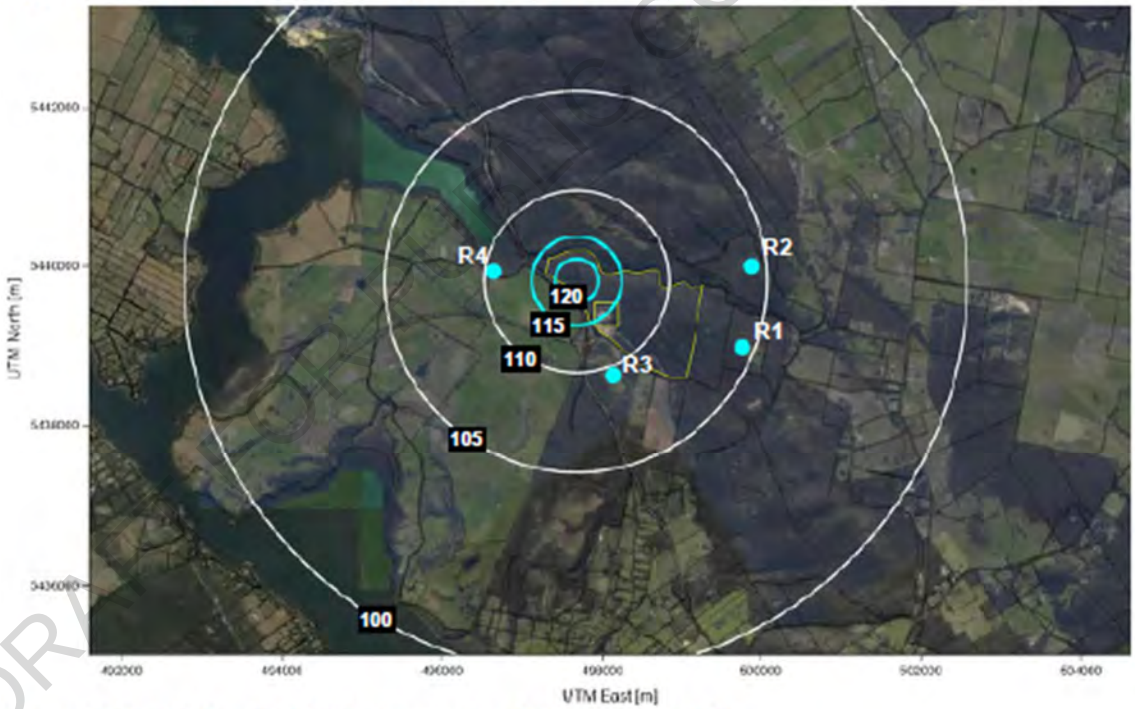

Figure 5-12: 'Highwall' OSMRE regression ABO contours, R4.

SECTION 4 – RISK AND BLAST MANAGEMENT CONTROLS

4.1 RISK IDENTIFICATION AND MITIGATION

4.1.1 RISK IDENTIFICATION

All blasts shall be planned and designed to achieve the required production outcome with minimum impact by blast induced effects at the Quarry and surrounding environment.

The Blast Contractor is responsible for conducting a risk assessment and safety audit of the Quarry as part of each blast. This includes the drilling of the holes for explosives, handling explosives, operation of detonation devices and the safe detonation of the charges.

Primary risks and hazards are:

a) Excessive blast and/or overpressure causing damage to adjoining properties;

b) Perceived levels of vibration and overpressure resulting in community complaint;

c) Flyrock impacting personnel or property;

d) Blast fumes impacting on those personnel in vicinity of blasting operations;

e) Use, handling and security of explosives;

f) On site blasting practices: priming, loading of holes, blast tie up;

g) Reactive ground, hot ground; and

h) Weather, rain events, lightning: storms on bench flooding.

East Arm Resources Pty Ltd will receive a copy of the risk assessment and associated documentation that supports the placement of drill holes, levels of explosives used and the detonation devices. This documentation will be securely held by East Arm Resources Pty Ltd for at least 5 years from the date of the blast.

4.1.2 RISK MITIGATION

Specific measures in the first instance will include:

a) Development of a Blast Management Plan for the Quarry (this plan);

b) Blast planning and design process to achieve the required outcomes are in place including mitigation of fly rock and blast fume;

c) Ensuring blasting procedures adequately cover risks identified at the Quarry;

d) Nomination of designated personnel to ensure compliance with legislation and security of explosives including:

- Shotfirer's licences and qualifications;
- Permits use explosives;
- Permits to handle explosives;

- Explosive transport licences and requirements;
- Type of explosives, authorisations, and availability;
- Dangerous goods storage and transport requirements;
- Licences to manufacture explosives;
- The requirements set out by other government departments/authorities.

e) Outline of methods of handling and use of explosives at the Quarry.

4.2 PRE-EMPTIVE MANAGEMENT MEASURES

4.2.1 OPERATING HOURS AND FREQUENCY OF BLASTING

Blasting at the Quarry is limited to between 10.00am and 4:00pm, Monday to Friday.

No blasting is to occur on Saturdays, Sundays, or Public Holidays.

Blast frequency is up to 1 blast per calendar week; however, blasting may be carried out more frequently than once per week under certain circumstances, including for example:

- in the event of a blast misfire. For safety reasons, the blast may need to be repeated, however, blast misfires are rare events and, as a result, are not considered further as part of this BMP; or
- blasts required to ensure the safety of the Quarry, its workers, or the public.

4.2.2 COMPETENCY AND AWARENESS TRAINING

QUARRY PERSONNEL

All relevant company personnel and will undergo site-specific inductions incorporating blast management awareness training as part of the induction program. The Quarry Manager is responsible for ensuring the appropriate blast management training for Quarry staff is included in the induction.

The following areas are to be broadly covered in the induction.

- Awareness of safety for surrounding residents and livestock.
- Awareness of pre-planning procedure for community notification and road closure planning.
- Awareness of explosive storage, transport and use in accordance with *AS2187.2 Explosive Storage, Transport and Use.*
- The requirement to minimise fly rock and dust emissions from blasting.
- Awareness of restricted blast operating hours and frequency.
- Awareness of community complaints protocols.
- Monitoring of blast emissions at required residences.

- Reporting procedures for any non-conforming ground vibration and over-pressure readings.

BLAST CONTRACTOR PERSONNEL

The Quarry Manager will ensure that the staff of the Blast Contractor receive a site-specific induction of the Quarry and its operations in relation to their attendance and work to be performed at the Quarry. The induction would include for example the safety measures in place (PPE requirements, Emergency Meeting Point), location of site toilets/office, first aid kit location, spill kit locations, car parking area, and the UHF channel used to communicate at the Quarry.

4.2.3 BLAST NOTIFICATION PROTOCOL

INTERNAL NOTIFICATION

The following blast notification protocols apply internal to the Quarry:

- a Quarry blast notification board will be located near the entrance to the Quarry to inform all personnel of the next planned blast or whether a blast is to occur on that day (i.e. Blast Day);
- the planned blast will be discussed as part of the toolbox meeting on Blast Day; and
- prior to initiating the blast, a notification will be made via the Quarry's radio network.

EXTERNAL NOTIFICATIONS

Blast notifications will be issued a minimum of 24 hours prior to any blast and will be the responsibility of the Quarry Manager. The information provided as part of a blast notification will include, as a minimum:

- Time;
- Date; and
- Contact details for further information.

Residents

The owners of the four nearest residences will be notified (in writing) at least 24 hrs prior to a blast. The addresses for these residential dwellings are: -

- 44 EAST ARM RD HILLWOOD TAS 7252;
- 135 YOUNGS RD MOUNT DIRECTION TAS 7252;
- 'SAY NOTHING' - 285 EAST ARM RD MOUNT DIRECTION TAS 7252; and
- 275 EAST ARM RD MOUNT DIRECTION TAS 7252.

Other residents or interested persons may:

- view upcoming blast times and dates on the Quarry's website; and
- sign up to receive an email, text notification or a phone call notification.

Department of State Growth

When blasts occur within 1,000 m of the East Tamar Highway it will be temporarily closed during blast events with the necessary approvals sought from the Department of State Growth. Any closures will need to be compliant with a DSG approved Traffic Management Plan.

4.2.4 STORAGE AND HANDLING OF EXPLOSIVES

The transportation, handling and use of explosives is conducted by the Blast Contractor in accordance with the Australian Explosives Code (1999), the Australian Code for the transport of explosives by road and rail (Third edition - 2009) and Australian Standard 2187 Explosives – Transport, storage, and Use (parts 1 and 2).

STORAGE

There shall be no storage of explosives or explosive precursors at the Quarry. All explosives or explosive precursors shall be transported to site and any residual removed to a Blast Contractor licensed magazine and storage facilities after blasting.

ACCOUNTING

All accounting of explosives or explosive precursors at the Quarry shall be supervised and signed off by the Shotfirer. Cart notes shall be filled out showing the name, description, class and quantity of each explosive item and precursor to be used at the Quarry.

4.3 OPERATIONAL CONTROLS

All blasting operations at the Quarry will be completed by a suitably qualified blast engineer/shotfirer to ensure that all blasts are designed, set out, and initiated in a competent manner.

Blasting practices would be adapted over time to suit geological and location requirements and would in each case be proactively designed for compliance with the blasting criteria described in **Table 4.** The blast design would be reviewed following each blast, in conjunction with any blast monitoring data, meteorological information and/or anecdotal information that becomes available.

Continuous review of the blast design will assist in minimising the potential impact of blast activities.

4.3.1 BLAST PLANNING

BLAST DESIGN

Blasthole burden and spacing will be calculated by the Blast Contractor to provide the result required. Patterns will be developed and used as a standard in different lithologies and areas of the site if required. Free faces shall be developed where possible to allow for the control of vibrations and blast movement. All free faces in blasts (excluding the top surface) where required shall be profiled and blastholes on this free face bore tracked. Faces shall be orientated to ensure air overpressure levels do not impact adversely on neighbouring sites.

LOADING

Blastholes will be loaded with explosive to design weight or collar height (whichever comes first) to avoid the possibility of filling voids. The Shotfirer may use a maximum of 10% extra may be used in a blasthole if the required collar height was not reached. Any variation to this will require a JSA to be conducted prior to loading of that blasthole.

STEMMING

Adjustment of stemming height shall be accomplished according to sound engineering practice and Quarry specific parameters. Good quality stemming shall be used – such as crushed aggregate of 10 to 14mm size.

INITIATION

The initiation sequence will be designed to allow adequate allowance for inter-hole or inter-row delay to enable progressive relief of burden to occur throughout a blast. This shall be produced in consultation with the Shotfirer, and any variations recorded by the shotfirer.

BLAST DESIGN PLANS

A plan of the blast to be undertaken shall be produced by the Blast Contractor indicating explosive quantity, blasthole location, blasthole depth, blasthole angle and stemming. Any variations to "normal" design will be indicated such that the Shotfirer has this information for loading and firing.

An example Blast Design Plan is in **Attachment 1.**

4.3.2 FIRING OF BLASTS

BLASTING TIMES

Blast times will be between the hours of 10am and 4pm. If a blast is likely to be delayed past 4pm, the EPA and nearby residents (those notified at Section 4.2.3) will be notified by the Quarry Manager.

OTHER SPECIAL PRECAUTIONS

Emergency access shall be given to emergency vehicles whereby the guard would notify the Blast Controller and shotfirer of the situation and hold the shot.

If in the opinion of the Shotfirer the proximity of an electrical storm is such as to constitute a danger to the process of charging and firing, the shotfirer must ensure that work in connection with the charging and firing ceases, that all employees are withdrawn from that area of work, and that the Blast Guards remain in place to prevent access to the area.

The blast crew and Blast Controller shall document and report all unusual occurrences while preparing, loading, or firing a shot and forward all comments to the Area Manager.

Any explosive found in a blast muckpile must be treated as a misfire.

If a blast is deemed to be at risk of producing flyrock that may result in damage to people or property, appropriate procedures must be implemented to eliminate this potential.

4.4 ESTABLISHING AND REMOVING THE BLAST EXCLUSION ZONE

Emphasis shall be placed on the safety of personnel. As such exclusion zones shall be established to ensure that the risk of impacting personnel is eliminated.

The procedure shall be used for the establishment and removal of the blast exclusion zones including:

- A description of the zone and method of implementation;
- Personnel tasks and responsibilities;
- A description of the means of communication; The control of radio transmissions that may influence the communication or security of the shot;
- Timings and procedures for notification of personnel on-site and off-site; Identification of the location of, and the method of manning of, control points;
- The method to establish and notify the shotfirer that the exclusion zones have been cleared; Method for immediate notification of and dealing with trespassers;
- Warning procedures prior to firing;
- What must occur if a misfire occurs during firing; and
- The method of notification to return the whole of the exclusion zone to normal.

Site briefings shall be conducted for personnel involved with the establishment and removal of the Blast Exclusion Zone.

DELAYED BLAST

In the very unlikely event when a blast cannot be initiated and is to remain loaded overnight, the firing control shall be made safe. When a site requires guarding, personnel shall be engaged to ensure that the shotfirer has sufficient rest prior to firing the next day. Such personnel shall be briefed on hazards and a procedure for contacting a responsible person in the case of trespass.

The Blast Exclusion Zone shall not be returned to normal until the 'all clear' for the blasting operation is given by the Shotfirer.

POST BLAST INITIATION

After the blast is fired the Shotfirer will lift radio silence and request that guards stay in position. The Shotfirer shall wait until the fumes have cleared and it is safe to return to the shot.

The Shotfirer shall then inspect the shot for any visible misfires. If no evidence of misfires the shotfirer shall announce ‘All Clear’.

The Blast Controller shall announce the ‘All Clear’ and release the Blast Guards from their positions. Traffic will be released from any temporarily closed surrounding roads.

4.5 FLYROCK

All blasts shall be designed to ensure no flyrock will impact personnel safety or property. Rock affected directly by blasting activities shall remain within the Blast Exclusion Zone. The blasts at the Quarry shall if

required have vertical free faces profiled and all blastholes immediately adjacent to these free faces, bore tracked after drilling. The information derived from this process shall be used to design and audit blasthole burdens to ensure explosive is not placed in blastholes with inadequate burden to prevent flyrock from occurring.

The Shotfirer shall check the information supplied by the Technical Services officers to ensure it represents what is present at loading and firing time.

Stemming lengths shall be adequate to ensure flyrock that could travel outside of the Blast Exclusion Zone is not produced from blasts at the Quarry. Stemming practices on the bench shall be supervised by the Shotfirer to ensure the adequate stemming length is enforced.

4.6 PREDICTED ADVERSE WEATHER CONDITIONS

It is noted that blast criteria still apply during adverse/unfavourable weather conditions such as high winds. Should local weather predictions include the potential for adverse/unfavourable weather conditions, EAR will delay blasting activities, where it is reasonable and safe to do so, to minimise the potential risk of blast impacts and to ensure compliance thresholds are still met.

SECTION 5 – MONITORING

This section details the monitoring program, for ground vibration, airblast overpressure and fume generation.

5.1 VIBRATION AND ABO

Monitoring will be used to capture and record all blast events. The following information will be recorded as part of the monitoring procedure.

- Blast noise overpressure (dBLpeak) and peak particle velocity (ppv) (mm/s) in a radial, vertical and transverse direction.
- The time and duration of monitoring for each location.
- License limits, where appropriate.
- Wind speed and direction.
- The type of monitoring being undertaken.
- The monitoring location.

The results of all blasts will be documented by the Blast Contractor and records maintained by the Quarry Manager.

Air blast overpressure and ground vibration results will be reviewed after every blast to determine compliance of blasting criteria (when measured at a sensitive premise) described in **Table 4.**

Any exceedance will be managed as described in section 6.2 EXCEEDANCE OF THRESHOLDS.

Table 4. Summary of Ground Vibration and Airblast Overpressure Thresholds

Parameter	Airblast Overpressure (dB(Lin)Peak))	Ground Vibration (mm/s)	Allowable Exceedance
Residence on other land	120	10	0%
	115	5	5% of the total number of blasts over a calendar year

5.2 FUME MONITORING

All blast fume monitoring will be undertaken in conjunction with the blast contractors. Where blast fumes are visible (i.e. greater than Level 1 in accordance with the colour charts provided in **Attachment 2**) an investigation of blast fume causes will be undertaken to inform future blast design.

5.3 METEOROLOGICAL CONDITIONS

5.3.1 INTRODUCTION

Real-time measurements of meteorological conditions are taken to support dust monitoring and to identify weather conditions which may trigger the need to modify operations. For instance, conditions that may be conducive to excessive dust generation and/ or movement of dust onto neighbouring properties, e.g. strong north-easterly winds, may trigger overburden dumping to cease temporarily.

5.3.2 MONITOLRING EQUIPMENT

A solar-powered weather station is to be installed and maintained at a yet to be determined location in the Quarry. This station will consist of solar panels, a weatherproof enclosure which contains a data logger (which reads the sensors) and power supply, and sensors which continuously measure:

- rainfall;
- wind speed and direction (measured at three metres above ground level);
- relative humidity;
- temperature; and
- solar radiation.

The station will be equipped with a digital cell phone kit which retrieves data from the logger and transmits it directly to a computer at the site office. Software is to be used for automatically downloading the data and to create monitoring programs e.g. for calculations of evaporation and temperature inversion. The equipment facilitates real-time monitoring of weather conditions.

SECTION 6 – INCIDENT RESPONSES

The objective of this section is to provide procedures for responding to impacts identified by the monitoring program and as occur from time to time by unforeseen, rare, or emergency situations.

Responding to identified impacts will be the responsibility of the Quarry Manager.

6.1 EMERGENCY RESPONSE

In any explosive related emergency, priority consideration is the preservation of life. If there is any uncertainty as to whether the area is safe or not - immediately evacuate the area.

Assessment of any emergency shall consider the risk of fire or ignition sources that could lead to detonation.

If a fire is to be fought, only fight the fire with the equipment readily available. In an emergency, call using the sites emergency response procedures.

All explosive incidents shall be reported to an Inspector of Mines / Explosives as soon as practicable. An incident site should not be interfered with unless authorised by an Inspector of Mines / Explosives.

Emergency Services (Fire, Police, Ambulance)	**000**
Environmental Protection Authority	**1800 005 171**
Worksafe Tasmania	**1300 366 322**

6.2 EXCEEDANCE OF THRESHOLDS

Following exceedance of the air blast overpressure or ground vibration criteria (**Table 4**), because of blasting, the following actions will be completed:

a) The Quarry Manager will be notified of the potential non-compliance.

b) The EPA would be notified within 24 hrs of the potential non-compliance.

c) An investigation into the potential non-compliance would be instigated, with the objective of identifying the following, where appropriate:

   i. the date and time of the non-compliance;

   ii. the duration of the non-compliance;

   iii. whether the non-compliance was directly related to operations within the Quarry or if any other factors contributed to the non-compliance;

   iv. the primary cause of the non-compliance;

   v. any contributing factors which led to the non-compliance;

   vi. whether appropriate controls were implemented to prevent the non-compliance; and

vii. corrective and preventative measures that may be implemented to prevent a recurrence of the non-compliance.

d) Within 7 days of the date of identifying the non-compliance EAR will provide a detailed report to the EPA. The report shall (at a minimum):

i. be made in writing;

ii. set out the condition(s) that the Quarry is non-compliant with

iii. why it does not comply and the reasons for the non-compliance (if known); and

iv. what actions have been, or will be, undertaken to address the non-compliance.

Following completion of the investigation, EAR will:

1. Provide a copy of the completed investigation report to the EPA.
2. Implement the corrective and preventative actions identified in the investigation report.

Any exceedance of the approved blast criteria will be reported in the Annual Environmental Review.

6.3 BLAST FUME GENERATION

All blast fume monitoring will be undertaken in conjunction with the blast contractors.

Where blast fumes are visible (i.e. greater than Level 1 in accordance with the colour charts provided in **Attachment 2**) an investigation of blast fume causes will be undertaken to inform future blast design.

Where blast fumes are not localised and are observed to leave the Quarry (the Mining Lease), neighbours in the vicinity of the blast would be notified of the event immediately.

6.4 COMPLAINTS

A complaints register is used at the Quarry to record complaints received from the public, or communicated to the Quarry Manager via the EPA, MRT, Council or other source.

Complainants will be contacted within 24 hours of notification to assess the nature of the complaint, take details and the complainant will be notified at that time of further action to be taken.

With the permission of the complainant, subsequent monitoring at the site of the complainant for several blasts may take place, and the results will be reported to both the complainant and the Quarry Manager.

6.5 MISFIRE

A risk assessment shall be conducted prior to handling a known misfired charge. Only a Shotfirer may deal with and handle a misfire or a person under their direct supervision. A misfire report must be completed for all misfires or suspected misfires.

The Shotfirer shall ensure all relevant misfires are reported the Area Manager and Quarry Manager.

When a misfire is identified it is then the responsibility of the Area Manager and Quarry Manager to contact the relevant authorities to notify of the misfire.

SECTION 7 – RECORDS, REPORTING AND REVIEW

7.1 RECORDS

Compliance with relevant blast criteria will be managed by appropriate operational management, which includes the collection and keeping of records.

7.1.2 BLAST RECORD

Details of the blast shall be record and maintained.

This information assists in the planning and implementation of further blasts and provides documentation in case of incident or complaint, and will include:

a) Blast location and number;

b) Blast design and risk assessment report[2] prepared by the Blast Contractor;

c) Environmental conditions at the time of the blast;

d) Monitoring equipment including type, serial number and location;

e) Video footage;

f) Details of measurements recorded during the blast;

g) Details of flyrock (if any);

h) Details of incidents and complaints (if any);

i) Details of actual hole depths and stemming heights; and

j) Proposed modification to the blast plan for future shots (if any).

The Blast Contractor is responsible for managing the environmental reporting program and.

7.1.2 BLAST MONITORING RESULTS

Measurements of air blast overpressure and peak particle velocity may be carried out by the Blast Contractor in accordance with the methods set down in the *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration, Australian and New Zealand Environment Council, September 1990*.

[2] The Blast Contractor is responsible for conducting a risk assessment and safety audit of the Quarry as part of each blast. This includes the drilling of the holes for explosives, handling explosives, operation of detonation devices and the safe detonation of the charges.

East Arm Resources Pty Ltd will receive a copy of the risk assessment and associated documentation that supports the placement of drill holes, levels of explosives used and the detonation devices. This documentation will be securely held by East Arm Resources Pty Ltd for at least 5 years from the date of the blast.

The noise/vibration monitoring results collected by the Blast Contractor will be securely held by East Arm Resources Pty Ltd for at least 5 years from the date of the blast.

7.2 REPORTING

7.2.1 ANNUAL ENVIRONMENTAL REVIEW

Within 60 days of June 30 each year an Annual Environmental Review (AER) will be submitted to the EPA reviewing the environmental performance of the development. Blast-related matters that will be reported in the AER include the following as relevant for the year of reporting.

- A summary of the outcomes of blast management for the period and that proposed for the following year.
- Any changes to blast management that occurred as part of operations during the year or that are proposed for the following year.
- The outcomes of all monitoring described in Section 5.
- A review of any incidents or complaints that relate to blast management.
- A statement regarding compliance with blast-related conditions of consent for the period.

7.3 REVIEW

7.3.1 CONTINUAL IMPROVEMENT

Opportunities for improvement of blast-related impacts will be discussed internally at toolbox meetings, in conjunction with all Quarry personnel. These opportunities would be presented to the Quarry Manager for consideration and any changes to operations as a result reported on as part of the Annual Environmental Review (AER) or, where relevant, reflected in an updated Plan.

In addition, general compliance, blast monitoring outcomes and the number of complaints would be used as an indication of the effectiveness of management. This includes issues identified through the AER preparation.

Incidents (as defined in Section 6) would trigger a brief review of the blast management system, where necessary.

7.3.2 PLAN REVIEW

The BMP is to be reviewed within 3 months of:

- the submission of an incident report;
- the submission of an Annual Environmental Review;
- the approval of any modification of the conditions of this approval (unless the conditions require otherwise); or
- the issue of a direction of the EPA which requires a review.

A review may be of short duration and not result in any change to the BMP, especially if there are no exceedances, non-compliances, or incidents to report.

If necessary, to either improve the environmental performance of the project, cater for a modification, or comply with a direction, this plan must be revised, to the satisfaction of the EPA and submitted to the Director for approval within six weeks of the review. The proponent will continue to apply existing management plans, strategies, or monitoring programs prior to the determination of a modification until the approval of a similar plan, strategy, or program.

SECTION 8 - ATTACHMENTS

ATTACHMENT 1 – EXAMPLE BLAST DESIGN PLAN

ATTACHMENT 2 – VISUAL NO_X GASSES RATING SCALE

APPENDIX 2 - VISUAL NOx GASES RATING SCALE

The following table, together with the Field Colour Chart in Appendix 3, details how NOx gases from a surface blast can be assessed.

Level	Typical Appearance
Level 0 No NOx gas	
Level 1 Slight NOx gas	
1A Localised	
1B Medium	
1C Extensive	
Level 2 Minor yellow/orange gas	
2A Localised	
2B Medium	
2C Extensive	
Level 3 Orange gas	
3A Localised	
3B Medium	
3C Extensive	
Level 4 Orange/red gas	
4A Localised	
4B Medium	
4C Extensive	
Level 5 Red/purple gas	
5A Localised	
5B Medium	
5C Extensive	

Assessing the amount of NOx gases produced from a blast will depend on the distance the observer is from the blast and the prevailing weather conditions. The intensity of the NOx gases produced in a blast should be measured on a simple scale from 0 to 5 based on the table above. The extent of the NOx gases also needs to be assessed and this should be done on a simple scale from A to C where:-

A = Localised (ie NOx Gases localised across only a few blast holes)

B = Medium (ie NOx Gases from up to 50% of blast holes in the shot)

C = Extensive (ie Extensive generation of NOx Gases across the whole blast)

APPENDIX 3 - FIELD COLOUR CHART

Pantone colour numbers have been included in the following Field Colour Chart to ensure colours will be produced correctly thereby ensuring a reasonable level of standardisation in reporting NOx gas events across the blasting industry.

Level	Colour	Pantone Number
Level 0 No NOx gas		Warm Grey 1C (RGB 244, 222, 217)
Level 1 Slight NOx gas		Pantone 155C (RGB 244, 219, 170)
Level 2 Minor yellow/orange gas		Pantone 157C (RGB 237, 160, 79)
Level 3 Orange gas		Pantone 158C (RGB 232, 117, 17)
Level 4 Orange/red gas		Pantone 1525C (RGB 181, 84, 0)
Level 5 Red/purple gases		Pantone 161C (RGB 99, 58, 17)

ATTACHMENT 3 – SPECIALIST REPORT (TARKARRI ENGINEERING)