

BLAST MONITORING PROGRAM
VULCAN SOUTH PROJECT
Tenure number: ML700073

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1 Introduction

Blasting is expected to be required to access coal resources below unweathered rock at three open pit locations within the Vulcan South Coal Mine (VSCM). The VSCM is located in the Bowen Basin, 35 kilometres (km) south-southeast of Moranbah and 34 km north-northwest of Dysart, Queensland. It lies within the jurisdiction of the Isaac Regional Council.

The VSCM is located on mining lease (ML) 700073 and is approved to operate under Environmental Authority (EA) number P-EA100265081 issued by the Queensland Department of Environment, Tourism, Science and Innovation (DETSI).

The EA contains condition **D11** that specifies the preparation of a Blast Monitoring Program.

Queensland Coking Coal Pty Ltd and QLD Coal Aust No. 1 Pty Ltd are the joint holders of the EA, and both companies are subsidiaries of Vitrinite Pty Ltd.

1.1 Impacts of blasting

Blasting operations can have unacceptable noise and vibration impacts if not conducted correctly. Excessive levels of structural vibration due to ground vibration from blasting can cause substantial damage to structures. People can detect vibration at much lower levels than those that would cause even superficial damage to the most susceptible structures.

All blasting must be carried out in a proper manner by a competent person in accordance with best practice environmental management, in order to minimise the likelihood of adverse effects being caused by airblast overpressure and ground-borne vibration at noise-sensitive places and on people using the surrounding area (DES, 2022).

Blasting can also result in air quality impacts. Air quality management and monitoring is covered in the Vulcan South Air Emissions Management Plan.

1.2 Purpose of this plan

Vitrinite has a statutory obligation to manage potential blast impacts from activities on the mining lease. This Blast Monitoring Program describes the objectives and monitoring program in place to monitor airblast overpressure and ground vibration during the operation of the VSCM.

Blasts must be planned and scheduled to manage blast impacts on nearby infrastructure and not cause environmental nuisance at sensitive places.

In accordance with EA Condition **A24**, this Blast Monitoring Program must be published on Vitrinite's website within twenty-eight (28) days of completion.

Sensitive receptor locations and classifications are subject to change. This program will be reviewed and updated as required to align with government and stakeholder requirements and the progression of mining.





2 Regulatory Framework

2.1 Environmental Protection Act

In Queensland, the environment is protected under the *Environmental Protection Act 1994* (EP Act).

Section 3 of the EP Act states that the objective of the Act is to protect Queensland’s environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development).

Section 12 of the EP Act defines noise as including ‘*vibration of any frequency, whether emitted through air or another medium*’.

Section 14(1) of the EP Act defines environmental harm as any adverse effect, or potential adverse effect (whether temporary or permanent and of whatever magnitude, duration or frequency) on an environmental value, and includes environmental nuisance.

Section 15 of the EP Act defines environmental nuisance as an unreasonable interference or likely interference with an environmental value cause by (a) noise.

Section 20 of the EP Act defines the Environmental Authority (EA) as the authority issued by the Queensland Department of Environment, Tourism, Science and Innovation (DETSI) that allows a person to carry out environmentally relevant activities (ERAs). ERAs are industrial, resource or intensive agricultural activities with the potential to release contaminants into the environment, and includes mining activities.

Section 319 of the EP Act relates to General Environmental Duty and states that a person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm.

The EP Act refers to the Environmental Protection Policies as being subordinate legislation to the Act.

2.2 Environmental Protection (Noise) Policy.

With respect to the acoustic environment, the object of the EP Act is achieved by the Environmental Protection (Noise) Policy 2019 (EPP (Noise)). This policy identified environmental values to be protected, states acoustic quality objectives and provides a framework for making decisions about the acoustic environment.

The EPP (Noise) defines a range of acoustic quality objectives for a range of receptors. The objectives are in the form of noise levels, and are defined for various periods of the day, and use a number of acoustic parameters.

2.3 Guideline – Noise and Vibration from Blasting

The Department of Environment, Tourism, Science and Innovation (DETSI) Guideline ‘Noise and Vibration from Blasting’ contains criteria and procedures that are applicable to noise and vibration emitted from blasting. It applies to activities such as mining, quarries, construction and other operations which involve the use of explosives for fragmenting rock.

The criteria are presented in **Table 2-1**. These criteria address human comfort and apply at residential and commercial receptors.

It is noted that higher limits would typically be used for prevention of structural damage.

Table 2-1 Blasting Vibration and Airblast Criteria for human comfort

Issue	Criteria
Airblast	Airblast overpressure of 115 dB (linear peak) for nine (9) out of ten (10) consecutive blasts initiated and not greater than 120 dB (linear peak) at any time
Vibration	5mm/second peak particle velocity for nine (9) out of ten (10) consecutive blasts and not greater than 10 mm/second peak particle velocity at any time.



2.4 Australia Standard AS 2187.2-2006 ‘Explosives – Storage and Use – Part 2: Use of Explosives’.

AS 2187.2-2006 is a critical standard for ensuring the safe use of explosives in various industries. By setting clear guidelines for operations, storage, handling, emergency management, record keeping and training, it helps to mitigate the risks associated with explosives and protect workers, the public, and the environment.

2.5 Aurizon Asset Protection Plan

The Aurizon Asset Protection Plan (APP) (MSEC, 2020) outlines how rail infrastructure must be protected to maintain operations and minimise risk of damage, harm and incidents.

Key rail infrastructure includes:

- rail tracks and loading loops;
- concrete footings and foundation bedrock supporting masts, bridge abutments and other infrastructure;
- cuttings and embankments; and
- high voltage powerlines including overhead cables, insulators, transformers and safety switches.

A summary of proposed vibration criteria for key railway infrastructure is provided in **Table 2-2** (APP Table 3.2 (MSEC, 2020)). These criteria are based on international literature and field studies, Australian and international standards and best practices.

Table 2-2 Proposed vibration criteria for railway infrastructure

Infrastructure element	Proposed value (mm/s)	Comment
Railway corridor (insulators, masts, sleepers, etc.)	150	Conservative value
Transformers	60	Elevated values possible based upon clarification of transformer susceptibility
Cuttings	80 (with geotechnical assessment)	Higher permissible values likely based upon geotechnical assessment
Embankments	Geotechnical assessment	No requirement for vibration criteria face angles less than 60 degrees
Culverts	150	Higher permissible values likely based upon geotechnical assessment
Communication	40	Higher values possible based upon clarification of communications infrastructure
Bridges	80	-

*From Asset Protection Plan Table 3.2





3 Environmental Authority Requirements

Statutory obligations pertaining to environmental nuisance from blast management are contained within the Vulcan South EA conditions. Vitrinite is bound by the *Environment Protection Act 1994* and must adhere to all conditions of its EA.

Structural vibration impacts to road and rail infrastructure are not explicitly prescribed within the EA conditions but are included within this program for context and awareness.

3.1 Conditions and Criteria for Blasting

The EA contains a condition (D11) that specifies the preparation of a Blast Monitoring Program.

Table 3-1 presents the conditions of the EA directly pertaining to blasting.

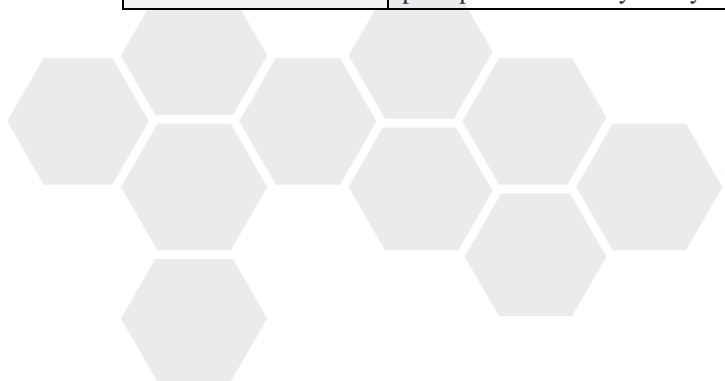
Table 3-2 presents the airblast overpressure and vibration limits imposed in the EA to protect environmental values (human comfort) that may be affected by blasting.

Table 3-1 Conditions of the EA pertaining to blasting

Condition number	Condition
D10	Blasting Blasting must not cause the limits prescribed in Table D2: Blasting noise and vibration limits to be exceeded at a sensitive place.
D11	Blast monitoring program The environmental authority holder must develop and implement a blast monitoring program to monitor compliance with Table D2: Blasting noise and vibration limits for all blasts conducted at the nearest and most affected sensitive place(s).
D12	Blast monitoring must include the following descriptors, characteristics, and conditions: (a) location of the blast(s) within the mining area (including which bench level); (b) atmospheric conditions including temperature, relative humidity, wind speed and wind direction; and (c) location, date and time of recording.
D13	If monitoring indicates exceedance of the limits in Table D2: Blasting noise and vibration limits, then the environmental authority holder must immediately implement airblast overpressure abatement measures so that airblast overpressure from the activity does not result in further environmental nuisance.

Table 3-2 EA Table D2: Blasting noise and vibration limits – EA100265081

Blasting noise and vibration limits	Sensitive place criteria	
	7am to 6pm	6pm to 7am
Airblast overpressure	115 dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120 dB (Linear) Peak at any time	No blasting is allowed during these times
Ground vibration peak particle velocity	5mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10 mm/second peak particle velocity at any time.	No blasting is allowed during these times





3.2 Air Quality Monitoring Conditions

EA Section B contains conditions relating to air quality, including:

- Condition **B8** requires development of an Air Emissions Management Plan;
- **Table B1** requires continuous monitoring at all sensitive receptors within 6 km of the mine site.

Refer to the Vulcan South Air Emissions Management Plan for air quality monitoring requirements.

3.3 General Noise

EA Section D outlines the requirements for continuous noise monitoring at sensitive receptors when the activity is in operation.

The VS EA clarifies that commercial receptors are not considered noise-sensitive places, given all commercial receptors within the potential area of impact are associated with neighbouring coal mines (**Table 4-1**).

With consideration of the information presented within **Section 4.1** of this program, Saraji Station Homestead will become the nearest residential building once mining activities commence and require continual noise monitoring to comply with condition **D3**.

A Noise Management Plan is not conditioned by the VS EA.

3.4 General EA Conditions

Section A of the EA outlines 29 general conditions that are relevant to all environmental aspects of the VS approval.

Refer to the most current version of EA for all conditions.

3.5 General Environmental Duty Requirements

Vitrinite must notify landholders and adjacent operators of their blast schedule. Other than the agreement with Aurizon, no other formal agreements are currently in place between Vitrinite and adjacent mining operators, utility providers or adjacent mining operators regarding blast monitoring.

Vitrinite must consider vibration impacts to on-site and adjacent infrastructure when planning blasts, to ensure vibration does not result in incidents with the potential to cause environmental harm, such as release of mine affected water from pipelines or dams.

Blast design and management of blast initiation will always assess each blast to ensure that the vibration and airblast criteria are met.

Meteorological conditions can significantly alter how sound travels and must be considered when planning blasts. When temperature inversion is known to exist, blasting should be avoided if practicable (ANZEC, 1990).





4 Sensitive Receptors and Infrastructure

Buildings and infrastructure are classified as various categories of sensitive receptors when considering blasting activities. This section identifies the receptors within and adjacent to the Vulcan South mining lease.

The location of the three proposed VS open cut pits and existing residential buildings, commercial buildings and other relevant infrastructure are shown on **Figure 4-1**, with residential and commercial receptor details presented in **Table 4-1**.

Further information is provided below.

4.1 Residential Receptors

Saraji Station, a pastoral property, underlies the Vulcan South mining lease ML700073 and the land to the immediate west.

Three buildings associated with Saraji Station are classified as Residential receptors, two of which are due to be relocated under an agreement between Vitrinite and the Saraji Station leaseholders.

A Noise Impact Assessment was conducted by Trinity (2022) to assess environmental noise nuisance impacts from Vulcan South operations (including blasting). The assessment determined, based on the assumed charge rate for the assessment, that the distance between noise-sensitive receptors and blasting sites must be greater than 1.5 km for the sound levels to remain within prescribed limits.

The assessment determined the Saraji Station Manager's Residence and Workers' Accommodation would be adversely affected by blasting. Exploration activities also indicated commercially viable coal reserves located below both buildings.

Subsequently, Vitrinite and the Saraji Station owners have agreed that Vitrinite will relocate both buildings to a distance greater than 6 km from the Project ML boundary. Whilst these locations will still be classified as residential receptors, they will be unlikely to be impacted by blasting or other mining activities.

As shown on **Figure 4-1**, the current locations of the Saraji Station Manager's Residence and Workers' Accommodation is now designated as the Vulcan South Southern Pit.

Saraji Station Homestead will then become the nearest residential receptor for activities associated with Vulcan South.

The next two closest residential receptors are detailed in **Table 4-1**, but not shown on **Figure 4-1** due to the substantial distance from the project.

4.2 Commercial Receptors

Vulcan South is located immediately south and west of two existing, large-scale open cut coal mining operations operated by BMA:

- Peak Downs Mine
- Saraji Mine.

Both mining operations undertake blasting as part of their open cut coal mining activities, and have personnel located within several operational office/warehouse complexes.

These complexes are classified as Commercial Receptors.

4.3 Sensitive infrastructure

The eastern-most land portion of ML 700073 contains sections of Saraji Road and the Goonyella Rail System, operated by Isaac Regional Council and Aurizon, respectively.

Road and rail infrastructure, including associated bridges, culverts, transformers, and communications towers may be susceptible to vibration impacts from blast activities undertaken within the mining lease.

No heritage-listed buildings are present within the potential area of impact; accordingly, there are no heritage-listed sensitive receptors.

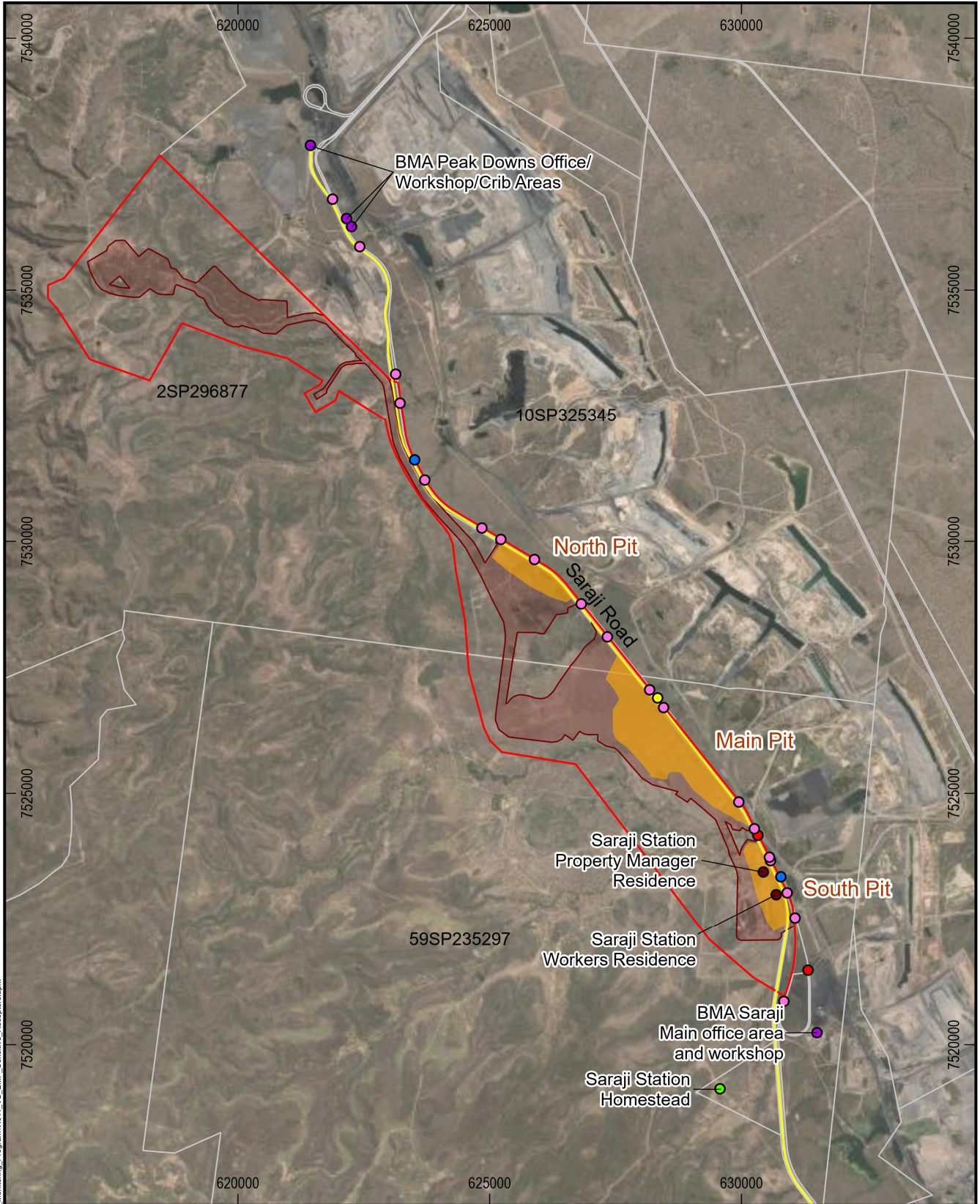


Table 4-1 Residential and commercial receptors

Receptor	Receptor name	Description	Latitude and longitude	Distance (m) from nearest disturbance footprint area	Direction from VS Project	Distance (m) from nearest BMA Operations
Residential	Saraji Station Residence	Residential – Owner’s residence	-22.42916 148.259057	2,970	South	-
Residential (to be relocated)	Property Manager Residence	Residential – Property manager’s residence	-22.390147 148.267067	Within MLA	Within Southern Pit	410
Residential (to be relocated)	Workers’ Residence	Residential – Workers’ residence	-22.394204 148.269578	Within MLA	Within Southern Pit	480
Commercial	BMA Peak Downs	Commercial – Field workshop and field office/crib area	-22.27497 148.18670	1,850	North to East	Within existing operations (Adjacent Goonyella System (100m) and main haul road (400m))
Commercial	BMA Peak Downs	Commercial – Field office/crib area	-22.27351 148.18567	2,020	North to East	Within existing operations (Adjacent Goonyella System (80m), hardstands (10m) and main haul road (350m))
Commercial	BMA Peak Downs	Commercial – main offices area and workshop area	-22.26044 148.17860	3,060	North to East	Within existing operations (400m from CHPP)
Commercial	BMA Saraji	Commercial – Main office area and workshop	-22.418965 148.277679	1,960	South	Within existing operations (300m from CHPP)
Residential	Luxor Residence†	Residential	-22.527639 148.122611	>15,000	South-west	>15,000
Residential	Cheeseboro Residence†	Residential	-22.427361 148.023250	>20,000	West	>20,000

† Locations not shown on Figure 4-1 due to distance from the Project.





Legend

Residential Building	Road
Residential Building (to be Relocated)	Rail
Commercial Building	Open Cut Pit
Bridge	Authorised Disturbance Footprint
Communication	ML 700073
Culvert	Property Boundary
Transformer	

Source: State of Queensland (Department of Resources) 2021-2024, Vitrinite 2021-2024, METServe 2021-2024, Earthstar Geographics.

Vulcan South

Sensitive Receptors (Blasting)

Kilometers

Scale: 1:110,000 (A4)

17/12/2024

Datum: GDA2020
Projection: MGA55

FIGURE 4-1

Path: S:\Projects\0101_VCP_Stage2\ArcGIS\ProjectFiles\Projects\Blast_Monitoring_Program\0101_VS_BMP_Sensitive_Receptors.aprx



5 Monitoring Methodology

The Blast Monitoring Program will measure and monitor airblast overpressure in dB (Linear peak) and ground vibration in PPV (mm/s). All aspects of blast monitoring will be conducted in accordance with project approval EA100265081 and Australia Standard AS 2187.2-2006 ‘Explosives – Storage and Use – Part 2: Use of Explosives’.

Blast monitoring parameters and the frequency at which they are monitored, along with the monitoring location, limit-guideline and sampling method is summarized in **Table 5-1**.

Table 5-1 Blast Monitoring

Location	Latitude Longitude	Frequency	Parameters	Purpose
Saraji Homestead (or nearest Saraji residential location to the blast)	-22.42916 148.259057	All blasts	<ul style="list-style-type: none"> ▪ Airblast overpressure (dB(linear peak)) ▪ Ground vibration (mm/s) 	To monitor impacts at the nearest residential location

5.1 Location and frequency

5.1.1 All blasts

Condition **D11** requires monitoring of airblast overpressure and ground vibration at the nearest and most affected sensitive place(s) for each blast. Under the EA, the definition for sensitive places for noise excludes commercial buildings. Accordingly, only the locations identified in **Table 4-1** as Residential Buildings are regarded as sensitive places under the EA for noise.

Further to this, the Saraji Station Workers Accommodation and the Station Manager’s Residence are both located within the Southern Pit disturbance footprint and will be relocated. Once actioned, the only sensitive place for environmental nuisance monitoring from blasting is the Saraji Homestead.

Fixed or mobile equipment is to be installed to record the airblast overpressure and peak particle velocity as required by the EA.

Condition **D12** outlines the data to be collected (refer **Table 3-1**). A data collection sheet is in **Appendix A**.

Continuous noise and air quality monitoring is required at Saraji Homestead [(or at a monitoring location representative (whether by reason or correlation or otherwise) of the sensitive place (where no measure at the sensitive place is agreed with the owner of the sensitive place) (Refer Table B1 footnote of the EA)]. Fixed blast monitoring equipment could be co-located with the continual air and noise monitoring equipment.

5.1.2 Additional monitoring

Condition **D9** requires that, when requested by the administering authority, additional noise and/or vibration monitoring is to be undertaken at sensitive receptors and within a timeframe nominated by the administering authority.

This may be requested in response to complaints or allegations of environmental nuisance at a sensitive place.

Mobile monitoring equipment would be required to record airblast overpressure and peak particle velocity at the required sensitive place(s).

Data should be recorded on the data collection sheet in **Appendix A**.

5.2 Monitoring equipment

5.2.1 Unattended method

Vitrinite has in place a fixed blast monitoring system which is an automated web-based system that provides real-time airblast overpressure and ground vibration data.



Blast monitors are to be calibrated in accordance with Australian Standard As 2187.2-2006 by a NATA accredited laboratory. Copies of calibration certifications are to be kept on file within Vitrinite's document control system and the date of last calibration recorded on each monitor.

5.2.2 Attended method

Portable attended monitoring units may be deployed to assist in measuring airblast overpressure and ground vibration at relevant locations surrounding the mining lease.

Portable monitoring units will be calibrated in accordance with Australian Standard As 2187.2-2006. Copies of calibration checks are to be kept on file within Vitrinite's document control system and a calibration record sheet to be kept with the unit.

5.2.3 Placement of monitoring equipment

Placement of monitoring equipment should be in accordance with the noise and vibration from blasting guideline ESR/2016/2169 (DES, 2022 or latest revision), reproduced below.

Outdoor measurements of airblast overpressure should be undertaken at a location:

- exposed to the direction of blasting; and
- at a distance of at least 4m from any noise-affected building or structure, or within the boundary of a noise sensitive place; and
- between 1.2m and 1.5m from the ground.

The ground-borne vibration transducer (or array) used for outdoor measurement of ground vibration must be:

- attached to a mass of at least 30kg to ensure good coupling with the ground where the blast site and the measurement site cannot be shown to be on the same underlying strata. The mass must be buried so that its uppermost surface is level with the ground surface.
- placed at a distance of not less than the longest dimension of the foundations of a noise-affected building or structure away from such a building or structure and be positioned between that building or structure and the blast location.





6 Data analysis and reporting

6.1 Data review

The monitoring results for each blast will be reviewed for compliance with the performance criteria for air overpressure and ground vibration as per **Table 3-2**.

The reporting and notification of blast results that exceed the blast criteria will be undertaken in accordance with the EA Condition A9.

6.2 Record collection

The monitoring records from each blast monitoring event that contain the information required in condition **D12** and **Table D2** will be filed in Vitrinite's document control system. A data collection sheet is in **Appendix A**.

All blast equipment monitoring records of installation, calibration and maintenance must be kept as per condition **A19**.

All monitoring results must be retained for the life of the EA as per condition **A20**.

6.3 Exceedance

As per the requirements of condition **D13** if an exceedance of the limits in **Table D2: Blasting noise and vibration limits (Table 3-2)** occurs, airblast overpressure abatement measures must be immediately implemented so that airblast overpressure from the activity does not result in further environmental nuisance.

Abatement measures will include reassessing the blast design and implementing changes to future blasts.

6.3.1 Notification to DETSI

Rolling records will be kept. If two blasts in the last ten consecutive blasts exceed the criteria documented in **Table D2**, an exceedance notification is required to be reported to DETSI in accordance with EA condition **A9**.

6.4 Complaints Management

EA conditions **A13** to **A16** outlines the process for recording and managing complaints.

Should DETSI receive a complaint associated with blasting at Vulcan South from a sensitive receptor, they can request Vitrinite to undertake noise and/or vibration monitoring at a sensitive place and within a nominated timeframe (condition **D9**).

6.5 Review of this Program

This program should be reviewed following any update of the Vulcan South EA, changes to the progression of mining or mine plan, re-location or classification of sensitive receptors, and any incidents or exceedances of EA criteria due to blasting activities.

6.6 Responsibility for this Program

The Site Senior Executive (SSE) holds overall responsibility for matters of environmental compliance at Vulcan South.





7 References

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

Australian Standard AS 2187.2-2006 'Explosives – Storage and Use - Part 2: Use of Explosives'.

Department of Environment, Science and Innovation (2023) *Environmental Authority P-EA-100265081*. Department of Environment, Science and Innovation, Queensland Government, Brisbane.

DES (2022), ESR/2016/2169 *Noise and Vibration from Blasting* Guideline. Department of Environment and Science.

MSEC (2020), *Asset Protection Plan for mining adjacent to the Coppabella to Gregory Railway Line - Vulcan Complex*, Mine Subsidence Engineering Consultants, Chatswood NSW.

Trinity Consultants (2022), *Noise Impact Assessment for Vulcan South*. Report prepared for Vitrinite Pty Ltd by Trinity Consultants Australia, South Brisbane, October 2022.





Appendix A Blast Monitoring Sheet

Requirement	Details
Blast Number	
Date	
Time	
Location Of Blast Include pit name and bench details (co-ordinates)	
Temperature (deg C)	
Relative Humidity (%)	
Wind Speed (m/s)	
Wind Direction	
Monitoring equipment used (type, serial number)	
Location of Monitoring equipment (co-ordinates)	
Monitoring Results	
Air blast overpressure (dB Linear) peak	
Peak Particle Velocity (mm/s)	

