KARUAH EAST QUARRY PROJECT

Blast Management Plan

Prepared for:

Karuah East Quarry Pty Limited
PO Box 3284
Thornton NSW 2322

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Karuah East Quarry Pty Limited (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
Revision 1	15 January 2019	Sam McDonald	Chris Jones	
Revision 1	May 2019	Sam McDonald	Chris Jones	Tim Grugeon (Karuah East)
Revision 0	29 October 2015	Nathan Archer	Chris Jones	Chris Jones

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APPENDICES

Appendix A Consultation with EPA Regarding Management Plans
Appendix B DPE Comments on draft BMP

1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Karuah East Quarry Pty Ltd (Karuah East, the Proponent) to prepare a Blast Management Plan (BMP) to satisfy the requirements of the Project Approval (PA 09_0175) granted on 17 June 2014 for the Karuah East Quarry Project (the Project).

The BMP has been prepared with reference to the following documents:

- *Environmental Assessment Report – Proposed Karuah East Hard Rock Quarry* prepared by ADW Johnson Pty Ltd dated 31 January 2013 (hereafter referred to as the EA);
- *Preferred Project Report – Proposed Karuah East Quarry* prepared by ADW Johnson Pty Ltd dated 30 July 2013 (hereafter referred to as the PPR);
- *Noise and Blasting Impact Assessment – Karuah East Quarry Project, Pacific Highway, Karuah* prepared by SLR dated 2 November 2012 (hereafter referred to as the NIA);
- Karuah East Quarry Environmental Assessment Section 57W Application (MOD 1) to amend Part 3A Project Approval 09_0175 Minor Increase to Approved Disturbance Area prepared by ADW Johnson Pty Ltd dated January 2018) (hereafter referred to as MOD 1);
- Karuah East Quarry Environmental Assessment Section 57W Application (MOD 2) to amend Part 3A Project Approval 09_0175 Minor Increase to Approved Disturbance Area prepared by ADW Johnson Pty Ltd dated August 2018) (hereafter referred to as MOD 2);
- Karuah East Quarry Response to Submissions Section 75W Application (MOD 1) to amend Part 3A Project Approval 09_0175 Minor Increase to Approved Disturbance Area prepared by ADW Johnson Pty Ltd dated March 2018 (hereafter referred to as MOD 1 RTS);
- Karuah East Quarry Response to Submissions Section 75W Application (MOD 2) to amend Part 3A Project Approval 09_0175 Minor Increase to Approved Disturbance Area prepared by ADW Johnson Pty Ltd dated October 2018 (hereafter referred to as MOD 2 RTS);
- Project Approval 09_0175;
- Project Approval 09_0175 (MOD 1);
- Project Approval 09_0175 (MOD 2);
- Environment Protection Licence (EPL) 20611;
- ANZECC. *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*, 1990;
- AS 2187.2-2006, *Explosives - Storage, Transport and Use*; and
- *Code of Good Practice: Prevention and Management of Blast Generated NOx Gases in Surface Blasting* prepared by Australian Explosives Industry and Safety Group Inc. (AEISG) dated June 2011.

1.1 Consultation for this Management Plan

This BMP has been prepared as per Schedule 3 Condition 12 of PA 09_0175 which required this plan to be prepared in consultation with Mid - Coast Council (Council) and Environment Protection Authority (EPA).

A copy of the BMP was provided to Council and the EPA for comment on 15 September 2015.

Council provided comments to Karuah East on 1 October 2015 regarding the Biodiversity Offset Strategy, Biodiversity Offset Area Management Plan and Landscape and Rehabilitation Management Plan. There were no comments from Council regarding the BMP.

The EPA (Karen Marler) responded to Karuah East by email on 14 October 2015 stating that they do not approve management plans. They responded that:

The EPA encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, the EPA does not review these documents as our role is to set environmental objectives for environmental management, not to be directly involved in the development of strategies to achieve those objectives.

A full copy of this response from EPA is attached as **Appendix A1**.

Karuah East consulted with the EPA during the application for an EPL for the Project.

The BMP was submitted to the DPE for review on 2 November 2015, and was approved on 14 December 2015. The BMP was updated to incorporate all comments received for the 2018 version. The DPE's review for the original 2015 document is attached as **Appendix A2**.

No further consultation was completed for the May 2019 update (See **Section 1.2** for details) as consultation was completed for MOD 1 and 2.

MOD 1

The CCC Consultative Committee was briefed on Mod 1 during meetings on the 14 August 2017 and the 4 December 2017.

The DPE were consulted on a range of matters associated with MOD 1 following lodgement on 12 July 2017. For further details on matters discussed refer to Table 1 in MOD 1 EA (ADW, 2018).

The MOD 1 Response to Submissions (ADW, 2018a) addressed feedback from the following agencies:

- Office of Environment and Heritage;
- Environment Protection Authority;
- NSW Department of Industry (Resources and Energy);
- NSW Department of Industry (Water); and
- Port Stephens Council.

MOD 2

The CCC Consultative Committee was briefed on MOD 2 during meetings on the 5 March 2018 and the 3 September 2018.

The DPE were consulted on a range of matters associated with MOD 2 following lodgement on 28 February 2018. For further details on matters discussed refer to Table 1 in the MOD 2 EA (ADW, 2018).

The MOD 2 Response to Submissions (ADW, 2018b) addressed feedback from the following agencies:

- Office of Environment and Heritage;
- Environment Protection Authority;
- NSW Department of Planning and Environment (Resources & Geoscience);
- NSW Roads and Maritime Services; and
- Port Stephens Council.

1.2 Management Plan History

A summary of the history of the management plan reviews is outlined below in **Table 1**:

Table 1 Management Plan History

Document Status	Date	Comment
Revision 1	May 2019	Document updated based on the requirement of the Independent Environmental Audit (EMM 2017). Updates included: • Review of status of Karuah East; • Update to site figures to illustrate minor changes to layout; and • Update on baseline data. The document has also been updated to include some details from Modification 1 (MOD 1) Environmental Assessment (ADW January 2018), MOD 2 (ADW August 2018), MOD1 RTS (ADW March 2018) and MOD 2 RTS (ADW October 2018).
Revision 0	26 October 2015	Document prepared and submitted to the DPE.

2 Statutory Requirements

2.1 Project Approval Requirements

The BMP forms part of the Environmental Management Strategy (EMS) for the project and has been prepared in accordance with the operating conditions provided in Schedule 3 Condition 11 of PA 09_0175 and as summarised in **Table 2.**

Table 2 Operating Conditions

Condition	Requirement	Relevant Section
Schedule 3 – Environmental Performance Conditions		
Operating Conditions		
11	The Proponent must:	
11(a)	Implement best blast management practice to: • Protect the safety of people and livestock in the surrounding area; • Protect public or private infrastructure/property in the surrounding area from any damage; and • Minimise the dust and blast fumes of any blast;	**Section 6**
11(b)	Schedule blasts to avoid the blasting schedule of any nearby quarrying operation;	**Section 6.6**
11(c)	Operate a suitable system to enable the public to get up-to-date information on the proposed blasting schedule on the site, and	**Section 6.7**

Condition	Requirement	Relevant Section
11(d)	Not undertake blasting within 500 metres of: (i) Any public road without the approval of the relevant road authority; or (ii) Any land outside the site not owned by the Proponent, unless: • The Proponent has a written agreement with the relevant landowner to allow blasting to be carried out closer to the land, and the Proponent has advised the Department in writing of the terms of this agreement, or • The Proponent has: - Demonstrated to the satisfaction of the DPE Secretary that the blasting can be carried out closer to the land without compromising the safety of the people or livestock on the land, or damaging the buildings and/or structures on the land; and - Updated the Blast Management Plan to include the specific measures that would be implemented while blasting is being carried out within 500 metres of the land,	**Section 6.4**
	To the satisfaction of the DPE Secretary.	-

Requirements of the BMP are provided in Schedule 3, Condition 12 and Schedule 5, Condition 3 of PA 09_0175. These are reproduced in **Table 3** together with the relevant section(s) of the BMP where the requirements have been addressed.

Table 3 Project Approval (PA 09_0175) Requirements

Condition	Requirement	Relevant Section
Schedule 3 – Environmental Performance Conditions		
Blast Management Plan		
12	The Proponent must prepare and implement a Blast Management Plan for the project to the satisfaction of the DPE Secretary. This plan must:	This document
12(a)	Be prepared by a suitably qualified expert whose appointment has been approved by the DPE Secretary;	Letter from DPE approving SLR on 22/7/2015
12(b)	Be prepared in consultation with Council and EPA, and submitted to the DPE Secretary for approval prior to the commencement of construction activities;	This document
12(c)	Describe the measures that would be implemented to ensure: • Best management practice is being employed; and • Compliance with the relevant conditions in this approval;	**Section 6** **Section 7**
12(d)	Include a road closure protocol if blasting occurs within 500 metres of a public road;	**Section 6.4**
12(e)	Include a specific blast fume management protocol, to demonstrate how emissions will be minimised including risk management strategies if blast fumes are generated; and	**Section 8**
12(f)	Include a monitoring program for evaluating the performance of the project including: • Compliance with the applicable criteria; and • Minimising fume emissions from the site.	**Section 7**
	The Proponent must implement the plan as approved by the DPE Secretary.	
Schedule 5 – Environmental Management, Reporting and Auditing		
Management Plan Requirements		

Condition	Requirement	Relevant Section
3	The Proponent must ensure that the Management Plans required under this approval are prepared in accordance with any relevant guidelines, and include:	Whole of document
3(a)	Detailed baseline data	**Section 5**
3(b)	A description of: • The relevant statutory requirements (including any relevant approval, licence or lease conditions); • Any relevant limits or performance measures/criteria; and • The specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;	**Section 2** **Section 4** **Section 12.2**
3(c)	A description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	**Section 6**
3(d)	A program to monitor and report on the: • Impacts and environmental performance of the project; and • Effectiveness of any management measures (see (c) above);	**Section 7**
3(e)	A contingency plan to manage any unpredicted impacts and their consequences;	**Section 10**
3(f)	A program to investigate and implement ways to improve the environmental performance of the project over time;	**Section 12.3**

Condition	Requirement	Relevant Section
3(g)	A protocol for managing and reporting any: • Incidents; • Complaints; • Non-compliances with statutory requirements; and • Exceedances of the impact assessment criteria and/or performance criteria; and	**Section 10**
3(h)	A protocol for periodic review of the plan.	**Section 11**

2.2 Details of MOD 1

ADW Johnson prepared the Environmental Assessment Section 75W Application (MOD 1) to amend Part 3A Project Approval 09_0175 for a Minor Increase to Approved Disturbance Area. This has been known as MOD 1.

The modification was minor in nature and included a nominal expansion to the approved area of disturbance (31.63 hectares) by an additional 2,500m$^{2.}$ This was an increase of less than 1% of the original Project Approval Area. Figures have been updated in all management plans outlining the MOD 1 extension area.

Key environmental aspects were assessed by SLR as part of the specialist report for MOD 1. The additional disturbance area will be utilised for vehicle manoeuvring and will likely reduce internal vehicle movements. There is no blasting within the extension area, therefore there are no additional impacts.

MOD 1 was approved by the DPE in April 2018.

2.3 Details of MOD 2

ADW Johnson prepared an Environmental Assessment Section 75W Application (MOD 2) to amend Part 3A Project Approval 09_0175 for a Minor Increase to Approved Disturbance Area. This has been known as MOD 2.

The modification was minor in nature which amended the Project Approval to expand the area of disturbance of the Karuah East Quarry by 1.133ha. Following detailed design and commencement of operations, it has been identified that the proposed minor extension will allow for increased operational efficiency, improved operational safety and improved environmental management, particularly relevant to surface water management. The MOD 2 area is heavily disturbed and is devoid of any significant vegetation. The area subject to MOD 2 contains a dwelling, an access road to the dwelling and a redundant electricity easement.

Key environmental aspects were assessed by SLR as part of the specialist report for MOD 2. The additional disturbance area will be utilised for vehicle manoeuvring and will likely reduce internal vehicle movements. There is no blasting within the extension area, therefore there are no additional impacts.

MOD 2 was approved by the DPE in 19 December 2018.

2.4 Federal Approval

Federal Approval (EPBC 2014/7282) was granted for the site under the *Environment Protection and Biodiversity Conservation Act* (EPBC Act 1999) on 20 March 2015.

The Federal Approval contains no conditions with regard to noise emissions or blast management.

2.5 Environment Protection Licence Requirements

The EPA regulates the operations conducted at the Project site through an Environment Protection Licence (EPL 20611) issued under the *Protection of the Environment Operations Act 1997* (POEO Act).

There are several conditions relating to blast management in the EPL which have been addressed in this BMP. Specific EPL conditions are summarised in **Table 4** together with the relevant sections of the BMP indicating where the requirements have been addressed.

Table 4 Environment Protection Licence Requirements

Condition	Summary of Condition	Relevant Section
P1.4	Monitoring Location	**Section 7**
L5	Blasting Limit Conditions	**Section 4**
O7.1	Noise and Blast Management Operating Conditions	**Section 6.1**
M7	Blasting Monitoring and Recording Conditions	**Section 7**
R4.1 and R4.2	Blast Reporting	**Section 9**

2.6 Statement of Commitments

Commitment 2.0 of the Statement of Commitments states that a Blast Monitoring Plan will be prepared prior to the commencement of construction works.

The relevant commitments relating to blasting are included in Commitment 5.0 of the Statement of Commitments and are reproduced in **Table 5** below.

Table 5 Statement of Commitments

Condition	Commitment	Relevant Section
Noise, Blasting and Vibration[1]		
	The proponent will not fire blasts at the existing quarry and the proposed Karuah East quarry at the same time;	**Section 6**
	The proponent will implement a blasting program where nearby receivers are notified in advance of a blast;	Whole document

Condition	Commitment	Relevant Section
	The following control measures for vibration will be undertaken: • Reducing the maximum instantaneous charge (MIC) by using delays, reduced hole diameter and/or deck loading2; • Changing the burden and spacing by altering the drill pattern and/or delay layout or altering the hole inclination; • Use the minimum practicable sub drilling which gives satisfactory toe conditions; and • Investigate alternative rock breaking techniques.	**Section 6**
	The following control measures for air blasting will be undertaken; • Reducing the maximum instantaneous charge (MIC) by using delays, reduced hole diameter and/or deck loading; • Ensure stemming depth and type is adequate; • Eliminate exposed detonating cord and secondary blasting; • Restrict blasting events to favourable weather conditions; • Orient quarry faces away from potentially sensitive receivers; • Use a hole spacing and burden which will ensure that the explosive force is just sufficient to break the ore to the required size; and • The proponent will take particular care when the face is already broken and consider deck loading where appropriate to avoid broken ground or cavities in the face.	**Section 6**

1 – Noise management requirements are presented separately in the Karuah East Noise Management Plan dated August 2015.

2 – Deck loading is a method of loading blast holes in which the explosive charges in the same hole are separated by stemming or an air cushion.

The requirement to complete a Blast Monitoring Plan in the Statement of Commitments is covered under this BMP.

3 Project Description

3.1 Overview

Hunter Quarries currently extract hard black andesite material from its existing quarry operation on adjoining lands. Approval was granted for this designated development on the adjoining land (Lot 21 DP 1024341, Lot 11 DP 1024564 and Lot 12 DP 1024564) by the Minister as State Significant Development on 3rd June 2005 (DA265/10/2004).

The existing Karuah Quarry currently operates under development approval DA 265/2004 and is approved to extract up to 500,000 tonnes per annum (tpa) of 'andesite' basalt material suitable for use as road base, construction aggregate and concrete batching, among various other applications.

Following exploratory works adjacent to the existing approved quarry, additional resource has been identified to the east on land owned by the Proponent (Project site). On 17 June 2014, the approval (09_0175) was granted by the Planning Assessment Commission on behalf of the Minister for Planning and Environment for the extraction of this additional resource through the development of Karuah East, a stand-alone operation to the existing quarry. Federal Approval (EPBC 2014/7282) was granted for Karuah East under the *Environment Protection and Biodiversity Conservation Act* (EPBC Act 1999) on 20 March 2015.

3.2 Project Site

The Project site is located on Lots 12 and 13 DP 1024564, off the Pacific Highway, approximately 3 km north of Karuah NSW.

The approved Project includes the following key elements:

- Staged extraction of approximately 29 million tonnes of "andesite" over a 20 year timeframe;
- Extraction of up to 1.5 million tonnes of andesite material per year;
- Removal and stockpiling of an estimated 380,000 m^3 of overburden (approximately 750,000 tonnes) from the quarry extraction area in accordance with the Rehabilitation Plan prepared for the EIS. Removal of overburden is not included in the proposed extraction rate of 1.5 million tonnes of andesite annually;
- Haulage of up to 1.5 million tonnes of andesite per year from the site to market by 25 to 30 tonne haul trucks via the Pacific Highway;
- Up to 216 truck loads per day (at maximum production);
- Implementation of water management and erosion and sediment control works to ensure no loss of sediment, dust minimisation and to control discharges from the site to ensure that all discharges are within acceptable volumetric and water quality criteria;
- Roadworks to secure access to the site including upgrade and extension of Blue Rock Lane, realignment of Andesite Road and Blue Rock Lane intersection and adjust road markings at Branch Lane & Andesite Road intersection;
- Employment of 28 on-site staff;
- Construction of new haul road and access through adjoining RMS land;
- Staged clearing;

- Expansion of approved disturbance area (MOD 1 and 2);
- Drilling and blasting activities;
- Loading and hauling of extracted material;
- Crushing and screening of extracted material;
- Stockpiling of material on-site; and
- Location of plant on Lot 13 comprised of office buildings, workshops, parking areas, crushing plant, wash plant, weigh bridge and product storage areas.

Figure 1 presents the Project site plan and layout.

3.3 Blasting Hours and Frequency

In accordance with Schedule 3, Condition 9 of PA 09_0175 and Condition L5.1 of EPL 20611, the Proponent must ensure that blasting on the site is only carried out during the hours presented in **Table 6**.

Table 6 Operating Hours

Day	Blasting Hours
Monday to Friday	9.00 am to 4.00 pm,
Saturdays, Sundays and Public Holidays	No blasting

In accordance with Schedule 3, Condition 10 of PA 09_0175 the Proponent must not carry out more than two blasts per week at the site, unless an additional blast is required following a blast misfire.

3.4 Sensitive Receivers

A number of sensitive receivers are located in the area surrounding the Project site. These receivers are presented in **Table 7** and

Figure 2. Also presented in **Table 7** is the closest distance at which blasting could potentially occur to the identified receivers.

Table 7 Sensitive Receivers

Receiver ID	Details	Nearest distance from active pit areas (m)
Existing Approved Dwellings		
A	Lot 100 DP 785172	919
B	Lot 3 DP 785172	849
C	Lot 2 DP 785172	1046
D	Lot 22 DP 1024341	1346
E	Lot 250 DP 1092111	1585
F	Lot 50 DP 1036893	963
G	Lot 1 DP 1032636	1161
Other Structures		
Lot 11[1]	Lot 11 DP1024564	440

Note 1 - No currently approved residential dwelling exists on Lot 11.

As indicated in **Table 7** no residential receivers are located within 500 m of the potentially nearest blasting areas.

The structure on Lot 11 (not approved dwelling) is 440 m from the potentially nearest blasting areas.

Figure 1 Karuah East Quarry Site Plan (MOD 2 Extension Area in Orange) – SLR 2019

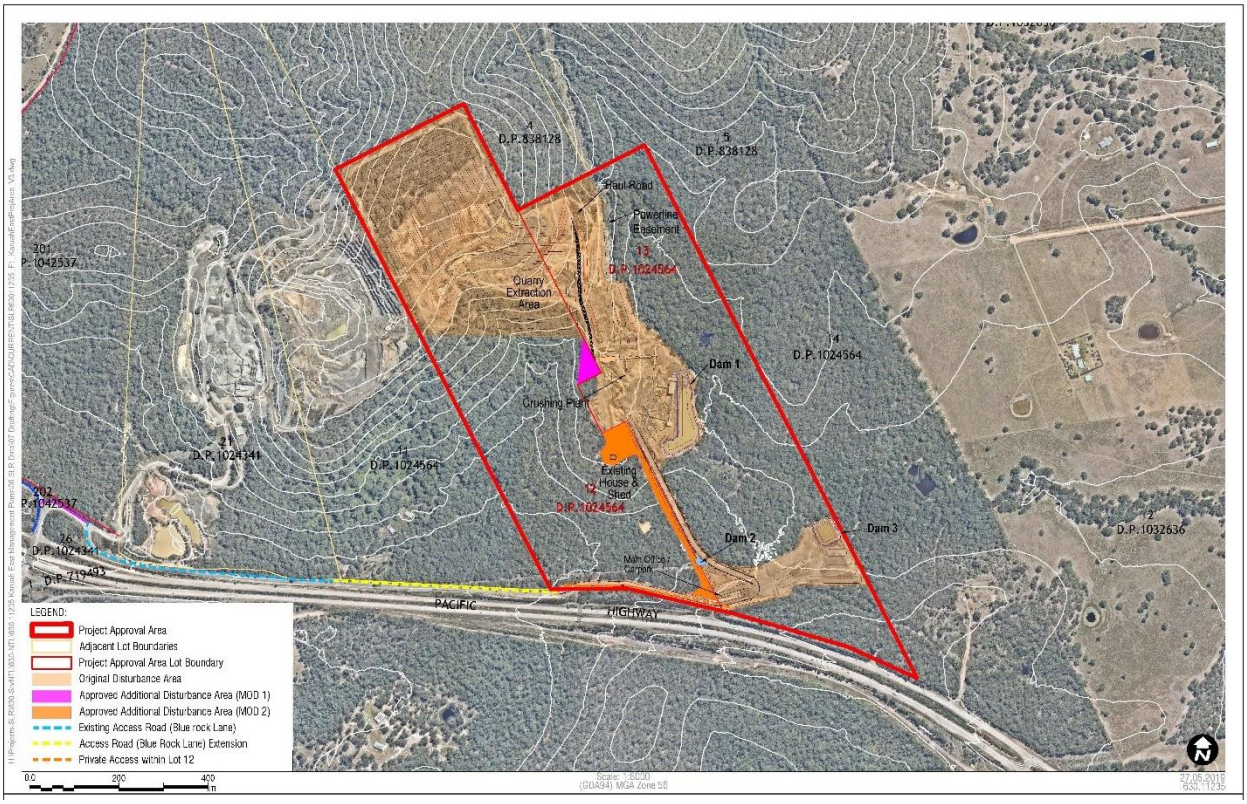
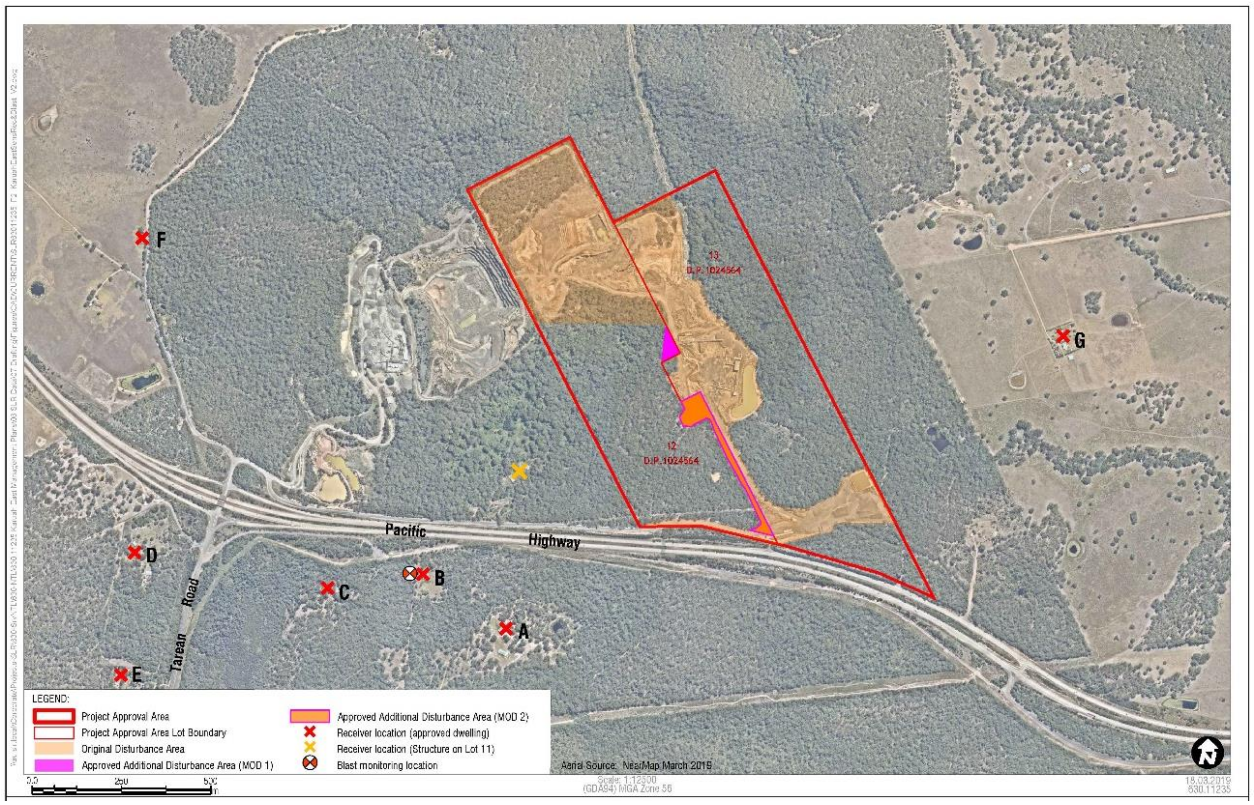


Figure 2 Sensitive Receivers and Blast Monitoring Locations



4 Blasting Criteria

4.1 PA 09_0175 Schedule 3 Condition 8

Blasting criteria for the Project are provided in Schedule 3, Condition 8 of PA 09_0175 and are summarised in **Table 8.**

Table 8 Project Approval Blasting Criteria

Location	Airblast overpressure (dB(Lin Peak))	Ground vibration (mm/s)	Allowable exceedance
Any residence on privately-owned land, or any public infrastructure	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months

These criteria do not apply if the Proponent has a written agreement with the relevant landowner or infrastructure provider/owner, and the Proponent has advised the Department in writing of the terms of this agreement.

4.2 EPL 20611 Condition L5

Conditions L5.3 to 5.6 of EPL 20611 detail the blast limits for the project. The blast limits contained in the EPL are consistent with those presented in **Table 8**

5 Baseline Data

5.1 Blast Monitoring Data

Extensive blast monitoring data has been recorded in the vicinity of the project during blasting operations at the existing Karuah Quarry which has been reported in the Annual Reviews (formally known as Annual Environmental Management Reports (AEMRs)). **Table 9** presents a summary of the blast monitoring results as reported in the Karuah Quarry AEMRs from 1 August 2010 to 31 December 2018.

Table 9 Summary of Karuah Blast Monitoring Results 2010 to 2018

Blast monitoring summary	Monitor 2 (Nearest Approved Resident to Karuah Quarry)
Total No. of blasts monitored	102
Blasts exceeding 5 mm/s	0
Blasts exceeding 115 dBL	0
Average PPV (mm/s)	1.03
Maximum PPV (mm/s)	3.42
Average airblast (dBL)	108.28

Blast monitoring summary	Monitor 2 (Nearest Approved Resident to Karuah Quarry)
Maximum airblast (dBL)	115.0

As presented between 2010 and 2018:

- No blasts have exceeded 120 dBL;
- No blasts have exceeded 115 dBL at the nearest residential dwelling; and
- No blasts have exceeded 5 mm/s at any location.

5.2 Summary of Blast Results – Karuah East Construction

The Karuah East Annual Review outlines the blasting that occurred in 2017-2018.

During the 2017 and 2018 Annual Review reporting period:

- There were a total of 16 blasts;
- No blasts exceeded 120 dBL;
- No blast exceeded 115 dBL at the nearest residential dwelling or privately owned land; and
- All blasts were within the vibration criteria.

A summary of blasting at Karuah East is presented in **Table 10**.

Table 10 Summary of Karuah East Quarry Blast Monitoring Results 2017 to 2018

Blast monitoring summary	Monitor 2 (Nearest Approved Resident to Karuah East Quarry)
Total No. of blasts monitored	16
Blasts exceeding 5 mm/s	0
Blasts exceeding 115 dBL	0
Average PPV (mm/s)	0.71
Maximum PPV (mm/s)	1.34
Average airblast (dBL)	106.23
Maximum airblast (dBL)	113.5

5.3 Blast Predictions

The NIA prepared by SLR in 2012 for the EA developed blasting site laws for Karuah East based upon blast monitoring results from the existing Karuah Quarry. The site laws were utilised to determine limiting factors to blast design for the site in order to achieve the criteria described in **Section 4**. Based on the predicted blast results the blast emissions criteria are predicted to be met without imposing any significant constraints on blast design throughout the life of the quarry.

6 Blast Management and Control Measures

Measures that will be implemented to ensure compliance with the blast criteria nominated in Schedule 3 Conditions 8 of PA 09_0175 are detailed below:

6.1 Operating Conditions

It is noted that in accordance with Condition O7.1 of the EPL 20611:

All acoustic bunds necessary to achieve compliance with the noise limits specified in this licence must be constructed prior to the commencement of quarrying activities and be maintained throughout the operational life of the premises to the height and location described in the Noise Management Plan.

The EIS and Preferred Project Report committed to construct noise barriers, with this information then replicated in the *Blast Management Plan (2015)*. Karuah East Quarry are currently preparing a modification to remove the requirement to construct noise barriers around the stockpile and stacker locations. It is anticipated that this will be submitted by May 2019.

6.2 Blast Design

Blasting will only be undertaken by accredited specialist blasting contractors.

The following control measures for vibration will be undertaken:

- Reducing the maximum instantaneous charge (MIC) by using delays, reduced hole diameter and/or deck loading;
- Changing the burden and spacing by altering the drill pattern and/or delay layout or altering the hole inclination;
- Blasts will not be undertaken at the same time as the existing Karuah Quarry;
- Use the minimum practicable sub drilling which gives satisfactory toe conditions; and
- Investigate alternative rock breaking techniques.

The following control measures for air blasting will be undertaken:

- Reducing the maximum instantaneous charge (MIC) by using delays, reduced hole diameter and/or deck loading;
- Ensure stemming depth and type is adequate;
- Eliminate exposed detonating cord and secondary blasting;
- Restrict blasting events to favourable weather conditions;
- Orient quarry faces away from potentially sensitive receivers;
- Use a hole spacing and burden which will ensure that the explosive force is just sufficient to break the ore to the required size; and
- The proponent will take particular care when the face is already broken and consider deck loading to avoid broken ground or cavities in the face.

6.3 Public Safety

In accordance with Schedule 3 Condition 11 of PA 09_0175, Karuah East must implement best practice blasting protocol to protect the safety of people, property and livestock.

Specific actions to protect public safety include:

- A blast exclusion zone will be established in accordance with the Drill and Blast Safe Work Procedure developed by the Blast Contractor;
- Pre-blast inspections;
- Sentries will be posted at all points to prevent access to the exclusion zone; and
- Notification of blasting times to registered residences.

6.4 Road Closure Management

No blasting will be undertaken within 500 m of a public road, therefore road closures will not be required for the project.

6.5 Monitoring of Meteorological Conditions

Blasting will only be undertaken in favourable weather conditions. Meteorological data from the on-site meteorological station will be evaluated prior to blasting and as close as practicable to the time of blasting. The expected weather conditions and their effect on the air-blast, dust and fume emissions generated by the blast will be considered and blasting plans and/or timing will be altered if necessary.

6.6 Avoidance of Concurrent Blasts with Nearby Quarrying Operations

In accordance with Schedule 3 Condition 11(b) of PA 09_0175, Condition L5.2 of EPL 20611 and the Statement of Commitments, Karuah East will ensure that blasts are not fired at the existing quarry and the proposed Karuah East quarry at the same time.

6.7 Consultation with Neighbouring Residences

In accordance with Schedule 3 Condition 11(c), a blasting notification register has been established at the quarry, with all registered individuals notified of upcoming blasting operations at the site.

7 Blast Monitoring Program

7.1 Overview

The Monitoring Program has been developed with reference to the procedures described in AS 2187.2-2006, "*Explosives - Storage, Transport and Use*" and with reference to the ANZECC's "*Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*", September 1990.

The blast emissions will be quantified for all blast events conducted at the project site. Each blast will be monitored for both blast overpressure and ground vibration by a qualified blast contractor.

In the event that the quarry's blast monitoring equipment is unavailable for service, due to installation or calibration requirements throughout the monitoring program, then blast emissions will be monitored by alternative calibrated instrumentation.

7.2 Blast Monitoring Locations and Frequency

The monitoring site has been selected in consultation with the EPA and is representative of the nearest privately owned residential dwellings and other sensitive infrastructure located within 2 kilometres of blasting activities.

Table 11 presents a summary of the blast monitoring requirements of this BMP as prescribed by Condition M7.1 of EPL 20611.

Table 11 Blast Monitoring Summary

Monitoring Location	Monitoring Parameter	Unit of Measurement	Monitoring Frequency	Sampling Method	Responsibility
Location B on Lot 3 DP 785172	Airblast Overpressure	Decibels (Linear Peak)	Every blast	Australian Standard AS 2187.2-2006	Quarry Manager Specialist blasting contractor
	Ground Vibration Peak Particle Velocity	Millimetres per second			

7.3 Blast Monitoring Records

Results of monitoring will be kept in a legible form for at least four years after each blasting event has been undertaken. These records are available to any authorised officer of the EPA when requested.

The following shall be recorded for each blast event:

- Date and time of blasting event;
- Location where monitoring was conducted;
- Overpressure and vibration at each location; and
- Maximum Instantaneous Charge (MIC).

8 Blast Fume Management

8.1 Overview

The generation of oxides of nitrogen (NO_X) or "blast fume" within the post blast gases is a result of a fuel deficiency in the explosive or detonation reaction causing incomplete combustion in a blast (AEISG 2011). These gases are toxic and can pose a health risk if persons are exposed to them before the plumes can dissipate due to the sudden localised release in potentially high concentrations.

It is noted that NO_X events may still occur even after prevention and mitigation actions have been put into place due to the inherent variability in the blasting environment.

8.2 Causes of NO_X Fumes Emissions

The Australian Explosives Industry and Safety Group Inc. (AEISG) identify that NO_X generating conditions might be a result of the following conditions:

- Explosive formulation and quality assurance;
- Geological conditions;
- Blast design;
- Explosive product selection;
- Presence of water in drill holes;
- On-bench practices; and
- Contamination of explosive in the blast hole.

8.3 Fume Management

Best practice control of blast fume will be achieved by the following:

- Blasting will only be undertaken by accredited specialist blasting contractors;
- Minimising the potential for delayed firing of shots which have been loaded into wet holes within the constraints of prevailing weather conditions;
- Conducting a pre-blast environmental assessment with consideration given to wind speed, direction and shear and the strength of temperature inversions prior to each blast. Blasts will be fired in suitable weather conditions that minimise the potential for blast fume to be blown towards neighbouring residential areas; and
- Establishment of blast exclusion zones to protect personnel.

8.4 Blast Fume Identification and Recording

Post blast fume will be identified and categorised using the AEISG (2011) Visual NO_X Fume Rating Scale presented in **Figure 3**. Assessing the amount of NO_X gases produced from a blast will depend on the distance the observer is from the blast and the prevailing weather conditions.

Blast site personnel will report any noticeable post blast NO_X fumes to the blast site manager including the extent and direction of such plumes and records of such events will be kept.

Figure 3 Visual NOx Fume Rating Scale

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	

8.5 Post Blast Fume Risk Management

In the event of any identified blast fume having a rating of Level 4 or greater, or in the event of a Level 3 blast leaving the site boundary, the quarry manager will be notified immediately.

If the fume is believed to have or has the potential to impact on sensitive receivers, Karuah East will contact those receivers immediately and provide instructions on how to manage and mitigate exposure. Typically, the impacted receivers will be the same as those notified prior to blasting as outlined in **Section 6.7**.

Any persons in the path of a blast fume should:

- Not enter the fume;
- Move away from the path of the fume
- If indoors close all windows and doors and stay inside; and
- If in a car, stay inside with windows and doors closed and use recirculated air conditioning

In accordance with the AEISG Code of Practice, if any person has been exposed to NOx gases, medical treatment will be sought as soon as it is safe to do so in accordance with the Karuah East Emergency Response Procedures.

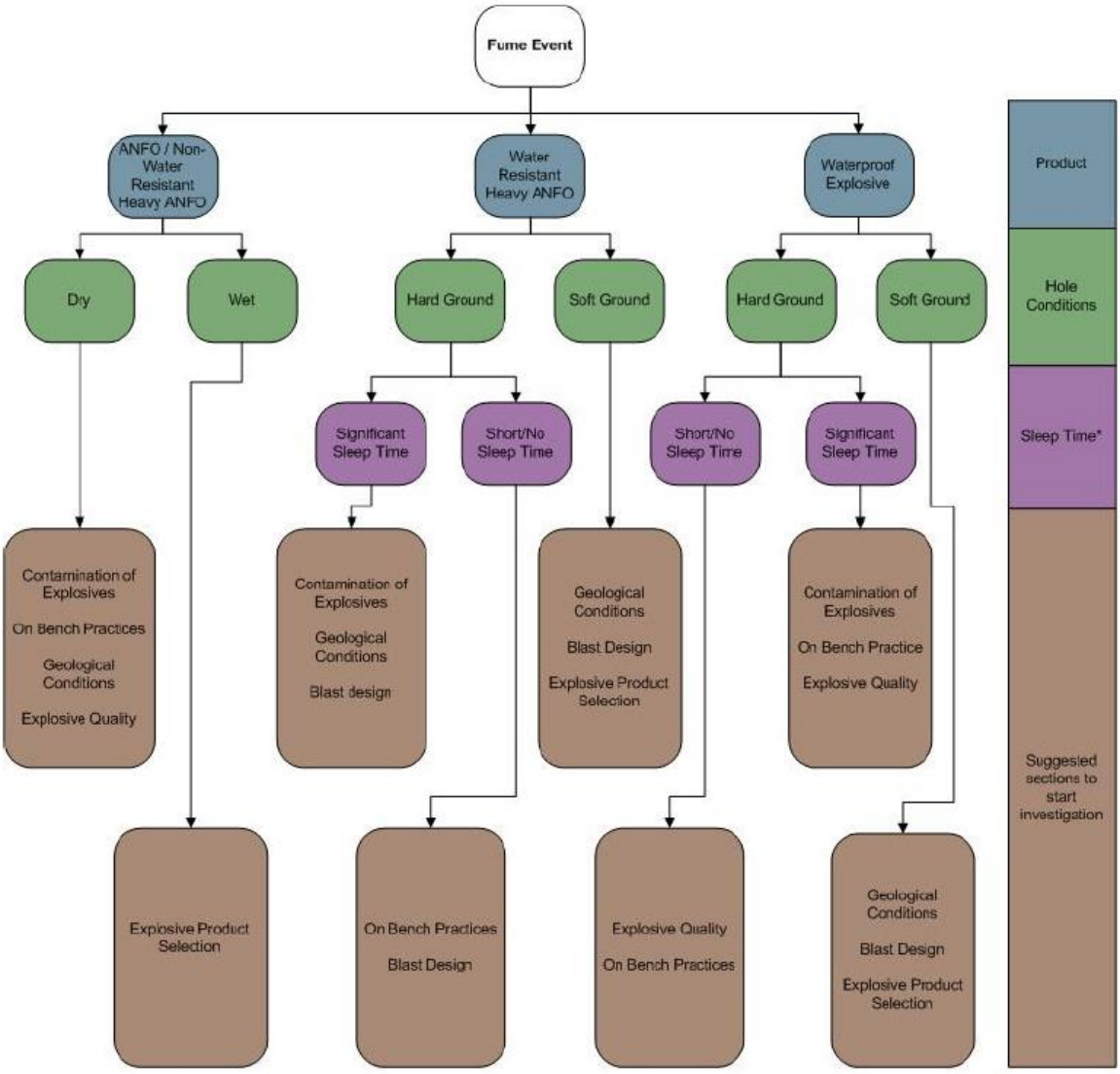
If a blast fume emergency occurs the incident will be managed in accordance with the Karuah East Pollution Incident Response Management Plan (PIRMP) and the relevant authorities notified as required. If requested, a formal incident report will be prepared. This report will include blast parameters including type and quantity of explosive, number of blast holes, meteorological conditions and any other relevant information in the identification of the cause of the blast fume.

8.6 Investigation of Blast Fume Events

Any reported blast fume event will be investigated to minimise the potential for the ongoing generation of NO_X fumes and to mitigate any potential impacts of such an event. As per the AEISG (2011), the fault tree presented in Error! Reference source not found. will be used to assist in the investigation. The investigation will involve the explosive manufacturer/supplier as necessary.

The results of any investigation will be factored in to future blast design to mitigate future impacts.

Figure 4 Fault Tree Analysis of Blast Fume Events



9 Reporting

9.1 Website Reporting

Monitoring results will be made available to the public on the Karuah East website (www.hunterquarries.com.au) on a monthly basis through the Monthly Environmental Monitoring Report as required by the EPL and *Guidelines for Publishing Pollution Monitoring Data (EPA)*. Annual reporting will be undertaken as per **Sections 9.4** and **9.5**.

9.2 Blast Limit Exceedance Reporting

In accordance with Condition R4.1 of EPL 20611, Karuah East will report any exceedance of the licence blasting limits to the regional office of the EPA as soon as practicable after the exceedance becomes known.

9.3 Incident Reporting

With regard to blasting, an incident shall be defined as:

- Any non-compliance with the conditions of the PA;
- Any complaint made to the quarry or any employee or agent of the quarry in relation to blasting from the Project site;
- Any serious blast fume event leaving the site;
- An incident that involves material harm.

Where a significant pollution incident occurs which causes an impact on material harm, reference will also be made to the Karuah East PIRMP for procedures relating to the management of pollution incidents.

The protocol for managing complaints and/or non-compliances is provided in **Section 10.**

9.4 Annual Blast Monitoring Report

In accordance with Condition R4.2 of EPL 20611, the quarry will supply a Blast Monitoring Report with the EPA licence Annual Return, which will include the following information relating to each blast carried out within the premises during the respective reporting period:

a. the date and time of the blast;
b. the location of the blast on the premises;
c. the blast monitoring results at each blast monitoring station; and
d. an explanation for any missing blast monitoring results.

9.5 Annual Review

By the end of March each year the quarry will submit to the DPE Secretary a report reviewing the annual environmental performance of the project. The contents of the required report are detailed in Schedule 5 Condition 4 of PA 09_0175.

10 Protocol for Managing Complaints and/or Exceedances

10.1 Complaints Handling

All complaints received regarding operational air quality from the Project will be acknowledged within 24 hours by appropriate personnel, and investigated within three working days. The complainant will be verbally notified of the outcome from the investigation within a maximum of three working days from receipt of the complaint and where applicable, provided with the necessary written responses within 10 working days, or otherwise agreed with the complainant.

Karuah East will operate a telephone complaints line for the purposes receiving complaints from members of the public in relation to activities conducted at the premises (refer to Section 5.3.5 of Karuah East EMS).

Karuah East will keep a record of any complaint made to the quarry or any employee or any agent of the quarry in relation to air quality from the Project site for at least four years after the complaint was made. Additionally, the record will be available to any authorised officer of the EPA who wishes to view them. Records will include:

- Date and time of complaint;
- Method by which the complaint was made;
- Personal details of the complainant (if provided);
- Nature of the complaint;
- Weather conditions corresponding to the time of the complaint;
- Action taken by the quarry and any follow up actions; and
- If no action was taken, the reason why no action was taken.

For further details on complaint management refer to Section 5.3.5 of the Karuah East EMS. Additionally, Condition M5 of the EPL 20611 outlines the process for recording pollution complaints.

10.2 Non-Compliance Response Procedure

Incident reporting is to be undertaken as per the requirements in **Section 9.2**. In the event of a measured exceedance of the relevant blast emission criteria, the following will be undertaken:

- The situation will be investigated to determine possible emission sources including microscopic analysis of dust deposition samples and investigation into the prevailing wind conditions experienced at the time of the complaint to identify the source of the dust;
- Where the source is identified as the Project site, additional controls will be implemented or operational activities altered until a favourable outcome can be achieved;
- The appropriate Karuah East personnel will be informed of any corrective actions taken or complaint received;
- A full and complete record of the incident, actions and sign-off by an authorised person will be recorded in a log book;

- The appropriate Karuah East personnel shall notify the DPE Secretary and any other relevant agencies as soon as practicable, after becoming aware of the incident (taking into account relevant averaging periods for the relevant air quality criteria); and
- Within 7 days of the incident, the appropriate Karuah East personnel shall provide the DPE Secretary and any relevant agencies with a detailed report of the incident.

Schedule 5 Condition 7 of PA 09_0175 requires:

The Proponent must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must be in writing to compliance@planning.nsw.gov.au and identify the Project (including the project application number and name) and set out the location and nature of the incident.

Schedule 5 Condition 7A of the PA 09_0175 requires:

Within seven days of becoming aware of a non-compliance, The Proponent must notify the Department of the non-compliance. The notification must be in writing to compliance@planning.nsw.gov.au and identify the Project (including the project application number and name), set out the condition of this 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.

Where a significant pollution incident occurs which causes an impact on material harm, reference will also be made to the Karuah East *Pollution Incident Response Management Plan* (PIRMP) for procedures relating to management of pollution incidents. Blast and fume pollution incidents will be investigated and reported in accordance with Karuah East's PIRMP.

11 Periodic Review

The BMP shall be reviewed and revised and/or updated, in accordance with Schedule 5 Condition 5 of PA 09_0175, within three months of any of the following:

- The submission of an annual review;
- The submission of an incident report;
- The submission of an audit; and
- Any modification to the conditions of the PA.

Review of the BMP will also take place if monitoring records indicate that it is warranted or in the event of any significant change to operations or blasting management procedures at the quarry.

The Karuah East management team will discuss and review the status of all management plans on an annual basis, but unless required all site environmental management plans will be reviewed and updated every three years.

Other government agencies will be consulted as part of EIS Modifications.

12 Community Consultation and Performance Monitoring

12.1 Community Consultative Committee

Condition 5 Schedule 6 of PA 09_0175 states that the Proponent shall establish and operate a Community Consultative Committee (CCC) for the project. The CCC must be established and operated in general accordance with the Community Consultative Committees Guidelines for State Significant Projects (Department of Planning; Environment, 2016); and be established prior to the commencement of construction activities, to the satisfaction of the DPE Secretary.

The CCC is to facilitate communication, consultation and information sharing between the quarry and the local community. The CCC for Karuah East Quarry comprises of:

- An independent chair person;
- Three community members;
- One representative from Council;
- One Planning Consultant; and
- Two representatives from the company, including the person with direct managerial responsibility for environmental management at the quarry.

The minutes of all CCC meetings are made publicly available on the Karuah East website at http://hunterquarries.com.au/karuah-east-documents/.

Further details of community consultation are outlined in the EMS.

12.2 Performance Monitoring

Compliance of this BMP with the PA conditions and any other relevant agency requirements will be measured according to the following performance indicators:

- Compliance with relevant blast criteria at monitoring locations;
- Compliance with Australian Standards;
- The frequency and nature of complaints reported to the quarry in relation to blasting events;
- Contractor and employee awareness of the company's Environmental Policy and this BMP; and
- Compliance with this BMP, as indicated by statutory reporting.

12.3 Continual Improvement

Through the effective application of best practice principles to on-site activities including, where cost-effective and practicable, the adoption of best practice technologies and blast control measures, the quarry will continue to improve on the quarry's environmental performance with progress to be monitored against the performance indicators noted in **Section 12.2**.

13 References

Section 75W Application to amend Part 3A Project Approval 09_0175 Minor Increase to Approved Disturbance Area (ADW Johnson 2017);

Environmental Assessment Report – Proposed Karuah East Quarry (ADW Johnson 2013);

Preferred Project Report - Proposed Karuah East Quarry (ADW Johnson 2013);

Noise and Blasting Impact Assessment – Karuah East Quarry Project, Pacific Highway, Karuah (SLR 2012);

Karuah East Quarry Environmental Assessment Section 57W Application (MOD 1) to amend Part 3A Project Approval 09_0175 Minor Increase to Approved Disturbance Area (ADW Johnson 2018a);

Section 75W Application (MOD 1) to amend Part 3A Project Approval 09_0175 Minor Increase to Approved Disturbance Area (ADW Johnson 2018b);

Response to Submissions Section 75W Application (MOD 1) to amend Part 3A Project Approval 09_0175 Minor Increase to Approved Disturbance Area (ADW Johnson 2018a); and

Response to Submissions Section 75W Application (MOD 2) to amend Part 3A Project Approval 09_0175 Minor Increase to Approved Disturbance Area (ADW Johnson 2018b).

APPENDIX A

Consultation with EPA regarding Management Plans

From: Karen Marler [mailto:Karen.Marler@epa.nsw.gov.au]
Sent: Wednesday, 14 October 2015 12:53 PM
To: Blake Almond
Cc: Peter Jamieson; Jocelyn Karsten; EPA RSD Hunter Region Mailbox; Christopher Jones
Subject: RE: Karuah East Quarry Project - Management Plans [EPA]

Hi Blake, the EPA does not approve management plans. In response to requests regarding consultation on management plans we provide the following standard response..

The Environment Protection Authority (EPA) encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, the EPA does not review these documents as our role is to set environmental objectives for environmental management, not to be directly involved in the development of strategies to achieve those objectives.

Regards

K

Karen Marler
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APPENDIX A2

DPE Comments on Draft BMP

2.5 Blast Management Plan (BMP)

Under Schedule 3, Condition 12 of the Project Approval 09_0175, KEQ is required to prepare and implement a Blast Management Plan to the satisfaction of the Secretary. Refer to the table below for the applicable approval requirements, the relevant sections in the submitted MP and the Department's review comments.

09_0175 Requirement	Section	Review Comment	Further Action
The Proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Secretary. This plan must:			
(a) be prepared by a suitably qualified expert whose appointment has been approved by the Secretary;	n/a	Requirement has been met satisfactorily.	NFA
(b) be prepared in consultation with Council and EPA, and submitted to the Secretary for approval prior to the commencement of construction activities;	Section 1.1	This requirement has only partially been met. Consultation with agencies to be provided in Appendix of management plan.	Please provide EPA consultation correspondence.
(c) describe the measures that would be implemented to ensure: • *best management practice is being employed; and* • *compliance with the relevant conditions of this approval;*	Section 6	Requirement has been met satisfactorily. The BMP includes appropriate blast design parameters, public safety protocols, meteor logical monitoring and consultation with nearby quarries and neighbouring residences.	NFA
(d) include a road closure protocol if blasting occurs within 500 metres of a public road;	Section 6.4	Requirement has been met satisfactorily. Blasting not undertaken within 500m of a public road.	NFA
(e) include a specific blast fume management protocol, to demonstrate how emissions will be minimised including risk management strategies if blast fumes are generated; and	Section 8	• 8.2 – include "presence of water in drill holes" as a cause of NOx Fume Emissions. • The BMP includes a description of the causes and management practices of fume emissions, as well as a visual fume identification/rating scale. The fume rating scale identifies the various levels of fume emissions, however the BMP does not specifically provide risk management strategies if blast fumes are generated.	Please include risk management strategies based on the fume rating scale.
(f) include a monitoring program for evaluating the performance of the project including: • *compliance with the applicable criteria; and* • *minimising fume emissions from the site.*	Section 7, 9, & 10.	Requirement has been met satisfactorily.	NFA
Other Comments			
	Section 2.4	Table 4 – please clarify what 'deck loading' is.	
	Section 3.1	Third Paragraph – Change 'Minister for Planning' to 'Planning Assessment Commission'	Amend text.
	Section 10.1	First sentence – change 'should' to 'will'.	Amend text.

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