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Karuah East Quarry Project

Blast Management Plan

Report Number 630.11235-R2

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Karuah East Quarry Pty Limited

PO Box 3284

Thornton NSW 2322

Version: Revision 0

Karuah East Quarry Project

Blast Management Plan

PREPARED BY:

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
10 Kings Road
New Lambton NSW 2305 Australia
(PO Box 447 New Lambton NSW 2305 Australia)
T: +61 2 4037 3200 F: +61 2 4037 3201
newcastleau@slrconsulting.com www.slrconsulting.com

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Reference	Status	Date	Prepared	Checked	Authorised
630.11235-R2	Revision 0	29 October 2015	Nathan Archer	Chris Jones	Chris Jones
630.11235-R2	Final to DP&E	16 October 2015	Nathan Archer	Chris Jones	Chris Jones
630.11235-R2	Draft for Consultation	15 September 2015	Nathan Archer	Chris Jones	Chris Jones

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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).
- Project Approval 09_0175;
- 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 the Project Approval (PA) which required this plan to be prepared in consultation with Council and EPA.

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

Great Lakes 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 Great Lakes 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 DP&E for review on 16 October 2015. The BMP has been updated to incorporate all comments received. The DP&E's review is attached as **Appendix A2**.

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 the PA and as summarised in **Table 1.**

Table 1 Operating Conditions

Condition	Requirement	Relevant Section
Schedule 3 – Environmental Performance Conditions		
Operating Conditions		
11	The Proponent shall:	-
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**
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 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 Secretary.	-

Requirements of the BMP are provided in Schedule 3, Condition 12 and Schedule 5, Condition 3 of the PA. These are reproduced in **Table 2** together with the relevant section(s) of the BMP where the requirements have been addressed.

Table 2 Project Approval (PA 09_0175) Requirements

Condition	Requirement	Relevant Section
Schedule 3 – Environmental Performance Conditions		
Blast Management Plan		
12	The Proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Secretary. This plan must:	This document
12(a)	Be prepared by a suitably qualified expert whose appointment has been approved by the Secretary;	Letter from DP&E approving SLR on 22/7/2015

Condition	Requirement	Relevant Section
12(b)	Be prepared in consultation with Council and EPA, and submitted to the 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**
Schedule 5 – Environmental Management, Reporting and Auditing		
Management Plan Requirements		
3	The Proponent shall 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**
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 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.

2.3 Environment Protection Licence Requirements

The Environment Protection Authority (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 3** together with the relevant sections of the BMP indicating where the requirements have been addressed.

Table 3 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**

2.4 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 4** below.

Table 4 Statement of Commitments

Condition	Commitment	Relevant Section
Noise, Blasting and Vibration[1]		
5	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
	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[2]; • 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;	**Section 6**

Condition	Commitment	Relevant Section
	• 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.	

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 & extension of Blue Rock Lane, realignment of Andesite Road & 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;
- 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 the PA and Condition L5.1 of the EPL, the Proponent shall ensure that blasting on the site is only carried out during the hours presented in **Table 5**.

Table 5 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 the PA the Proponent will not carry out more than two (2) 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 6** and **Figure 2**. Also presented in **Table 6** is the closest distance at which blasting could potentially occur to the identified receivers.

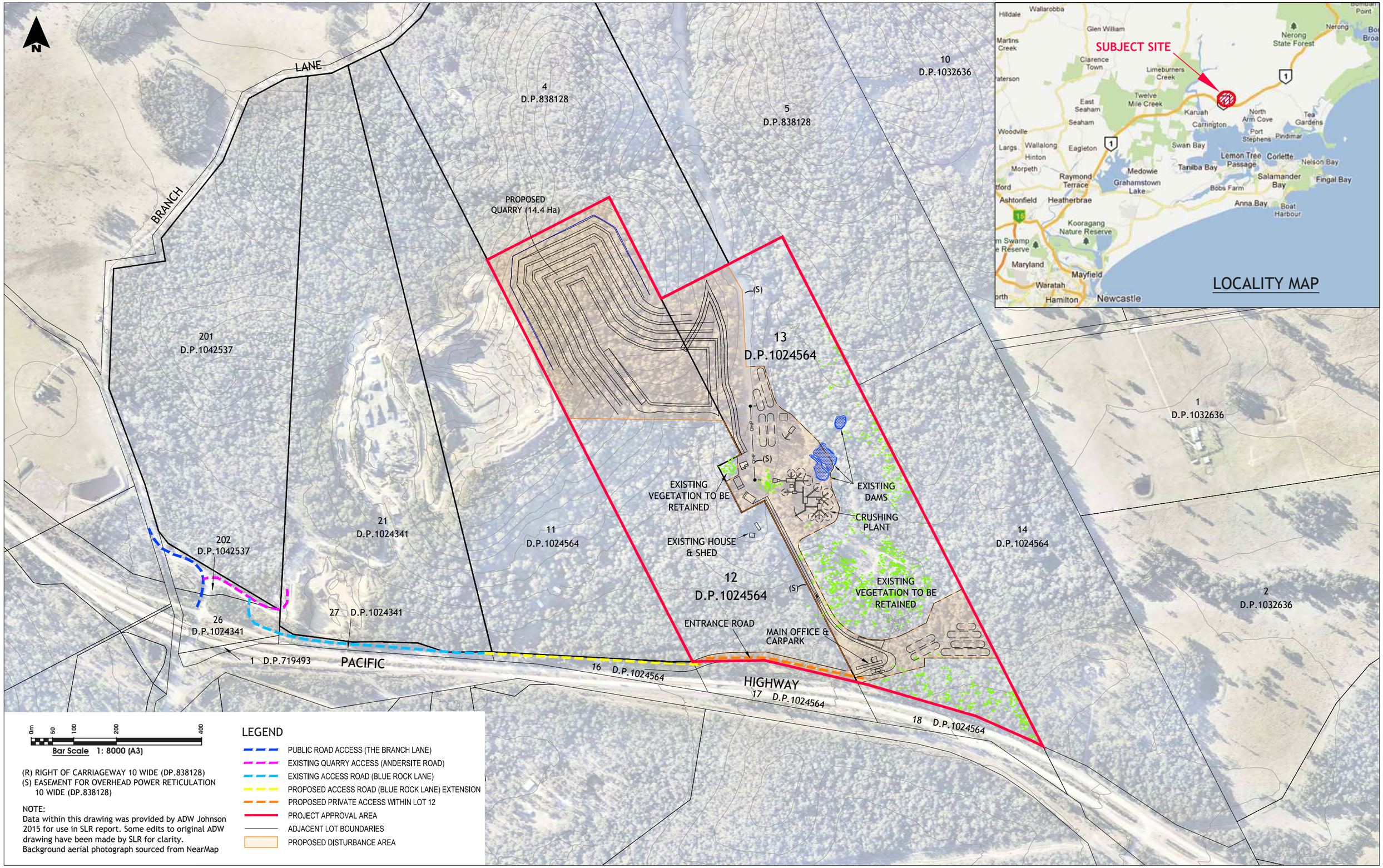
Table 6 Sensitive Receivers

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 6**, 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.



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Karuah East Quarry - Site and Locality Plan

FIGURE 1

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Karuah East Quarry - Sensitive Receivers and Blasting Monitoring Locations

FIGURE 2

4 BLASTING CRITERIA

4.1 PA Schedule 3 Condition 8

Blasting criteria for the Project are provided in Schedule 3, Condition 8 of the PA and are summarised in **Table 7**.

Table 7 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 Condition L5

Conditions L5.3 to 5.6 of the EPL detail the blast limits for the project. The blast limits contained in the EPL are consistent with those presented in **Table 7**.

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 Environmental Management Reports (AEMRs). **Table 8** presents a summary of the blast monitoring results as reported in the AEMRs from 1 August 2010 to 15 January 2015.

Table 8 Summary of Blast Monitoring Results 2010 to 2015

Blast monitoring summary	Monitor 1 (Front Gate)	Monitor 2 (Nearest Approved Resident to Karuah Quarry)
Total No. of blasts monitored	65	65
Blasts exceeding 5 mm/s	0	0
Blasts exceeding 115 dBL	1	0
Average PPV (mm/s)	1.25	0.98
Maximum PPV (mm/s)	2.79	1.96
Average airblast (dBL)	108	108
Maximum airblast (dBL)	115.6	115.0

As presented in **Table 8** between 2010 and 2015:

- 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 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 are detailed below:

6.1 Operating Conditions

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

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.

As such, the four (4) metre noise barriers around the stockpile and stacker locations will be constructed prior to the commencement of quarrying activities (during construction phase).

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 where appropriate to avoid broken ground or cavities in the face.

6.3 Public Safety

In accordance with Schedule 3 Condition 11 of the PA, Karuah East will 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 the PA, Condition L5.2 of the EPL 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 9 presents a summary of the blast monitoring requirements of this BMP as prescribed by Condition M7.1 of the EPL.

Table 9 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 4 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 the 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 should 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.

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	

Source: AEISG 2011.

Figure 3 Visual NOx Fume Rating Scale

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 if possible.

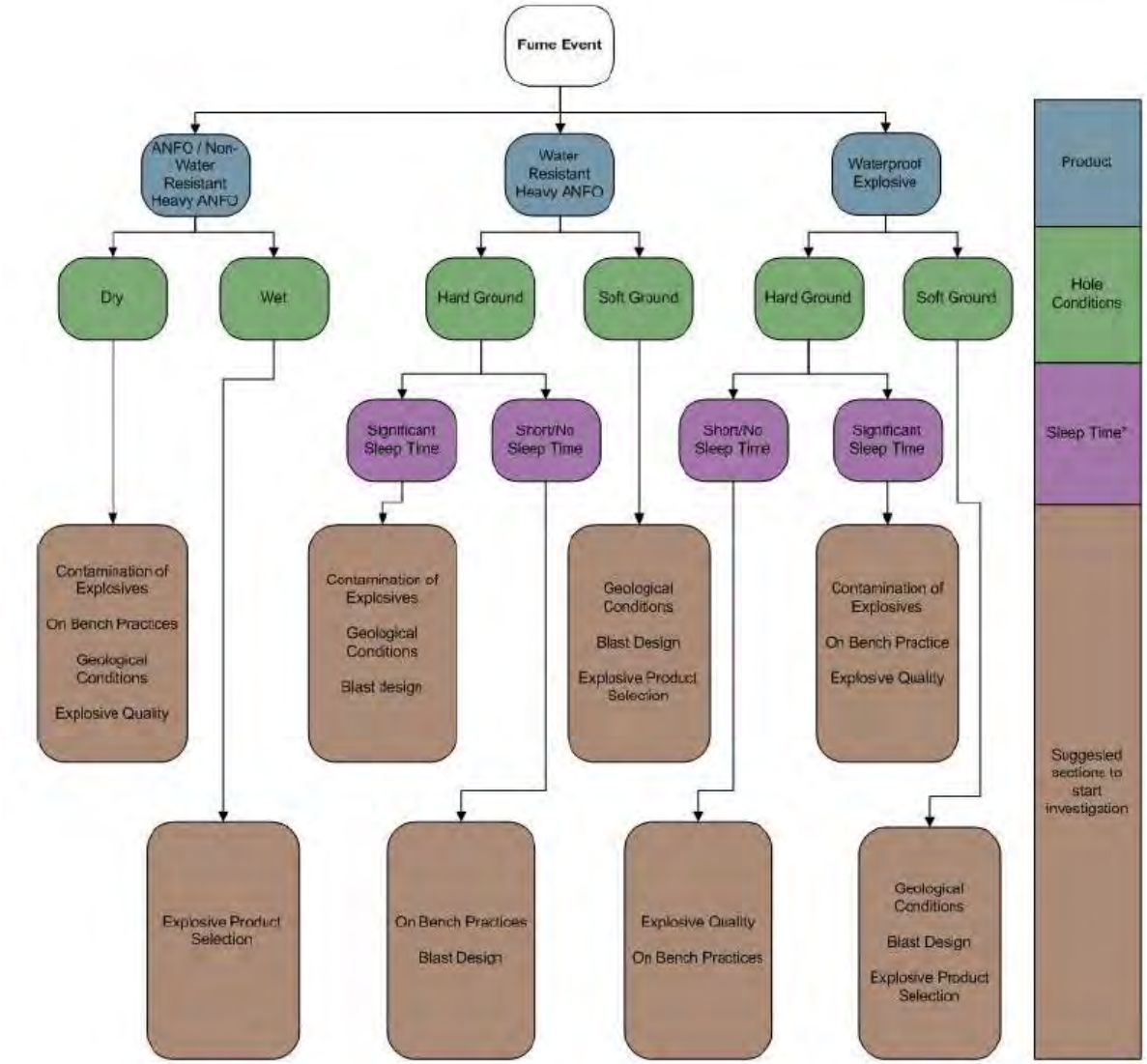
In accordance with the AEISG Code of Practice, if any person has been exposed to NOx gases, medical treatment will be sought as soon as it is safe to do so in accordance with the Karuah East Emergency Response Procedures.

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 **Figure 4** 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.



Source: AEISG 2011.

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 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 the EPL, 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.

A detailed incident report will be submitted to the Secretary and relevant agencies within seven (7) working days of the incident and results of related investigations will be reported to the Secretary as soon as possible in accordance with Condition 5 of Schedule 7 of the PA.

There is a low likelihood that a blasting impact would cause material harm to the environment. If this is the case the incident would be reported immediately to the DP&E and other relevant departments as per the requirement of Schedule 5 Condition 7 of the PA:

The Proponent shall immediately notify the Secretary and any other relevant agencies of any incident that has caused, or threatens to cause, material harm to the environment.

For any other incident associated with the project, the Proponent shall notify the Secretary and any other relevant agencies as soon as practicable after the Proponent becomes aware of the incident. Within 7 days of the date of the incident, the Proponent shall provide the Secretary any relevant agencies with a detailed report on the incident, and such further reports as may be requested.

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 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 the EPL, 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 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 the PA.

10 PROTOCOL FOR MANAGING COMPLAINTS AND/OR EXCEEDENCES

10.1 Complaints Handling

All complaints received regarding blast impacts from the Project will be responded to within 24 hours by appropriate personnel.

The quarry will keep a record of any complaint made to the quarry or any employee or agent of the quarry in relation to blasting at the Project site. 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.

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 an investigation will be undertaken to determine the likely cause of the exceedance. The investigation will seek to determine:

- Whether the exceedance of the criteria was directly related to the blast or if environmental factors contributed to the exceedance;
- The primary cause of the incident;
- Any contributing factors which led to the incident; and
- Whether appropriate controls were implemented to prevent the incident.
- Details of any non-compliance and the results of investigations will be reported to relevant agencies as soon as possible.

Corrective and/or preventative actions will be assigned to relevant responsibilities as a result of the investigation. Actions will be communicated through planning meetings and toolbox talks and outstanding actions will be monitored for their effectiveness upon completion. 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 the PA, within three (3) 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.

Any modifications to the BMP will be undertaken in consultation with the appropriate government agencies.

12 COMMUNITY CONSULTATION AND PERFORMANCE MONITORING

12.1 Community Consultative Committee

Condition 5 Schedule 6 of the PA states that the Proponent shall establish and operate a Community Consultative Committee (CCC) for the project. The CCC must be operated in general accordance with the *Guidelines for Establishing and Operating Community Consultative Committees for Mining Projects (Department of Planning, 2007)* and be established prior to commencement of construction activities, to the satisfaction of the Secretary.

The CCC is to facilitate communication, consultation and information sharing between the quarry and the local community. Further details of community consultation will be 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 as required.
- 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.
- 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**.

APPENDIX A1

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
Head Regional Operations Unit - Hunter| **NSW Environment Protection Authority** |
☎: (02) 49086803 | Mobile ☎: 0409 606 368 | 🖷: (02) 49086810|🖰: karen.marler@epa.nsw.gov.au

APPENDIX A2

DP&E 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.