



# **ANNUAL REVIEW FOR THE KARUAH EAST HARD ROCK QUARRY, KARUAH, NSW**

***Review Period: 1 January, 2017 – 31  
December 2017***

***Prepared by Karuah East Quarry Pty Ltd and SLR Consulting***

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APPENDIX 6 – Water Monitoring Data

APPENDIX 7 – *Tetratheca juncea* Monitoring

APPENDIX 8 – Audit Action Plan Status Update

## ABBREVIATIONS

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<b>CCC</b>	Community Consultative Committee
<b>DA</b>	Development Application
<b>DDG</b>	Dust Deposition Gauge
<b>DPE</b>	NSW Department of Planning and Environment
<b>EA</b>	Environmental Assessment
<b>EIS</b>	Environmental Impact Statement
<b>EMS</b>	Environmental Management Strategy
<b>EPL</b>	Environment Protection Licence
<b>Ha</b>	Hectare
<b>km</b>	Kilometre
<b>L</b>	Litre
<b>LDP</b>	Licensed Discharge Point
<b>OEH</b>	Office of Environment and Heritage
<b>POEO Act</b>	Protection of the Environment Operations Act 1997
<b>NPWS</b>	NSW National Parks and Wildlife Service, now part of OEH
<b>RFS</b>	NSW Rural Fire Service
<b>SLR</b>	SLR Consulting Australia Pty Ltd
<b>SWMP</b>	Site Water Management Plan
<b>tpa</b>	tonnes per annum

## **i      PURPOSE OF THE REPORT**

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Karuah East Quarry Pty Ltd (Karuah East Quarry) has prepared this report which fulfils the Annual Review requirement of the Project Approval PA 09\_0175 (Schedule 5, Condition 4).

This Annual Review covers the reporting period from the **1 January 2017 to 31 December 2017**.

This report provides specific detail on the project including a summary of environmental monitoring data and environmental performance during the reporting period. All environmental data in full can be supplied at request.

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<b>Name of Operation</b>	Karuah East Quarry Pty Ltd
<b>Name of Operator</b>	Karuah East Quarry Pty Ltd
<b>Development Consent / Project Approval #</b>	PA 09_0175
<b>Name of holder of Development Consent / Project Approval</b>	Karuah East Quarry Pty Ltd
<b>Mining Lease #</b>	None
<b>Water Licences</b>	None
<b>Annual Review start date</b>	1 January 2017
<b>Annual Review end date</b>	31 December 2017
<p>I, Alex Badior, certify that this audit report is a true and accurate record of the compliance status of Karuah East Hardrock Quarry for the period 1 January 2017 to 31 December 2017 and that I am authorised to make this statement on behalf of Karuah East Quarry Pty Ltd.</p> <p><i>Note.</i></p> <p><i>The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, \$1 million and for an individual, \$250,000.</i></p> <p><i>The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or \$22,000, or both).</i></p>	
<b>Name of authorised reporting officer</b>	Alex Badior
<b>Title of authorised reporting officer</b>	a/Quarry Manager
<b>Signature of authorised reporting officer</b>	
<b>Date</b>	26.3.18

## 1.0 STATEMENT OF COMPLIANCE

**Tables 1 - 3** outline the compliance status of the quarry operations at the end of the 2017 reporting period in accordance with relevant approval conditions.

**Table 1 Statement of Compliance**

Were all conditions of the relevant approval(s) complied with?	
Project Approval (PA 09_0175)	NO
Environment Protection Licence (No. 20611)	NO

**Table 2 DPE Compliance Status Key**

Risk level	Colour code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with: <ul style="list-style-type: none"> <li>potential for serious environmental consequences, but is unlikely to occur; or</li> <li>potential for moderate environmental consequences, but is likely to occur</li> </ul>
Low	Non-compliant	Non-compliance with: <ul style="list-style-type: none"> <li>potential for moderate environmental consequences, but is unlikely to occur; or</li> <li>potential for low environmental consequences, but is likely to occur</li> </ul>
Admin NC	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

**Table 3 Non-Compliance**

Relevant Approval	Condition #	Condition Description (Summary)	Compliance Status	Site Comment	Where Addressed in Annual Review
PA 09_0175	Schedule 3 Condition 16	Air Quality Management Plan requirements	Non - compliance relating to overrun of samples (incorrect HVAS sampling frequency)	In both June and December, HVAS filters were not changed at the correct time leading to an overrun of the sample	Section 6.4.3
PA 09_0175	Schedule 3 Condition 19	Surface Water Discharges	Non-compliance relating to exceedance of concentration limits during the three discharge events.	Exceedance of pH, TSS and Oil and Grease. concentration limits. pH is naturally low in the area, and investigations suggest oil and grease levels caused by natural sources	Section 7.6

Relevant Approval	Condition #	Condition Description (Summary)	Compliance Status	Site Comment	Where Addressed in Annual Review
PA 09_0175	Schedule 3 Condition 21	Water Management Plan requirements	Non-compliance relating to frequency of groundwater level monitoring	Groundwater level monitoring undertaken every 6 months during construction phase rather than quarterly	Section 3.3 and Section 7.4
PA 09_0175	Schedule 3 condition 27	<i>Tetratheca juncea</i> translocation	Non-compliance with sub condition e – performance criteria	Identified in Independent Environmental Audit and addressed in Audit Action Plan.	Section 10 Appendix 8
PA 09_0175	Schedule 3 condition 29	Long Term Security of Offsets	Non-compliance relating to finalisation of conservation agreement	Identified in Independent Environmental Audit and addressed in Audit Action Plan.	Section 10 Appendix 8
PA 09_0175	Schedule 3 condition 32	Landscape and Rehabilitation Management Plan	Non-compliance relating to soil stockpiling within cleared area	Identified in Independent Environmental Audit and addressed in Audit Action Plan.	Section 10 Appendix 8
PA 09_0175	Schedule 3 condition 34	Conservation and Rehabilitation Bond	Non-compliance relating to date of submission of Bond	Identified in Independent Environmental Audit and addressed in Audit Action Plan.	Section 10 Appendix 8
PA 09_0175	Schedule 5 condition 7	Incident Reporting	Non-compliance relating to reporting of exceedance of EPL discharge criteria	Identified in Independent Environmental Audit and addressed in Audit Action Plan.	Section 10 Appendix 8
EPL 20611	L1.1	Pollution of waters	Non-compliance relating to reporting of exceedance of EPL discharge criteria	Identified in Independent Environmental Audit and addressed in Audit Action Plan.	Section 10 Appendix 8
EPL 20611	L2.1	Concentration Limits	Non-compliance relating to exceedance of concentration limits during the three discharge events.	Exceedance of pH, TSS and Oil and Grease. concentration limits. pH is naturally low in the area, and investigations suggest oil and grease levels caused by natural sources.	Section 7.6 Section 10 Appendix 8
EPL 20611	L2.2	Concentration Limits		Identified in Independent Environmental Audit and addressed in Audit Action Plan.	
EPL 20611	L2.4	Concentration Limits		Identified in Independent Environmental Audit and addressed in Audit Action Plan.	

Relevant Approval	Condition #	Condition Description (Summary)	Compliance Status	Site Comment	Where Addressed in Annual Review
EPL 20611	M2.2	Air Monitoring Requirements	Non - compliance relating to overrun of samples (incorrect HVAS sampling frequency)	In both June and December, HVAS filters were not changed at the correct time leading to an overrun of the sample	Section 6.4.3
EPL 20611	M6.1	Telephone Complaints Line	Non-compliance relating to complaint number not being easily identifiable on company website	Identified in Independent Environmental Audit and addressed in Audit Action Plan.	Section 9.3 Section 10 Appendix 8
EPL 20611	M6.2	Telephone Complaints Line		Website updated in July 2017	

## 2.0 INTRODUCTION

This Annual Review covers the reporting period from the **1 January 2017** to **31 December 2017** for the Karuah East Quarry.

### 2.1 Project Overview

Karuah East Quarry is located on Lots 12 and 13 (DP 1024564) off the Pacific Highway, approximately three kilometres north of Karuah, NSW.

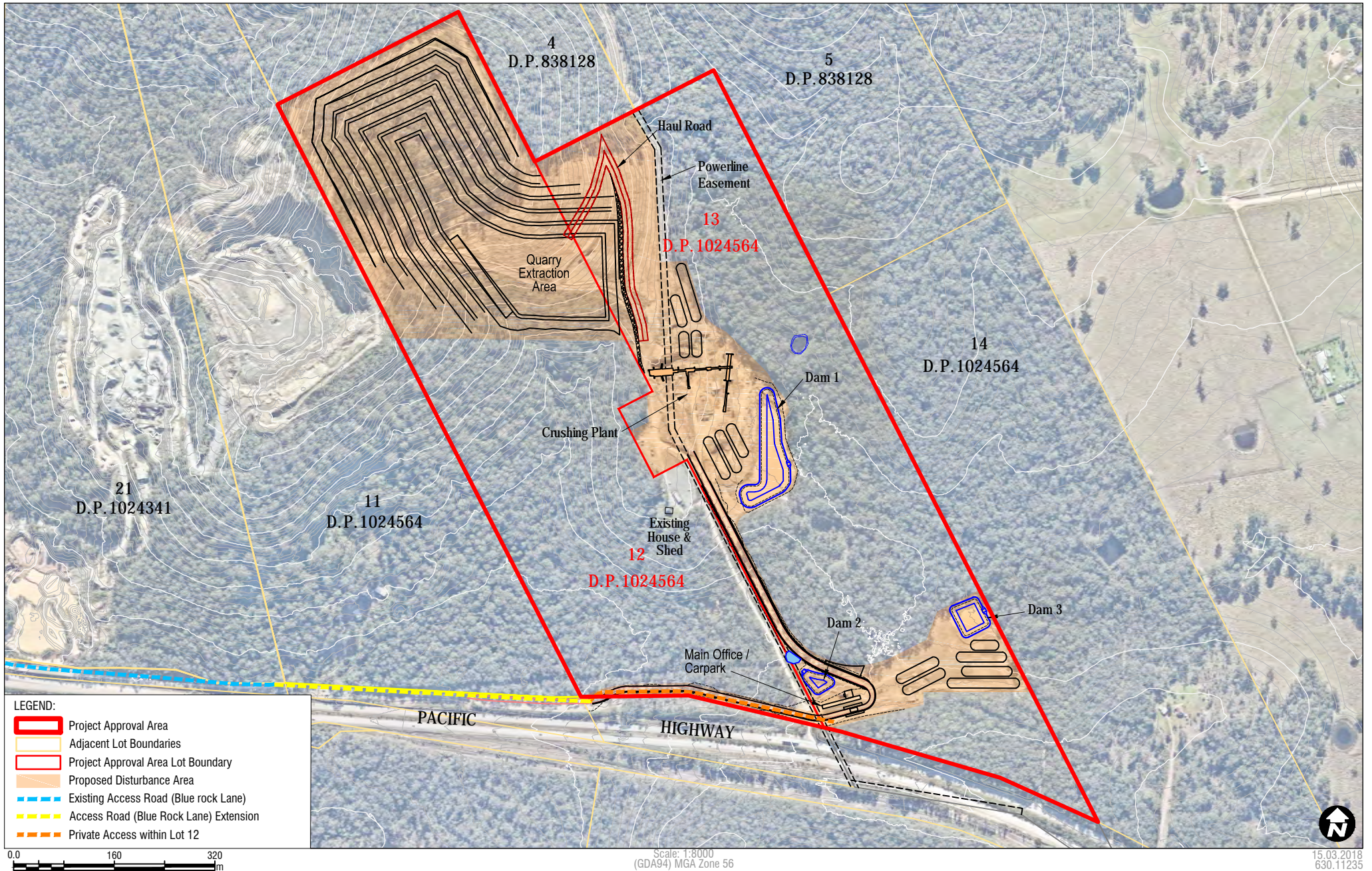
The approved development includes the following key elements:

- 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<sup>3</sup> of overburden (approximately 750,000 tonnes) from the quarry extraction area. Removal of overburden is not included in the proposed annual extraction rate of 1.5 million tonnes of andesite;
- 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 truckloads per day (at maximum production);
- Implementation of erosion and sediment and water management control works to ensure no loss of sediment, minimise dust generation and 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 and Andesite Road intersection;
- Employment of up to 28 onsite staff;
- Construction of a new haul road and access through adjoining Roads and Maritime Services (RMS) land;
- Staged clearing;
- Drilling and blasting activities;
- Loading and hauling of extracted material;
- Crushing and screening of extracted material;
- Stockpiling of material onsite; and
- Location of plant on Lot 13 comprised of office buildings, workshops, parking areas, crushing plant, wash plant, weigh bridge and product storage areas.

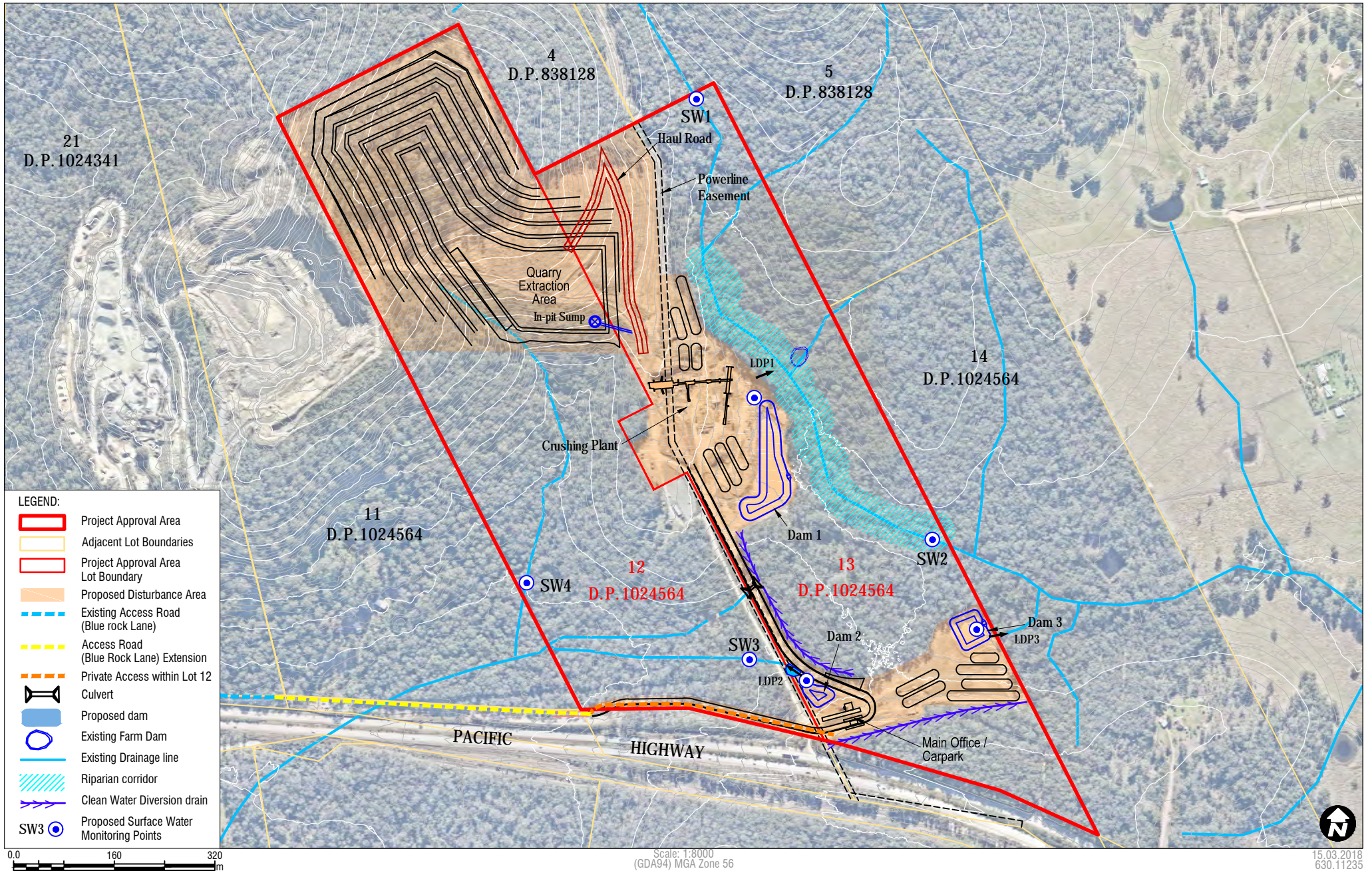
Operations commenced on 16 November 2017, with further details provided in **Section 4**.

**Figure 1** presents the Karuah East Quarry site plan and layout. **Figure 2** outlines the water management system.











### 3.0 APPROVALS

The Karuah East Quarry is required to hold relevant approvals for the quarrying operations. These approvals are detailed in **Table 4**, and attached as **Appendix 1 and 2**.

**Table 4 Current Consents and Licences**

Instrument	Date of Issue	Date of Expiration	Comments
Project Approval (PA 09_0175)	17 June 2014	31 December 2034	This is the main statutory document for the site
Federal Approval (EPBC 2014/7278)	20 March 2015	30 March 2045	Federal approval relating to the <i>Environment Protection Biodiversity Conservation (EPBC) Act 1999</i>
Environment Protection Licence (No. 20611)	26 August 2015	-	The EPL is a requirement of the <i>Protection of the Environment Operations Act (POEO Act) 1997</i>

Following detailed quarry plant design, it has been identified that a minor extension to the approved disturbance area will allow for improved operational efficiencies associated with plant infrastructure within the quarry by reducing internal truck movements, allowing for better vehicle manoeuvrability and improving site security. During the reporting period, ADW Johnson prepared and submitted a *Section 75W Application to amend Part 3A Project Approval 09\_0175* in December 2017 for this minor increase to the approved disturbance area. Details of this modification and any further modifications undertaken to PA 09\_0175 will be detailed in the 2018 Annual Review.

The Karuah East Quarry Environment Protection Licence (EPL 20611) covers all activities at Karuah East Quarry. **Table 5** outlines the licensing limits for production and material handling.

**Table 5 EPL Fee-Based Activity**

EPL Fee-Based Activity	Current Scale (tpa)
Crushing, Grinding or Separating	> 500,000 t – 2,000,000 t processed
Land-based extractive activity	> 500,000 t – 2,000,000 t obtained

Copies of the approvals are attached as **Appendix 1 and 2**. An Annual Compliance Report for EPBC Approval 2014/7282 is prepared each year and is available on the Hunter Quarries website <http://hunterquarries.com.au/karuah-east-documents/>.

### 3.1 Management Plans

The site operates under a series of approved environmental management plans, including:

- *Environmental Management Strategy;*
- *Air Quality and Greenhouse Gas Management Plan;*
- *Biodiversity Offset Area Management Plan;*
- *Blast Management Plan;*
- *Heritage Management Plan;*
- *Landscape and Rehabilitation Management Plan;*
- *Noise Management Plan;*
- *Traffic Management Plan;*
- *Water Management Plan;* and
- *Tetratheca juncea Translocation Program.*

These management plans are being updated in the first half of 2018.

### 3.2 Consent Conditions for Reporting in the Annual Review

The preparation of an Annual Review is required by Schedule 5, Condition 4 of PA 09\_0175. This Annual Review has been prepared in accordance with the Department of Planning and Environment's (DPE) *Annual Review Guidelines* (2015).

**Table 6** details the requirements of Condition 4 of Schedule 5 of PA 09\_0175 and the respective section(s) in this document where these consent conditions are addressed.

**Table 6 Checklist for Annual Review Reporting**

Condition Number	Condition Requirement for Annual Review	Document Section
Schedule 5, Condition 4(a)	<i>By the end of March each year, the Proponent shall review the environmental performance of the project to the satisfaction of the Secretary. This review must:</i> <i>(a) describe the development (including rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year;</i>	This document. First Annual Review
Schedule 5, Condition 4(b)	<i>(b) include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, which includes a comparison of these results against:</i> <ul style="list-style-type: none"> <li><i>the relevant statutory requirements, limits or performance measures/criteria;</i></li> <li><i>the monitoring results of previous years; and</i></li> <li><i>the relevant predictions in the EA;</i></li> </ul>	Section 6
Schedule 5, Condition 4(c)	<i>identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;</i>	Section 11
Schedule 5, Condition 4 d)	<i>identify any trends in the monitoring data over the life of the project;</i>	No trends yet as less than one year of data
Schedule 5, Condition 4(e)	<i>identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and</i>	Section 6
Schedule 5, Condition 4(f)	<i>describe the measures that would be implemented over the current calendar year to improve the environmental performance of the project.</i>	Section 12

### 3.3 Government Agencies Feedback

Karuah East received a letter from the DPE dated 3 May 2017 which stated that the 2016 Annual Review had been reviewed and it generally satisfied the requirements of the Project Approval in relation to the Annual Review. No further updates or changes were required to the 2016 document.

A Show Cause letter was received from the DPE on 8 September 2017 in relation to the potential non-compliance with PA 09\_0175. An Official Caution letter was received from the DPE on 16 October 2017 regarding non-compliance with Schedule 3, condition 21 of the PA 09\_0175. **Section 7.4** contains further details on groundwater monitoring.

## 4.0 OPERATIONS SUMMARY

The following section briefly describes the general operation and environmental performance of Karuah East Quarry during this 2017 reporting period.

### 4.1 Land Preparation

During the reporting period no land clearing or preparation was undertaken.

### 4.2 Construction Activities

During 2017 there was a large amount of construction associated with the Karuah East Quarry Project, including:

- Blue Rock Close road has been completed, with a Construction Completion Certificate issued by the RMS on 15 November 2017;
- The internal access road has been completed - the road has been capped and sealed as required. This road is the main entry to the Quarry site from Blue Rock Close;
- The installation of the disturbance boundary fencing commenced on 14 August 2017. The fencing is installed as a chain-wire fauna exclusion fence;
- The weighbridge, wheel wash and weighbridge office and amenities have been completed;
- The primary crushing plant was completed in September 2017;
- Dam 2 was reconstructed on 24 August 2017;
- Construction on the entry gate was completed in November 2017 started; and
- First stage of extraction area has been developed.



**Photo 1 – Internal access road and chain-wire fence (November 2017)**



**Photo 2 – Crushing plant with extraction area in background (November 2017)**



**Photo 3 – Weighbridge and Office (November 2017)**

### 4.3 Quarry Operations

Karuah East Quarry officially commenced operations on 16 November 2017. Material is now being transported offsite via the new Blue Rock Close entry. The current operations involve progressive drilling and blasting, which is followed by crushing and screening to produce the required materials.

The monthly production summary during the reporting period is included in **Table 7**.

**Table 7 Monthly Production Summary (tonnes)**

Month	Monthly total (tonnes)
1 Jan 17 – 14 Nov 17	Construction only
16 Nov 17 – 30 Nov 17	10,293
Dec 17	16,884
<b>Total production for the Annual Review period</b>	<b>27,177</b>

Project Approval 09\_0175 permits the extraction of up to 1.5 million tonnes per annum from Karuah East Quarry. As evident from **Table 7**, the 2017 production total was significantly below this annual limit.

### 4.4 Operating Hours

In accordance with Schedule 2, Condition 7 of the PA 09\_0175, Karuah East Quarry operates during the following hours (see **Table 8**):

**Table 8 Approved Operating Hours**

Activity	Operating Hours
Quarrying Operations	7.00 am to 6.00 pm, Monday to Friday; and 7.00 am to 1.00 pm, Saturdays. No quarrying operations on Sundays or Public Holidays
Construction activities	7.00 am to 6.00 pm, Monday to Friday; and 8.00 am to 1.00 pm, Saturdays. Unless noise from the activities does not exceed 35 dB(A) <sub>L<sub>Aeq</sub>(15minute)</sub> at any privately-owned residence.
Maintenance activities	24 hours a day, 7 days per week, providing maintenance activities are inaudible at any privately-owned residence.

*Note: This condition does not apply in the event of a direction from police or other relevant authority for safety or emergency reasons regarding works which may need to be undertaken to avoid loss of life, property loss and/or to prevent environmental harm.*

### 4.5 Operating Equipment

During the 2017 reporting period the following equipment were utilised for the construction of the Karuah East Quarry:

- Excavator x 4;
- Bulldozer x 2;
- Mobile crusher (screening and crushing equipment);
- Front end loader;
- 13,000 L water tanker;
- Onsite Haul trucks x 2; and
- Road Grader.

Once operations commenced in November 2017, the primary crushing plant was commissioned and utilised. Mobile crushers were used for secondary crushing.

## 4.6 Next Reporting Period

**Table 9** outlines forecast operations for the next reporting period.

**Table 9 Forecast Operations for Next Reporting Period**

Aspect	Forecast for Next Reporting Period
Pit Expansion Areas	The extraction area will be developed further in 2018
Infrastructure Development / Upgrades	Permanent amenities will be constructed for quarry staff during 2018, along with a new workshop.
Mining Fleet Upgrades	There will be a requirement for additional mining fleet to be purchased as extraction rates increase. Stage 2 of the crushing plant will commence in 2018.



## 5.0 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

The actions required as an outcome of the previous Annual Review, including any actions that have been undertaken and when the actions were completed are provided in **Table 10**.

**Table 10 Actions Required from Previous Annual Review**

Action Required from Previous Annual Review	Action taken by Operator	Where Discussed in Annual Review
Complete the Independent Environmental Audit	The Independent Environmental Audit was completed in July 2017 by EMM Consulting.	Section 10
Complete construction activities and commence operations	Operations commenced in November 2017. Construction activities will be ongoing in the 2018 reporting period to support ongoing operations.	Section 4
Continue environmental monitoring in accordance with management plans and approval requirements	On-going	Section 6
Continue CCC and community support	On-going	Section 9
Continue to update the website with monitoring data and key environment and community information	On-going	Section 9

## 6.0 ENVIRONMENTAL PERFORMANCE

**Appendix 3** includes a number of Figures that identify the location of the environmental monitoring sites discussed in the following sections.

### 6.1 Meteorological Monitoring

Schedule 3, Condition 17 of PA 09\_0175 requires:

*For the life of the project, the Proponent shall ensure that there is a suitable meteorological station operating in the vicinity of the site that complies with the requirements in the Approved Methods for Sampling of Air Pollutants in New South Wales guideline.*

A new meteorological station was installed in August 2016 which is used by both the Karuah Quarry and Karuah East Quarry. The location of the station is shown in **Appendix 3**. It should be noted that although the meteorological data has been presented for the full year, operational activities associated with Karuah East Quarry commenced in mid/November 2017.

**Table 11** presents a summary of the meteorological data collected by the meteorological station during the Annual Review reporting period.

**Table 11 Annual Review Meteorological Data**

Month	Temp (C°)			Rainfall			Wind
	Average (°C)	Min Temp (°C)	Max Temp (°C)	Total (mm)	Max Daily (mm)	No rain days > 1 mm	Max Wind Gust (km/h)
Jan/17	25.5	15.5	43.7	61.4	36.4	8	55.6
Feb/17	25.3	13.1	46.7	87.6	43.6	8	62.7
Mar/17	21.9	13.2	33.8	282.2	45.2	18	56.8
Apr/17	17.1	7.3	27.9	100.6	26.8	12	47.3
May/17	14.5	2.3	25.9	21.8	7.4	5	37.9
Jun/17	12.6	4.3	20.0	228.4	44.4	16	33.1
Jul/17	10.8	0.8	23.5	25.4	20.2	2	52.1
Aug/17	12.3	3.0	27.8	51.8	21.4	5	59.2
Sep/17	16.3	3.7	35.6	21.0	12.6	2	34.8
Oct/17	19.2	7.9	37.0	91.8	35.0	8	54.4
Nov/17	19.4	8.7	32.0	86.2	23.6	10	52.1
Dec/17	23.8	12.5	42.5	40.6	13.0	8	78.1

Average temperatures during the reporting period ranged from 10.8 degrees Celsius (°C) to 25.5 °C, with a maximum of 46.7 °C recorded in February 2017. Heavy rainfall events occurred in both March and June 2017 (over 200mm recorded for the month), with the rest of the year ranging from 21.8mm to 100.6mm per month. The maximum wind gust was recorded in December 2017. 2017 total rainfall was 1098.8mm compared to a total of 1229.5mm in 2016.

## 6.2 Noise

### 6.2.1 EIS / Preferred Project Report Predictions

#### Construction

All predicted construction noise levels (stage 1 of quarry lifecycle) are below project specific noise criteria (SLR, 2012).

#### Operations

As part of the *Noise and Blasting Impact Assessment* (SLR, 2012), noise levels are predicted based on the three stages of the quarry lifecycle. All predicted levels were below the project specific noise criteria.

### 6.2.2 Approved Criteria

Approved noise criteria from PA 09\_0175 are outlined in **Table 12** and are based on the *Interim Construction Noise Guidelines* (ICNG) (EPA, 2009).

#### Construction

**Table 12 ICNG Construction Noise Management Levels**

Time of Day	Management Level	How to apply
Recommended standard hours : Monday to Friday 7:00am to 6:00pm	Noise affected RBL + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise.  Where the predicted or measured $L_{Aeq,(15mins)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise.  The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
Saturday 8:00am to 1:00pm No work on Sundays or public holidays	Highly noise affected 75 dBA	The highly affected noise level represents the point above which there may be strong community reaction to noise.  Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise below this level.  If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise levels of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected RBL + 5 dBA	A strong justification would typically be required for works outside the recommended standard hours.  The proponent should apply all feasible and reasonable work practices to meet the noise affected level.  Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.

In accordance with the ICNG, **Table 13** presents the adopted construction noise goals for the project.

**Table 13 Project Specific Construction Noise Goals (dBA LAeq(15minute))**

Location	Adopted RBL <sup>1</sup>	Noise Management Level (dBA LAeq(15minute))	
		Noise Affected	Highly Noise Affected
Any approved Residence on Lot 11 DP 1024564 <sup>2</sup>	44	54	75
A to E	44	54	
F	44	54	
G	34	44	

Note 1 – Adopted RBL as outlined in Noise Management Plan.

Note 2 – At present there is no approved residence on Lot 11.

### **Operational**

Operational noise criteria are outlined in Schedule 3, Condition 3 of PA 09\_0175 and state:

*The Proponent shall ensure that the operational noise generated by the project does not exceed the criteria in **Table 14**.*

**Table 14 Operational Noise Criteria (dBA LAeq(15minute))**

Location	Criteria (day)
Residence on Lot 11 DP 1024564	43
A	40
B	37
G	38
All other residences	35

The noise criteria in **Table 14** do not apply if the Proponent has an agreement with the relevant landowner to generate higher noise levels.

### **EPL Condition L4**

The noise limits set out in Condition L4.1 of the EPL 20611 are reproduced in **Table 15** are generally consistent with the criteria detailed in PA 09\_0175.

**Table 15 EPL Noise Limits (dBA LAeq(15minute))**

Location	Noise Limit dBA - Day LAeq(15minute)
Residence A on Lot 100 DP 785172	40
Residence B on Lot 3 DP 785172	37
Residence G on Lot 1 DP 1032636	38
Any other residence or sensitive receiver not subject to a private negotiated agreement	35
Any approved residence on Lot 11 DP 1024564	43

## Operational Noise Limits on Lot 11

It is noted that the noise limits detailed in EPL 20611 for Lot 11 are for “any approved residence on Lot 11 DP 1024564”. Currently, there is not an approved residence on Lot 1, therefore it is considered that the noise limits do not currently apply at this location.

As outlined in Section 1.1 of the *Noise Management Plan*, the DPE agree that criteria only applies to ‘Residence on Lot 11’ if there is a Council approved residence within Lot 11. At this point in time, there is not a Council approved residence on Lot 11. Karuah East Quarry is committed to undertaking noise monitoring to determine compliance at ‘approved residences’ only. Should a residence be approved by Council on Lot 11, the *Noise Management Plan* will be updated to include noise monitoring at this location.

### 6.2.3 Key Environmental Performance or Management Issues

In accordance with PA 09\_0175, both attended and unattended noise monitoring has been conducted at the nearest residential receivers to the quarry during the 2017 reporting period.

A summary of the results are provided in **Tables 16 to 24** below, with full copies of the noise monitoring reports appended to this Annual Review (see **Appendix 4**). Construction noise levels were within the consent condition criteria at all locations during the monitoring period.

#### February 2017 Construction Noise Monitoring

**Table 16 Operator Attended Noise Survey Results (February 2017)**

Date/Start Time Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission and Typical Maximum Levels LAmax – dBA
	LAmax	LA1	LA10	LA90	LAeq	
Location F Day 10/02/2007 11:02 am W = 1.5 m/s NW Temp = 33°C	79	68	48	42	55	Local road traffic 79 dBA Pacific Highway 45 to 55 dBA Frogs/insects 45 to 47 dBA Birds 50 to 54 dBA <b>Karuah East Project construction not audible</b>
Location G Day 10/02/2017 10:33am W = 1.5 m/s NW Temp = 34°C	56	44	41	35	39	Pacific Highway 35 to 42 dBA Frogs/Insects 38 to 51 dBA Birds 42 to 56 dBA Aeroplane 45 dBA <b>Karuah East Project construction audible</b> Engine noise 35 to 37 dBA Reversing beeper 30 to 35 dBA Loading clunk 37 to 41 dBA <b>Estimated LAeq(15 minute) noise contribution 36 dBA</b>

**Table 17 Compliance Noise Assessment – Construction (February 2017)**

Location	Estimated LAeq(15minute) Contribution	Consent Conditions LAeq(15minute)	Compliance
Location F	<32 <sup>1</sup>	54	Yes
Location G	36	44	Yes

Note 1: Karuah East construction activities remained inaudible during operator attended noise measurement suggesting that any contribution would be at least 10 dB below the overall LA90 noise level presented in **Table 15**.

Results presented in **Table 16 and 17** indicate that compliance with the relevant consent conditions was achieved at all noise monitoring locations for February 2017 monitoring.

Karuah East Quarry construction activities were found to be inaudible and therefore noise contributions from the quarry were found to be within the relevant consent condition criteria at all monitoring locations.

### **May 2017 Construction Noise Monitoring**

**Table 18 Operator Attended Noise Survey Results (May 2017)**

Date/Start Time Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission and Typical Maximum Levels LAmax – dBA
	LAmax	LA1	LA10	LA90	LAeq	
Location F Day 04/05/2017 12:59 pm W = Calm Temp = 19°C	79	65	50	44	54	Local road traffic 75 to 79 dBA Pacific Highway 43 to 53 dBA <b>Karuah East Project construction audible in lulls</b> Rock hammer 42 to 46 dBA <b>Estimated construction LAeq(15 minute) noise contribution &lt;30 dBA</b>
Location G Day 04/05/2017 1:42 pm W = 1.5 m/s Temp = 19°C	56	44	41	35	39	Pacific Highway 43 to 53 dBA Frogs/Insects 35 to 38 dBA Birds 43 to 53 dBA Aeroplane 44 dBA <b>Karuah East Project construction audible</b> Reversing beeper 35 dBA <b>Estimated construction LAeq(15 minute) noise contribution &lt;30 dBA</b>
Location D Day 04/05/2017 2:28pm W = Calm Temp = 20°C	73	69	63	57	61	Pacific Highway 58 to 73 dBA Birdsong to 45 dBA <b>Karuah East Project construction audible</b> Rock breaker 58 to 63 dBA <b>Estimated construction LAeq(15 minute) noise contribution 59 dBA</b>

**Table 19 Compliance Noise Assessment – Construction (May 2017)**

Location	Estimated LAeq(15minute) Contribution	Noise Management Level LAeq(15minute)		Compliance	
		Noise Affected	Highly Noise Affected	Noise Affected	Highly Noise Affected
Location F	41	54	75	Yes	Yes
Location G	<30	44		Yes	Yes
Location D	59	54		No	Yes

Results presented in **Table 18 and 19** indicate that compliance with the relevant consent conditions was achieved at noise monitoring locations F and G for May 2017 monitoring. The measured construction LAeq(15 minute) noise levels exceeded the Noise Affected criterion at Location D, however remained below the Highly Noise Affected Criterion. The main noise contributor was from a rock breaker used for construction the access road.

### August 2017 Construction Noise Monitoring

**Table 20 Operator Attended Noise Survey Results (August 2017)**

Date/Start Time Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission and Typical Maximum Levels LAmax – dBA
	LAmax	LA1	LA10	LA90	LAeq	
Location F Day 23/08/2017 13:48 W = Calm Temp = 21°C	54	50	48	41	45	Pacific Highway 43 to 54 dBA Birds 35 to 42 dBA <b>Karuah East Project construction not audible</b>
Location G Day 23/08/2017 14:18 W = 2.5 m/s SSE Temp = 21°C	56	49	46	40	43	Pacific Highway 40 to 45 dBA Birds 34 to 56 dBA Local traffic 45 dBA <b>Karuah East Project construction audible</b> Crushers 31 dBA <b>Estimated construction LAeq(15 minute) noise contribution 31 dBA</b>

**Table 21 Compliance Noise Assessment – Construction (August 2017)**

Location	Estimated LAeq(15minute) Contribution	Consent Conditions LAeq(15minute)	Compliance
Location F	<31 <sup>1</sup>	54	Yes
Location G	31	44	Yes

Note 1: Karuah East construction activities remained inaudible during operator attended noise measurement suggesting that any contribution would be at least 10 dB below the overall LA90 noise level presented in **Table 19**.

Results presented in **Table 20 and 21** indicate that compliance with relevant consent conditions were achieved at all noise monitoring locations for construction during the August 2017 monitoring event.

### December 2017 Operational Noise Monitoring

**Table 22 Operator Attended Noise Survey Results (December 2017)**

Date/Start Time Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission and Typical Maximum Levels LAmax – dBA
	LAmax	LA1	LA10	LA90	LAeq	
Location F Day 13/12/2017 15:39 W = 4.5m/s NE Temp = 31°C	78	66	51	46	56	Local road traffic 75 to 78 dBA Pacific Highway 38 to 49 dBA Insects 39 to 48 dBA <b>Karuah East Project inaudible</b>
Location G Day 12/12/2017 14:45 W = 4 m/s NE Temp = 31°C	66	48	44	41	43	Pacific Highway 32 to 38 dBA Insects 35 to 39 dBA Birds 34 to 66 dBA Wind gusts 33 to 35 dBA Residential construction 35 to 42 dBA <b>Karuah East Project inaudible</b>

**Table 23 Compliance Noise Assessment – Operations (December 2017)**

Location	Estimated LAeq(15minute) Contribution	Consent Conditions LAeq(15minute)	Compliance
Location F	Inaudible	35	Yes
Location G	Inaudible	38	Yes

Results presented in **Table 22 and 23** indicate that compliance with relevant consent conditions were achieved at all noise monitoring locations for operations during the December 2017 monitoring event.

Unattended noise monitoring was also conducted at location G from Monday 4 December 2017 to Monday 11 December 2017 inclusive, the results of which are provided in **Table 24**.

**Table 24 Compliance Noise Assessment – Operations (December 2017)**

INP Period	LA1	LA10	LA90	LAeq
<b>Location G</b>				
Daytime <sup>1</sup>	69	66	54	67
Evening <sup>2</sup>	66	64	51	59
Night <sup>3</sup>	67	64	52	62

1. Daytime - 7.00 am to 6.00 pm Monday to Friday, 7.00 am to 1.00 pm Saturday, not operational on Sunday.

2. Evening - 6.00 pm to 10.00 pm.

3. Night - 10.00 pm to 7.00 am Monday to Saturday, 10.00 pm to 8.00 am Sunday.

Given observations made during the operator attended noise survey at the monitoring location, it is likely that daytime noise levels at Location G were dominated by road traffic noise from the Pacific Highway and natural sources such as birdsong, insects, and livestock.

#### 6.2.4 Management Measures

The following best practice noise control measures shall continue to be implemented:

- Adherence to operating hours;
- Noise monitoring will be undertaken on site and within the community;
- Keep plant and equipment well maintained;
- Regular inspection and maintenance of equipment to ensure it is in good working order and operating at the lowest feasible noise level;
- Equipment is not to be operated until it is maintained or repaired;
- Regular training for staff and contractors (i.e. toolbox talks) for the use of equipment in ways to minimise noise;
- Operate mobile plant in a quiet, efficient manner;
- Switching off vehicles and plant when not in use;
- A speed limit of 40 km/hour or less will be applied and enforced for all construction related vehicles onsite;
- Incorporate clear signage at the site including relevant contact numbers for community enquiries; and
- Prompt response to any community concerns.

#### 6.2.5 Proposed Improvements to Management Measures

Noise monitoring indicates that the noise levels emitted by the site were below the requirements in the PA 09\_0175 criteria during the construction and operation phase at Karuah East Quarry during 2017. Operational noise monitoring will continue to be completed during the 2018 Annual Review period.



Additional noise mitigation measures will be put in place in 2018 now the site is operational in accordance with the Noise Management Plan.

## 6.3 Blasting

### 6.3.1 EIS Predictions

The Noise Impact Assessment (NIA) (SLR, 2012) prepared as part of the EIS, developed blasting site laws for Karuah East Quarry based on 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 6.3.2**. Based on the predicted blast results the blast emission criteria are predicted to be met without imposing any significant constraints on blast design throughout the life of the quarry.

### 6.3.2 Approved Criteria

Blasting criteria for the site are provided in Schedule 3, Condition 8 of PA 09\_0175 and are summarised in **Table 25**.

**Table 25 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

Conditions L5.3 to 5.6 of EPL 20166 detail the blast limits for the project. The blast limits contained in the EPL are consistent with those presented in PA 09\_0175.

### 6.3.3 Key Environmental Performance or Management Issues

There have been 8 blasts during the reporting period at Karuah East Quarry, the results of the blast monitoring undertaken are contained in **Table 26**. Note that Monitor 1 is located at the front gate of the quarry and is for internal monitoring purposes only.

Blast monitoring locations are shown in **Appendix 3**.

**Table 26 Blast Results 2017**

Date and time	Overpressure and vibration	Monitor 2 (Nearest Residence)
11/01/2017 12:37 pm	Overpressure dB(L)	Below detection limits
	Vibration (mm/s)	Below detection limits
23/01/2017 1:18 pm	Overpressure dB(L)	97.8
	Vibration (mm/s)	0.68
06/02/2017 12:33 pm	Overpressure dB(L)	Below detection limits
	Vibration (mm/s)	Below detection limits
10/02/2017 12:33 pm	Overpressure dB(L)	Below detection limits
	Vibration (mm/s)	Below detection limits
19/04/2017 12:50 pm	Overpressure dB(L)	102.7
	Vibration (mm/s)	0.68

Date and time	Overpressure and vibration	Monitor 2 (Nearest Residence)
15/05/2017 12:05pm	Overpressure dB(L)	Below detection limits
	Vibration (mm/s)	Below detection limits
21/09/2017 12:28 pm	Overpressure dB(L)	Below detection limits
	Vibration (mm/s)	Below detection limits
26/10/2017 12:33 pm	Overpressure dB(L)	111.4
	Vibration (mm/s)	1.34

During the 2017 Annual Review reporting period:

- 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.

#### 6.3.4 Management Measures

Section 6 of the *Blast Management Plan* outlines the proposed blasting controls on site. In summary these include:

- Considerations of explosive loading, initiation sequence and firing;
- Use of experienced blast contractors;
- Monitoring of meteorological conditions prior to blasting; and
- Notifying landowners (at their request) and occupiers of blast events.

Additionally, all blasting activities at Karuah East Quarry are monitored by a licensed blasting contractor.

#### 6.3.5 Proposed Improvements to Management Measures

Karuah East Quarry will continue to monitor all blasts at Receptor B as per the approved *Blast Management Plan*. Blast design and management will be completed in accordance with the approved *Blast Management Plan*.

### 6.4 Air Quality

#### 6.4.1 EIS Predictions

The revised Air Quality Impact Assessment (AQIA) (updated for the Preferred Project Report) indicates that Karuah East Quarry may operate without significant impact on the surrounding environment. In particular, the updated AQIA has confirmed that potential cumulative impacts of Karuah East Quarry and existing Karuah Quarry are well below acceptable criteria levels and will not impose adverse impacts. Overall, it has been demonstrated that the AQIA for Karuah East Quarry is acceptable in terms of air quality considerations for both the construction and operational phases.

#### 6.4.2 Approved Criteria

AQIA criteria relevant to the Project are provided in Schedule 3, Condition 13 and Tables 3 to 5 of PA 09\_0175 and have been reproduced in **Table 27**, **Table 28**, and **Table 29**. The criteria are prescribed by the NSW Environment Protection Authority (EPA) in their document, *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2005)* (Approved Methods).

All reasonable and feasible avoidance and mitigation measures are to be employed so that particulate matter emissions generated by the project do not exceed the criteria in **Table 27** to **Table 29** at any residence on privately owned land.

**Table 27 Long-term impact assessment criteria for particulate matter**

Pollutant	Averaging Period	<sup>d</sup> Criterion
Total suspended particulate (TSP) matter	Annual	<sup>a</sup> 90 µg/m <sup>3</sup>
Particulate matter < 10 µm (PM <sub>10</sub> )	Annual	<sup>a</sup> 30 µg/m <sup>3</sup>

**Table 28 Short-term impact assessment criteria for particulate matter**

Pollutant	Averaging Period	<sup>d</sup> Criterion
Particulate matter < 10 µm (PM <sub>10</sub> )	24 hour	<sup>a</sup> 50 µg/m <sup>3</sup>

**Table 29 Long-term impact assessment criteria for deposited dust**

Pollutant	Averaging Period	Maximum increase in deposited dust level	Maximum total deposited dust level
<sup>c</sup> Deposited dust	Annual	<sup>b</sup> 2 g/m <sup>2</sup> /month	<sup>a</sup> 4 g/m <sup>2</sup> /month

Notes to **Table 27** to **Table 29** above:

- Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to all other sources).
- Incremental impacts (i.e. incremental increase in concentrations due to the project on its own).
- Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003 Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter - Deposited Matter - Gravimetric Method.
- Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agreed by the Director-General in consultation with EPA.

No specific limit conditions are specified for air quality emissions in EPL 2166.

### 6.4.3 Key Environmental Performance or Management Issues

The principle source of air pollution at the quarry is in the form of airborne dust, which arises from activities such as construction, quarrying, vehicle movements and crushing. Air quality monitoring has been performed to meet the *Approved Methods of Sampling and Analysis of Air Pollutants in NSW*.

#### Depositional Dust

Depositional dust results are outlined within **Table 30**. There is a comparison between construction and operations.

All dust gauges were below the annual average for Karuah East Quarry during both construction and operations in the reporting period.

The average depositional dust results during the two operational months are slightly higher at all dust gauges than the average results during construction only, with the exception of DDG 3 which remained the same. There were no contaminated results during the reporting period.

**Table 30 Depositional Dust Monitoring Summary (g/m<sup>2</sup>/month)**

Date	DDG 1	DDG 2	DDG 3	DDG 4	DDG 5	Comment
<b>Construction</b>						
21/12/2016 to 18/01/2017	0.4	0.8	0.7	2.5	3.1	Construction activities
18/01/2017 to 16/02/2017	1.3	0.9	1.2	1.2	1.9	Construction activities
16/02/2017 to 20/03/2017	0.4	1.4	0.5	3.8	1.3	Construction activities
20/03/2017 to 21/04/2017	0.6	0.7	0.5	0.8	1.3	Construction activities
21/04/2017 to 23/05/2017	0.6	0.6	1.1	0.8	0.8	Construction activities
23/05/2017 to 20/06/2017	0.5	1.3	0.9	1.6	0.5	Construction activities
20/06/2017 to 18/07/2017	0.4	0.2	0.5	1.2	0.4	Construction activities
18/07/2017 to 17/08/2017	0.6	0.5	0.6	0.5	0.8	Construction activities
17/08/2017 to 14/09/2017	1.4	0.2	1.4	1.5	0.7	Construction activities
14/09/2017 to 12/10/2017	1.1	0.1	1.2	1.8	1.5	Construction activities
12/10/2017 to 09/11/2017	1.7	0.5	0.9	1.0	1.2	Construction activities
<b>Annual Average (Jan to October 2017)</b>	0.8	0.7	0.9	1.5	1.2	
<b>Minimum (Jan to October 2017)</b>	0.4	0.1	0.5	0.5	0.4	
<b>Maximum (Jan to October 2017)</b>	1.7	1.4	1.4	3.8	3.1	
<b>Operations</b>						
09/11/2017 to 07/12/2017	1.0	1.8	0.7	1.8	2.1	Operations commenced 16 November 2016
07/12/2017 to 08/01/2018	1.3	0.6	1.1	1.7	1.3	Operations
<b>Annual Average (November to December 2017)</b>	1.15	1.2	0.9	1.8	1.7	
<b>Minimum (November to December 2017)</b>	1	0.6	0.7	1.7	1.3	
<b>Maximum (November to December 2017)</b>	1.3	1.8	1.1	1.8	2.1	

### High Volume Air Sampler

**Table 31** outlines the High Volume Air Sampler (HVAS) results during the 2017 reporting period.

**Table 31 High Volume Air Sampler Results (µg/m³)**

Date	TSP (µg/m³)	PM10 (µg/m³)	Comments
06/01/2017	30	14	
12/01/2017	42	24	
18/01/2017	44	18	
24/01/2017	40	21	
30/01/2017	34	18	
05/02/2017	40	24	
11/02/2017	54	36	
17/02/2017	41	20	
23/02/2017	30	16	
01/03/2017	13	11	
07/03/2017	30	16	
13/03/2017	30	18	
19/03/2017	21	15	
25/03/2017	25	17	
31/03/2017	25	14	
06/04/2017	12	7	
12/04/2017	13	6	
18/04/2017	17	11	
24/04/2017	18	10	
30/04/2017	18	10	
06/05/2017	17	5	
12/05/2017	23	14	
18/05/2017	20	10	
24/05/2017	23	9	
30/05/2017	20	9	
05/06/2017	11	7	
11/06/2017	9	7	
17/06/2017	18	9	Value is a 48 hour average for two scheduled run dates (17/6/17 and 23/6/17).
26/06/2017	12	9	An unscheduled "catch up" sample day for the 23/6/17.
29/06/2017	9	6	
05/07/2017	16	6	
11/07/2017	11	5	
17/07/2017	10	4	
23/07/2017	10	2	
29/07/2017	9	3	
04/08/2017	6	1	
10/08/2017	14	2	

Date	TSP ( $\mu\text{g}/\text{m}^3$ )	PM <sub>10</sub> ( $\mu\text{g}/\text{m}^3$ )	Comments
16/08/2017	25	9	
22/08/2017	14	9	
28/08/2017	16	6	
03/09/2017	15	9	
09/09/2017	14	6	
15/09/2017	20	6	
21/09/2017	26	15	
27/09/2017	55	22	
03/10/2017	14	6	
09/10/2017	31	16	
15/10/2017	12	7	
21/10/2017	26	12	
27/10/2017	13	8	
2/11/2017	28	14	
8/11/2017	11	7	
14/11/2017	17	6	
20/11/2017	11	8	
26/11/2017	9	5	
2/12/2017	32	19	Sample over a 72 hour period covering sample dates 2/12, 8/12 and 14/12
8/12/2017	-	-	Overrun from 2/12
14/12/2017	-	-	Overrun from 2/12
20/12/2017	58	29	
26/12/2017	25	16	
<b>Year to date Average</b>	<b>22.1</b>	<b>11.6</b>	
<b>Year to date minimum</b>	<b>6.0</b>	<b>1.0</b>	
<b>Year to date maximum</b>	<b>58.0</b>	<b>36.0</b>	
<b><sup>1</sup>24hr Max Criteria</b>	<b>N/A</b>	<b>50</b>	
<b><sup>1</sup>Annual Average Criteria</b>	<b>90</b>	<b>30</b>	

**Notes:**

- <sup>1</sup> = Maximum criteria as specified in PA 09\_0175

There was an elevated Total Suspended Particulates (TSP) result in December and an elevated Particulate Matter less than 10 microns (PM<sub>10</sub>) result in February 2017, however both TSP and PM<sub>10</sub> was below the relevant 24 hour and annual average criteria during the reporting period.

EPL 20611 Condition M2.2 and the *Air Quality Management Plan* (required by PA 09\_0175 Schedule 3 Condition 16) require monitoring of TSP and PM<sub>10</sub> every 6 days. In both June and December 2017, there was an overrun of the samples (due to filters not being changed on the correct days) resulting in a non-compliance with these conditions.

#### 6.4.4 Management Measures

The following best practice air quality control measures will be implemented operational phase of the quarry:

- Disturb only the minimum area necessary for onsite activities;
- Exposed areas are rehabilitated as soon as practicable with inert material and vegetation;

- Perform regular inspections of weather conditions to identify conditions which would be unfavourable in terms of dust levels at nearest sensitive locations blowing in the direction of sensitive receptors and implement remedial measures where required;
- All trafficable areas and vehicle manoeuvring areas in or on the premises will be maintained in a condition that will minimise the emission of dust to the air, or emission from the premises of wind-blown or traffic generated dust;
- Trucks entering and leaving the premises that are carrying loads of dust generating materials will have their loads covered at all times, except during loading and unloading; and
- All plant and equipment to be installed at the site to be maintained and operated in a proper and efficient condition, in accordance with manufacturer's instructions and POEO Act and Regulation.

#### 6.4.5 Proposed Improvements to Management Measures

The Karuah East Quarry will continue to monitor air quality in accordance with the conditions of PA 09\_0175 and will also review measures for improving dust management on site. Air quality monitoring during this reporting period illustrated dust levels are compliant with PA 09\_0175 criteria.

### 6.5 Biodiversity

#### 6.5.1 EIS Predictions

Major design amendments were undertaken in an effort to substantially decrease potential flora and fauna impacts associated with the Karuah East Quarry. This has resulted in a significant reduction in potential direct impacts on two state and federally listed threatened flora species - *Tetratheca juncea* and *Grevillea parviflora ssp parviflora*.

No Endangered Ecological Communities or Critically Endangered Ecological Communities listed under the *Threatened Species Conservation Act 1995* (TSC Act) and EPBC Act were recorded.

#### 6.5.2 Approved Criteria

There are no specific criteria associated with biodiversity management for the Karuah East Quarry. Activities are completed in accordance with the Preferred Project Report, Federal Approval, *Biodiversity Offset Area Management Plan* and *Land and Rehabilitation Management Plan* (LRMP).

#### 6.5.3 Key Environmental Performance or Management Issues

##### **Biodiversity Offset Area and Lot 12**

The Biodiversity Offset Area (BOA) for the Karuah East Quarry is a 131.49ha consolidated land parcel comprised of three lots:

- Lot 13 DP 1024564 (part);
- Lot 14 DP 1024564; and
- Lot 5 DP 838128.

Ecological monitoring for the Karuah East Quarry was completed by Kleinfelder in October 2017. A copy of the 2017 Ecological Monitoring Report is attached as **Appendix 5**.

A total of 18 vegetation monitoring sites were established and surveyed within the BOA and Lot 12 in October 2015. These permanent monitoring sites were surveyed in October 2016 and October 2017 using the same methods as the baseline survey (see **Appendix 5**). A series of criteria have been developed as part of the overall ecological monitoring program, including:

- Fencing, gates and signage;
- Access tracks;

- Erosion, sedimentation and soil management;
- Existing dwellings;
- Revegetation and regeneration;
- Habitat augmentation;
- Threatened flora translocation;
- Weed control;
- Vertebrate pest management; and
- Fire management.

The results from the 2017 monitoring indicate that while some species are stressed from dry conditions, the vegetation and fauna habitats within the Karuah East Biodiversity Offset Area (BOA) and Lot 12 are in high condition and remain relatively unchanged since the baseline survey.

The 2017 threatened species monitoring identified a decrease in threatened flora abundance at the majority of the monitoring locations. Decline in threatened species abundance cannot be confidently attributed to the quarry disturbance as there is no correlation between monitoring points with higher percentage of decline and proximity to the quarry; high levels of decline (>10%) was observed at both sites close to and away from the impact area. A likely cause for the decrease in threatened species abundance is the below average rainfall experienced throughout 2017 in the region (Kleinfelder, 2018).

Some sites did exhibit growth and had healthy plants. Typically, these sites were more protected, occurring lower areas and along protected creek lines.

#### **Tetradlea juncea Translocation**

In accordance with the Translocation Plan for *Tetradlea juncea* (*T.juncea*) (Firebird ecoSultants, 2015), monitoring of *T.juncea* was undertaken by Firebird ecoSultants (2017) to satisfy the requirements of the PA 09\_0175 for the Karuah East Quarry.

The site was originally surveyed and found that the approved impact area had 243 clumps of *T.juncea*. However, at the time of translocation (May 2016) 367 individuals were recorded. Translocation of the *T.juncea* located within the impact area to the offset area will assist in protecting the genetic diversity of the population.

The 367 *T.juncea* individuals were translocated into prepared areas within the offset area which covered between 2,500m<sup>2</sup> and 3,000m<sup>2</sup>. The offset area was selected to ensure that an appropriate vegetation community and aspect would replicate the source environment as much as practicable.

The collection method entailed digging within the offset before collecting a translocation section from the impact area and placing the section into the hole within the offset. Site preparation included the removal of threatening processes that may impact upon the success of plant survival. These include weed control, protection from herbivory and management of fire risks. An irrigation system was installed to ensure moisture levels remain adequate for plant survival.

In October 2017, monitoring of the *T. juncea* individuals was undertaken in accordance with the Translocation Plan for *T. juncea* (Firebird, 2015). Monitoring involved the following:

- Flower Counts;
- Observe general plant health;
- Identify all plants within each Section; and
- Photo points.

The monitoring of the *T. juncea* translocation as of October 2017 has shown a survival flowering rate of 51% for the second year of monitoring. Kleinfelder (2018) also observed a significant decrease in *T. juncea* numbers in the nearby biodiversity offset site during their annual monitoring survey.



It has been observed that some *T. juncea* had commenced flowering earlier in 2017 than in previous years at the translocation site as well as in other areas around the Hunter Region. It has also been observed that *T. juncea* at both the translocation site and the nearby biodiversity offset site also began flowering much later in the year, some individuals were observed to be in flower in March 2018. It is therefore considered that the observed decline in *T. juncea* individuals may be a result of sporadic flowering as a response to irregular climatic factors such as high temperatures and low rainfall. The global increase in temperature may influence *T. juncea* to flower earlier in the year, however the below average rainfall may also result in the *T. juncea* to withhold from flowering until they experience more rainfall. The significance of this is that some *T. juncea* at the translocation site may have already stopped flowering or not yet begun flowering at the time of the October 2017 survey. It is also possible that stress from these climatic factors has led to the death of some individuals. However, it should be noted that the translocation site is considerably more overgrown with native vegetation than the previous year which increased the chance of potentially missing individual *T. juncea* during the survey effort.

However, it should also be noted that the translocation site is considerably more overgrown with native vegetation than the previous year. *T. juncea* are quite difficult to find when they are not in flower, particularly in heavily vegetated areas. Thus, it is considered that there was a chance of potentially missing individual *T. juncea* during the survey effort which would result in a lower predicted rate of survival.

A further three years of monitoring will be able to show more certainty of the success of translocation of *T. juncea*.



**Photo 6 - *T. juncea* in flower in October 2017**



**Photo 7 – Unhealthy/browning *T. juncea***

Please see **Appendix 7** for the full report.

During 2017, the Independent Environmental Audit (**see Section 10**) identified that the translocation plan is compliant with conditions (a) through (d) and (f) of Schedule 3, Condition 27 of PA 09\_0175. However, it is not compliant with (e) as it does not include performance criteria to measure the success of the program. The Audit Action Plan (**Appendix 8**) confirms that the translocation plan will be updated to satisfy this condition.

#### **6.5.4 Management Measures**

A large number of management strategies are proposed within the BOA based on the key aspects listed in **Section 6.5.3**. These are outlined in Section 3 of the BOA Management Plan (Kleinfelder 2015).

A large number of management strategies relating to land management and rehabilitation are outlined within the LRMP, including:

- Inductions;
- Controlling access to the site;
- Weed and feral animal management;
- Pre-clearing protocol;
- Salvaging of key resources during clearing (including removal of habitat trees);
- Fauna displacement and relocation; and
- Seed collection and propagation.



### 6.5.5 Proposed Improvements to Management Measures

The Karuah East Quarry will continue to implement the BOA Management Plan and LRMP during 2018. Kleinfelder (2018) recommend that fence installation, salvaged habitat installation, weed control, fire management plan and vertebrate pest monitoring are undertaken in 2018. These actions will be undertaken in accordance with the relevant sections of the BOA Management Plan.

It should be noted that Karuah East has already completed the following activities in 2018:

- Exclusion fauna fencing installed up to the extraction;
- 95 nest boxes were installed in February 2018; and
- Lantana sprayed twice in a limited area in the Lot 13 BOA.

## 6.6 Heritage (Aboriginal and Non-Aboriginal)

### 6.6.1 EIS Predictions

An Aboriginal Heritage Impact Assessment was completed as part of the EIS specialist report prepared by RPS (2012). A search of the Aboriginal Heritage Information Management System (AHIMS) database revealed no listed sites inside the project area and the pedestrian survey revealed no Aboriginal cultural heritage items. No evidence of Aboriginal cultural heritage was found during the survey and no impacts were predicted.

### 6.6.2 Approved Criteria

There are no specific Project Approval criteria associated with heritage relating to the project. Heritage is managed in accordance with the approved *Heritage Management Plan* (RPS, 2015).

The process for managing any unexpected heritage items is outlined in **Section 6.6.4**.

### 6.6.3 Key Environmental Performance or Management Issues

There were no issues relating to Aboriginal cultural heritage during the reporting period.

### 6.6.4 Management Measures

The process for managing unexpected Aboriginal objects/items is outlined in the *Heritage Management Plan* (RPS, 2015).

Should unexpected Aboriginal objects/features be encountered, work must stop immediately and the area cordoned off with a high visibility barrier. The Quarry Manager is to then contact a heritage consultant and Registered Aboriginal Parties (RAPs). The heritage consultant, in consultation with the RAPs, is to conduct a field survey to assess the Aboriginal objects/features identified. The heritage consultant, in consultation with the RAPs, will then recommend appropriate mitigation measures.

The Quarry Manager is to implement the mitigation measures that are recommended by the heritage consultant and agreed to by the RAPs and in accordance with the Office of Environment and Heritage regulations. If additional visual inspection and salvage is recommended, the Quarry Manager is to arrange for the heritage consultant and RAPs to undertake those works.

Provided that these heritage contingency protocols have been followed, works within the project area may proceed.

### 6.6.5 Proposed Improvements to Management Measures

There are no further proposed management responses other than those outlined in the *Heritage Management Plan* (RPS, 2015).

## 6.7 General Waste Management

### 6.7.1 Environmental Management

Karuah East Quarry uses a licensed contractor for waste removal at the site. There has been minimal waste generated as part of the construction process in the reporting period

Typical waste generation at the quarry now the site is operational has consisted of non-hazardous and general wastes, as well as oily wastes. The general and non-hazardous wastes were placed in a skip bin and removed from site.

Oily water which accumulates in the workshop sump within a bunded area will be removed by a contractor when the sump is full. Additionally, scrap steel and tyres are separated and stockpiled until there is a sufficient quantity for removal by a licensed contractor for recycling.

### 6.7.2 Environmental Performance

JR Richards, a waste contractor, removes waste from a 3 metre cubed waste bin at the site. Over the year, approximately 52 cubic metres of waste was removed from the site.

### 6.7.3 Proposed Improvements to Management Measures

The Karuah East Quarry will continue to implement a waste management strategy similar to the adjacent Karuah Quarry.

## 6.8 Summary of Environmental Performance

Table 32 provides a summary of the environmental performance at the site for the reporting period.

**Table 32 Environmental Performance**

Aspect	Approval Criteria/EIS Prediction	Performance During the Operating Period	Trend/Key Management Implications	Implemented / Proposed Management Actions
Noise	See Section 6.2.1	Compliant	Within criteria	Continued monitoring
Blasting	See Section 6.3.1	Compliant	Within criteria	Continued monitoring
Air Quality	See Section 6.4.1	Non - Compliant	Within criteria	Continued monitoring
Biodiversity	See Section 6.5.1	Compliant	Within criteria	Continued monitoring
Heritage	See Section 6.6.1	Compliant	Within criteria	Continued monitoring
Waste	No predictions	Compliant	Minimal change over successive years	Continued monitoring

TSP, PM<sub>10</sub> and DDG were all within criteria during both construction and operations phases in the reporting period. However, the frequency of HVAS monitoring during the reporting period was non-compliant due to a couple of overruns of samples (in June and December) which resulted in samples not being taken every 6 days as required.

## 7.0 WATER MANAGEMENT

### 7.1 Summary of Water Management at Site

#### 7.1.1 Environmental Management

Surface water at Karuah East Quarry is managed in accordance with the *Water Management Plan (WMP)*. The primary objective of water management is to remain compliant with EPL 20166 and ensure there is no uncontrolled discharge of water from the site. The goal for any water that leaves the site from a controlled or uncontrolled discharge is that this water meets the required EPL criteria. This objective is intrinsic to erosion and sedimentation designs and controls for the quarry. As such, the following specific objectives of this WMP have been established as part of the construction and operational phases:

- Conducting best practice land clearing procedures for all proposed disturbance areas;
- Implementation of erosion and sediment controls during construction and operation at per the Blue Book and WMP;
- Separating undisturbed runoff from disturbed runoff where possible to minimise and isolate the amount of disturbed or dirty water runoff;
- Directing sediment-laden runoff into designated sediment control dams;
- Diverting clean runoff from areas upstream of the operation into natural depressions and creeks;
- Allowing sediments to settle in sediment control dams so that the water can be re-used for onsite dust suppression, thereby maintaining dam capacities for subsequent rainfall events;
- Maintaining sediment control structures to ensure that the designed capacities are maintained for optimum settling of sediments; and
- Implementing an effective revegetation and maintenance program for the site.

#### ***Water Storage and Use***

The Karuah East Quarry has three sediment dams, including:

- Dam 1 - Catchment (crushing plant and product stockpiles);
- Dam 2 - Catchment (product stockpiles and office infrastructure area)
- Dam 3 - Catchment (product stockpiles area).

#### 7.1.2 Improvements to Management Measures

Additional water management structures were completed during 2017 as part of the construction phase, with this including the relocation of Dam 2 to improve dirty water capture. There are likely to be some smaller upgrades to water management in 2018 within the existing disturbance footprint. If larger upgrades are required, the Karuah East Quarry will submit an EA Modification to the DPE.

The current water management system and location of dams are shown in **Figure 2**.

### 7.2 EIS/Preferred Project Report Predictions

Surface water was assessed for the Karuah East Quarry EIS and then updated for the Preferred Project Report (2013).

The only direct disturbance to occur to the local drainage system will be in the upper reaches of the northern most drainage line in Lot 12. The length of the channel which will be disturbed as a result of excavation is located in the upper reaches of the catchment with no clearly defined bed or banks. Therefore, the impact on the wider catchment as a result of disturbance to the upper reaches of this drainage line is not anticipated to be significant.

With regards to offsite discharges, a water balance model has been developed to predict the frequency and volume of discharges from the project. The water balance predicts that uncontrolled discharges will be minimal, averaging only one discharge day per year in Stage 2 (which represents approximately half of the total disturbance area) and two days in Stage 5 (at full disturbance).

## 7.3 Surface Water Monitoring Results

### 7.3.1 Approved Criteria

Discharge criteria for the Karuah East Quarry is provided in Condition L2.4 of EPL 20166 and outlined in **Table 33**. These pollutants will be tested during discharge events from LDP001, LDP002 and LDP003. Discharge events are discussed in **Section 7.6**.

**Table 33 Surface Water Criteria**

Pollutant	Units of Measure	50 Percentile Concentration Limit	90 Percentile Concentration Limit	3DGM Concentration Limit	100 Percentile Concentration Limit
Oil and Grease	Milligrams per litre	-	-	-	5 and/or none visible
pH	pH	-	-	-	6.5 - 8.5
Total Suspended Solids	Milligrams per litre	-	-	-	40

The approved WMP refers to several water quality parameters being tested during the first twelve months of operations. The ANZECC Guidelines provide guidance criteria which are outlined in **Table 34**.

**Table 34 Water Quality Data - ANZECC Guidelines**

Parameter	Unit	ANZECC Guidelines <sup>1</sup>
Conductivity (Field)	uS/cm	125 – 2200
Conductivity (Lab)	uS/cm	125 – 2200
Total Dissolved Solids	mg/L	-
Total Phosphorus	mg/L	0.025
Ammonia	mg/L	0.02
Nitrogen (Nitrate)	mg/L	0.350
Total Hardness (as CaCO <sub>3</sub> )	mg/L	--
Arsenic	mg/L	0.024
Cadmium	mg/L	0.0002
Calcium	mg/L	--
Chromium	mg/L	0.001
Copper	mg/L	0.0014
Lead	mg/L	0.0034
Magnesium	mg/L	--
Manganese	mg/L	1.9
Nickel	mg/L	0.011
Potassium	mg/L	--
Sodium	mg/L	--
Vanadium	mg/L	--
Zinc	mg/L	0.0312

Note 1 - Key default trigger values presented in ANZECC 2000 for slightly disturbed upland rivers in NSW.. Heavy metals based on hard water (120-179 mgCaCO<sub>3</sub>/L)

As detailed in the WMP, surface water monitoring is undertaken at the following locations:

- Dam 1;
- Dam 2;
- Dam 3;
- SW 1 and SW 2 - Existing second order drainage line (within Lot 13 flowing along the eastern boundary of the PA Area); both upstream and downstream of the quarry;
- SW 3 - Existing drainage line downstream of Dam 2; and
- SW 4 - Existing drainage line downstream of the quarry extraction area.

Dams 1, 2 and 3 will be monitored monthly for the first year of operations determine a diagnostic set of analytes adopted for ongoing monitoring. Following determination of appropriate analytes, monitoring will be undertaken biannually to determine ongoing compliance with the water quality performance criteria. SW 1-4 will be tested biannually (when flowing) during operations to determine ongoing compliance with the water quality performance criteria. SW2 and SW3 will be tested within 24 hours any discharge

### 7.3.2 Monitoring Results

**Tables 35 and 36** summarise the surface water quality results. A full list of monitoring results is outlined in **Appendix 6**.

Both Dam 1 and Dam 2 were sampled every month from February 2017. Dam 2 was sampled from September to December 2017 followings it's relocation. As required, SW 1-4 were monitored twice during the reporting period.

pH in dams is slightly higher than SW1-4, with all monitoring locations being slightly acidic and on average below the criteria range. EC levels at all monitoring locations were within the criteria range.

Average TSS levels are below criteria at SW1, SW2 and SW4, but above criteria at SW3 and all three dams. Water in Dam's 1 and 3 were flocculated in April 2017 and again in June 2017 to decrease TSS values. Calcium chloride at a dosage recommended by an experienced and qualified engineer was used as the flocculent. Calcium chloride was specifically chosen for its relatively fast reaction time and its low toxicity. Testing results showed a significant improvement in water quality after flocculation.

Average nitrate levels above criteria at all dams and SW2. Phosphorous, ammonia and chromium levels were above criteria at all monitoring location in 2017 with the exception of SW4. Oil and grease was above criteria all locations except SW1. Copper and zinc levels were above criteria SW2, SW3 and all dams. Lead results exceeded criteria at SW and all dams.

Results from 2017 are comparable to those reported in 2016. As operations only commenced towards the end of this reporting period (November), another year full year of data in 2018 will allow trends to be identified in the 2018 Annual Review.

Karah East will continue to monitor and treat the dam water in the future when required.

Table 35 Surface Water Quality Results for Dams

Parameter	Criteria	Dam 1			Dam 2			Dam 3		
		Min	Max	Average	Min	Max	Average	Min	Max	Average
pH (pH unit)	<b>6.5 - 8.5</b>	5.3	7.0	6.5	5.6	6.7	6.2	5.3	7.3	6.5
TSS (mg/L)	<b>40</b>	5	220	68	7	366	97	8	1180	276
TDS (mg/L)	-	363	864	641	256	731	444	195	1955	1073
EC (µS/cm)	<b>125-2200</b>	349	907	530	382	490	443	216	838	492
Nitrogen (Nitrate) (mg/L)	<b>0.35</b>	0.1	5.8	4.7	0.5	1.9	1.2	0.01	8.9	5.24
Total Phosphorous (mg/L)	<b>0.025</b>	0.01	0.7	0.1	0.0	0.2	0.1	0.01	0.6	0.3
Ammonia (mg/L)	<b>0.02</b>	0.02	0.3	0.1	0.0	0.2	0.1	0.02	0.1	0.06
Oil and Grease (mg/L)	<b>5</b>	5.0	39.0	10.6	5.0	15.0	8.3	5.0	31.0	11.9
Calcium (mg/L)	-	0.6	10.0	5.2	1.8	12.0	5.2	0.4	16.0	8.9
Magnesium (mg/L)	-	2.7	7.0	5.4	4.2	11.0	6.7	1.7	18.0	11.6
Sodium (mg/L)	-	46.0	110.0	87.7	76.0	85.0	81.5	28.0	150.0	82.9
Potassium (mg/L)	-	1.4	3.3	2.3	1.2	3.7	2.3	0.5	5.3	3.3
Total Hardness (as CaCO <sub>3</sub> )	-	14.0	45.0	35.3	22.0	58.0	40.0	8.0	98.0	70.3
Arsenic (mg/L)	<b>0.024</b>	0.001	0.003	0.002	0.001	0.003	0.002	0.001	0.009	0.004
Cadmium (mg/L)	<b>0.0002</b>	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Chromium (mg/L)	<b>0.001</b>	0.001	0.011	0.01	0.001	0.01	0.005	0.003	0.03	0.014
Copper (mg/L)	<b>0.001</b>	0.001	0.01	0.01	0.001	0.01	0.007	0.001	0.04	0.01
Nickel (mg/L)	<b>0.011</b>	0.001	0.005	0.003	0.001	0.008	0.004	0.001	0.02	0.008
Lead (mg/L)	<b>0.003</b>	0.001	0.009	0.01	0.001	0.01	0.004	0.001	0.03	0.01
Manganese (mg/L)	<b>1.9</b>	0.04	0.3	0.2	0.07	0.3	0.1	0.01	1.3	0.6
Vanadium (mg/L)	-	0.005	0.05	0.03	0.001	0.04	0.02	0.001	0.1	0.05
Zinc (mg/L)	<b>0.021</b>	0.008	0.3	0.1	0.008	0.2	0.09	0.02	0.2	0.1



Table 36 Surface Water Quality Results for SW1-4

Parameter	Criteria	SW1			SW2			SW3			SW4		
		Min	Max	Average	Min	Max	Average	Min	Max	Average	Min	Max	Average
pH (pH unit)	<b>6.5 - 8.5</b>	4.9	5.5	5.2	4.8	6.4	5.9	4.8	5.7	5.4	5.3	5.8	5.5
TSS (mg/L)	<b>40</b>	5	6	5.5	7	65	26.0	86	2630	803	6	9	7.5
TDS (mg/L)	<b>-</b>	229	234	232	239	542	396	320	820	501	171	201	186
EC (µS/cm)	<b>125-2200</b>	313	329	321	309	520	385	199	253	222	259	263	261
Nitrogen (Nitrate) (mg/L)	<b>0.35</b>	0.005	0.005	0.005	0.01	2.1	0.5	0.02	0.1	0.09	0.005	0.005	0.005
Total Phosphorous (mg/L)	<b>0.025</b>	0.02	0.22	0.1	0.02	2.0	0.3	0.09	1.9	0.8	0.02	0.02	0.02
Ammonia (mg/L)	<b>0.02</b>	0.02	0.07	0.04	0.03	0.2	0.1	0.02	0.04	0.03	0.01	0.02	0.02
Oil and Grease (mg/L)	<b>5</b>	5.0	5.0	5.0	4.0	17.0	6.5	5.0	27.0	13.3	24.0	97.0	60.5
Calcium (mg/L)	<b>-</b>	5.2	5.5	5.4	3.4	48.0	8.9	3.2	8.1	4.8	3.5	3.8	3.7
Magnesium (mg/L)	<b>-</b>	6.6	7.4	7.0	5.2	70.0	12.5	5.5	18.0	10.2	4.8	5.8	5.3
Sodium (mg/L)	<b>-</b>	35.0	36.0	35.5	40.0	350.0	86.6	27.0	34.0	29.3	26.0	29.0	27.5
Potassium (mg/L)	<b>-</b>	2.4	2.9	2.7	2.2	31.0	5.5	2.2	5.4	3.4	1.9	2.0	2.0
Total Hardness (as CaCO <sub>3</sub> )	<b>-</b>	40.0	44.0	42.0	30.0	410.0	73.7	31.0	93.0	53.7	28.0	33.0	30.5
Arsenic (mg/L)	<b>0.024</b>	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.007	0.004	0.001	0.001	0.001
Cadmium (mg/L)	<b>0.0002</b>	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Chromium (mg/L)	<b>0.001</b>	0.001	0.002	0.002	0.001	0.006	0.003	0.009	0.04	0.02	0.001	0.001	0.001
Copper (mg/L)	<b>0.001</b>	0.001	0.001	0.001	0.001	0.008	0.004	0.009	0.04	0.02	0.001	0.001	0.001
Nickel (mg/L)	<b>0.011</b>	0.001	0.001	0.001	0.001	0.004	0.002	0.004	0.02	0.01	0.001	0.001	0.001
Lead (mg/L)	<b>0.003</b>	0.001	0.001	0.001	0.001	0.005	0.002	0.008	0.05	0.02	0.001	0.001	0.001
Manganese (mg/L)	<b>1.9</b>	0.01	0.2	0.1	0.04	0.2	0.09	0.1	0.7	0.3	0.01	0.01	0.01
Vanadium (mg/L)	<b>-</b>	0.001	0.001	0.001	0.001	0.02	0.01	0.03	0.1	0.06	0.001	0.001	0.001
Zinc (mg/L)	<b>0.021</b>	0.008	0.01	0.01	0.01	0.09	0.03	0.04	0.2	0.08	0.006	0.007	0.007

## 7.4 Groundwater Monitoring Results

### 7.4.1 Approved Criteria

There are no criteria applicable to groundwater monitoring in Project Approval 09\_0175 or EPL 20611.

In accordance with the approved WMP, groundwater levels are monitored on a quarterly basis to identify any adverse impacts arising from the operation of the quarry in the future, and to identify long-term groundwater level trends. Groundwater samples will be collected for laboratory analysis on a 6-monthly basis. The groundwater quality results will be laboratory analysed for the parameters below and compared to background water quality results:

- pH, EC, Total Dissolved Solids (TDS); Alkalinity;
- Total nitrogen, total phosphorus;
- Major ions, calcium, magnesium, sodium, potassium, chloride, sulphate, carbonate, bicarbonate;
- Total Petroleum Hydrocarbon (TPH); and
- BTEX (benzene, toluene, ethyl benzene, xylene). Additional Analysis – 12 monthly (every second sample only):
- Nutrient suite: total nitrogen, nitrate, total Kjeldahl nitrogen, total phosphorus, phosphate;
- Metals (arsenic, cadmium, chromium, copper, lead, zinc, nickel, manganese, mercury, total iron, filterable iron);
- Polycyclic Aromatic Hydrocarbon (PAH); and
- Organophosphorus pesticides, phenoxy acid herbicides.

The existing monitoring bores at BH205, BH207, BH208 and BH303 are used for monitoring groundwater of the quarry area. BH207 was relocated in September 2016 and BH205 was relocated on 11 March 2017. Both of these piezometers were relocated within 30m to their original locations to allow construction to progress.

New monitoring bores will be installed if any existing monitoring bores are destroyed during the quarry operations, or are subject to general failure. The locations of new bores will be added to the Water Management Plan and provided to DPE and DPI Water.

### 7.4.2 Monitoring Results

#### Groundwater Level

**Table 37** shows a comparison of groundwater levels in 2016 and 2017. As evident, water levels have remained relatively consistent across all locations, with only BH207 showing a consistent increase in water level since the start of monitoring. This increase in water level is likely due to the relocation of the piezometer in September 2016.

**Table 37 Average Groundwater Quality Results for Key Parameters**

Date	Groundwater level (metres below ground level)			
	BH205	BH207	BH208	BH303
30 March 2016	22.8	12.4	19.5	29.9
4 October 2016	24.0	9.6	19.8	30.5
4 April 2017	25.3	9.4	20.0	30.7
5 October 2017	22.9	8.9	19.9	30.6

A Show Cause letter was received from the DPE on 8 September 2017 in relation to the potential non-compliance with PA 09\_0175 regarding frequency of groundwater level monitoring. Karuah East responded in a letter to the DPE on 26 September 2017 stating reasons why the quarry remains compliant, however an Official Caution letter was received from the DPE on 16 October 2017 regarding non-compliance with Schedule 3, condition 21 of the PA 09\_0175.

Karuah East has commenced quarterly monitoring of groundwater levels in accordance with this condition as of October 2017.

### Groundwater Quality

Sampling of groundwater monitoring locations occurred on 4 April 2017 and 6 October 2017. Results have been compared against data sampled from 2010 (pre-Karuah East Quarry) in **Table 38**.

**Table 38 Average Groundwater Quality Results for Key Parameters**

Monitoring Location	pH	TDS (mg/L)	EC (µS/cm)	Number of Samples
<b>Pre Karuah East (Average results from 2010 data)</b>				
BH 205	7.2	665	Not sampled	2
BH207	7.4	1540	Not sampled	1
BH303	6.3	600	Not sampled	1
<b>Average Results 2016</b>				
BH 205	7.3	1182	2015	2
BH 207	6.9	1578	2780	2
BH 208	6.4	2000	3010	2
BH303	6.4	889	1555	2
<b>Average Results 2017</b>				
BH 205	8.7	1200	2230	2
BH 207	7.2	1800	3600	2
BH 208	6.6	1900	3500	2
BH303	6.9	1175	2350	2

The pH results in 2017 are slightly higher than those recorded in pre-Karuah East and results from 2016. The average TDS levels were comparable to 2016 at all four locations, and all above 2010 levels. Average EC at all monitoring locations was higher than 2016 results. EC was not sampled during 2010 monitoring.

Karuah East will continue to monitor groundwater quality during 2018. Any trends will be identified in the 2018 Annual Review when data from pre-construction, construction and operational phases is available for comparison.

## 7.5 Water Take

There is no Water Take at the Karuah East Quarry, with the site having no groundwater extraction licences.

## 7.6 Discharges

The water balance predicts that uncontrolled discharges will be minimal, averaging only one discharge day per year in Stage 2 (which represents approximately half of the total disturbance area) and two days in Stage 5 (at full disturbance).

There have been three discharge events during 2017; two uncontrolled and one controlled. The first uncontrolled discharge occurred from LDP003/Dam 3 from 7 March to 11 March 2017. The second uncontrolled discharge occurred from LDP001 and LDP003 from 9 June to 22 June 2017. This discharge event was reported to the EPA and DPE on 15 June 2017. A controlled discharge from LDP002 of approximately 400,000 litres occurred from 10 November to 11 November 2017. Condition M2.3 of EPL 20611 requires that samples be taken daily during controlled and uncontrolled discharges and within 12 hours prior to any controlled discharge. The monitoring results for these discharge events are presented in Table 39.

Table 39 Discharge Monitoring Results 2017

Discharge Point	Date	pH	EC (µS/cm)	Turbidity (NTU)	TSS (mg/L)	Oil and Grease (mg/L)	Comment
	EPL Criteria	6.5 - 8.5	-	-	40	5	
LDP001	21-Mar-17	<b>5.97</b>	612	557	<b>383</b>	<b>18</b>	No discharge
	31-Mar-17	6.50	609	653	<b>454</b>	<b>153</b>	
	09-Jun-17	6.82	551	227	30	<b>118</b>	Mod discharge
	14-Jun-17	6.52	497	415	<b>192</b>	<b>119</b>	Light discharge
	15-Jun-17	<b>6.05</b>	469	492	<b>136</b>	<b>18</b>	Light discharge
	16-Jun-17	<b>5.94</b>	457	498	<b>220</b>	<b>22</b>	Light discharge
	19-Jun-17	6.51	503	927	<b>449</b>	<b>26</b>	Light discharge
	20-Jun-17	6.64	472	738	<b>143</b>	<b>27</b>	Light discharge
	21-Jun-17	6.12	456	1025	<b>868</b>	<b>22</b>	Very light discharge
LDP002	09-Nov-17	<b>5.7</b>	551	15	12	5	Controlled discharge
	10-Nov-17	<b>5.8</b>	565	19	18	5	Controlled discharge
LDP003	06-Mar-17	<b>4.70</b>	171	4900	<b>1889</b>	<b>13</b>	
	07-Mar-17	<b>4.35</b>	175	4940	<b>1995</b>	<b>9</b>	
	08-Mar-17	<b>5.83</b>	185	4420	<b>1773</b>	<b>20</b>	
	09-Mar-17	<b>5.60</b>	187	4460	<b>1857</b>	<b>20</b>	
	20-Mar-17	<b>4.78</b>	286	1420	<b>1420</b>	<b>16</b>	
	31-Mar-17	<b>6.34</b>	287	2450	<b>1665</b>	<b>84</b>	
	09-Jun-17	6.68	340	668	<b>74</b>	<b>104</b>	Light discharge
	14-Jun-17	<b>6.49</b>	480	905	<b>750</b>	<b>112</b>	Light discharge
	15-Jun-17	<b>5.99</b>	471	1280	<b>598</b>	<b>9</b>	Light discharge
	16-Jun-17	<b>5.95</b>	482	1164	<b>1180</b>	<b>25</b>	Light discharge
	19-Jun-17	<b>6.39</b>	448	2015	<b>432</b>	<b>29</b>	Light discharge
	20-Jun-17	6.52	439	1535	<b>320</b>	<b>26</b>	Light discharge
	21-Jun-17	<b>6.23</b>	437	1630	<b>335</b>	<b>22</b>	Very light discharge

**Bold = exceedance of criteria**

Discharge from LDP001 and LDP003 during the reporting period exceeded EPL criteria for both TSS and oil and grease, and was slightly below the pH minimum of 6.5 on the majority of occasions.

The average pH over the period of 9 to 21 June 2017 at Dam 1 and Dam 3 was below the EPL discharge criterion but was not abnormally low for the area. As shown from previous monitoring results, the pH values are naturally low.

Karuah East Quarry believes that the source of this oil & grease is not related to construction and operational activities. There is the potential that this is from a natural origin or from past land use. A laboratory analysis of BTEX and TRH was conducted on a sample taken from Dam 3 in March 2017 when the oil and grease value was shown to be high. Inorganic hydrocarbons (i.e., diesel, petroleum, engine oil) were not detected in this water sample. Karuah East Quarry are continuing to investigate the source of these high oil and grease values.

At LDP002 results were within EPL 20611 discharge criteria, with the exception of pH which was slightly more acidic during the November controlled discharge.

## **7.7 Salinity Trading Scheme Credit Use**

Not applicable to Karuah East Quarry.

## **7.8 Compensatory Water to Other Users**

Not applicable to Karuah East Quarry.

## 8.0 REHABILITATION

There have been limited opportunities to establish rehabilitation at the quarry site as the site has been in a construction phase and only just commenced operation. Future rehabilitation activities will be undertaken in accordance with the approved LRMP.

### 8.1 Rehabilitation Performance During Reporting Period

A summary of rehabilitation at Karuah East Quarry is outlined in **Table 40**.

**Table 40 Summary of Rehabilitation Performance During Reporting Period**

Guideline Requirement	Site Comment
Extent of the operations and rehabilitation at completion of the reporting period	No Rehabilitation.
Agreed post- rehabilitation land use	Final landuse is outlined within the LRMP. The vegetation at closure will be native woodland consistent with the surrounding bushland.
Key rehabilitation performance indicators	No Rehabilitation.
Renovation or removal of buildings	No Rehabilitation.
Any other Rehabilitation Taken including: <ul style="list-style-type: none"> <li>• Exploration activities;</li> <li>• Infrastructure;</li> <li>• Dams; and</li> <li>• The installation or maintenance of fences, bunds and any other works.</li> </ul>	No Rehabilitation.
Any rehabilitation areas which have received formal sign off from DRG	No Rehabilitation.
Variations to activities undertaken to those proposed (including why there were variations and whether DRG was notified)	No Rehabilitation.
Outcomes of trials, research projects and other initiatives	No Rehabilitation.
Key issues that may affect successful rehabilitation	No Rehabilitation.

**Table 41 Disturbance and Rehabilitation Status**

Quarry Area Type	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
Total Quarry Footprint (including access road in)	21.4 ha	21.4 ha	21.4 ha
Total Active Disturbance	21.4 ha	21.4 ha	21.4 ha
Land Being Prepared for Rehabilitation	0	0	0
Land Under Active Rehabilitation	0	0	0
Completed Rehabilitation	0	0	0

## 8.2 Actions for the next Reporting Period

The DPE (2015) *Annual Review Guidelines* requires an outline of the rehabilitation actions proposed during the next reporting period. These actions are detailed in **Table 42**.

**Table 42 Actions for the Next Reporting Period**

Action	Site Comment
Describe the steps to be undertaken to progress agreement during next reporting period, where final rehabilitation outcomes have not yet been agreed between stakeholders.	There is no planned additional rehabilitation at the site in the next Annual Review period.
Outline proposed rehabilitation trials, research projects and other initiatives to be undertaken during next reporting period.	There are no additional rehabilitation trials during the next Annual Review period.
Summary of rehabilitation activities proposed for next report period.	There is no planned additional rehabilitation at the site in the next Annual Review period.

## 9.0 COMMUNITY

### 9.1 Community Engagement Activities

A Community Consultative Committee (CCC) was formed for the Karuah East Quarry in accordance with Schedule 5, Condition 6 of PA 09\_0175, which states:

*The Proponent shall establish and operate a Community Consultative Committee (CCC) for the project. The CCC must:*

- (a) be established and operated in general accordance with the Guidelines for Establishing and Operating Community Consultative Committees for Mining Projects (Department of Planning, 2007, or its latest version); and*
- (b) be established prior to the commencement of construction activities, to the satisfaction of the Secretary.*

Meetings were held on the following dates:

- 13 February 2017;
- 8 May 2017;
- 14 August 2017 and
- 4 December 2017.

The CCC comprises of an independent chair, three community members, two company representatives and two environmental consultants. Other attendees include a representative from the Great Lakes Council. Meeting minutes are found on the website <http://hunterquarries.com.au/karuah-east-documents/>.

Key aspects discussed include:

- Site inspection;
- Current construction – work completed in past three months;
- Proposed construction/operations – work proposed for the next three months; and
- Environmental management performance and summary of monitoring results.

### 9.2 Community Contributions

The Karuah East Quarry feels strongly about supporting the local community and has a history of community contributions. Community contributions are being made through Hunter Quarries Pty Limited through the Karuah Quarry.

### 9.3 Complaint Management

If a complaint is received, it is logged and investigated by the Quarry Manager. Feedback is then provided to the complainant and government agencies, as required. This process forms a part of the Karuah East Environmental Management Strategy (EMS).

A telephone number has been established for the purpose of receiving complaints and enquiries from the community and this number is available on the Karuah East Quarry website ([www.hunterquarries.com.au](http://www.hunterquarries.com.au)) and is provided on a sign at the entrance to the quarry. The community can contact the quarry on (02) 4997 5966 as well as through the Karuah East Quarry website.



### 9.3.1 2017 Complaints

There were three complaints received regarding Karuah East Quarry during this Annual Review reporting period. This is an increase from one complaint received in the 2016 reporting period.

#### Complaint 1

On 9 June 2017 a query/complaint was received from the DPE via phone. The DPE had received a query/complaint directly from the public in regards to possible illegal tree clearing and dirty water concerns. The DPE conducted a follow up inspection of the site on 15 June 2017, which determined that:

- All clearing activities were in accordance with the Project Approval. All clearing activities had ceased in November 2016;
- Karuah East Quarry noted that there were water issues as a result of recent heavy rain. These issues were abated when the rain had stopped; and
- Existing sediment dams were treated with flocculent to lower suspended sediment.

Long term actions are being put in place to improve water management across the KEQ site. This included upgrades to an existing sediment dam (Dam 2) and creating an improved system of separating clean and dirty water.

#### Complaint 2

On 28 August 2017 a complaint was received from a member of the CCC on behalf of himself and two other residents on Halloran Road. It was noticed in the week beginning 21 August 2017 that noise levels were elevated, in particular on 25 August and the morning of 28 August. In particular, it was noticed that the noise was being generated from the mobile crushers that were operating in the lower extraction area. The mobile crushers commenced in the week before the complaint was received.

Upon further investigation, the noise levels were possibly higher due to the meteorological conditions in the week leading up to the complaint. Mornings were cool with light westerly winds. Attended noise monitoring was undertaken on the 23 August 2017 to coincide with the commencement of mobile crushing activities in the lower extraction area. The noise monitoring results at the western end Halloran Road (location G) showed that the contributed noise levels relating to the Karuah East Quarry project were within criterion limits.

#### Complaint 3

On 31 October 2017, a complaint was received from the DPE via phone and email regarding noise and dust levels. The DPE received the complaint directly from the public, with no specific times or dates given. The complainant provided the following information to the DPE:

- The crusher is supposed to be in a sound and dust proof building which it is not and they have already started using the crusher when they're not supposed to be doing it yet.
- There is dust everywhere all over his place.
- The quarry is noisy during daytime hours.

Karuah East responded to the DPE on 3 November 2017.

- The crushers are not required to be in a sound and dust proof building but the permanent crushing plant requires the crushers and screens to be enclosed for long term operational activities as per the Noise and Dust Management Plans.
- The most recent noise monitoring results have shown that the levels are within the project criterion.
- All dust monitoring results have shown that the levels are within the project criterion.

It was recommended to the DPE that the complainant be encouraged to contact Karuah East directly to work through this matter further.

## 10.0 INDEPENDENT ENVIRONMENTAL AUDIT

An Independent Environmental Audit is required for at Karuah East Quarry in accordance with Schedule 5 Condition 9 of PA 09\_0175. This is to be completed “within 12 months of the commencement of development on the site, and every 3 years thereafter”. The first Independent Environmental Audit was completed in July 2017 by EMM Consulting. A copy of the Independent Environmental Audit is available on the website <http://hunterquarries.com.au/karuah-east-documents/>.

The Audit Action Plan and current progress against the recommendations is contained in **Appendix 8**.

## 11.0 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

### 11.1 Summary of Incidents

Due to heavy rainfall, an uncontrolled discharge event occurred from 9 June to 22 June 2017 from Dam's 1 and 3. Monitoring results during the discharge showed that pH, Total Suspended Solids (TSS) and oil and grease were not within the EPL criterion. This discharge event was reported to the EPA and DPE on 15 June 2017.

Overall, the pH values recorded were mostly below the EPL limits for discharge but were not abnormal for the area. The pH values are naturally low.

The TSS and oil and grease values were significantly above the EPL criterion during discharge. Further investigations into the increased oil and grease suggests that it is of natural origin and not directly related to the Karuah East Quarry activities. This is confirmed with the high oil and grease values recorded in clean water at SW4 on 16 June 2017. Furthermore, a laboratory analysis of BTEX (benzene, toluene, ethylbenzene and xylene) and Total Recoverable Hydrocarbons (TRH) was conducted on a sample from Dam 3 in March 2017 when the oil and grease value was shown to be high. Inorganic hydrocarbons (i.e., diesel, petroleum, engine oil) were not detected in this water sample.

### 11.2 Summary of Non-compliance

**Table 43 Summary of Non Compliances**

Date	Incident/Non Compliance	Action/Comment
2017	PA 09_0175 S3 Condition 21 Non-compliance due to frequency of groundwater level monitoring.	Groundwater level monitoring undertaken every 6 months during construction phase rather than quarterly. Official Caution received from DPE (See <b>Section 7.4</b> ). Quarterly monitoring commenced in October 2017.
June and December 2017	PA 09_0175 S3 Condition 16 EPL 20611 M2.2 Non - compliance relating to overrun of samples (incorrect HVAS sampling frequency)	In both June and December, HVAS filters were not changed at the correct time leading to an overrun of the sample. Filters were changed as soon as error identified.
March, June and November 2017	PA 09_0175 S3 Condition 19 EPL 20611 L2.4 Non-compliance relating to exceedance of concentration limits during the three discharge events.	Exceedance of pH, TSS and Oil and Grease concentration limits. pH is naturally low in the area, and investigations suggest oil and grease levels caused by natural sources. Water in Dam's 1 and 3 were flocculated in April 2017 and again in June 2017 to decrease TSS values.

In addition, the non-compliances identified during the Independent Environmental Audit (see **Section 10**), along with how they have been addressed, are detailed in the Audit Action Plan in **Appendix 8**.

## 12.0 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

**Table 44** outlines the proposed actions in the next Annual Review.

**Table 44 Proposed Actions in the Next Annual Review**

Proposed Action	Timeline	Management Plan Requires Revision
Complete construction activities	On-going	Possibly
Continue environmental monitoring in accordance with management plans and approval requirements	On-going	Possibly
Continue CCC and community support	On-going	No
Continue to update the website with monitoring data and key environment and community information	On-going	No
Finalise updates to management plans in accordance with Independent Environmental Audit recommendations	Q2 2018	Yes

## 13.0 REFERENCES

The following documents and reports have been used to assist in writing the quarry's Annual Review:

### Management Plans

- *Air Quality and Greenhouse Gas Management Plan (SLR 2015);*
- *Biodiversity Offset Area Management Plan (Kleinfelder 2015);*
- *Blast Management Plan (SLR 2015);*
- *Environmental Management Strategy (SLR 2015);*
- *Heritage Management Plan (RPS 2015);*
- *Landscape and Rehabilitation Management Plan (Kleinfelder and SLR 2015);*
- *Noise Management Plan (SLR 2015);*
- *Tetratheca juncea Translocation Program (Firebird 2015);*
- *Traffic Management Plan (Streetwise 2015); and*
- *Water Management Plan (SLRE 2015).*

### Statutory Documents

- *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);*
- *Environment Protection Licence (No. 20611);*
- *Preferred Project Report - Proposed Karuah East Quarry (ADW Johnson July 2013);*
- *Project Approval (PA 09\_0175); and*
- *Federal Approval (EPBC 2014/7278).*

# **APPENDIX 1 – Project Approval and Federal Approval**

# Project Approval

## Section 75J of the *Environmental Planning and Assessment Act 1979*

As delegate of the Minister for Planning and Environment, the Planning Assessment Commission approves the project application referred to in Schedule 1, subject to the conditions in Schedules 2 to 5.

These conditions are required to:

- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the ongoing environmental management of the project.



Alan Coutts  
Member of the Commission



David Johnson  
Member of the Commission

Sydney

17 June 2014

### SCHEDULE 1

**Application Number:**

09\_0175

**Proponent:**

Karuah East Quarry Pty Limited

**Approval Authority:**

Minister for Planning and Environment

**Land:**

Lot 12 DP 1024564  
Lot 13 DP 1024564  
Lot 202 DP 1042537  
Lot 26 DP 1024341  
Lot 27 DP 1024341  
Lot 16 DP 1024564  
Lot 17 DP 1024564

**Project:**

Karuah East Quarry Project

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## DEFINITIONS

Annual review	The review required under condition 4 of Schedule 5
BCA	Building Code of Australia
Biodiversity offset strategy	The conservation and enhancement strategy described in the EA, and depicted conceptually in the figure in Appendix 4
CCC	Community Consultative Committee
Conditions of this approval	Conditions contained in Schedules 1 to 5 inclusive
Council	Great Lakes Council
CPI	Australian Bureau of Statistics Consumer Price Index
Day	The period from 7.00 am to 6.00 pm Monday to Friday, and from 7.00 am to 1.00 pm on Saturday
DRE	Division of Resources and Energy within the Department of Trade and Investment, Regional Services and Infrastructure
EA	Environmental Assessment titled <i>Environmental Assessment Report, Proposed Karuah East Hard Rock Quarry</i> , prepared by ADW Johnson Pty Limited and dated 31 January 2013, including the response to submissions prepared by ADW Johnson Pty Limited and dated 31 May 2013 and the Preferred Project Report titled <i>Preferred Project Report Proposed Karuah East Quarry</i> , prepared by ADW Johnson Pty Limited and dated 30 July 2013
EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i>
EPL	Environment Protection Licence under the <i>POEO Act</i>
Extraction Area	Extraction Area shown in Figure 1 in Appendix 1
Feasible	Feasible relates to engineering considerations and what is practical to build
Incident	A set of circumstances that: <ul style="list-style-type: none"> <li>causes or threatens to cause material harm to the environment; and/or</li> <li>breaches or exceeds the limits or performance measures/criteria in this approval</li> </ul>
km	Kilometre
Land	As defined in the EP&A Act, except where used in the noise and air quality conditions in schedules 3 and 4 of this approval where it is defined to mean the whole of a lot, or contiguous lots, owned by the same landowner, in a current plan registered at the Land Titles Office at the date of this approval
Material harm to the environment	Actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial
Minister	Minister for Planning and Environment, or delegate
NOW	NSW Office of Water
OEH	Office of Environment and Heritage
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
Privately-owned land	Land that is not owned by a public agency or the Proponent (or its subsidiary)
Project	The development as described in the EA
Proponent	Karuah East Quarry Pty Limited, or its successors in title, or any other person who seeks to carry out the project
Quarrying operations	Includes the removal of overburden and extraction, processing, handling, storage and transportation of quarry products on the site
Quarry products	Extractive material which extracted from and transported from the site
Reasonable	Reasonable relates to the application of judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential improvements
Rehabilitation	The treatment or management of land disturbed by the project for the purpose of establishing an appropriately revegetated, safe, stable and non-polluting environment
RMS	Roads and Maritime Services

Secretary  
Statement of commitments  
Site

Secretary of Planning and Environment, or nominee  
The Proponent's commitments in Appendix 6  
The land listed under "Land" in schedule 1

## SCHEDULE 2 ADMINISTRATIVE CONDITIONS

### OBLIGATION TO MINIMISE HARM TO THE ENVIRONMENT

1. In addition to meeting the specific performance criteria established under this approval, the Proponent shall implement all reasonable and feasible measures to prevent and/or minimise any material harm to the environment that may result from the construction, operation, or rehabilitation of the project.

### TERMS OF APPROVAL

2. The Proponent shall carry out the project generally in accordance with the:
  - (a) EA;
  - (b) statement of commitments; and
  - (c) conditions of this approval.

*Notes:*

- *The general layout of the project is shown in Appendix 1.*
- *The statement of commitments is reproduced in Appendix 6.*

3. If there is any inconsistency between the above documents, the most recent document shall prevail to the extent of the inconsistency. However, the conditions of this approval shall prevail to the extent of any inconsistency.
4. The Proponent shall comply with any reasonable requirement/s of the Secretary arising from the Department's assessment of:
  - (a) any reports, strategies, plans, programs, reviews, audits or correspondence that are submitted in accordance with this approval; and
  - (b) the implementation of any actions or measures contained in these documents.

### LIMITS ON APPROVAL

#### Quarrying Operations

5. The Proponent may carry out quarrying operations on the site until 31 December 2034.

*Note: Under this approval, the Proponent is required to rehabilitate the site and carry out additional undertakings to the satisfaction of the Secretary. Consequently, this approval will continue to apply in all other respects other than the right to conduct quarrying operations until the rehabilitation of the site and those undertakings have been carried out to a satisfactory standard.*

#### Production Limit

6. The Proponent shall not extract, process and transport more than 1.5 million tonnes of quarry products from the site in any calendar year.

#### Hours of Operation

7. The Proponent shall comply with the operating hours in Table 1.

*Table 1: Operating hours*

<b>Activity</b>	<b>Operating Hours</b>
Quarrying Operations	7.00 am to 6.00 pm, Monday to Friday; and 7.00 am to 1.00 pm, Saturdays. No quarrying operations on Sundays or Public Holidays.
Construction activities	7.00 am to 6.00 pm, Monday to Friday; and 8.00 am to 1.00 pm, Saturdays, unless noise from these activities does not exceed 35dB(A) $L_{Aeq(15 min)}$ at any privately-owned residence.

Maintenance activities	24 hours a day, 7 days per week, providing maintenance activities are inaudible at any privately-owned residence
------------------------	--

*Note: This condition does not apply in the event of a direction from police or other relevant authority for safety or emergency reasons regarding works which may need to be undertaken to avoid loss of life, property loss and/or to prevent environmental harm.*

## STRUCTURAL ADEQUACY

8. The Proponent shall ensure that any new buildings and structures, and any alterations, or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the BCA.

*Notes:*

- *Under Part 4A of the EP&A Act, the Proponent is required to obtain construction and occupation certificates for proposed building works.*
- *Part 8 of the EP&A Regulation sets out the requirements for the certification of the project.*

## DEMOLITION

9. The Proponent shall ensure that all demolition work on site is carried out in accordance with AS 2601-2001: *The Demolition of Structures*, or its latest version.

## PROTECTION OF PUBLIC INFRASTRUCTURE

10. The Proponent shall:
- (a) repair, or pay the full costs associated with repairing, any public infrastructure that is damaged by the project; and
  - (b) relocate, or pay the full costs associated with relocating, any public infrastructure that needs to be relocated as a result of the project.

## DEVELOPER CONTRIBUTIONS

11. The Proponent shall pay Council, in accordance with Council's *Great Lakes Wide Development Contributions Plan (November 2007) – Amended*:
- (a) a one-off Headquarters Building contribution of \$1.00 per \$1,000.00 of capital value of the project; and
  - (b) annual road maintenance contributions of \$.037 per tonne per km, for every tonne of quarry products transported from the site on local roads in accordance with Council's *Great Lakes Wide Development Contributions Plan (November 2007) – Amended*. Each payment must be:
    - (i) paid to Council at the end of each calendar year;
    - (ii) based on weighbridge records of the quantity of quarry products transported from the site; and
    - (iii) increased annually over the life of the project in accordance with the CPI.

*Note: If the parties are not able to agree on any aspect of the road maintenance contributions, either party may refer the matter to the Secretary for resolution.*

## OPERATION OF PLANT AND EQUIPMENT

12. The Proponent shall ensure that all plant and equipment used at the site is:
- (a) maintained in a proper and efficient condition; and
  - (b) operated in a proper and efficient manner.

### **STAGED SUBMISSION OF ANY STRATEGY, PLAN OR PROGRAM**

13. With the approval of the Secretary, the Proponent may submit any strategy, plan or program required by this approval on a progressive basis.

*Notes:*

- *While any strategy, plan or program may be submitted on a progressive basis, the Proponent will need to ensure that the existing operations on site are covered by suitable strategies, plans or programs at all times; and*
- *If the submission of any strategy, plan or program is to be staged, then the relevant strategy, plan or program must clearly describe the specific stage to which the strategy, plan or program applies, the relationship of this stage to any future stages, and the trigger for updating the strategy, plan or program.*

### **PRODUCTION DATA**

14. The Proponent shall:
- (a) provide annual quarry production data to DRE using the standard form for that purpose; and
  - (b) report this data in the Annual Review (see condition 4 of Schedule 5).

### SCHEDULE 3 ENVIRONMENTAL PERFORMANCE CONDITIONS

#### IDENTIFICATION OF APPROVED LIMITS OF EXTRACTION

1. The Proponent shall, prior to carrying out quarrying operations on the site:
  - (a) engage a registered surveyor to mark out the boundaries of the approved limits of extraction within the Extraction Area; and
  - (b) submit a survey plan of the extraction boundaries, to the satisfaction of the Secretary.
2. The Proponent shall ensure that the extraction boundaries are clearly marked at all times while quarrying operations are being carried out, in a manner that allows the limits of extraction to be clearly identified.

#### NOISE

##### Operational Noise Criteria

3. The Proponent shall ensure that the operational noise generated by the project does not exceed the criteria in Table 2.

Table 2: Operational noise criteria (dB(A)  $L_{Aeq}(15 \text{ min})$ )

Location	Criteria (day)
Residence on Lot 11 DP 1024564	43
A	40
B	37
G	38
All other residences	35

Notes:

- Receiver locations are shown in Appendix 2.
- Noise generated by the project is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy.
- Appendix 4 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

However, the noise criteria in Table 2 do not apply if the Proponent has an agreement with the relevant landowner to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of the agreement.

##### Road Traffic Noise Criteria

4. The Proponent shall take all reasonable and feasible measures to ensure that the traffic noise generated by the project does not cause additional exceedances of the criteria in Table 3 at any residence on privately-owned land.

Table 3: Road traffic noise criteria (dB(A)  $L_{Aeq}(\text{period})$ )

Road	Criteria (day)
Pacific Highway	60
Local roads	55

### Cumulative Noise Criteria

5. The Proponent shall implement all reasonable and feasible measures to ensure that the noise generated by the project combined with the noise generated by adjacent quarrying operations does not cause any exceedances of the criteria in Table 4.

Table 4: Cumulative noise criteria (dB(A)  $L_{Aeq}(\text{period})$ )

Location	Criteria (day)
F	50
G	50
All other privately-owned residences, except the residence on Lot 11	55

Notes:

- Receiver locations are shown in Appendix 2.
- The structure used as a residence on Lot 11 is excluded from Table 4 because the other major contributor to cumulative noise totals is quarrying operations conducted on this Lot, under agreement with the Lot owner.
- Cumulative noise is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.
- Appendix 4 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

### Operating Conditions

6. The Proponent shall:
- implement best management practice, to minimise the construction, operational and traffic noise of the project;
  - minimise the noise impacts of the project during meteorological conditions when the noise limits in this approval do not apply; and
  - regularly assess noise monitoring data and relocate, modify, and/or stop operations on site to ensure compliance with the relevant conditions of this approval;
  - apply and enforce a speed limit of 40 km/hour for all project-related vehicles on site;
  - ensure that project-related trucks slowing to use the intersection of Branch Lane and Andesite Road do not use engine or compression braking systems, to the satisfaction of the Secretary.

### Noise Management Plan

7. The Proponent shall prepare and implement a Noise Management Plan for the project to the satisfaction of the Secretary. This plan must:
- be prepared by a suitably qualified expert whose appointment has been approved by the Secretary;
  - be prepared in consultation with EPA, and submitted to the Secretary for approval prior to the commencement of construction activities;
  - describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions in this approval;
  - describe the proposed noise management system in detail; and
  - include a monitoring program that:
    - uses attended and unattended monitoring to evaluate the compliance of the project against the noise criteria in this approval;
    - evaluates and reports on:
      - the effectiveness of the on-site noise management system; and
      - compliance against the noise operating conditions; and
    - defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

## BLASTING

### Blasting Criteria

8. The Proponent shall ensure that blasting on the site does not cause exceedances of the criteria in Table 5.

Table 5: Blasting criteria

<b>Location</b>	<b>Airblast overpressure (dB(Lin Peak))</b>	<b>Ground vibration (mm/s)</b>	<b>Allowable exceedance</b>
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

However, 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.

### Blasting Hours

9. The Proponent shall ensure that blasting on site is only carried out during the hours in Table 6.

Table 6: Blasting hours

<b>Day</b>	<b>Blasting hours</b>
Monday – Friday	9.00 am to 4.00 pm
Saturdays, Sundays and Public Holidays	No blasting

### Blasting Frequency

10. The Proponent shall not carry out more than 2 blasts a week on the site, unless an additional blast is required following a blast misfire.

*Note: A blast may involve a number of explosions within a short period, typically less than two minutes.*

### Operating Conditions

11. The Proponent shall:
- 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 fume emissions of any blast;
  - schedule blasts to avoid the blasting schedule of any nearby quarrying operation;
  - operate a suitable system to enable the public to get up-to-date information on the proposed blasting schedule on the site, and
  - not undertake blasting within 500 metres of:
    - any public road without the approval of the relevant road authority; or
    - 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,
- to the satisfaction of the Secretary.



## 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:
- be prepared by a suitably qualified expert whose appointment has been approved by the Secretary;
  - be prepared in consultation with Council and EPA, and submitted to the Secretary for approval prior to the commencement of construction activities;
  - describe the measures that would be implemented to ensure:
    - best management practice is being employed; and
    - compliance with the relevant conditions of this approval;
  - include a road closure protocol if blasting occurs within 500 metres of a public road;
  - include a specific blast fume management protocol, to demonstrate how emissions will be minimised including risk management strategies if blast fumes are generated; and
  - include a monitoring program for evaluating the performance of the project including:
    - compliance with the applicable criteria; and
    - minimising fume emissions from the site.

## AIR QUALITY

### Air Quality Criteria

13. The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the project do not exceed the criteria in Tables 7 to 9 at any residence on privately-owned land.

Table 7: Long-term impact assessment criteria for particulate matter

Pollutant	Averaging period	<sup>d</sup> Criterion
Total suspended particulates (TSP)	Annual	<sup>a</sup> 90 µg/m <sup>3</sup>
Particulate matter < 10 µm (PM <sub>10</sub> )	Annual	<sup>a</sup> 30 µg/m <sup>3</sup>

Table 8: Short-term impact assessment criteria for particulate matter

Pollutant	Averaging period	<sup>d</sup> Criterion
Particulate matter < 10 µm (PM <sub>10</sub> )	24 hour	<sup>a</sup> 50 µg/m <sup>3</sup>

Table 9: Long-term Impact Assessment Criteria for Deposited Dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
<sup>c</sup> Deposited dust	Annual	<sup>b</sup> 2 g/m <sup>2</sup> /month	<sup>a</sup> 4 g/m <sup>2</sup> /month

#### Notes to Tables 7-9:

- <sup>a</sup> Total impact (ie incremental increase in concentrations due to the project plus background concentrations due to all other sources);
- <sup>b</sup> Incremental impact (ie incremental increase in concentrations due to the project on its own);
- <sup>c</sup> Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.
- <sup>d</sup> Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agreed by the Secretary in consultation with EPA.

## Greenhouse Gas Emissions

14. The Proponent shall implement all reasonable and feasible measures to minimise the release of greenhouse gas emissions from the site.

### **Operating Conditions**

15. The Proponent shall:
- (a) implement best management practice to minimise dust emissions by the project;
  - (b) regularly assess air quality monitoring data and relocate, modify, and/or stop operations on site as may be required to ensure compliance with the air quality criteria in this approval;
  - (c) minimise the air quality impacts of the project during adverse meteorological conditions and extraordinary events (see note d under Tables 7-9); and
  - (d) minimise surface disturbance of the site, other than as permitted under this approval.

### **Air Quality Management Plan**

16. The Proponent shall prepare and implement an Air Quality 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;
  - (b) be prepared in consultation with Council and EPA, and submitted for approval to the Secretary prior to the commencement of construction activities;
  - (c) describe the measures that would be implemented to ensure:
    - compliance with the relevant air quality conditions of this approval;
    - best management practice is employed; and
    - the air quality impacts of the project are minimised during adverse meteorological conditions and extraordinary events;
  - (d) describe the proposed air quality management system; and
  - (e) include a monitoring program that:
    - is capable of evaluating the performance of the project;
    - includes a protocol for determining any exceedances of the relevant conditions of approval;
    - effectively supports the air quality management system; and
    - evaluates and reports on the adequacy of the air quality management system.

### **METEOROLOGICAL MONITORING**

17. For the life of the project, the Proponent shall ensure that there is a suitable meteorological station operating in the vicinity of the site that complies with the requirements in the *Approved Methods for Sampling of Air Pollutants in New South Wales* guideline.

### **SOIL & WATER**

*Note: The Proponent is required to obtain the necessary water licences for the project under the Water Act 1912 and/or the Water Management Act 2000.*

#### **Water Supply**

18. The Proponent shall ensure it has sufficient water during all stages of the project, and if necessary, adjust the scale of quarrying operations on site to match its available supply.

#### **Surface Water Discharges**

19. The Proponent shall comply with the discharge limits in any EPL, or with Section 120 of the POEO Act.

#### **Effluent Management**

20. The Proponent shall:
- (a) not irrigate, discharge or dispose of sewage or bathroom effluent from the site; and
  - (b) operate and maintain a suitable effluent storage facility, to the satisfaction of Council and EPA.

## Water Management Plan

21. The Proponent shall prepare and implement a Water Management Plan for the project to the satisfaction of the Secretary. This plan must:
- (a) be prepared in consultation with the EPA and NOW by suitably qualified and experienced person/s whose appointment has been approved by the Secretary;
  - (b) be submitted to the Secretary for approval prior to the commencement of construction activities;
  - (c) include:
    - (i) a Site Water Balance that includes details of:
      - sources and security of water supply, including contingency planning;
      - water use on site; and
      - measures that would be implemented to minimise use of clean water and maximise recycling of dirty water on the site;
    - (ii) a Surface Water Management Plan, that includes:
      - baseline data on surface water flows and quality in the watercourses that could be affected by the project;
      - a detailed description of the surface water management system on the site, including the design objectives and performance criteria for the:
        - clean water diversions;
        - erosion and sediment controls;
        - water storages (including Maximum Harvestable Rights requirements); and
        - control of water pollution from areas of the site that have been rehabilitated;
      - surface water impact assessment criteria, to be developed following analysis of baseline data, including trigger levels for investigating any potentially adverse surface water quality impacts;
      - a program to monitor:
        - any surface water discharges;
        - the effectiveness of the water management system;
        - surface water flows and quality in local watercourses; and
        - ecosystem health of local watercourses; and
      - an assessment of appropriate options to improve storage and retention times in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom);
    - (iii) a Groundwater Monitoring Program that includes:
      - baseline data of groundwater levels surrounding the site;
      - groundwater impact assessment criteria, to be developed following analysis of baseline data, including trigger levels for investigating any potentially adverse groundwater impacts; and
      - a program to monitor and/or validate the impacts of the project on groundwater resources; and
    - (iv) a Surface and Ground Water Response Plan that describes the measures and/or procedures that would be implemented to:
      - respond to any exceedances of the surface water impact assessment criteria and groundwater impact assessment criteria; and
      - mitigate and/or offset any adverse impacts on surface water and groundwater resources located within and adjacent to the site.

## TRANSPORT

### Roadworks

22. The Proponent shall, at its own cost, complete the following roadworks shown conceptually in Figure 2 of Appendix 1, prior to transporting quarry products from the site:
- (a) extending Blue Rock Close, with tar seal and appropriate pavement, road markings and advance warning signage, to the satisfaction of Council and RMS;
  - (b) realigning and upgrading the Blue Rock Close/Andersite Road intersection with appropriate road markings, pavement thickening and advance warning signage, to the satisfaction of Council;

- (c) upgrading the Branch Lane/Andersite Road intersection with appropriate road markings and advance warning signage, to the satisfaction of Council;
- (d) constructing the site access road on Lots 12 and 13 DP 1024564 with appropriate pavement and advance warning signage, to the satisfaction of Council; and
- (e) installing a wheel-wash facility on the site.

#### **Monitoring of Product Transport**

23. The Proponent shall:
- (a) keep accurate records of:
    - the amount of quarry products transported from the site (per calendar month and year); and
    - the number of laden truck movements from the site (per hour, day, week, calendar month and year); and
  - (b) publish these records on its website quarterly.

#### **Parking**

24. The Proponent shall provide sufficient parking on-site for all project-related traffic, in accordance with Council's parking codes, to the satisfaction of the Secretary.

#### **Operating Conditions**

25. The Proponent shall ensure that all project-related heavy vehicles:
- (a) enter and exit the site in a forward direction; and
  - (b) exit the site with loads covered.

#### **Transport Management Plan**

26. The Proponent shall prepare and implement a Transport Management Plan for the project to the satisfaction of the Secretary. This plan must:
- (a) be prepared by a suitably qualified traffic consultant whose appointment has been approved by the Secretary;
  - (b) be prepared in consultation with RMS and Council, and submitted to the Secretary for approval prior to the commencement of construction activities;
  - (c) include a Driver Code of Conduct;
  - (d) describe the measures that would be implemented to ensure:
    - compliance with the relevant conditions of this approval;
    - that drivers of project-related heavy vehicles are aware of potential safety issues along the haulage routes; and
    - that drivers of project-related heavy vehicles comply with the Driver Code of Conduct; and
  - (e) include a program to monitor the effectiveness of these measures.

#### **LANDSCAPE**

##### ***Tetratheca Juncea* Translocation**

27. The Proponent shall develop and implement a translocation program for *Tetratheca juncea* to the satisfaction of the Secretary. This program must:
- (a) be prepared in consultation with OEH, by a suitably qualified and experienced ecologist whose appointment has been approved by the Secretary;
  - (b) be submitted to the Secretary for approval prior to the commencement of construction activities that involve clearing of or potential harm to *Tetratheca juncea*;
  - (c) include measures for the translocation of all *Tetratheca juncea* stems in the area of disturbance to nearby areas with similar physical and biological habitat features;
  - (d) include a monitoring program to study the *Tetratheca juncea* stems before and after translocation;
  - (e) include short and long-term goals and performance criteria to measure the effectiveness of the program; and
  - (f) provide for the transfer of information obtained as a result of implementing the program to OEH and P&I.

## Biodiversity Offset Strategy

28. The Proponent shall, prior to the commencement of vegetation clearing activities, finalise and implement the Biodiversity Offset Strategy, as described in the EA, summarised in Table 10 and shown conceptually in Figure 1 of Appendix 4, in consultation with OEH and Council, and to the satisfaction of the Secretary.

Table 10: Biodiversity Offset Strategy

Area	Offset Type	Minimum Size (ha)
Offset Area	Existing vegetation to be managed and enhanced	129.32 ha

*Note:* The Biodiversity Offset Strategy shall direct that the land proposed as the Biodiversity Offset shall be free of any dwelling-houses and associated sheds, bushfire asset protection zones and other related utilities or structures so as to preserve the integrity and function of that offset area. The Biodiversity Offset Strategy shall also provide details of the revegetation of any parts of the offset area that are cleared of native vegetation or are in an otherwise substantially modified state, other than required management trails and boundary fencing buffer distances.

## Long Term Security of Offsets

29. The Proponent shall, within 12 months of the finalisation of the Biodiversity Offset Strategy, make suitable arrangements to provide appropriate long-term security for the offset area, in consultation with OEH and Council, and to the satisfaction of the Secretary.

*Note:* In order of preference, mechanisms to provide appropriate long term security to the land within the Biodiversity Offset Strategy include transfer to the National Park Estate, Biobanking Agreement, Voluntary Conservation Agreement, or restrictive covenant on land titles.

## Rehabilitation Objectives

30. The Proponent shall rehabilitate the site to the satisfaction of the Secretary. This rehabilitation must:
- be generally consistent with the rehabilitation strategy as described in the EA and shown conceptually in Figure 1 in Appendix 5; and
  - comply with the objectives in Table 11.

Table 11: Rehabilitation Objectives

Feature	Objective
Site (as a whole)	Safe, stable & non-polluting.
Surface Infrastructure	To be decommissioned and removed, unless the Secretary agrees otherwise.
Quarry Wall Benches	Landscaped and revegetated utilising native tree and understorey species, ensuring that the tree canopy is restored and integrated with the surrounding tree canopy.
Quarry Pit Floor	Landscaped and revegetated with wetland vegetation.
Other land affected by the project	Restore ecosystem function, including maintaining or establishing self-sustaining eco-systems comprised of: <ul style="list-style-type: none"> <li>native endemic species; and</li> <li>a landform consistent with the surrounding environment.</li> </ul>
Community	Ensure public safety. Minimise the adverse socio-economic effects associated with quarry closure.

## Progressive Rehabilitation

31. The Proponent shall:
- rehabilitate the site progressively, that is, as soon as reasonably practicable following disturbance;

- (b) take all reasonable and feasible measures to minimise the total area of the site exposed at any time; and
- (c) implement interim rehabilitation strategies where areas prone to dust generation cannot yet be permanently rehabilitated.

#### **Landscape and Rehabilitation Management Plan**

32. The Proponent shall prepare and implement a Landscape and Rehabilitation Management Plan for the project to the satisfaction of the Secretary. This Plan would relate to the area of the quarry and all perimeter lands. This plan must:

- a. be prepared by a suitably qualified expert whose appointment has been approved by the Secretary;
- b. be prepared in consultation with OEH and Council, and submitted to the Secretary for approval prior to the commencement of construction activities;
- c. describe how the implementation of the *Tetratheca juncea* Translocation Program would be integrated with the overall rehabilitation of the site;
- d. describe the short, medium and long-term measures that would be implemented to:
  - manage remnant vegetation and habitat on the site; and
  - ensure compliance with the rehabilitation objectives and progressive rehabilitation obligations of this approval.
- e. include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, including triggers for any remedial action;
- f. include a detailed description of the measures that would be implemented over the next 3 years (to be updated for each 3 year period following initial preparation of the plan), including the procedures to be implemented for:
  - ensuring compliance with the rehabilitation objectives and progressive rehabilitation obligations of this approval;
  - enhancing the quality of remnant vegetation and fauna habitat;
  - restoring native endemic vegetation and fauna habitat within the rehabilitation area, including details of the target revegetation communities of the rehabilitated landform;
  - coordinating the relocation of native fauna to protected habitats associated with pre-clearing fauna surveys;
  - maximising the salvage of environmental resources within the approved disturbance area - including tree hollows, vegetative and soil resources - for beneficial reuse in the enhancement of the rehabilitation area;
  - collecting and propagating seed;
  - ensuring minimal environmental consequences for threatened species, populations and habitats;
  - minimising the impacts on native fauna on site, including the details and implementation of appropriate pre-clearance surveys;
  - minimising the impacts on fauna movement between undisturbed areas of the site and nearby vegetation (including potential fauna crossings);
  - controlling weeds and feral pests;
  - controlling erosion;
  - controlling access and providing for management trails; and
  - bushfire management and implementation of ecologically appropriate bushfire intervals.
- g. include a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;
- h. identify the potential risks to successful implementation of the *Tetratheca juncea* Translocation Program and rehabilitation of the site, and include a description of the contingency measures that would be implemented to mitigate these risks;
- i. include details as to how the rehabilitated land would be permanently conserved and managed as part of the broader Biodiversity Offset Area approved in these conditions;
- j. include details of who would be responsible for monitoring, reviewing, and implementing the plan; and

- k. include details as to the timing of actions set-out in the plan

#### **Biodiversity Offset Area Management Plan**

33. The Proponent shall prepare and implement a Biodiversity Offset Area Management Plan for the project to the satisfaction of the Secretary. This Plan would relate to the area of the Biodiversity Offset Area required in these Conditions. This plan must:
- a. be prepared by a suitably qualified expert whose appointment has been approved by the Secretary;
  - b. be prepared in consultation with OEH and Council, and submitted to the Secretary within 12-months of the approval of the Biodiversity Offset Strategy required in these conditions;
  - c. describe how the implementation of the *Tetratheca juncea* Translocation Program would be integrated with the Biodiversity Offset Area management;
  - d. describe the short, medium and long-term measures that would be implemented to manage remnant vegetation and habitat on the Biodiversity Offset Area;
  - e. include detailed performance and completion criteria for evaluating the performance of the conservation, restoration and management of the Biodiversity Offset Area, including triggers for any remedial action;
  - f. providing for the transfer of environmental resources from the approved disturbance area - including tree hollows, vegetative and soil resources - for beneficial reuse in the enhancement of the Biodiversity Offset Area;
  - g. providing for the incorporation of the final rehabilitated landform into the Biodiversity Offset Area and its management;
  - h. include a detailed description of the measures that would be implemented over the next 3 years (to be updated for each 3 year period following initial preparation of the plan), including the procedures to be implemented for:
    - enhancing the quality of remnant vegetation and fauna habitat;
    - restoring native endemic vegetation and fauna habitat within the parts of the Biodiversity Offset Area that are cleared or modified, including details of the target revegetation communities of the restored landform;
    - coordinating the relocation of native fauna to protected habitats associated with pre-clearing fauna surveys;
    - collecting and propagating seed;
    - maximising the protection and restoration of threatened species, populations and habitats in the Biodiversity Offset Area;
    - maximising fauna movement between the Biodiversity Offset Area and adjacent habitats;
    - controlling weeds and feral pests;
    - controlling erosion;
    - controlling access and providing for management trails; and
    - bushfire management and implementation of ecologically appropriate bushfire intervals.
  - i. include a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;
  - j. identify the potential risks to successful implementation of the Biodiversity Offset program, and include a description of the contingency measures that would be implemented to mitigate these risks;
  - k. include details of who would be responsible for monitoring, reviewing, and implementing the plan;
  - l. include details of the indicative costs of management actions; and
  - m. include details as to the timing of actions set-out in the plan

#### **Conservation & Rehabilitation Bond**

34. The Proponent shall lodge a Conservation and Rehabilitation Bond with P&I within 6 months of the approval of the Landscape and Rehabilitation Management Plan, to ensure that the Biodiversity Offset Strategy and the rehabilitation of the site is implemented in accordance with the performance and completion criteria set out in the Landscape and Rehabilitation Management Plan. The sum of the bond shall be determined by:
- (a) calculating the cost of implementing the Biodiversity Offset Strategy over the next 3 years;

- (b) calculating the cost of rehabilitating disturbed areas of the site, taking into account the likely surface disturbance over the next 3 years of quarrying operations; and
- (c) employing a suitably qualified quantity surveyor or other expert to verify the calculated costs, to the satisfaction of the Secretary.

*Notes:*

- *If capital and other expenditure required by the Landscape and Rehabilitation Management Plan is largely complete, the Secretary may waive the requirement for the lodgement of a bond in respect of the remaining expenditure.*
- *If the Biodiversity Offset Strategy and rehabilitation of the site area are completed to the satisfaction of the Secretary, then the Secretary will release the bond. If the Biodiversity Offset Strategy and rehabilitation of the site are not completed to the satisfaction of the Secretary, then the Secretary will call in all or part of the bond, and arrange for the completion of the relevant works.*
- *The component of the bond relating to the implementation of the Biodiversity Offset Strategy may be waived, if a separate arrangement is entered into between the Proponent and OEH which satisfactorily replaces that component, to the satisfaction of the Secretary.*

35. Within 3 months of each Independent Environmental Audit (see condition 9 of schedule 5), the Proponent shall review, and if necessary revise, the sum of the Conservation and Rehabilitation Bond to the satisfaction of the Secretary. This review must:
- (a) consider the performance of the implementation of the Biodiversity Offset Strategy and rehabilitation of the site to date;
  - (b) consider the effects of inflation; and
  - (c) calculate the cost of implementing the Biodiversity Offset Strategy and rehabilitating the disturbed areas of the site (taking into account the likely surface disturbance over the next 3 years of quarrying operations); and

## **HERITAGE**

### **Heritage Management Plan**

36. The Proponent shall prepare and implement a Heritage 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;
  - (b) be prepared in consultation with the local Aboriginal community and OEH, and submitted to the Secretary for approval prior to the commencement of construction activities;
  - (c) describe the measures that would be implemented to:
    - monitor initial surface disturbance on site for Aboriginal cultural heritage sites or objects;
    - manage the discovery of Aboriginal cultural heritage sites, objects or human remains on site; and
    - ensure ongoing consultation with Aboriginal stakeholders in the conservation and management of Aboriginal cultural heritage values on site.

## **VISUAL**

37. The Proponent shall:
- (a) ensure that clearing vegetation from any visually prominent ridgeline is undertaken in a progressive manner, to provide for a maximum of 6 months of future quarrying operations; and
  - (b) mitigate the visual impact of the project through the progressive and early rehabilitation of the upper quarry benches in accordance with the objectives in Table 11, to the satisfaction of the Secretary.

### **Advertising Signage**

38. The Proponent shall not erect or display any advertising structure or sign on the site without the written approval of the Secretary.

*Note: This condition does not apply to business identification, traffic management, and/or safety or environmental signs.*



## **EMEGENCY AND HAZARDS MANAGEMENT**

### **Dangerous Goods and Hazardous Materials**

39. The Proponent shall ensure that the storage, handling, and transport of dangerous goods and hazardous materials is conducted in accordance with the relevant *Australian Standards*, particularly AS1940 and AS1596, and the *Dangerous Goods Code*.

### **Safety**

40. The Proponent shall secure the site to ensure public safety at all times, to the satisfaction of the Secretary.

### **Bushfire Management**

41. The Proponent shall:
- (a) ensure that the project is suitably equipped to respond to any fires on site; and
  - (b) assist the Rural Fire Service and emergency services as much as possible if there is a fire in the surrounding area.

### **WASTE**

42. The Proponent shall:
- (a) minimise the waste generated by the project; and
  - (b) ensure that the waste generated by the project is appropriately stored, handled, and disposed of,
- to the satisfaction of the Secretary.

## **SCHEDULE 4 ADDITIONAL PROCEDURES**

### **NOTIFICATION OF LANDOWNERS**

1. As soon as practicable after obtaining monitoring results showing an:
  - (a) exceedance of any relevant criteria in Schedule 3, the Proponent shall notify affected landowners in writing of the exceedance, and provide regular monitoring results to each affected landowner until the project is again complying with the relevant criteria; and
  - (b) an exceedance of the relevant air quality criteria in Schedule 3, the proponent shall send a copy of the NSW Health fact sheet entitled "*Mine Dust and You*" (as may be updated from time to time) to the affected landowners and/or existing tenants of the land.

### **INDEPENDENT REVIEW**

2. If an owner of privately-owned land considers the project to be exceeding the relevant criteria in schedule 3, then the landowner may ask the Secretary in writing for an independent review of the impacts of the project on its land.

If the Secretary is satisfied that an independent review is warranted, then within 2 months of the Secretary's decision the Proponent shall:

- (a) commission a suitably qualified, experienced and independent expert, whose appointment has been approved by the Secretary, to:
    - consult with the landowner to determine its concerns;
    - conduct monitoring to determine whether the project is complying with the relevant criteria in Schedule 3; and
    - if the project is not complying with these criteria, then identify the measures that could be implemented to ensure compliance with the relevant criteria; and
  - (b) give the Secretary and landowner a copy of the independent review.
3. If the independent review determines that the project is complying with the relevant criteria in Schedule 3, then the Proponent may discontinue the independent review with the approval of the Secretary.

If the independent review determines that the project is not complying with the relevant criteria in Schedule 3, then the Proponent shall:

- (a) implement all reasonable and feasible mitigation measures, in consultation with the landowner and appointed independent expert, and conduct further monitoring until the project complies with the relevant criteria; or
- (b) secure a written agreement with the landowner to allow exceedances of the relevant criteria, to the satisfaction of the Secretary.

## **SCHEDULE 5 ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING**

### **ENVIRONMENTAL MANAGEMENT**

#### **Environmental Management Strategy**

1. The Proponent shall prepare and implement an Environmental Management Strategy for the project to the satisfaction of the Secretary. This strategy must:
  - (a) be submitted to the Secretary for approval prior to the commencement of construction activities;
  - (b) provide the strategic framework for environmental management of the project;
  - (c) identify the statutory approvals that apply to the project;
  - (d) describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the project;
  - (e) describe the procedures that would be implemented to:
    - keep the local community and relevant agencies informed about the operation and environmental performance of the project;
    - receive, handle, respond to, and record complaints;
    - resolve any disputes that may arise during the course of the project;
    - respond to any non-compliance; and
    - respond to emergencies; and
  - (f) include:
    - copies of any strategies, plans and programs approved under the conditions of this approval; and
    - a clear plan depicting all the monitoring required to be carried out under the conditions of this approval.

#### **Adaptive Management**

2. The Proponent shall assess and manage project-related risks to ensure that there are no exceedances of the criteria and/or performance measures in schedule 3. Any exceedance of these criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation.

Where any exceedance of these criteria and/or performance measures has occurred, the Proponent shall, at the earliest opportunity:

- (a) take all reasonable and feasible measures to ensure that the exceedance ceases and does not recur;
- (b) consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and
- (c) implement remediation measures as directed by the Secretary; to the satisfaction of the Secretary.

#### **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:
  - (a) detailed baseline data;
  - (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;
  - (c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;
  - (d) a program to monitor and report on the:
    - impacts and environmental performance of the project; and

- effectiveness of any management measures (see (c) above);
- (e) a contingency plan to manage any unpredicted impacts and their consequences;
- (f) a program to investigate and implement ways to improve the environmental performance of the project over time;
- (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
- (h) a protocol for periodic review of the plan.

*Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.*

#### **Annual Review**

4. By the end of March each year, the Proponent shall review the environmental performance of the project to the satisfaction of the Secretary. This review must:
  - (a) describe the development (including rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year;
  - (b) include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, which includes a comparison of these results against:
    - the relevant statutory requirements, limits or performance measures/criteria;
    - the monitoring results of previous years; and
    - the relevant predictions in the EA;
  - (c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
  - (d) identify any trends in the monitoring data over the life of the project;
  - (e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and
  - (f) describe the measures that would be implemented over the current calendar year to improve the environmental performance of the project.

#### **Revision of Strategies, Plans and Programs**

5. Within 3 months of:
  - (a) the submission of an annual review under Condition 4 above;
  - (b) the submission of an incident report under Condition 7 below;
  - (c) the submission of an audit report under Condition 9 below; or
  - (d) any modification to the conditions of this approval, (unless the conditions require otherwise),
 the Proponent shall review the strategies, plans, and programs required under this approval, to the satisfaction of the Secretary. Where this review leads to revisions in any such document, then within 4 weeks of the review the revised document must be submitted for the approval of the Secretary.

*Note: The purpose of this condition is to ensure that strategies, plans and programs are regularly updated to incorporate any measures recommended to improve environmental performance of the project.*

#### **Community Consultative Committee**

6. The Proponent shall establish and operate a Community Consultative Committee (CCC) for the project. The CCC must:
  - (a) be established and operated in general accordance with the *Guidelines for Establishing and Operating Community Consultative Committees for Mining Projects* (Department of Planning, 2007, or its latest version); and
  - (b) be established prior to the commencement of construction activities, to the satisfaction of the Secretary.

##### **Notes:**

- *The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Proponent complies with this approval.*
- *In accordance with the guideline, the Committee should comprise an independent chair and appropriate representation from the Proponent, Council, recognised environmental groups and the local community.*

## REPORTING

### Incident Reporting

7. 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.

### Regular Reporting

8. The Proponent shall regularly report on the environmental performance of the project on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this approval.

## INDEPENDENT ENVIRONMENTAL AUDIT

9. Within 12 months of the commencement of development on the site, and every 3 years thereafter, unless the Secretary directs otherwise, the Proponent shall commission and pay the full cost of an Independent Environmental Audit of the project. This audit must:
  - (a) be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary;
  - (b) include consultation with the relevant agencies;
  - (c) assess the environmental performance of the project and whether it is complying with the relevant requirements in this approval and any relevant EPL and/or Water Licence (including any assessment, plan or program required under these approvals);
  - (d) review the adequacy of any approved strategy, plan or program required under the these approvals; and
  - (e) recommend measures or actions to improve the environmental performance of the project, and/or any assessment, plan or program required under these approvals.

*Note: This audit team must be led by a suitably qualified auditor and include experts in any fields specified by the Secretary.*

10. Within 3 months of commissioning this audit, or as otherwise agreed by the Secretary, the Proponent shall submit a copy of the audit report to the Secretary, together with its response to any recommendations contained in the audit report.

## ACCESS TO INFORMATION

11. The Proponent shall:
  - (a) make the following information publicly available on its website:
    - the EA;
    - any statutory approvals for the project;
    - approved strategies, plans and/ programs;
    - a summary of the monitoring results of the project, which have been reported in accordance with the various plans and programs approved under the conditions of this approval;
    - a complaints register, updated quarterly;
    - minutes of CCC meetings;
    - annual reviews;
    - any independent environmental audit, and the Proponent's response to the recommendations in any audit; and
    - any other matter required by the Secretary; and
  - (a) keep this information up-to-date, to the satisfaction of the Secretary.

## APPENDIX 1 PROJECT LAYOUT

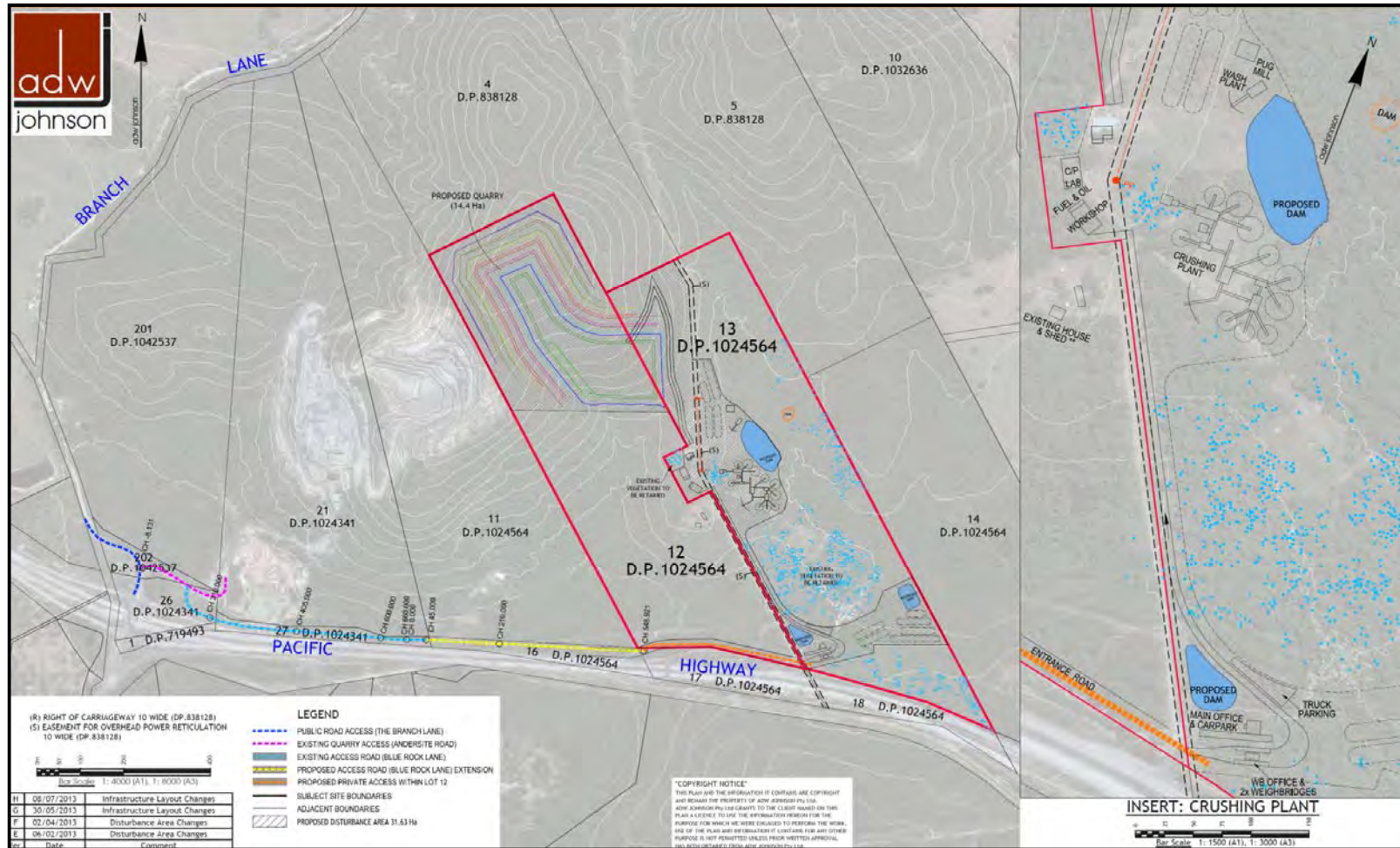


Figure 1: Project Layout



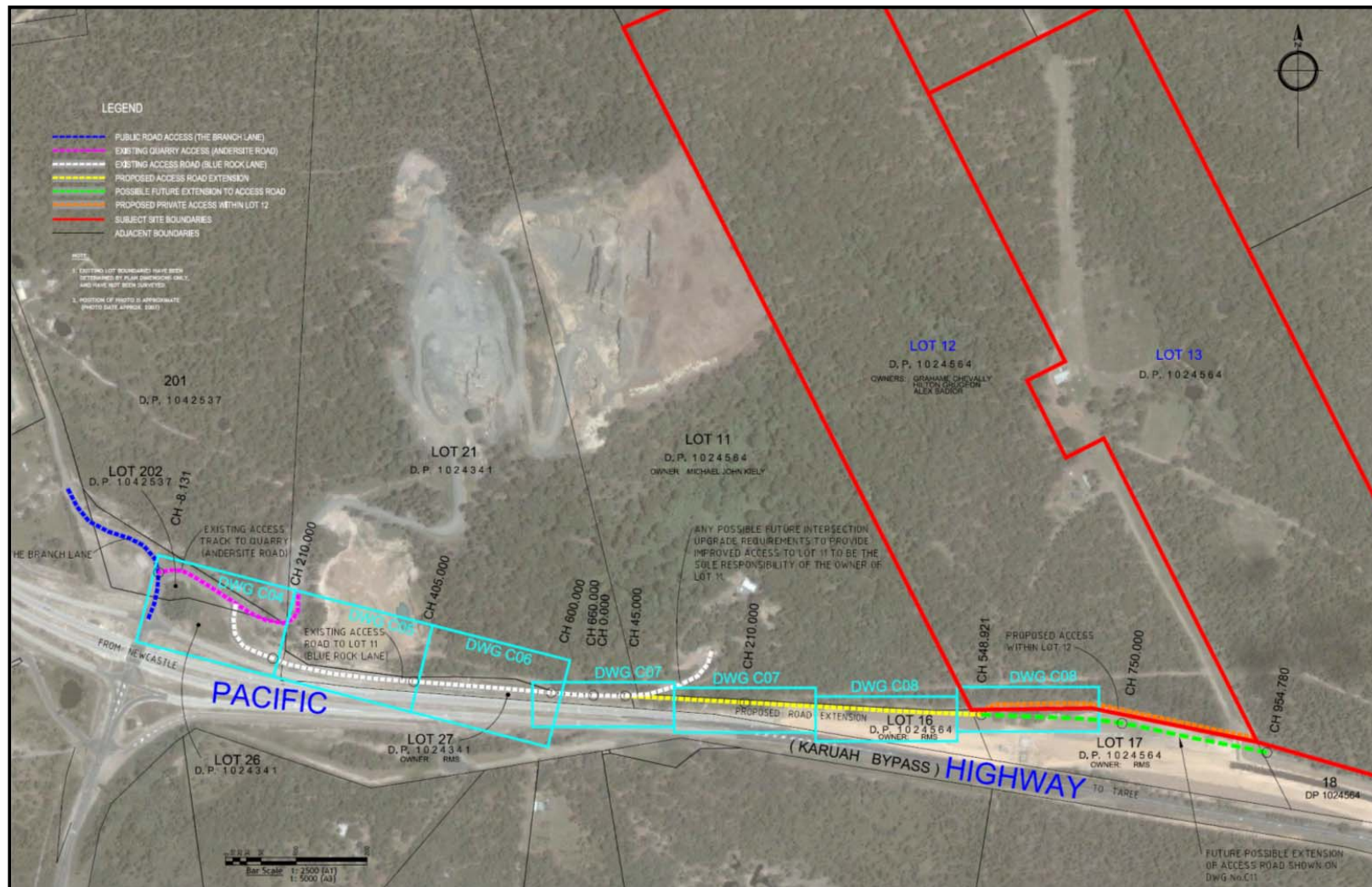


Figure 2: Proposed roadworks

**APPENDIX 2  
NOISE RECEIVER LOCATIONS**



*Figure 1: Closest residences*



### **APPENDIX 3 NOISE COMPLIANCE ASSESSMENT**

#### **Applicable Meteorological Conditions**

1. The noise criteria in Tables 2 and 4 are to apply under all meteorological conditions except the following:
  - (a) during periods of rain or hail; or
  - (b) wind speeds greater than 3 m/s measured at 10 m above ground level.

#### **Determination of Meteorological Conditions**

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by the meteorological station in the vicinity of the site.

#### **Compliance Monitoring**

3. Attended monitoring is to be used to evaluate compliance with the relevant conditions of this approval.
4. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (as amended from time to time), in particular the requirements relating to:
  - (a) monitoring locations for the collection of representative noise data;
  - (b) meteorological conditions during which collection of noise data is not appropriate;
  - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
  - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

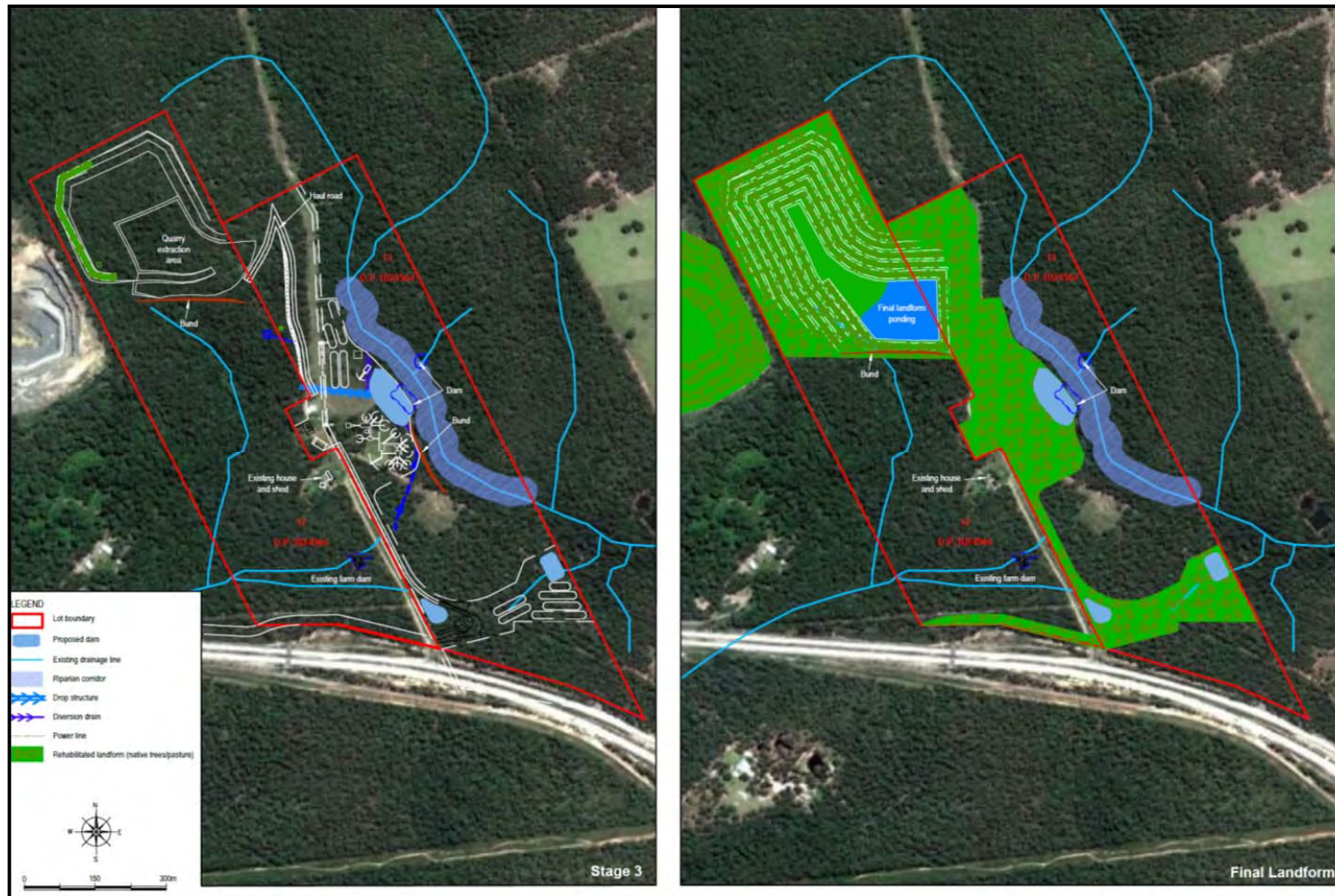
# **APPENDIX 4** **CONCEPTUAL BIODIVERSITY OFFSET AREA**



**Figure 1: Conceptual Biodiversity Offset Area**



## APPENDIX 5 REHABILITATION STRATEGY



*Figure 1: Conceptual Rehabilitated Landform*

**APPENDIX 6**  
**STATEMENT OF COMMITMENTS**





**Australian Government**  
**Department of the Environment**

**Approval**

**Karuah East Quarry, Pacific Highway, 3 km from Karuah, NSW (EPBC 2014/7282)**

This decision is made under sections 130(1) and 133 of the *Environment Protection and Biodiversity Conservation Act 1999*.

**Proposed action**

**Person to whom the approval is granted** Karuah East Quarry Pty Ltd

**Proponent's ACN** 141 505 035

**Proposed action** To develop a hard rock (andesite) quarry and associated infrastructure in the Lower North Coast, Pacific Highway, 3 km north of Karuah, NSW

**Approval decision**

Controlling Provision	Decision
Listed threatened species and communities (sections 18 & 18A)	Approved

**Conditions of approval**

This approval is subject to the conditions specified below.

**Expiry date of approval**

This approval has effect until 30 March 2045.

**Decision-maker**

**name and position** Tim Wyndham  
Acting Assistant Secretary  
South-Eastern Australia Environment Assessments Branch

**signature**

**Date of decision**

20.3.15



## Conditions attached to the approval

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### *Proposed project area*

1. The person taking the action must not impact on any **Black-eyed Susan** or **Trailing Woodruff** outside the **project area** identified at **Appendix A**.
2. The person taking the action must not impact on any habitat for the **Koala** outside the **project area** identified at **Appendix B**.

### *Mitigation*

3. Prior to the **commencement of construction**, the person taking the action must install fencing around the perimeter of the **project area** and identify signed **no-go areas**. Fencing and **no-go areas** must be maintained for the life of the action.
4. Prior to the **commencement of construction** and for the life of the action, all on-site personnel must be inducted on environmental sensitivities in the area, including the risk of **Koala** vehicle strike. Induction material is to be prepared by a **suitably qualified ecologist**.
5. Should injury to Koalas occur, advice from a **wildlife expert** must be sought and action taken in accordance with that advice. Records of any Koala injury within the **project area** must be documented and maintained.
6. Within 48 hours before the clearing of vegetation, pre-clearance surveys must be undertaken by a **suitably qualified ecologist** to ensure the absence of the **Koala** in the **project area**. If any **Koalas** are found to be present, **salvage and translocation** must be undertaken by a **suitably qualified ecologist**.

### *Offsets*

7. The person taking the action must comply with the offset conditions set out in the **NSW Project Approval**.
8. Prior to the **commencement of construction**, to compensate for the impact to the **Trailing Woodruff** and habitat for the **Koala**, the person taking the action must secure suitable offset sites consistent with the **Karuah East Quarry EPBC Act Assessment Report**. In the case that offsets for the **Trailing Woodruff** or habitat for the **Koala** consistent with those set out in the **Karuah East Quarry EPBC Act Assessment Report** cannot be secured, alternative offset sites must be secured, consistent with the **EPBC Act Offsets Policy**.



9. Prior to the **commencement of construction**, the person taking the action must provide the **Minister** with a Biodiversity Area Offset Management Plan for approval. The Biodiversity Area Offset Management Plan must be consistent with the **NSW Project Approval** and include:
- a) **survey information** identifying the number of **Trailing Woodruff** present across all proposed offset sites; and
  - b) details on the management and monitoring of the **Trailing Woodruff**, and corrective actions and **contingency plans** to be implemented where the re-establishment of the **Trailing Woodruff** fails to meet targets specified in the **Karuah East Quarry EPBC Act Assessment Report**.

The approved Biodiversity Area Offset Management Plan must be implemented.

#### *Administrative*

10. Within 30 days after the **commencement of construction**, the person taking the action must advise the **Department** in writing of the actual date of **commencement of construction**.
11. The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement the management plan, and make it available upon request to the **Department**. Such records may be subject to audit by the **Department** or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the **Department's** website. The results of audits may also be publicised through the general media.
12. Within three months of every 12 month anniversary of the **commencement of construction**, the person taking the action must publish a report on their website addressing compliance with each of the conditions of this approval over the previous 12 months, including implementation of any management plan, as specified in the conditions. Documentary evidence providing proof of the date of publication must be provided to the Department at the same time as the compliance report is published. The compliance reports must remain on the website for 12 months from the date of publishing. Potential or actual contraventions of the conditions of the approval must be reported to the **Department** in writing within 2 business days of the person taking the action becoming aware of the potential or actual contravention. All contraventions must also be included in the compliance reports.
13. Upon the direction of the **Minister**, the person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the **Minister**. The independent auditor must be approved by the **Minister** prior to the commencement of the audit. Audit criteria must be agreed to by the **Minister** and the audit report must address the criteria to the satisfaction of the **Minister**.
14. If the person taking the action wishes to carry out any activity otherwise than in accordance with the management plan as specified in the conditions, the person taking the action must submit to the Department for the **Minister's** written approval a revised version of that management plan. The varied activity shall not commence until the **Minister** has approved the varied management plan in writing. If the **Minister** approves the revised management plan, that management plan must be implemented in place of the management plan originally.



15. If the **Minister** believes that it is necessary or convenient for the better protection of listed threatened species and ecological communities to do so, the **Minister** may request that the person taking the action make specified revisions to the management plan specified in the conditions and submit the revised management plan for the **Minister's** written approval. The person taking the action must comply with any such request. The revised approved management plan must be implemented. Unless the **Minister** has approved the revised management plan then the person taking the action must continue to implement the management plan originally approved, as specified in the conditions.
16. If, at any time after 5 years from the date of this approval, the person taking the action has not **substantially commenced** the action, then the person taking the action must not **substantially commence** the action without the written agreement of the **Minister**.
17. Unless otherwise agreed to in writing by the **Minister**, the person taking the action must publish all management plans referred to in these conditions of approval on their website. Each management plan must be published on the website within 1 month of being approved. The person taking the action must notify the **Department** within 5 business days of publishing the management plan on their website and the management plan must remain on the website for the period this approval has effect.



## Definitions:

**Black-eyed Susan** is the EPBC listed threatened species *Tetratheca juncea*.

**Commencement of construction** is the date that preparatory works are first undertaken, including but not limited to clearing of vegetation, the erection of any onsite temporary structures and the use of heavy duty equipment for the purpose of breaking the ground for infrastructure or earthworks. This does not include investigative activities such as accessing the site for surveying or planning purposes.

**Contingency plans** include compensatory measures such as additional direct offsets which would be required to meet the EPBC Act Offsets Policy.

**Department** means the Australian Government Department administering the *Environment Protection and Biodiversity Conservation Act 1999*.

**EPBC Act Offsets Policy** means the Australian Government policy document titled: *EPBC Act environmental offsets policy Department of the Environment, 2013 Policy guiding the use of offsets under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*.

**Karuah East Quarry EPBC Act Assessment Report** means the report prepared by Eco Logical Australia, October 2014.

**Koala** is the EPBC listed threatened species *Phascolarctos cinereus*.

**Minister** means the Australian Government Minister administering the *Environment Protection and Biodiversity Conservation Act 1999* and includes a delegate of the Minister.

**No-go areas** means areas adjacent to the **project area** containing habitat for EPBC listed threatened species, to be excluded from construction, vehicles, personnel and equipment.

**NSW Project Approval** means Project Approval number 09\_0175, granted under section 75J of the *Environmental Planning and Assessment Act 1979* by the Minister for Planning to Karuah East Quarry Pty Ltd and dated 17 June 2014.

**Project area** means the Karuah East Hard Rock Quarry identified by the red line at Appendix A and Appendix B.

**Salvage and translocation** means the relocation of animals or plants from an area adversely affected by development to an area reserved or protected from ongoing impacts.

**Substantially commence/d** means the installation of any permanent infrastructure associated with the action excluding signage and fences.

**Suitably qualified ecologist** means an ecologist with relevant tertiary qualifications and at least 2 years of experience in koala surveying and salvage and translocation.

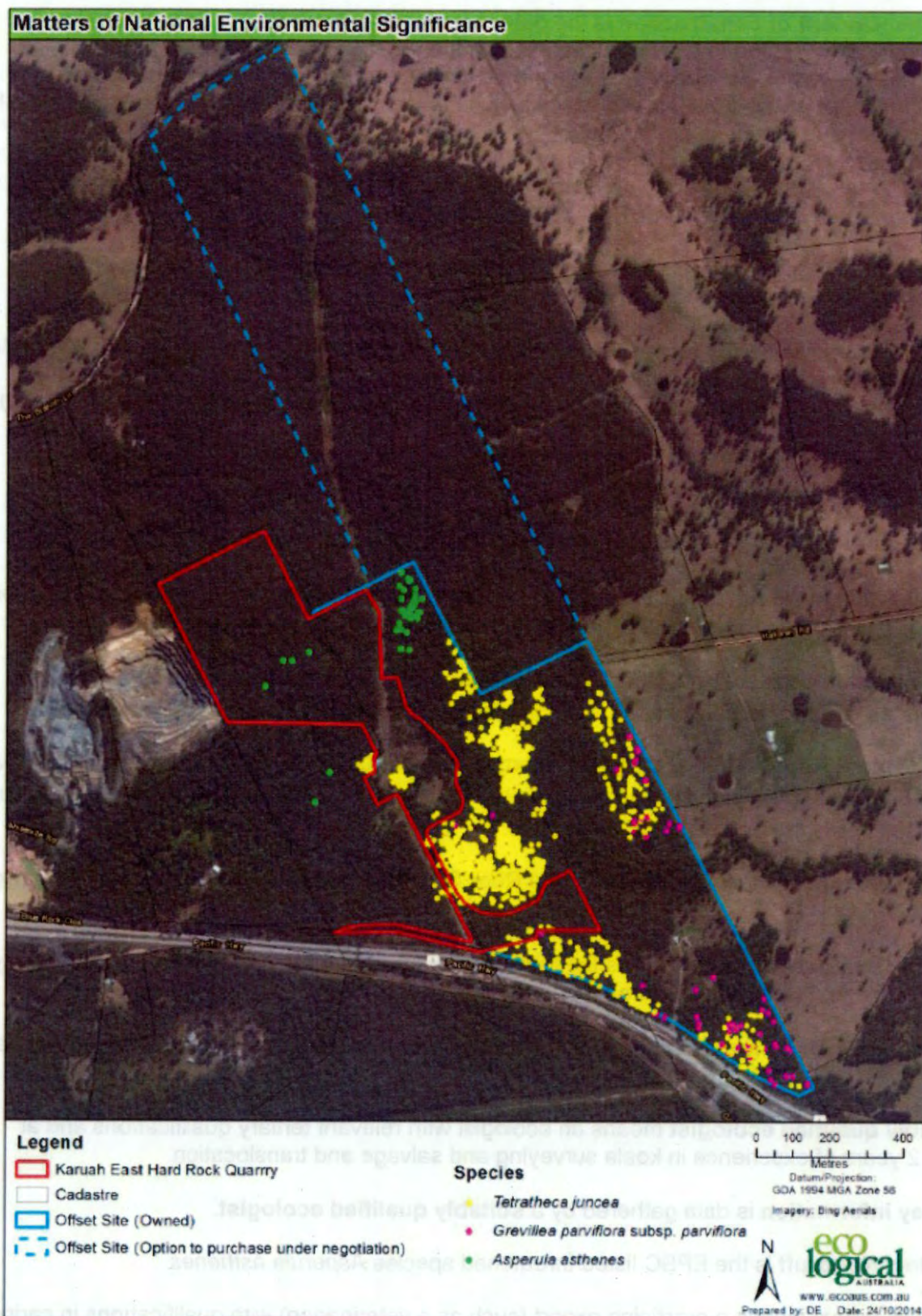
**Survey information** is data gathered by a **suitably qualified ecologist**.

**Trailing Woodruff** is the EPBC listed threatened species *Asperula asthenes*.

**Wildlife expert** means a practicing expert (such as a veterinarian) with qualifications in caring for injured wildlife and access to adequate equipment to provide appropriate care.



**Appendix A** – locations of the Black-eyed Susan and Trailing Woodruff in the **project area** and surrounding properties.



**Figure 11** Threatened species recorded within the offset site



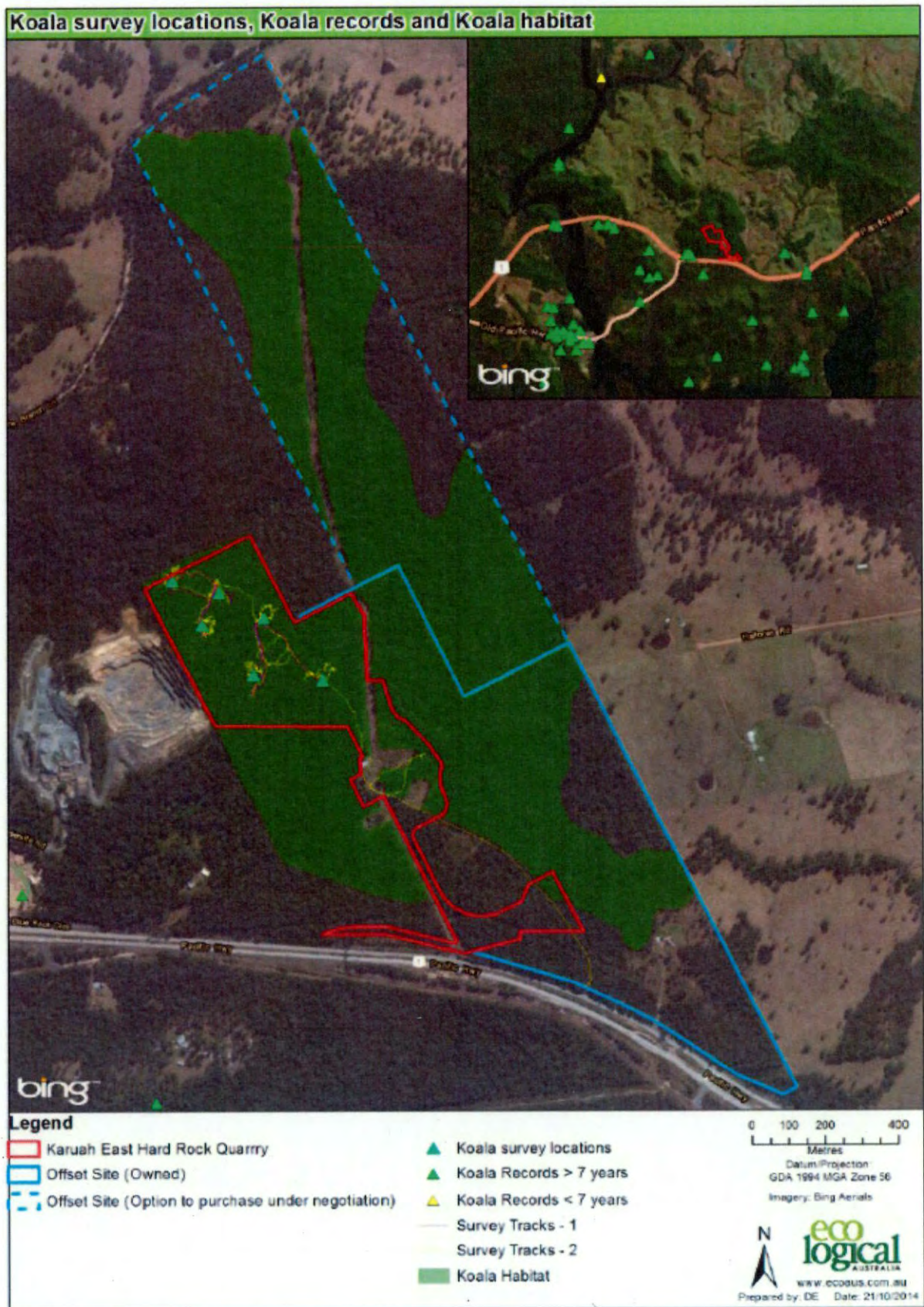


Figure 9 Koala habitat within both the quarry impact area and the adjacent offset areas



Item		Location	
1. Project area		Project area	
2. Surrounding area		Surrounding area	
3. Other items		Other items	
4. Other items		Other items	
5. Other items		Other items	
6. Other items		Other items	
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85. Other items		Other items	
86. Other items		Other items	
87. Other items		Other items	
88. Other items		Other items	
89. Other items		Other items	
90. Other items		Other items	
91. Other items		Other items	
92. Other items		Other items	
93. Other items		Other items	
94. Other items		Other items	
95. Other items		Other items	
96. Other items		Other items	
97. Other items		Other items	
98. Other items		Other items	
99. Other items		Other items	
100. Other items		Other items	

## **APPENDIX 2 – Environment Protection Licence**

# Environment Protection Licence



Licence - 20611

Licence Details	
Number:	20611
Anniversary Date:	26-August

Licensee
KARUAH EAST QUARRY PTY LIMITED
PO BOX 3284
THORNTON NSW 2322

Premises
KARUAH EAST QUARRY
PACIFIC HIGHWAY
KARUAH NSW 2324

Scheduled Activity
Crushing, grinding or separating
Extractive activities

Fee Based Activity	Scale
Crushing, grinding or separating	> 500000-2000000 T annual processing capacity
Land-based extractive activity	> 500000-2000000 T annual capacity to extract, process or store

Region
North - Hunter
Ground Floor, NSW Govt Offices, 117 Bull Street
NEWCASTLE WEST NSW 2302
Phone: (02) 4908 6800
Fax: (02) 4908 6810
PO Box 488G NEWCASTLE
NSW 2300

# Environment Protection Licence

Licence - 20611



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# Environment Protection Licence

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Licence - 20611



## Information about this licence

### Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

### Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

### Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

### Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

### Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

### Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

# Environment Protection Licence



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The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

### Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

### Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

### This licence is issued to:

KARUAH EAST QUARRY PTY LIMITED
PO BOX 3284
THORNTON NSW 2322

subject to the conditions which follow.

# Environment Protection Licence



Licence - 20611

## 1 Administrative Conditions

### A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled development work listed below at the premises listed in A2:

Works necessary to commence quarry operations (eg stormwater controls, development of roads).

A1.2 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Crushing, grinding or separating	Crushing, grinding or separating	> 500000 - 2000000 T annual processing capacity
Extractive activities	Land-based extractive activity	> 500000 - 2000000 T annual capacity to extract, process or store

A1.3 Notwithstanding the condition above, the scale of the land-based extractive activity and / or scale of crushing, grinding and separating authorised under this licence must not exceed 1.5 million tonnes of quarry products per annum, being the amount equivalent to the extraction limit approved by the project approval MP09\_0175 granted under the *Environmental Planning and Assessment Act 1979* for the premises specified in A2.

### A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
KARUAH EAST QUARRY
PACIFIC HIGHWAY
KARUAH
NSW 2324
LOT 26 DP 1024341, LOT 27 DP 1024341, LOT 12 DP 1024564, LOT 13 DP 1024564, LOT 16 DP 1024564, LOT 17 DP 1024564, LOT 202 DP 1042537

### A3 Information supplied to the EPA

A3.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

# Environment Protection Licence

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In this condition the reference to "the licence application" includes a reference to:

- a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
- b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

## 2 Discharges to Air and Water and Applications to Land

### P1 Location of monitoring/discharge points and areas

- P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

<i>Air</i>			
EPA identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
4	Air emissions monitoring		Adjacent to Residence C at 5760 Pacific Highway, Karuah, referred to as DDG1 on Figure 2 "Sensitive Receivers & Air Quality Monitoring Locations" in draft Karuah East Quarry Project Air Quality Plan", July 2015. Located within EPA document DOC15/281558.
5	Air emissions monitoring		Adjacent to Residence B at 5770 Pacific Hwy, Karuah, referred to as DDG2 on Figure 2 titled "Sensitive Receivers & Air Quality Monitoring Locations" in draft Karuah East Quarry Project Air Quality Plan", July 2015. Located within EPA document DOC15/281558
6	Air emissions monitoring		Located Lot 24 DP 1024341 Pacific Karuah, referred to as DDG3 on Figure 2 titled "Sensitive Receivers and Air Quality Monitoring Locations" in draft Karuah East Quarry Project Air Quality Plan", July 2015. Located within EPA document DOC15/281558.
7	Air emissions monitoring		Located at 21 Halloran Road, North Arm Cove, referred to as DDG4 on Figure 2 titled "Sensitive Receivers and Air Quality Monitoring Locations" in draft Karuah East Quarry Project Air Quality Plan", July 2015. Located within EPA document DOC15/281558.
8	Air emission monitoring		Located on Lot21 DP1024341 Pacific Hwy, Karuah, referred to as DDG5 on Fig 2 "Karuah East Quarry - Sensitive Receivers & Air Quality Monitoring Locations" attached to licence variation application received 16/12/16. Located within EPA document DOC16/58114

# Environment Protection Licence

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9	Air emission monitoring	Residence B located at Lot 3 DP 785172, Karuah, referred to as "B" HVAS on Fig 2 "Karuah East Quarry - Sensitive Receivers & Air Quality Monitoring Locations" in licence variation application received 16/12/16. Located within EPA document DOC16/581149
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P1.2 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.

P1.3 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

## Water and land

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
1	Discharge to waters	Discharge to waters	The discharge point from Dam 1 as shown on the plan titled "Proposed Surface Water Management Plan - Figure 3", which is filed as part of EPA document DOC15/253402.
2	Discharge to waters	Discharge to waters	The discharge point from Dam 2 as shown on the plan titled "Proposed Surface Water Management Plan - Figure 3", which is filed as part of EPA document DOC15/253402.
3	Discharge to waters	Discharge to waters	The discharge from Dam 3 as shown on the plan titled "Proposed Surface Water Management Plan - Figure 3", which is filed as part of EPA document DOC15/253402.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

## Noise

EPA identification no.	Type of monitoring point	Location description
11	Air blast overpressure & ground vibration peak particle velocity monitoring	Blast Monitor located adjacent to Residence B as identified in 'Figure 1 - Appendix 2 - Noise Receiver Locations' located in EPA document DOC15/253402.

## 3 Limit Conditions

# Environment Protection Licence



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## L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

## L2 Concentration limits

L2.1 For each monitoring/discharge point or utilisation area specified in the table\ below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\.

L2.4 Water and/or Land Concentration Limits

### POINT 1,2,3

Pollutant	Units of Measure	50 Percentile concentration limit	90 Percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Oil and Grease	milligrams per litre				5 and/or none visibl
pH	pH				6.5 - 8.5
Total suspended solids	milligrams per litre				40

## L3 Waste

L3.1 The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by the licence.

L3.2 This condition only applies to the storage, treatment, processing, reprocessing or disposal of waste at the premises if those activities require an environment protection licence.

## L4 Noise limits

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- L4.1 Noise generated at the premises must not exceed the noise limits in the table below. The locations referred to in the table below are indicated in Table 3 and Figure 10 of the document entitled Environmental Assessment Report - Proposed Karuah East Quarry (ADW Johnson Pty Limited 2013) which has been filed on EPA file LIC08/1088-03.

Location	Noise Limit dB(A)
	Day LAeq (15 minute)
Residence A on Lot 100 DP 785172	40
Residence B on Lot 3 DP 785172	37
Residence G on Lot 1 DP 1032636	38
Any other residence or sensitive receiver not subject to a private negotiated agreement	35
Any approved residence on Lot 11 DP 1024564	43

- L4.2 For the purpose of the table above, Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.

- L4.3 The noise limits set out in this licence apply under all meteorological conditions except for the following:
- Wind speed greater than 3 metres/second at 10 metres above ground level; or
  - Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or
  - Stability category G temperature inversion conditions.

#### L4.4 Determining Compliance

To determine compliance:

- with the Leq(15 minute) noise limits in the Noise Limits table, the noise measurement equipment must be located:
  - approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
  - within 30 metres of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
  - within approximately 50 metres of the boundary of a National Park or a Nature Reserve.
- with the LA1(1 minute) noise limits in the Noise Limits table, the noise measurement equipment must be located within 1 metre of a dwelling façade.
- with the noise limits in the Noise Limits table, the noise measurement equipment must be located:
  - at the most affected point at a location where there is no dwelling at the location; or
  - at the most affected point within an area at a location prescribed by part (a) or part (b) of this condition.

Note: A non-compliance of the Noise Limits table will still occur where noise generated from the premises in excess of the appropriate limit is measured:

- at a location other than an area prescribed in part (a) and part (b); and/or
- at a point other than the most affected point at a location.

- L4.5 For the purposes of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.



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## L5 Blasting

- L5.1 Blasting in or on the premises must only be carried out between 0900 hours and 1600 hours, Monday to Friday. No blasting is permitted Saturdays, Sundays or public holidays. Blasting outside of the hours specified in this condition can only take place with the written approval of the EPA.
- L5.2 Blasting is not permitted simultaneously with adjacent quarry(s).
- L5.3 The airblast overpressure level from blasting operations in or on the premises must not exceed: 115 dB (Lin Peak) for more than 5% of the total number of blasts during each reporting period at monitoring point 11 detailed in Condition P1.4.
- L5.4 The airblast overpressure level from blasting operations in or on the premises must not exceed: 120 dB (Lin Peak) at any time at monitoring point 11 detailed in Condition P1.4.
- L5.5 The ground vibration peak particle velocity from blasting operations carried out in or on the premises must not exceed 5 mm/second for more than 5% of the total number of blasts during each reporting period at monitoring point 11 detailed in Condition P1.4.
- L5.6 The ground vibration peak particle velocity from blasting operations carried out in or on the premises must not exceed 10 mm/second at any time at monitoring point 11 detailed in Condition P1.4.
- L5.7 Error margins associated with any monitoring equipment used to measure airblast overpressure or peak particle velocity are not to be taken into account in determining whether or not the limit has been exceeded.
- L5.8 The airblast overpressure and ground vibration levels in the conditions above do not apply at noise sensitive locations that are owned by the licensee or subject to a private agreement, relating to airblast overpressure and ground vibration levels, between the licensee and land owner.
- L5.9 Offensive blast fume must not be emitted from the premises.

### *Definition:*

*Offensive blast fume means post-blast gases from the detonation of explosives at the premises that by reason of their nature, duration, character or quality, or the time at which they are emitted, or any other circumstances:*

- 1. are harmful to (or likely to be harmful to) a person that is outside the premises from which it is emitted, or*
- 2. interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted.*

## L6 Hours of operation

- L6.1 All construction work at the premises must be conducted between 7am to 6pm Monday to Friday and between 8am to 1pm Saturdays and at no time on Sundays and public holidays. This condition does not apply in the event of a direction from police or other relevant authority for safety or emergency reasons.



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Note: 'safety or emergency reasons' refers to emergency works which may need to be undertaken to avoid loss of life, property loss and/or prevent environmental harm.

- L6.2 Construction may occur outside these hours provided the noise (LAeq 15min) from these activities does not exceed 35 dBA at any privately owned residence.
- L6.3 All quarrying operations, including extraction, processing and loadings / transport must be conducted between 7am to 6pm Monday to Friday and 7am to 1pm Saturdays and at no time on Sundays and public holidays.

Maintenance activities may occur 24 hours per day, 7 days per week, provided these activities are inaudible at any privately owned residence.

## **L7 Potentially offensive odour**

- L7.1 No condition of this licence identifies a potentially offensive odour for the purposes of Section 129 of the Protection of the Environment Operations Act 1997.

Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.

## **4 Operating Conditions**

### **O1 Activities must be carried out in a competent manner**

- O1.1 Licensed activities must be carried out in a competent manner.  
This includes:
  - a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
  - b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

### **O2 Maintenance of plant and equipment**

- O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
  - a) must be maintained in a proper and efficient condition; and
  - b) must be operated in a proper and efficient manner.

### **O3 Dust**

- O3.1 All areas in or on the premises must be maintained in a condition that prevents or minimises the emission of dust to the air.

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- O3.2 Any activity carried out in or on the premises must be carried out by such practical means as to prevent dust or minimise the emission of dust to the air.
- O3.3 Any plant operated in or on the premises must be operated by such practical means to prevent or minimise dust or other air pollutants.
- O3.4 All trafficable areas and vehicle manoeuvring areas in or on the premises must be maintained, at all times, in a condition that will minimise the emission of dust to the air, or emission from the premises of wind-blown or traffic generated dust.
- O3.5 The licensee must ensure it has sufficient water during all stages of the quarry, and if necessary adjust the scale of quarrying operations on the premises to match its available supply.
- O3.6 Trucks entering and leaving the premises that are carrying loads of dust generating materials must have their loads covered at all times, except during loading and unloading.

## O4 Emergency response

- O4.1 The licensee must maintain, and implement as necessary, a current Pollution Incident Response Management Plan (PIRMP) for the premises. The licensee must keep the incident response plan on the premises at all times. The incident response plan must document systems and procedures to deal with all types of incidents (e.g. spills, explosions or fire) that may occur at the premises or that may be associated with activities that occur at the premises and which are likely to cause harm to the environment.

The PIRMP must be tested at least annually or following a pollution incident.

The licensee must develop the Pollution Incident Response Management Plan in accordance with the requirements in Part 5.7A of the Protection of the Environment Operations (POEO) Act 1997 and POEO regulations.

## O5 Processes and management

- O5.1 All tanks and storage areas for drums containing material that has potential to cause environmental harm must be bunded or have an alternative spill containment system in-place.

The bunding and/or spill containment systems must be properly designed, engineered, and constructed to be suitable for the material types and quantities stored therein in accordance with all appropriate standards, including Australian Standards (AS)1940 and AS1596.

- O5.2 Bunds must:
  - a) have walls and floors constructed of impervious materials;
  - b) be of sufficient capacity to contain 110% of the volume of the tank (or 110% volume of the largest tank where a group of tanks are installed);
  - c) have floors graded to a collection sump; and
  - d) not have a drain valve incorporated in the bund structure,

or be constructed and operated in a manner that achieves the same environmental outcome.

# Environment Protection Licence

Licence - 20611



- O5.3 All refuelling must be undertaken in a dedicated refuelling area. The refuelling area must be a hardstand and suitably bunded in accordance with EPA bunding guidance.
- O5.4 The licensee must, before undertaking any earthmoving or vegetation removal works, implement erosion and sediment control measures to prevent pollution of waters in accordance with Soils and Construction: Managing Urban Stormwater 2004 (Landcom, 2004).
- O5.5 Stormwater from all areas of the premises which has the potential to mobilise sediments and other material must be controlled and diverted through the appropriate erosion and sediment control and/or pollution control measures/structures, so as not to cause, permit or allow water pollution to occur.
- O5.6 The in-pit sump must be sized at all times to prevent a discharge to waters in the event of pump failure.

## O6 Waste management

- O6.1 The licensee must not irrigate, discharge or dispose of sewage effluent, on the premises.
- O6.2 The licensee must operate and maintain a wastewater collection and storage tank/s to enable the pump out and offsite disposal of any sewage effluent.
- O6.3 The licensee must ensure that sewage effluent collected at the premises is pumped out and disposed of in a lawful manner.

## O7 Other operating conditions

### Noise and Blast Management

- O7.1 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.

### Bitumin Pre-coat Plant

- O7.2 The licensee must not have a bitumin pre-coat plant on the site. Project Approval MP09\_0175 did not assess or approve such a plant.

## 5 Monitoring and Recording Conditions

### M1 Monitoring records

- M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.
- M1.2 All records required to be kept by this licence must be:

# Environment Protection Licence

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- a) in a legible form, or in a form that can readily be reduced to a legible form;
- b) kept for at least 4 years after the monitoring or event to which they relate took place; and
- c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:

- a) the date(s) on which the sample was taken;
- b) the time(s) at which the sample was collected;
- c) the point at which the sample was taken; and
- d) the name of the person who collected the sample.

## M2 Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

### M2.2 Air Monitoring Requirements

#### POINT 4,5,6,7,8

Pollutant	Units of measure	Frequency	Sampling Method
Particulates - Deposited Matter	grams per square metre per month	Monthly	AM-19

#### POINT 9

Pollutant	Units of measure	Frequency	Sampling Method
PM10	micrograms per cubic metre	Every 6 days	AM-18
Total suspended particles	micrograms per cubic metre	Every 6 days	AM-15

### M2.3 Water and/ or Land Monitoring Requirements

#### POINT 1,2,3

Pollutant	Units of measure	Frequency	Sampling Method
Oil and Grease	milligrams per litre	Special Frequency 1	Visual Inspection
pH	pH	Special Frequency 1	Grab sample
Total suspended solids	milligrams per litre	Special Frequency 1	Grab sample
Turbidity	nephelometric turbidity units	Special Frequency 1	Grab sample

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Note: For the purposes of the table above 'Special Frequency 1' means:

- (a) within 12 hours prior to any controlled discharge; and
- (b) daily during a controlled discharge; or
- (c) daily during any uncontrolled discharge.

## M3 Testing methods - concentration limits

M3.1 Monitoring for the concentration of a pollutant emitted to the air required to be conducted by this licence must be done in accordance with:

- a) any methodology which is required by or under the Act to be used for the testing of the concentration of the pollutant; or
- b) if no such requirement is imposed by or under the Act, any methodology which a condition of this licence requires to be used for that testing; or
- c) if no such requirement is imposed by or under the Act or by a condition of this licence, any methodology approved in writing by the EPA for the purposes of that testing prior to the testing taking place.

Note: The *Protection of the Environment Operations (Clean Air) Regulation 2010* requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".

M3.2 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

## M4 Weather monitoring

M4.1 Prior to the commencement of operation of the development, the Proponent must establish a permanent meteorological station complying with the Approved Methods for Sampling and Analysis and the Australian Standard AS2923 - 1987, at the facility. The meteorological station must monitor the following parameters:

Parameter	Units of measure	Averaging period	Frequency	Sampling Method
Rainfall	mm/hr	1 hour	Continuous	AM-4
Sigma Theta @ 10m	degrees	1 hour	Continuous	AM-2
Siting	-	-	-	AM-1
Temperature @ 10m	Kelvin	1 hour	Continuous	AM-4
Temperature @ 2m	Kelvin	1 hour	Continuous	Am-4
Total Solar Radiation @ 10m	W/m2	1 hour	Continuous	AM-4

# Environment Protection Licence

Licence - 20611



Wind direction @ 10m	degrees	1 hour	Continuous	AM-2
Wind speed @ 10m	m/s	1 hour	Continuous	AM-2

Note: Sampling methods as identified in the table above refer to those outlined in NSW EPA, 2001, Approved Methods for the Sampling and Analysis of Air Pollutants in NSW.

- M4.2 The location of the site chosen for the station and details of equipment, measurement and maintenance / service procedures and schedules to be installed and maintained must be submitted to the EPA and approved in writing by the EPA before any sampling or analysis is carried out.
- M4.3 The meteorological monitoring station must be calibrated at least once every 12 months. The EPA is to be provided with data on request in a Microsoft Office software compatible format.

## M5 Recording of pollution complaints

- M5.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.
- M5.2 The record must include details of the following:
- the date and time of the complaint;
  - the method by which the complaint was made;
  - any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
  - the nature of the complaint;
  - the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
  - if no action was taken by the licensee, the reasons why no action was taken.
- M5.3 The record of a complaint must be kept for at least 4 years after the complaint was made.
- M5.4 The record must be produced to any authorised officer of the EPA who asks to see them.

## M6 Telephone complaints line

- M6.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.
- M6.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.
- M6.3 The preceding two conditions do not apply until 1 month after the date of the issue of this licence.

# Environment Protection Licence

Licence - 20611



## M7 Blasting

M7.1 To determine compliance with Blast Limit conditions of this licence:

- a) Airblast overpressure and ground vibration levels must be measured and electronically recorded for monitoring point 11 for the parameters specified in Column 1 of the table below; and
- b) The licensee must use the units of measure, sampling method, and sample at the frequency specified opposite in the other columns.

Parameter	Units of Measure	Frequency	Sampling Method
Airblast Overpressure	Decibels (Linear Peak	All blasts	Australian Standard AS 2187.2-2006
Ground Vibration Peak Particle Velocity	millimetres/second	All blasts	Australian Standard AS 2187.2-2006

## M8 Noise monitoring

M8.1 To assess compliance with the noise limits for this premises attended noise monitoring must be undertaken in accordance with all noise conditions and:

- a) at each one of the locations listed in the noise limits table of this licence;
- b) occur annually each reporting period at the time of year generally associated with maximum noise transmission (ie generally winter conditions);
- c) occur during each day period as defined in the NSW Industrial Noise Policy.

Note: the frequency of this noise monitoring may be varied at the discretion of the EPA.

## 6 Reporting Conditions

### R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:

1. a Statement of Compliance,
2. a Monitoring and Complaints Summary,
3. a Statement of Compliance - Licence Conditions,
4. a Statement of Compliance - Load based Fee,
5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan,
6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and
7. a Statement of Compliance - Environmental Management Systems and Practices.

At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.



# Environment Protection Licence

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- R1.3 Where this licence is transferred from the licensee to a new licensee:
- a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
  - b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

- R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
- a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
  - b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.
- R1.5 The Annual Return for the reporting period must be supplied to the EPA via eConnect *EPA* or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').
- R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.
- R1.7 Within the Annual Return, the Statements of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
- a) the licence holder; or
  - b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

## R2 Notification of environmental harm

- R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.
- R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

## R3 Written report

- R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
- a) where this licence applies to premises, an event has occurred at the premises; or
  - b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,
- and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written



# Environment Protection Licence

Licence - 20611



report of the event.

- R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.
- R3.3 The request may require a report which includes any or all of the following information:
- a) the cause, time and duration of the event;
  - b) the type, volume and concentration of every pollutant discharged as a result of the event;
  - c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
  - d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
  - e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
  - f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
  - g) any other relevant matters.
- R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

## R4 Other reporting conditions

### Reporting blasting limit exceedance

- R4.1 The licensee must report any exceedance of the licence blasting limits to the regional office of the EPA as soon as practicable after the exceedance becomes known to the licensee or to one of the licensee's employees or agents.

### Annual Blast Monitoring Report

- R4.2 The licensee must supply a Blast Monitoring Report with the EPA licence Annual Return, which must 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;
  - d) an explanation for any missing blast monitoring results.

### Noise Monitoring Report

- R4.3 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the annual monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:
- a) an assessment of compliance with noise limits presented in this licence; and
  - b) an outline of any management actions taken within the monitoring period to address any exceedances

# Environment Protection Licence

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Licence - 20611



of the limits contained in this licence.

## 7 General Conditions

### **G1 Copy of licence kept at the premises or plant**

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

# Environment Protection Licence

Licence - 20611



## Dictionary

### General Dictionary

<b>3DGM [in relation to a concentration limit]</b>	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
<b>Act</b>	Means the Protection of the Environment Operations Act 1997
<b>activity</b>	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
<b>actual load</b>	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
<b>AM</b>	Together with a number, means an ambient air monitoring method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .
<b>AMG</b>	Australian Map Grid
<b>anniversary date</b>	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
<b>annual return</b>	Is defined in R1.1
<b>Approved Methods Publication</b>	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
<b>assessable pollutants</b>	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
<b>BOD</b>	Means biochemical oxygen demand
<b>CEM</b>	Together with a number, means a continuous emission monitoring method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .
<b>COD</b>	Means chemical oxygen demand
<b>composite sample</b>	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
<b>cond.</b>	Means conductivity
<b>environment</b>	Has the same meaning as in the Protection of the Environment Operations Act 1997
<b>environment protection legislation</b>	Has the same meaning as in the Protection of the Environment Administration Act 1991
<b>EPA</b>	Means Environment Protection Authority of New South Wales.
<b>fee-based activity classification</b>	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
<b>general solid waste (non-putrescible)</b>	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

# Environment Protection Licence

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<b>flow weighted composite sample</b>	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
<b>general solid waste (putrescible)</b>	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
<b>grab sample</b>	Means a single sample taken at a point at a single time
<b>hazardous waste</b>	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
<b>licensee</b>	Means the licence holder described at the front of this licence
<b>load calculation protocol</b>	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
<b>local authority</b>	Has the same meaning as in the Protection of the Environment Operations Act 1997
<b>material harm</b>	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
<b>MBAS</b>	Means methylene blue active substances
<b>Minister</b>	Means the Minister administering the Protection of the Environment Operations Act 1997
<b>mobile plant</b>	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
<b>motor vehicle</b>	Has the same meaning as in the Protection of the Environment Operations Act 1997
<b>O&amp;G</b>	Means oil and grease
<b>percentile [in relation to a concentration limit of a sample]</b>	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
<b>plant</b>	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
<b>pollution of waters [or water pollution]</b>	Has the same meaning as in the Protection of the Environment Operations Act 1997
<b>premises</b>	Means the premises described in condition A2.1
<b>public authority</b>	Has the same meaning as in the Protection of the Environment Operations Act 1997
<b>regional office</b>	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
<b>reporting period</b>	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 months. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
<b>restricted solid waste</b>	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
<b>scheduled activity</b>	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
<b>special waste</b>	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
<b>TM</b>	Together with a number, means a test method of that number prescribed by the <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> .

# Environment Protection Licence



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<b>TSP</b>	Means total suspended particles
<b>TSS</b>	Means total suspended solids
<b>Type 1 substance</b>	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
<b>Type 2 substance</b>	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
<b>utilisation area</b>	Means any area shown as a utilisation area on a map submitted with the application for this licence
<b>waste</b>	Has the same meaning as in the Protection of the Environment Operations Act 1997
<b>waste type</b>	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non - putrescible), special waste or hazardous waste

Mr Peter Jamieson

Environment Protection Authority

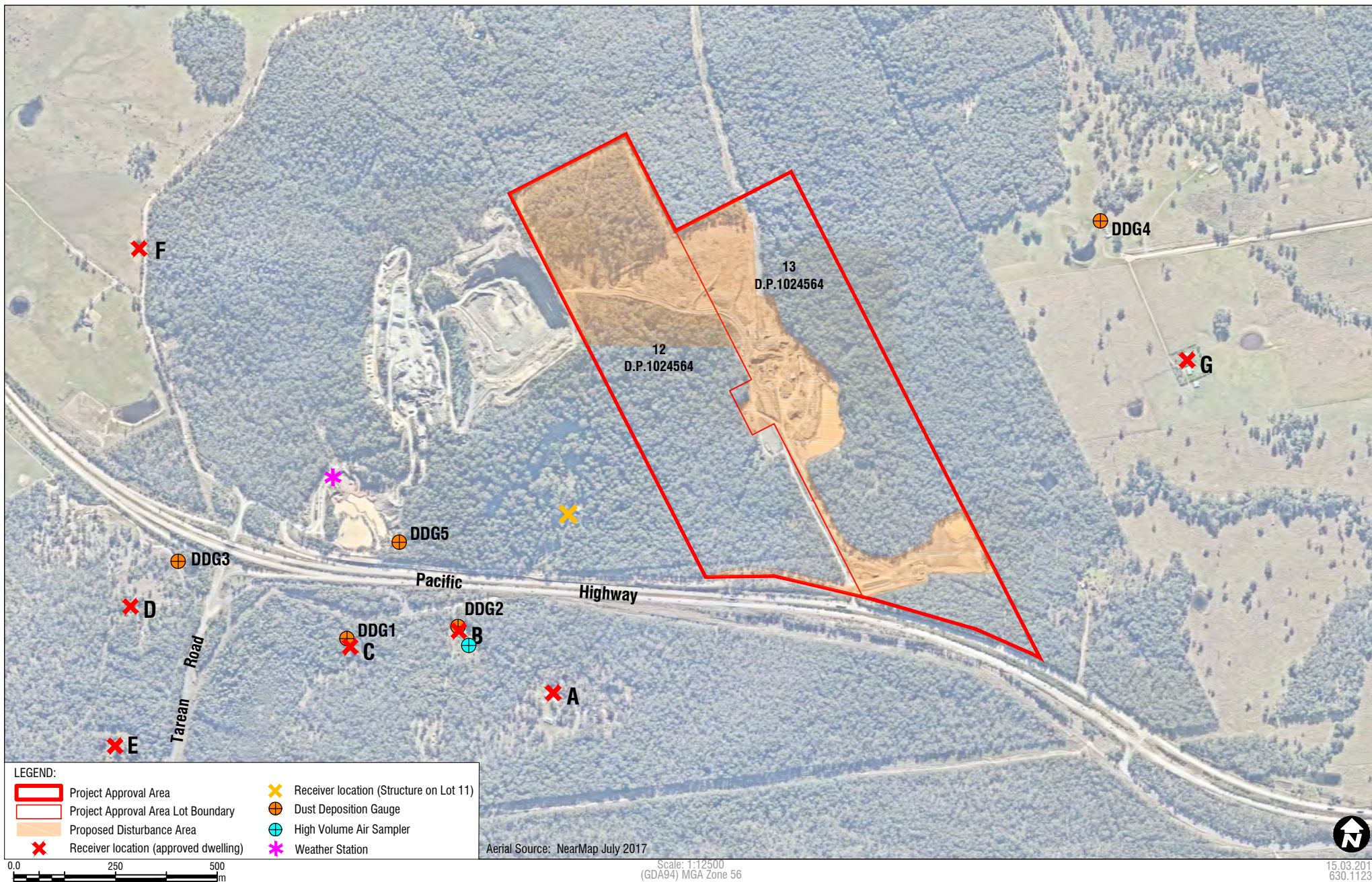
(By Delegation)

Date of this edition: 26-August-2015

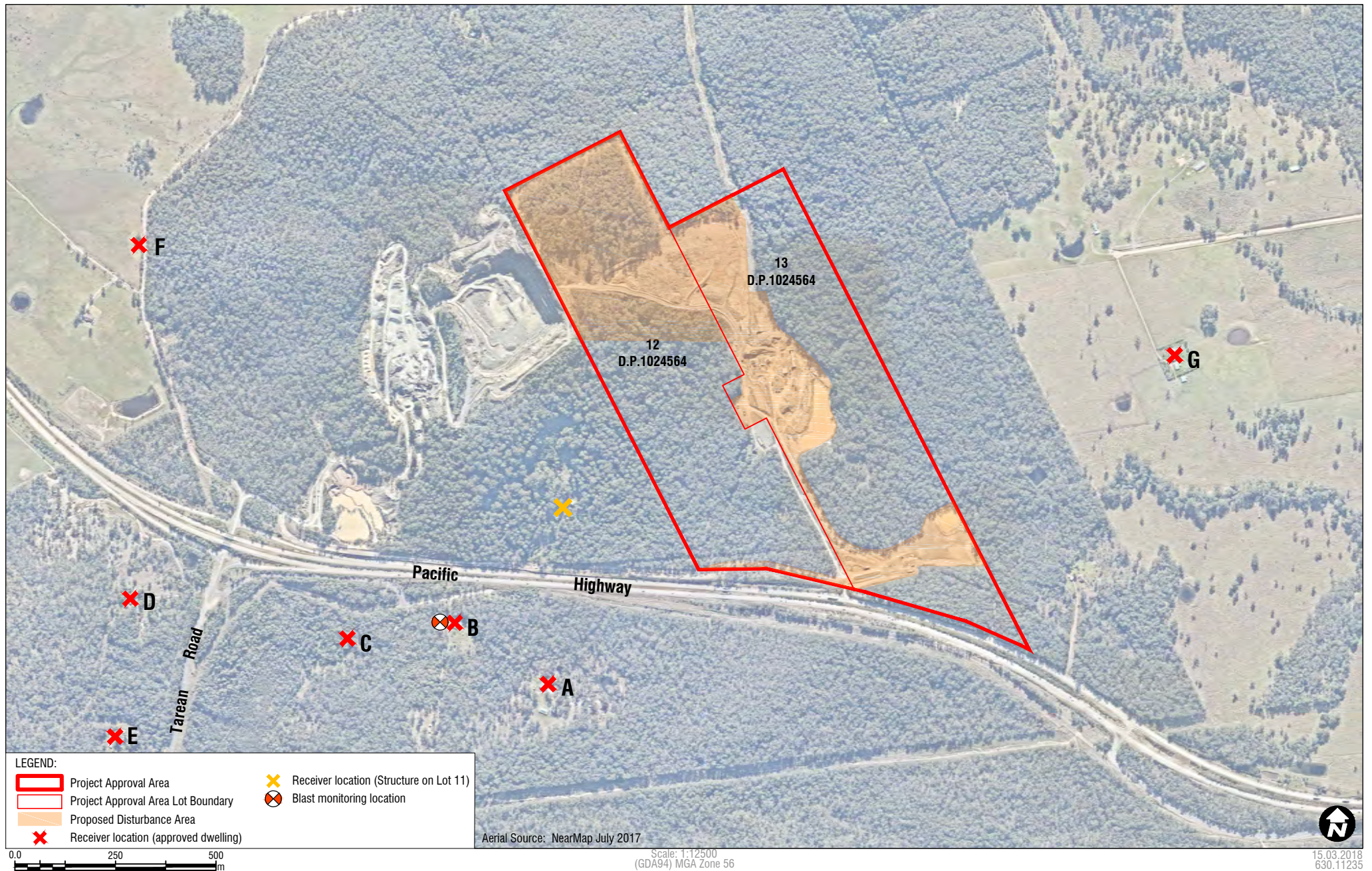
End Notes		
2	Licence varied by notice	1533596 issued on 21-Sep-2015
3	Licence varied by notice	1547416 issued on 06-Dec-2016

## **APPENDIX 3 – Key Figures/Plans**

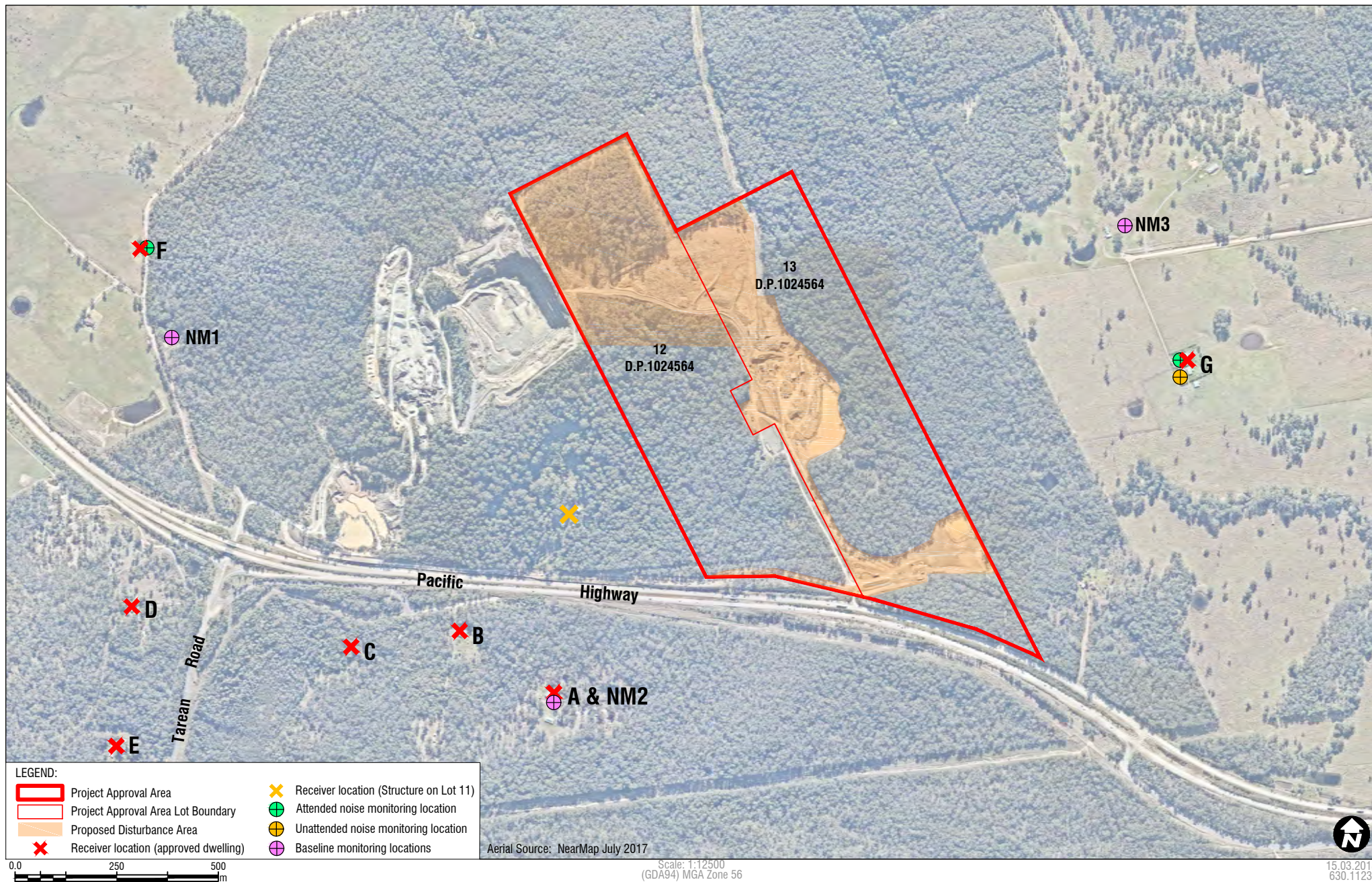














## **APPENDIX 4– Noise Monitoring Reports**



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## Construction Compliance Monitoring

### Karuah East Project

February 2017

Report Number 630.11672-R03

20 March 2017

Karuah East Quarry Pty Ltd

PO Box 23

KARUAH NSW 2324

Version: v1.0

# Construction Compliance Monitoring

## Karuah East Project

### February 2017

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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 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 Karuah East Quarry Pty Ltd. 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
630.11672-R03-v1.0	20 March 2017	Martin Davenport		

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## 1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Karuah East Quarry Pty Ltd to conduct construction noise compliance monitoring for the Karuah East Project located on Lots 12 and 13 DP 1024564, off the Pacific Highway, approximately 3 km north of Karuah, New South Wales (NSW) (the Development Site).

The objective of the construction noise compliance monitoring was to measure impacts of noise from the Development Site and to provide in-principle recommendations with regard to management strategies and mitigation measures, where necessary, with the aim of achieving the project specific noise criteria.

The construction noise compliance monitoring has been prepared with reference to Australian Standard AS 1055:1997 *Description and Measurement of Environmental Noise* Parts 1, 2 and 3 and in accordance with the NSW EPA Interim Construction Noise Guideline (ICNG) and Karuah East Quarry Noise Management Plan (NMP) 630.11235-R1 *Karuah East Quarry Project Noise Management Plan* dated October 2015.

### 1.1 Acoustic Terminology

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

## 2 SENSITIVE RECEPTORS

The Karuah East Quarry NMP identified the closest sensitive receptors to the Development Site. These locations are listed in **Table 1** and shown in **Figure 1**.

**Table 1 Sensitive Receptor Locations Used in this Assessment**

Receiver ID	Details
<b>Existing Approved Dwellings</b>	
A	Lot 100 DP 785172
B	Lot 3 DP 785172
C	Lot 2 DP 785172
D	Lot 22 DP 1024341
E	Lot 250 DP 1092111
F	Lot 50 DP 1036893
G	Lot 1 DP 1032636
<b>Other Structures</b>	
Lot 11 <sup>1</sup>	Lot 11 DP1024564

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

**Figure 1 Sensitive Receptor Locations – Development Site**



**Karuah East Quarry - Sensitive Receivers and Monitoring Locations**  
**FIGURE 1**



### 3 CONSTRUCTION COMPLIANCE NOISE CRITERIA

In accordance with the Noise Management Plan, **Table 2** presents the adopted construction noise goals for the Development Site.

**Table 2 Project Specific Construction Noise Goals**

Location	Adopted Rating Background Level (RBL)	Noise Management Level (dBA LAeq(15minute))	
		Noise Affected	Highly Noise Affected
Any approved Residence on Lot 11 DP 1024564 <sup>1</sup>	44	54	75
A to E	44	54	
F	44	54	
G	34	44	

Note 1: At present there is no approved residence on Lot 11.

#### 3.1 General Methodology

Operator-attended compliance noise surveys were conducted to characterise and quantify the noise emissions from the Development Site. In accordance with the NMP, noise monitoring was undertaken at two locations, Location F and Location G (refer to **Figure 1**).

All acoustic instrumentation employed throughout the monitoring programme has been designed to comply with the requirements of AS IEC 61672 2004 "*Electroacoustics - Sound Level Meters*" (parts 1 and 2) and carries current NATA or manufacturer calibration certificates. Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding  $\pm 0.5$  dBA.

#### 3.2 Operator Attended Noise Compliance Monitoring

Operator-attended noise measurements were conducted during the daytime period on Friday 10 February 2017 at the noise monitoring locations F and G. Details of the monitoring locations are provided in **Table 3** and shown in **Figure 1**.

**Table 3 Ambient Noise Monitoring Locations**

Sound level meter Type/ Serial No.	Location	Location (m, UTM)	
		Easting	Northing
SVAN 957 S/N 21425	Location F – Eastern Boundary of property	405644	6389785
	Location G – North western boundary of property <sup>1</sup>	408055	6389753

Note 1: Noise monitoring conducted at the property gate

Each operator-attended noise survey was 15 minutes in duration.

The results of the operator attended noise measurements are given in **Table 4**. Ambient noise levels given in the tables include all noise sources such as traffic, insects, birds, and any other industrial operations.

**Table 4 Operator Attended Noise Survey Results**

Date/Start Time Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission and Typical Maximum Levels LAmax – dBA
	LAmax	LA1	LA10	LA90	LAeq	
Location F Period: Day Date:10/02/2017 Time: 11:02 am Wind: 1.5 m/s NW Temperature: 33°C	79	68	48	42	55	Local road traffic 79 dBA Pacific Highway 45 to 55 dBA Frogs/Insects 45 to 47 dBA Birds 50 to 54 dBA <b>Karuah East Project Construction not audible</b>
Location G Period: Day Date:10/02/2017 Time: 10:33 am Wind:1.5 m/s NNW Temperature: 34°C	56	44	41	35	39	Pacific Highway 35 to 42 dBA Frogs/Insects 38 to 51 dBA Birds 42 to 56 dBA Aeroplane 45 dBA <b>Karuah East Project Construction Audible</b> Engine noise 35 to 37 dBA Reversing beeper 30 to 35 dBA Loading clunk 37 to 41 dBA <b>Estimated construction LAeq(15minute) noise contribution 36 dBA</b>

### 3.3 Compliance Assessment and Discussion of Results

The noise levels at noise monitoring location F and G have been determined and shown in **Table 5**.

**Table 5 Compliance Noise Assessment – Construction Noise**

Location	Estimated LAeq(15minute) Contribution	Consent Conditions LAeq(15minute)	Compliance
Location F	<32 <sup>1</sup>	54	Yes
Location G	36	44	Yes

Note 1: Karuah East construction activities was inaudible during operator-attended noise measurement suggesting that the noise contribution from the Development Site would be at least 10 dB below the overall LA90 noise level presented in **Table 4**.

Results presented in **Table 5** indicate that compliance with the relevant consent conditions was achieved at compliance assessment noise monitoring locations F and G.

## 4 CONCLUSION

SLR Consulting Australia Pty Ltd (SLR) has undertaken construction noise compliance monitoring for the Karuah East Project located on Lots 12 and 13 DP 1024564, off the Pacific Highway, approximately 3 km north of Karuah NSW (Development Site).

The objective of the construction noise compliance monitoring was to measure impacts of noise from the Development Site and to provide recommendations with regard to management strategies and mitigation measures, where necessary, with the aim of achieving the project specific noise criteria.

Operator-attended noise compliance measurements were conducted during the daytime period on Friday 10 February 2017 at monitoring location F and location G.

Compliance was achieved at both noise monitoring locations F and G during the daytime noise monitoring period.

## 5 REFERENCES

- 630.11235-R1 Karuah East Quarry Project Noise Management Plan, SLR Consulting Australia Pty Ltd, October 2015.
- AS 1055:1997 *Description and Measurement of Environmental Noise* Parts 1, 2 and 3, Australian Standard, 1997.
- AS IEC 61672.1—2004 & Electroacoustics - Sound level meters, Part 1: Specifications, Standards Australia, 2004.



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Construction Noise  
Karuah East Project  
May 2017

Report Number 630.11672-R04

7 March 2018

Karuah East Quarry Pty Ltd  
PO Box 23  
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Version: -v1.0

# Construction Noise

## Karuah East Project

### May 2017

#### PREPARED BY:

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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 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.

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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
630.11672-R04--v1.0	7 March 2018	Martin Davenport	Yang Liu	

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The objective of the construction noise compliance monitoring was to measure impacts of noise from the Development Site and to provide in-principle recommendations with regard to management strategies and mitigation measures, where necessary, with the aim of achieving the project specific noise criteria.

The construction noise compliance monitoring has been prepared with reference to Australian Standard AS 1055:1997 *Description and Measurement of Environmental Noise* Parts 1, 2 and 3 and in accordance with the NSW EPA Interim Construction Noise Guideline (ICNG) and Karuah East Quarry Noise Management Plan (NMP) 630.11235-R1 *Karuah East Quarry Project Noise Management Plan* dated October 2015.

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E	Lot 250 DP 1092111
F	Lot 50 DP 1036893
G	Lot 1 DP 1032636
<b>Other Structures</b>	
Lot 11 <sup>1</sup>	Lot 11 DP1024564

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

**Figure 1 Sensitive Receptor Locations – Development Site**



**Karuah East Quarry - Sensitive Receivers and Monitoring Locations**  
**FIGURE 1**

### 3 CONSTRUCTION COMPLIANCE NOISE CRITERIA

In accordance with the Noise Management Plan, **Table 2** presents the adopted construction noise goals for the Development Site.

**Table 2 Project Specific Construction Noise Goals**

Location	Adopted Rating Background Level (RBL)	Noise Management Level (dBA LAeq(15minute))	
		Noise Affected	Highly Noise Affected
Any approved Residence on Lot 11 DP 1024564 <sup>1</sup>	44	54	75
A to E	44	54	
F	44	54	
G	34	44	

Note 1: At present there is no approved residence on Lot 11.

#### 3.1 General Methodology

Operator-attended compliance noise surveys were conducted to characterise and quantify the noise emissions from the Development Site. In accordance with the NMP, noise monitoring was undertaken at two locations, Location F and Location G (refer to **Figure 1**). An additional noise measurement was conducted at the northern boundary of Location D due to the proximity of road works to this location.

All acoustic instrumentation employed throughout the monitoring programme has been designed to comply with the requirements of AS IEC 61672 2004 "*Electroacoustics – Sound Level Meters*" (parts 1 and 2) and carries current NATA or manufacturer calibration certificates. Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding  $\pm 0.5$  dBA.

#### 3.2 Operator Attended Noise Compliance Monitoring

Operator-attended noise measurements were conducted during the daytime period on Thursday 4 May 2017 at the noise monitoring locations F, G and D. Details of the monitoring locations are provided in **Table 3** and shown in **Figure 1**.

**Table 3 Ambient Noise Monitoring Locations**

Sound level meter Type/ Serial No.	Location	Location (m, UTM)	
		Easting	Northing
SVAN 957 S/N 20669	Location F – Eastern Boundary of property	405644	6389785
	Location G – North western boundary of property <sup>1</sup>	408055	6389753

Note 1: Noise monitoring conducted at the property gate

Each operator-attended noise survey was 15 minutes in duration.

The results of the operator attended noise measurements are given in **Table 4**. Ambient noise levels given in the tables include all noise sources such as traffic, insects, birds, and any other industrial operations.

**Table 4 Operator Attended Noise Survey Results**

Date/Start Time Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission and Typical Maximum Levels Lamax – dBA
	Lamax	LA1	LA10	LA90	LAeq	
Location F Period: Day Date:04/05/2017 Time: 12:59 pm Wind: Calm Temperature: 19°C	79	65	50	44	54	Local road traffic 75 – 79 Pacific Highway 43 to 53 Quarry audible in lulls, dumping ~ 45 Karuah East Project Construction Audible Rock hammer 42- 46 <b>Estimated construction LAeq(15minute) noise contribution 41 dBA</b>
Location G Period: Day Date:04/05/2017 Time: 1:41 pm Wind:1.5 m/s S Temperature: 19°C	56	44	41	35	39	Pacific Highway 43 to 50 Frogs/Insects 35 to 38 Birds 43 to 53 Aeroplane 44 <b>Karuah East Project Construction Audible</b> Reversing beeper 35 <b>Estimated construction LAeq(15minute) noise contribution &lt;30 dBA</b>
Location D Period: Day Date:04/05/2017 Time: 2:28 pm Wind: Calm Temperature:20 °C	73	69	63	57	61	Pacific Highway ~ 58-73 Birdsong to 45 Karuah East Project Construction Audible Rock breaker audible 58 – 63 <b>Estimated construction LAeq(15minute) noise contribution 59 dBA</b>

### 3.3 Compliance Assessment and Discussion of Results

The noise levels at noise monitoring location F and G have been determined and shown in **Table 5**.

**Table 5 Compliance Noise Assessment – Construction Noise**

Location	Estimated LAeq(15minute) Contribution	Noise Management Level (dBA LAeq(15minute))		Compliance	
		Noise Affected	Highly Noise Affected	Noise Affected	Highly Noise Affected
Location F	41	54	75	Yes	Yes
Location G	<30	44		Yes	Yes
Location D	59	54		No	Yes

Results presented in **Table 5** indicate that compliance with the relevant consent conditions was achieved at compliance assessment noise monitoring locations F and G. The measured construction LAeq(15minute) noise levels exceeded the Noise Affected criterion at Location D, however remained below the Highly Noise Affected Criterion. It is noted that the main noise contributor to the measured LAeq(15minute) construction noise levels at Location F and Location D was from a rock breaker used for constructing the access road.

## 4 CONCLUSION

SLR Consulting Australia Pty Ltd (SLR) has undertaken construction noise compliance monitoring for the Karuah East Project located on Lots 12 and 13 DP 1024564, off the Pacific Highway, approximately 3 km north of Karuah NSW (Development Site).

The objective of the construction noise compliance monitoring was to measure impacts of noise from the Development Site and to provide recommendations with regard to management strategies and mitigation measures, where necessary, with the aim of achieving the project specific noise criteria.

Operator-attended noise compliance measurements were conducted during the daytime period on Thursday 4 May 2017 at monitoring location F, G and D.

Compliance was achieved at noise monitoring locations F and G during the daytime noise monitoring period. The measured  $L_{Aeq(15\text{minute})}$  noise levels from construction activities were above the Noise Affected criterion at Location D however remained below the Highly Noise Affected Criterion.

## 5 REFERENCES

- 630.11235-R1 Karuah East Quarry Project Noise Management Plan, SLR Consulting Australia Pty Ltd, October 2015.
- AS 1055:1997 *Description and Measurement of Environmental Noise* Parts 1, 2 and 3, Australian Standard, 1997.
- AS IEC 61672.1—2004 & Electroacoustics - Sound level meters, Part 1: Specifications, Standards Australia, 2004.

### 1 Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that in common usage 'noise' is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is  $2 \times 10^{-5}$  Pa.

### 2 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	Loud
80	Kerbside of busy street	
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB Linear or dBZ.

### 3 Sound Power Level

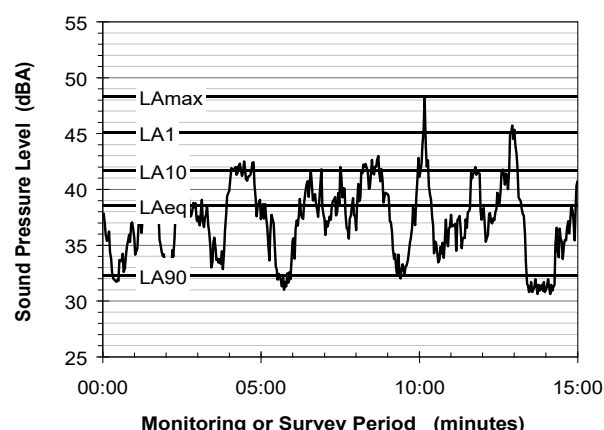
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or Lw, or by the reference unit  $10^{-12}$  W.

The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

### 4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels  $L_{AN}$ , where  $L_{AN}$  is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the  $L_{A1}$  is the noise level exceeded for 1% of the time,  $L_{A10}$  the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

- $L_{A1}$  The noise level exceeded for 1% of the 15 minute interval.
- $L_{A10}$  The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
- $L_{A90}$  The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
- $L_{Aeq}$  The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the 'repeatable minimum'  $L_{A90}$  noise level over the daytime and night-time measurement periods, as required by the EPA. In addition the method produces mean or 'average' levels representative of the other descriptors ( $L_{Aeq}$ ,  $L_{A10}$ , etc).

### 5 Tonality

Tonal noise contains one or more prominent tones (ie distinct frequency components), and is normally regarded as more offensive than 'broad band' noise.

### 6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.



## 7 Frequency Analysis

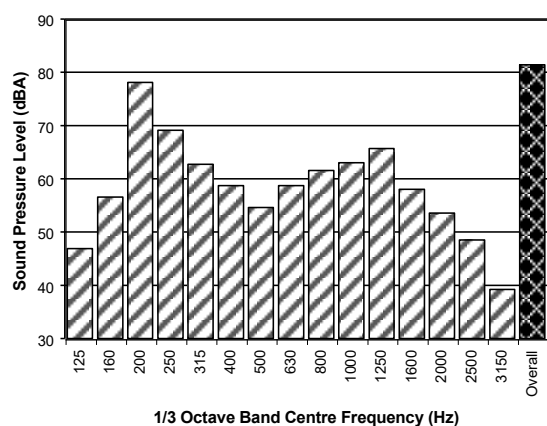
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



## **APPENDIX 5 – Ecological Monitoring Report**

Construction Compliance Monitoring  
Karuah East Project  
August 2017

Report Number 630.11672-R05

7 March 2018

Karuah East Quarry Pty Ltd  
PO Box 23  
KARUAH NSW 2324

Version: -v1.0

# Construction Compliance Monitoring

## Karuah East Project

### August 2017

#### PREPARED BY:

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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 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 Karuah East Quarry Pty Ltd. 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
630.11672-R05--v1.0	7 March 2018	Jordan Murray	Martin Davenport	

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## 1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Karuah East Quarry Pty Ltd to conduct construction noise compliance monitoring for the Karuah East Project located on Lots 12 and 13 DP 1024564, off the Pacific Highway, approximately 3 km north of Karuah, New South Wales (NSW) (the Development Site).

The objective of the construction noise compliance monitoring was to measure impacts of noise from the Development Site and to provide in-principle recommendations with regard to management strategies and mitigation measures, where necessary, with the aim of achieving the project specific noise criteria.

The construction noise compliance monitoring has been prepared with reference to Australian Standard AS 1055:1997 *Description and Measurement of Environmental Noise* Parts 1, 2 and 3 and in accordance with the NSW EPA Interim Construction Noise Guideline (ICNG) and Karuah East Quarry Noise Management Plan (NMP) 630.11235-R1 *Karuah East Quarry Project Noise Management Plan* dated October 2015.

### 1.1 Acoustic Terminology

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

## 2 SENSITIVE RECEPTORS

The Karuah East Quarry NMP identified the closest sensitive receptors to the Development Site. These locations are listed in **Table 1** and shown in **Figure 1**.

**Table 1 Sensitive Receptor Locations Used in this Assessment**

Receiver ID	Details
<b>Existing Approved Dwellings</b>	
A	Lot 100 DP 785172
B	Lot 3 DP 785172
C	Lot 2 DP 785172
D	Lot 22 DP 1024341
E	Lot 250 DP 1092111
F	Lot 50 DP 1036893
G	Lot 1 DP 1032636
<b>Other Structures</b>	
Lot 11 <sup>1</sup>	Lot 11 DP1024564

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



**Figure 1 Sensitive Receptor Locations – Development Site**



**Karuah East Quarry - Sensitive Receivers and Monitoring Locations**  
**FIGURE 1**

### 3 CONSTRUCTION COMPLIANCE NOISE CRITERIA

In accordance with the Noise Management Plan, **Table 2** presents the adopted construction noise goals for the Development Site.

**Table 2 Project Specific Construction Noise Goals**

Location	Adopted Rating Background Level (RBL)	Noise Management Level (dBA LAeq(15minute))	
		Noise Affected	Highly Noise Affected
Any approved Residence on Lot 11 DP 1024564 <sup>1</sup>	44	54	75
A to E	44	54	
F	44	54	
G	34	44	

Note 1: At present there is no approved residence on Lot 11.

#### 3.1 General Methodology

Operator-attended compliance noise surveys were conducted to characterise and quantify the noise emissions from the Development Site. In accordance with the NMP, noise monitoring was undertaken at two locations, Location F and Location G (refer to **Figure 1**).

All acoustic instrumentation employed throughout the monitoring programme has been designed to comply with the requirements of AS IEC 61672 2004 "*Electroacoustics - Sound Level Meters*" (parts 1 and 2) and carries current NATA or manufacturer calibration certificates. Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding  $\pm 0.5$  dBA.

#### 3.2 Operator Attended Noise Compliance Monitoring

Operator-attended noise measurements were conducted during the daytime period on Wednesday 23 August 2017 at the noise monitoring locations F and G. Details of the monitoring locations are provided in **Table 3** and shown in **Figure 1**.

**Table 3 Ambient Noise Monitoring Locations**

Sound level meter Type/ Serial No.	Location	Location (m, UTM)	
		Easting	Northing
B&K Type 2250L S/N 3004636	Location F – Eastern Boundary of property	405644	6389785
	Location G – North western boundary of property <sup>1</sup>	408055	6389753

Note 1: Noise monitoring conducted at the property gate

Each operator-attended noise survey was 15 minutes in duration.

The results of the operator attended noise measurements are given in **Table 4**. Ambient noise levels given in the tables include all noise sources such as traffic, insects, birds, and any other industrial operations.

**Table 4 Operator Attended Noise Survey Results**

Date/Start Time Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission and Typical Maximum Levels LAmax – dBA
	LAmax	LA1	LA10	LA90	LAeq	
Location F Period: Day Date:23/08/2017 Time: 13:48 Wind: Calm Temperature: 21°C	54	50	48	41	45	Pacific Highway 43 to 54 dBA Birds 35 to 42 dBA <b>Karuah East Project Construction not audible</b>
Location G Period: Day Date:23/08/2017 Time: 14:18 Wind:2.5 m/s SSE Temperature: 21°C	56	49	46	40	43	Pacific Highway 40 to 45 dBA Birds 34 to 56 dBA Local Traffic 45 dBA <b>Karuah East Project Construction Audible</b> Crushers ~ 31 dBA <b>Estimated construction LAeq(15minute) noise contribution 31 dBA</b>

### 3.3 Compliance Assessment and Discussion of Results

The noise levels at noise monitoring location F and G have been determined and shown in **Table 5**.

**Table 5 Compliance Noise Assessment – Construction Noise**

Location	Estimated LAeq(15minute) Contribution	Consent Conditions LAeq(15minute)	Compliance
Location F	<31 <sup>1</sup>	54	Yes
Location G	31	44	Yes

Note 1: Karuah East construction activities was inaudible during operator-attended noise measurement suggesting that the noise contribution from the Development Site would be at least 10 dB below the overall LA90 noise level presented in **Table 4**.

Results presented in **Table 5** indicate that compliance with the relevant consent conditions was achieved at compliance assessment noise monitoring locations F and G.

## 4 CONCLUSION

SLR Consulting Australia Pty Ltd (SLR) has undertaken construction noise compliance monitoring for the Karuah East Project located on Lots 12 and 13 DP 1024564, off the Pacific Highway, approximately 3 km north of Karuah NSW (Development Site).

The objective of the construction noise compliance monitoring was to measure impacts of noise from the Development Site and to provide recommendations with regard to management strategies and mitigation measures, where necessary, with the aim of achieving the project specific noise criteria.

Operator-attended noise compliance measurements were conducted during the daytime period on Wednesday 23 August 2017 at monitoring location F and location G.

Compliance was achieved at both noise monitoring locations F and G during the daytime noise monitoring period.

## 5 REFERENCES

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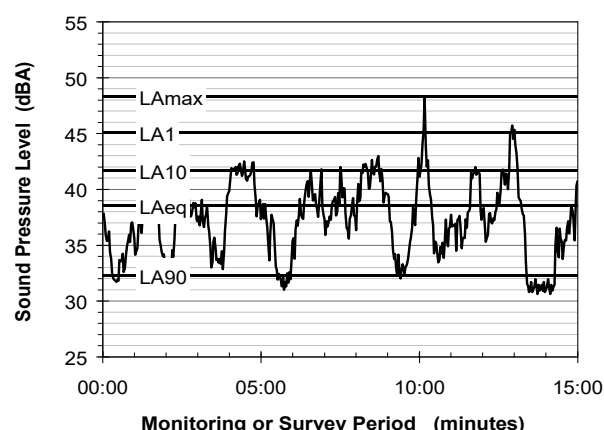
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Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

- LA1 The noise level exceeded for 1% of the 15 minute interval.
- LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
- LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
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When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the 'repeatable minimum' LA90 noise level over the daytime and night-time measurement periods, as required by the EPA. In addition the method produces mean or 'average' levels representative of the other descriptors (LAeq, LA10, etc).

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Tonal noise contains one or more prominent tones (ie distinct frequency components), and is normally regarded as more offensive than 'broad band' noise.

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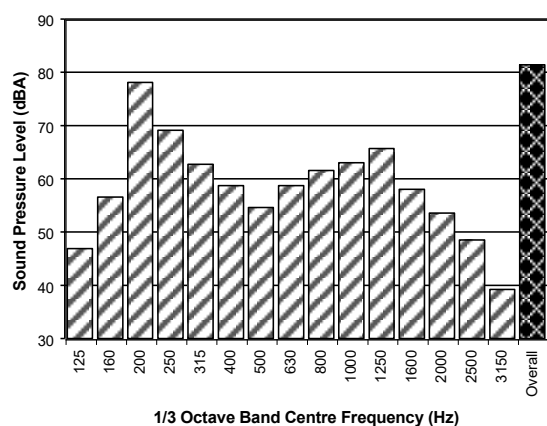
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- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.







global environmental solutions

Operational Compliance Monitoring

Karuah East Quarry

Quarter 4

December 2017

Report Number 630.12317-R01

7 March 2018

Karuah East Quarry Pty Ltd

PO Box 23

KARUAH NSW 2324

Version: -v1.0

# Operational Compliance Monitoring

## Karuah East Quarry

### Quarter 4

### December 2017

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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 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.

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#### DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
630.12317-R01--v1.0	7 March 2018	Jordan Murray	Martin Davenport	

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## 1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Karuah East Quarry Pty Ltd to conduct operational noise compliance monitoring for the Karuah East Quarry located on Lots 12 and 13 DP 1024564, off the Pacific Highway, approximately 3 km north of Karuah, New South Wales (NSW) (the Project Site).

The objectives of the operational noise compliance monitoring were as follows:

- Conduct operator-attended noise surveys at two locations (F and G) surrounding the Project Site and quantify all sources of noise including measured and/or estimated contribution and maximum level of individual sources.
- Conduct unattended noise monitoring at Location G to supplement the operator-attended noise measurements.
- Assess noise emissions of the Project Site with respect to the operational noise goals for the Project Site.

The operational noise compliance monitoring has been prepared with reference to Australian Standard AS 1055:1997 *Description and Measurement of Environmental Noise* Parts 1, 2 and 3 and in accordance with the Karuah East Quarry Noise Management Plan (NMP) 630.11235-R1 *Karuah East Quarry Project Noise Management Plan* dated October 2015.

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

## 2 SENSITIVE RECEPTORS

The Karuah East Quarry NMP identified the closest sensitive receptors to the Development Site. These locations are listed in **Table 1** and shown in **Figure 1**.

**Table 1 Sensitive Receptor Locations Used in this Assessment**

Receiver ID	Details
<b>Existing Approved Dwellings</b>	
A	Lot 100 DP 785172
B	Lot 3 DP 785172
C	Lot 2 DP 785172
D	Lot 22 DP 1024341
E	Lot 250 DP 1092111
F	Lot 50 DP 1036893
G	Lot 1 DP 1032636
<b>Other Structures</b>	
Lot 11 <sup>1</sup>	Lot 11 DP1024564

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

**Figure 1 Sensitive Receptor Locations – Project Site**



Karuah East Quarry - Sensitive Receivers and Monitoring Locations  
**FIGURE 1**

### 3 OPERATIONAL COMPLIANCE CRITERIA

In accordance with the Noise Management Plan, **Table 2** presents the adopted operational noise goals for the Project Site.

**Table 2 Operational Noise Criteria (dBA LAeq(15minute))**

Location	Criteria (day)
Residence on Lot 11 DP 1024564 <sup>1</sup>	43
A	40
B	37
G	38
All other residences	35

1. No currently approved residential dwelling exists on Lot 11 and therefore it is considered that the noise limits do not currently apply at this location.

#### 3.1 General Methodology

Operator-attended compliance noise surveys were conducted to characterise and quantify the noise emissions from the Project Site. In accordance with the NMP, operator attended noise monitoring was undertaken at two locations, Location F and Location G and unattended noise monitoring undertaken at Location G (refer to **Figure 1**).

All acoustic instrumentation employed throughout the monitoring programme has been designed to comply with the requirements of AS IEC 61672 2004 "*Electroacoustics – Sound Level Meters*" (parts 1 and 2) and carries current NATA or manufacturer calibration certificates. Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding  $\pm 0.5$  dBA.

#### 3.2 Operator Attended Noise Compliance Monitoring

Operator-attended noise measurements were conducted during the daytime period on Wednesday 13 December 2017 at the noise monitoring locations F and G. Details of the monitoring locations are provided in **Table 3** and shown in **Figure 1**.

**Table 3 Ambient Noise Monitoring Locations**

Sound level meter Type/ Serial No.	Location	Location (m, UTM)	
		Easting	Northing
B&K Type 2250L / 3004636	Location F – Eastern Boundary of property	405644	6389785
	Location G – North western boundary of property <sup>1</sup>	408055	6389753

Note 1: Noise monitoring conducted at the property gate.

Each operator-attended noise survey was 15 minutes in duration.

#### 3.3 Unattended Continuous Noise Monitoring

An environmental noise logger was deployed at monitoring Location G in accordance with the NMP (refer to **Figure 1**). Noise monitoring was undertaken from Monday 4 December 2017 to Monday 11 December 2017, inclusive. Details of the noise loggers used for the unattended continuous noise monitoring are given in **Table 4**.

The environmental noise loggers were programmed to record statistical noise level indices continuously in 15 minute intervals.



**Table 4 Noise Logger and Noise Monitoring Location**

Location	Noise Logger/Serial Number	Date of Logging
G	B&K Type 2250L/3004635	04/12/2017-11/12/2017

## 4 OPERATOR-ATTENDED NOISE MONITORING RESULTS

### 4.1 Results of Operator-attended Noise Monitoring

The results of the operator attended noise measurements are given in **Table 5**. Ambient noise levels given in the tables include all noise sources such as traffic, insects, birds, and any other industrial operations. The table provides the following information:

- Monitoring location
- Date, start time, Wind velocity (m/s) and Temperature (°C) at the measurement location; and
- Typical maximum (L<sub>Amax</sub>) and contributed noise levels.

Quarry contributions listed in the tables are from Karuah East Quarry and are stated only when a contribution could be quantified.

**Table 5 Operator Attended Noise Survey Results**

Date/Start Time Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emission and Typical Maximum Levels L <sub>Amax</sub> – dBA
	L <sub>Amax</sub>	LA1	LA10	LA90	LAeq	
Location F Period: Day Date:13/12/2017 Time: 15:39 Wind: 4.5 m/s NE Temperature: 31°C	78	66	51	46	56	Local road traffic 75 - 78 Pacific Highway 38 – 49 Insects 39 – 48 <b>Karuah East Project Inaudible</b>
Location G Period: Day Date:13/12/2017 Time: 14:45 Wind:4 m/s NE Temperature: 31°C	66	48	44	41	43	Pacific Highway 32 – 38 Livestock Insects 35 – 39 Birds 34 – 66 Wind gusts 33 – 35 Residential Construction 35 - 42 <b>Karuah East Project Inaudible</b>

### 4.2 Operator-attended Noise Monitoring Summary

Noise generated by traffic on the Pacific Highway and Branch Lane dominated ambient noise levels at noise monitoring location F, Karuah East quarry engine noise was faintly audible. Noise generated by traffic on the Pacific Highway, insect noise, and nearby construction dominated ambient noise levels at noise monitoring location G.

The results of the operational compliance assessment are given in **Table 6**.

**Table 6 Compliance Noise Assessment – Operations**

Location	Estimated Karuah LAeq(15minute) Contribution	Consent Conditions LAeq(15minute)	Compliance
	Day	Day	Day
F	Inaudible	35	Yes
G	Inaudible	38	Yes

Results presented in **Table 6** indicate that compliance with the relevant consent conditions was achieved at all noise monitoring locations.

## 5 UNATTENDED CONTINUOUS NOISE MONITORING

The unattended ambient noise logger data from monitoring Location G is presented graphically on a daily basis and attached as **Appendix B**. A summary of the results of the unattended continuous noise monitoring is given in **Table 7**. The ambient noise level data quantifies the overall noise level at a given location independent of its source or character.

Precautions can be taken to minimise influences from extraneous noise sources (eg optimum placement of the loggers away from creeks, trees, houses, etc), however, not all these sources or their effects can be eliminated. This is particularly the case during the warmer times of year when noise from insects, frogs, birds and other animals can become quite prevalent.

Weather data was obtained from the Bureau of Meteorology automatic weather station located at Williamtown Airport approximately 22 km south west of the monitoring locations. Unattended noise data corresponding with periods of rainfall and/or wind speeds in excess of 5 m/s (approximately 18km/hr) were discarded in accordance with INP data exclusion methodology.

**Table 7 Unattended Continuous Monitoring Ambient Noise Levels**

INP Period	LA1	LA10	LA90	LAeq
<b>Location G</b>				
Daytime	69	66	54	67
Evening <sup>3</sup>	66	64	51	59
Night <sup>4</sup>	67	64	52	62

Given observations made during the operator attended noise survey at the monitoring location, it is likely that daytime noise levels at Location G were dominated by road traffic noise from the Pacific Highway and natural sources such as birdsong, insects, and livestock.

## **6 CONCLUSION**

SLR Consulting Australia Pty Ltd (SLR) has undertaken operational noise compliance monitoring for the Karuah East Project in accordance with the NMP.

Operator-attended noise compliance measurements were conducted during the daytime period on Wednesday 13 December 2017 at monitoring locations F and G. Unattended noise monitoring was conducted at location G from Monday 4 December 2017 to Monday 11 December 2017 inclusive.

Compliance with the relevant noise goals was achieved at noise monitoring locations F and G during the daytime noise monitoring period.

## Acoustic Terminology

## 1 Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that in common usage 'noise' is often used to refer to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is  $2 \times 10^{-5}$  Pa.

## 2 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the loudness of that sound. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dBA or 2 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	Loud
80	Kerbside of busy street	
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB Linear or dBZ.

## 3 Sound Power Level

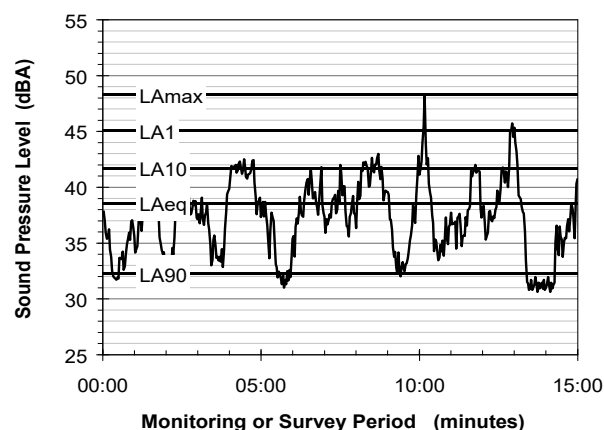
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or Lw, or by the reference unit  $10^{-12}$  W.

The relationship between Sound Power and Sound Pressure may be likened to an electric radiator, which is characterised by a power rating, but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

## 4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

- LA1 The noise level exceeded for 1% of the 15 minute interval.
- LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.
- LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
- LAeq The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. A standardised method is available for determining these representative levels.

This method produces a level representing the 'repeatable minimum' LA90 noise level over the daytime and night-time measurement periods, as required by the EPA. In addition the method produces mean or 'average' levels representative of the other descriptors (LAeq, LA10, etc).

## 5 Tonality

Tonal noise contains one or more prominent tones (ie distinct frequency components), and is normally regarded as more offensive than 'broad band' noise.

## 6 Impulsiveness

An impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.

## 7 Frequency Analysis

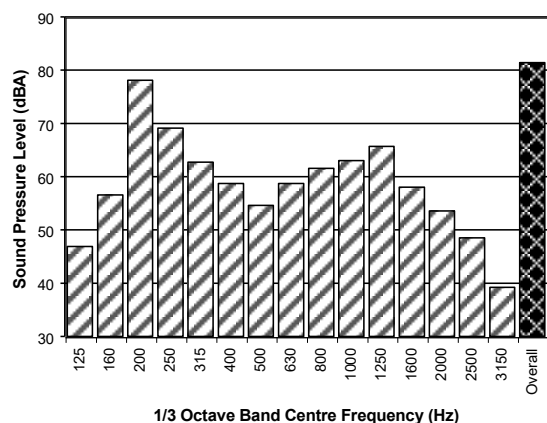
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

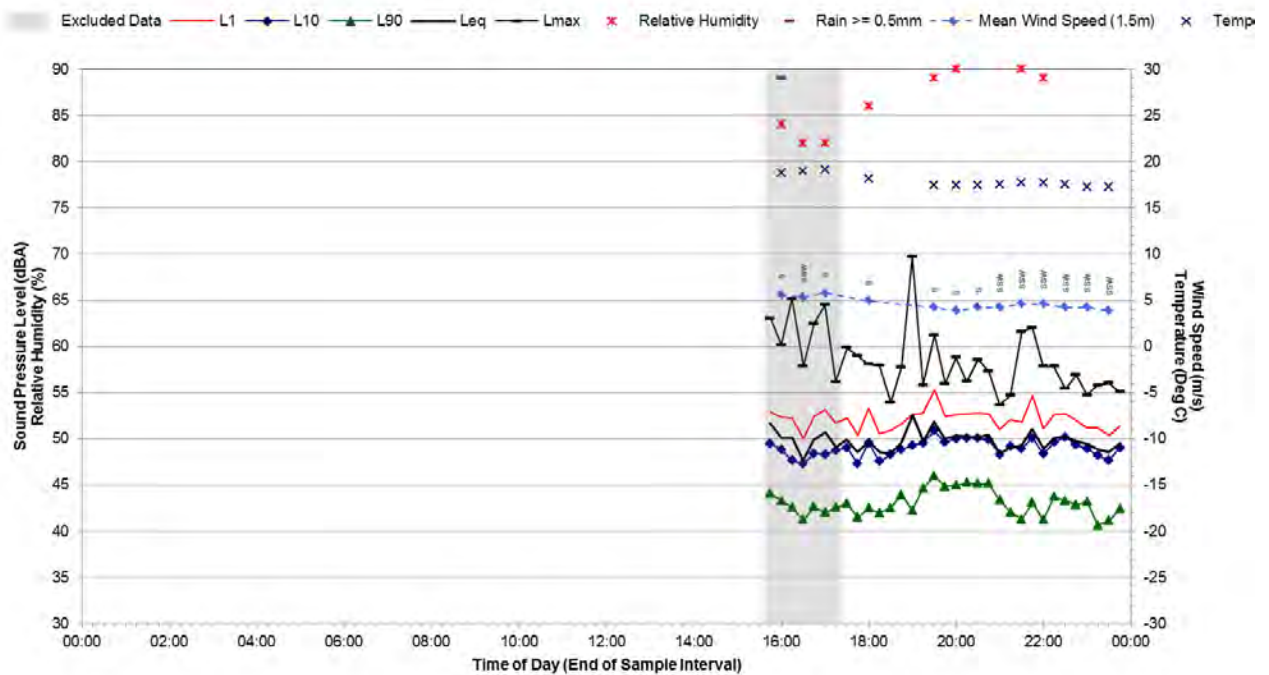
- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



## Location G Continuous Statistical Ambient Noise Monitoring Results

### Statistical Ambient Noise Levels Location G - Monday, 4 December 2017

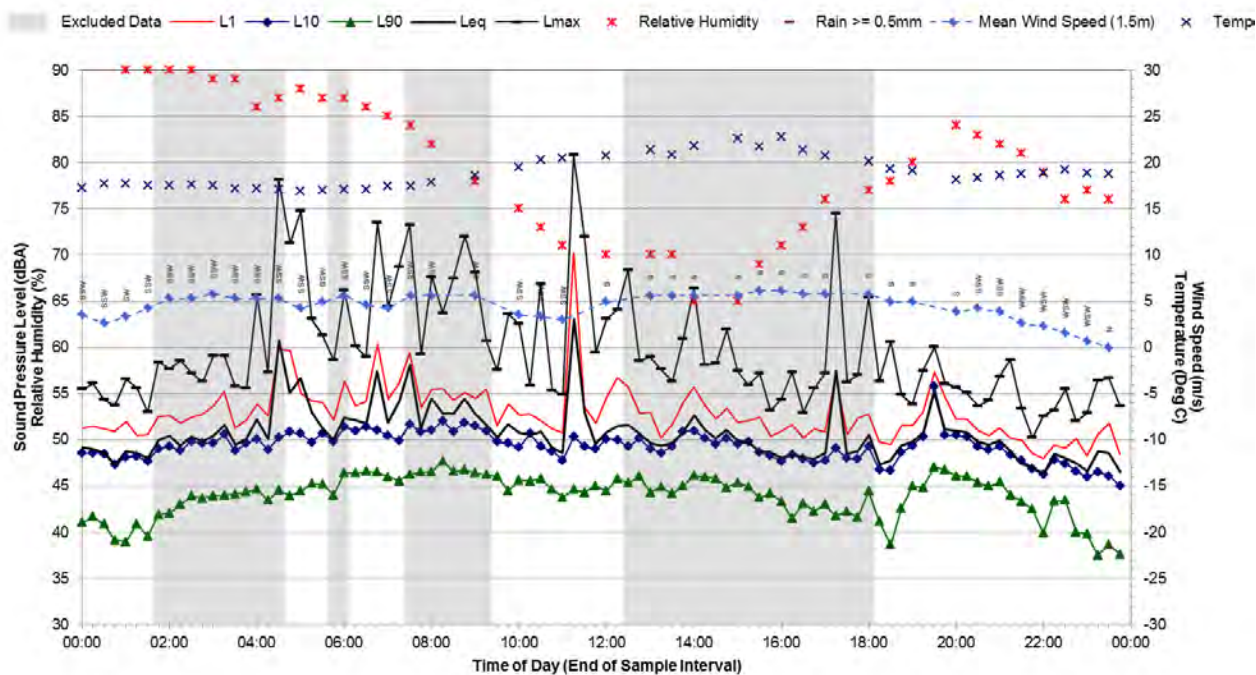




## Location G Continuous Statistical Ambient Noise Monitoring Results

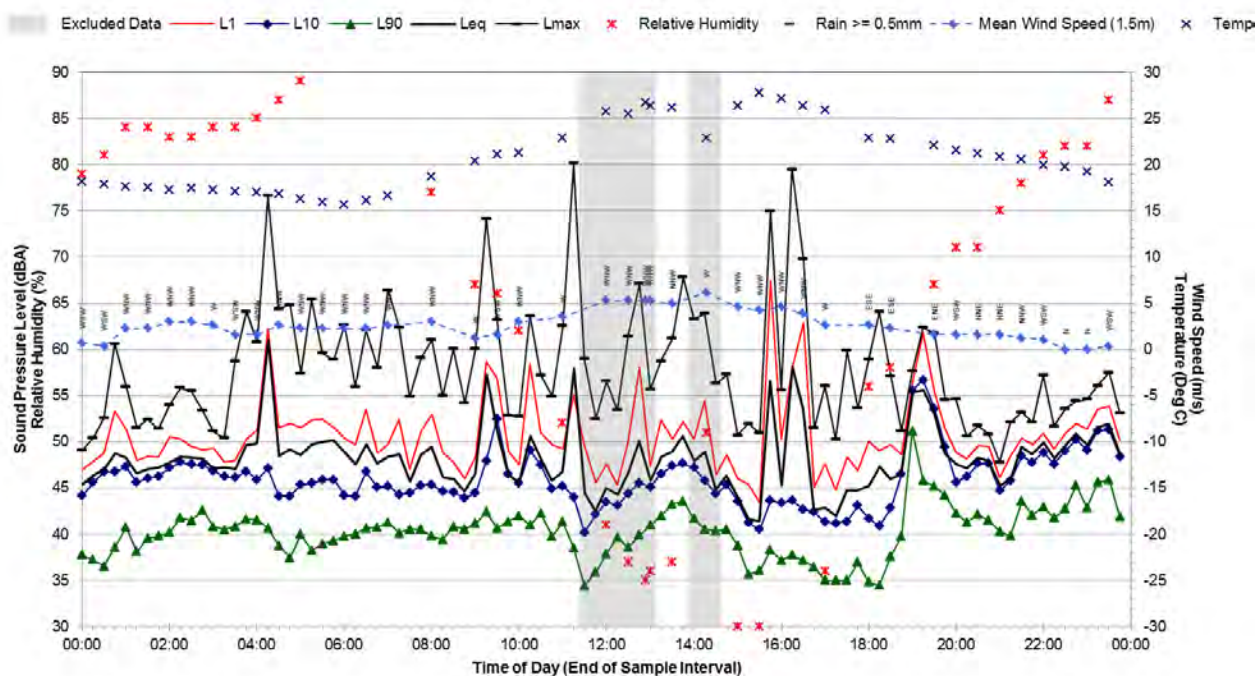
## Statistical Ambient Noise Levels

Location G - Tuesday, 5 December 2017



## Statistical Ambient Noise Levels

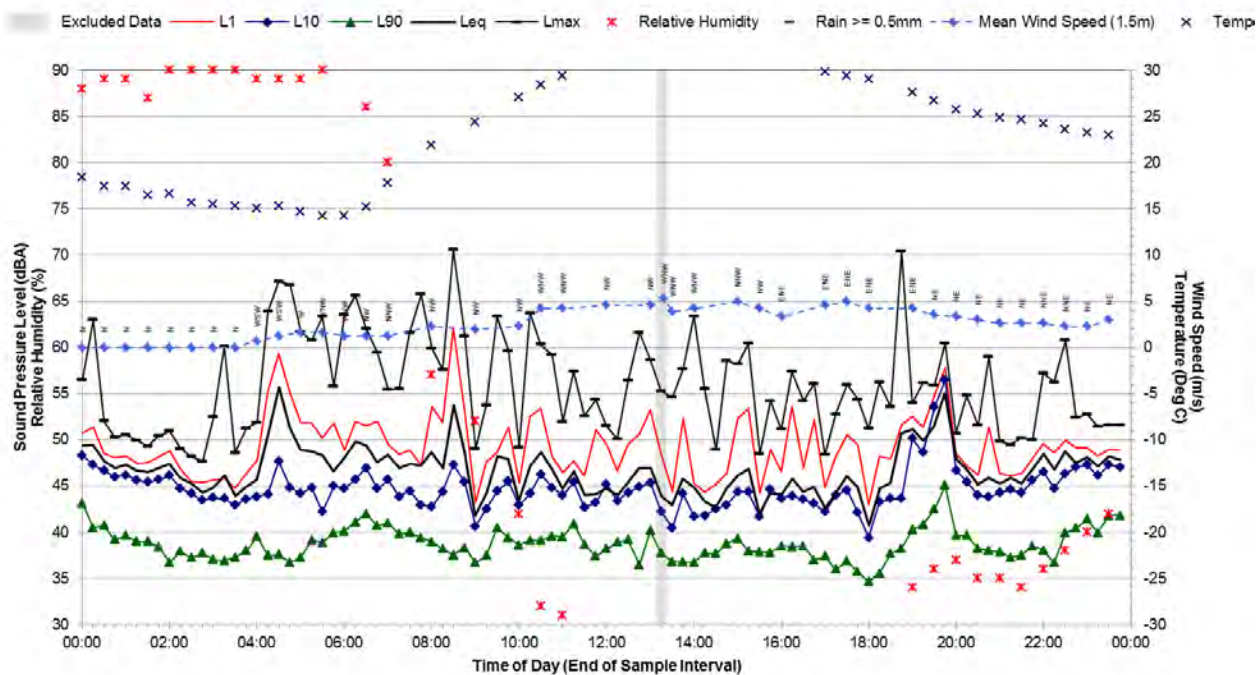
Location G - Wednesday, 6 December 2017



## Location G Continuous Statistical Ambient Noise Monitoring Results

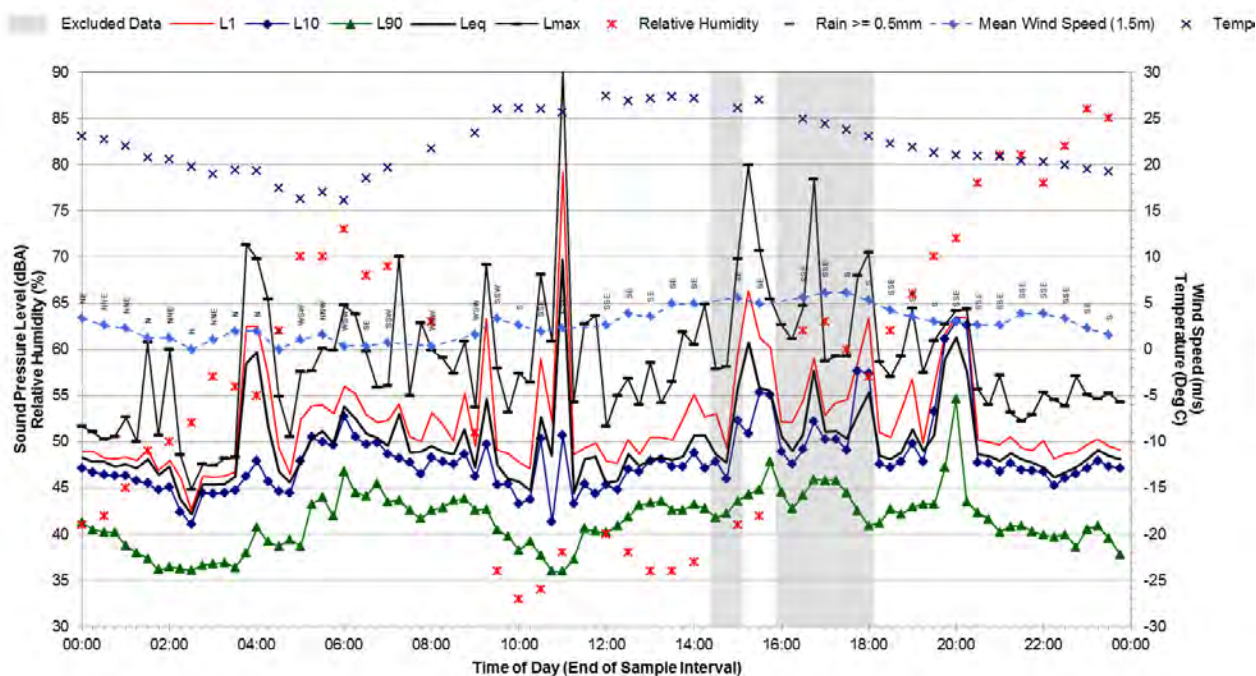
## Statistical Ambient Noise Levels

Location G - Thursday, 7 December 2017



## Statistical Ambient Noise Levels

Location G - Friday, 8 December 2017

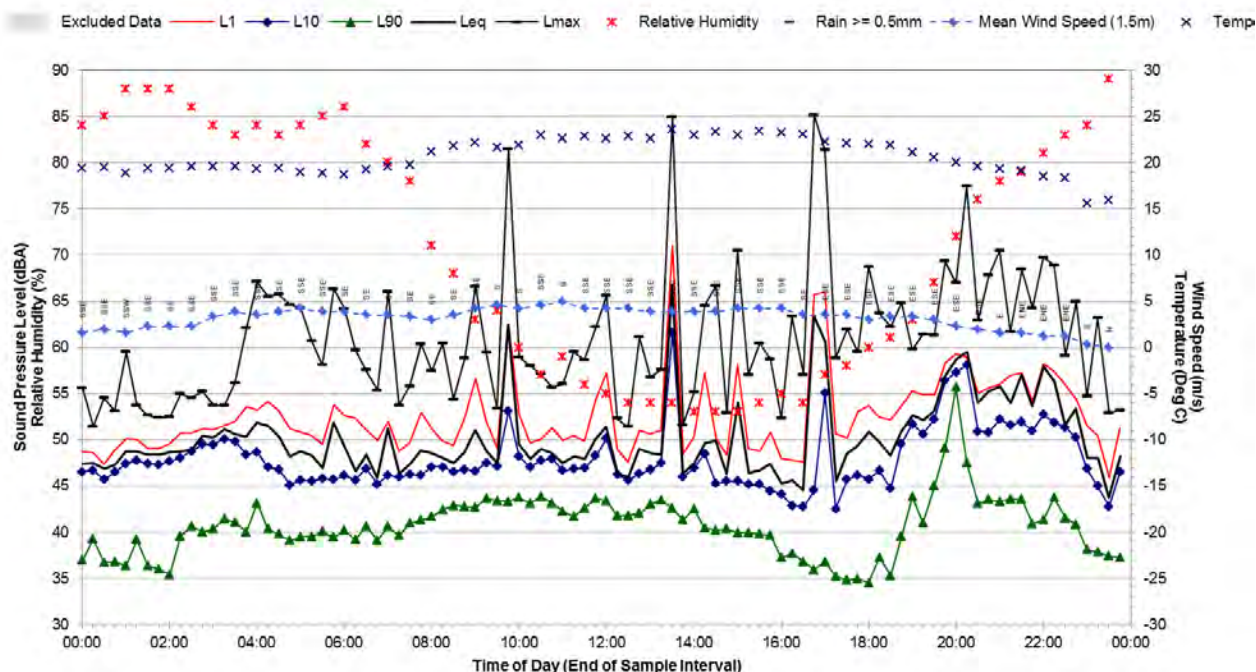




## Location G Continuous Statistical Ambient Noise Monitoring Results

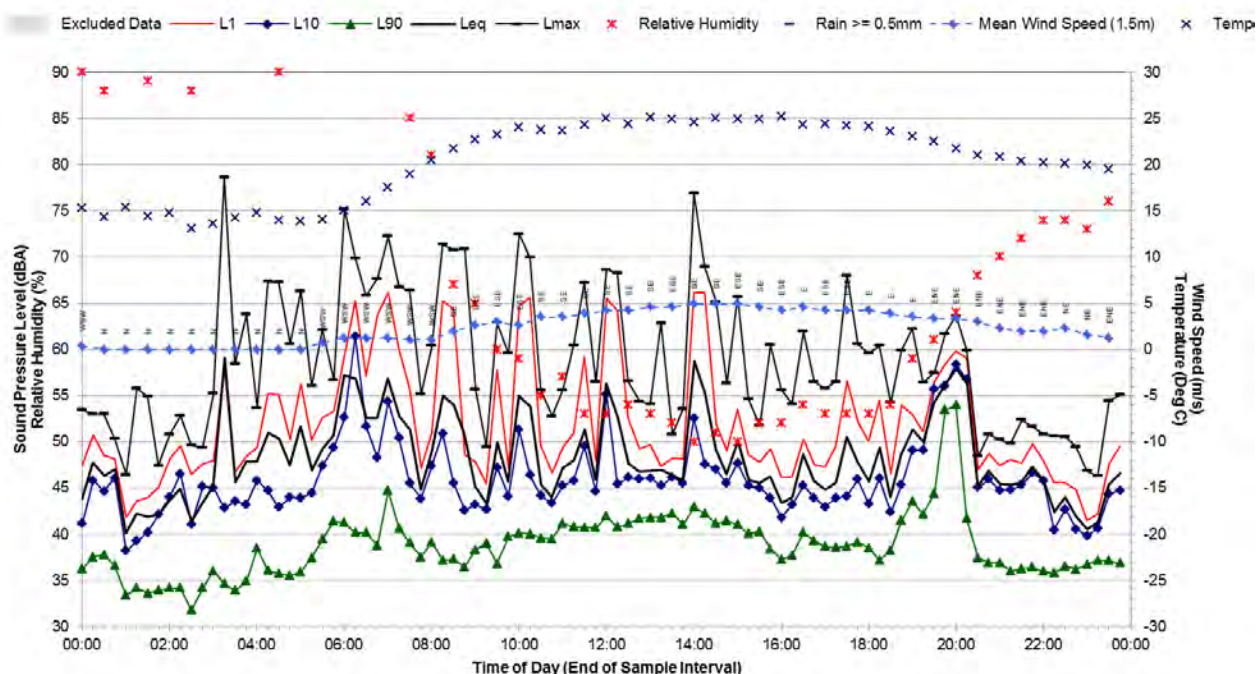
### Statistical Ambient Noise Levels

Location G - Saturday, 9 December 2017



### Statistical Ambient Noise Levels

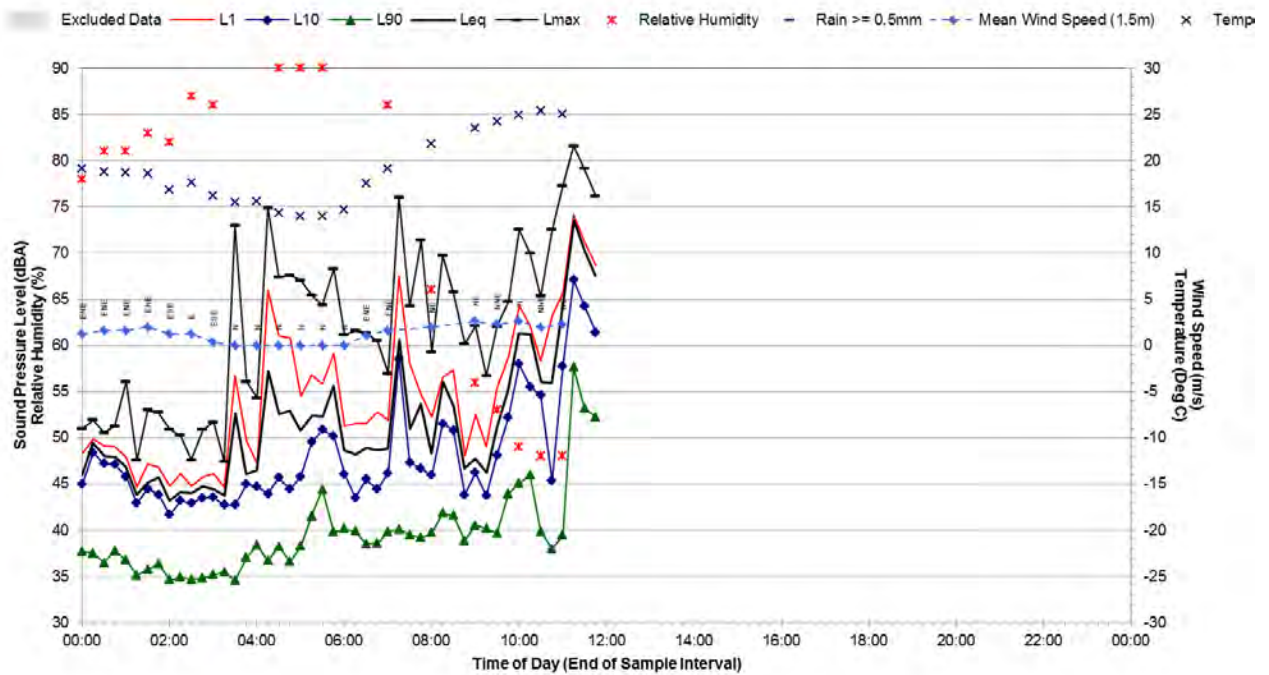
Location G - Sunday, 10 December 2017



## Location G Continuous Statistical Ambient Noise Monitoring Results

### Statistical Ambient Noise Levels

Location G - Monday, 11 December 2017



## **APPENDIX 5 – Ecological Monitoring Report**



## 2017 Annual Monitoring Report



### Karuah East Quarry Biodiversity Offset Area and Lot 12

Karuah East Quarry Pty Ltd

26 March 2018





## 2017 Annual Monitoring Report

### Karuah East Quarry Biodiversity Offset Area and Lot 12

**Kleinfelder Document Number:** NCA17R69778

**Project No:** 20182544

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**Prepared for:**

**KARUAH EAST QUARRY PTY LTD**

BLUE ROCK CLOSE

KARUAH NSW 2324

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- Appendix 2. Vegetation Monitoring Data
- Appendix 3. Photo Monitoring Points
- Appendix 4. Exotic Species Recorded in the Offset Area
- Appendix 5. Staff Contributions



# 1. INTRODUCTION

---

## 1.1 BACKGROUND

The Karuah East Quarry (KEQ) Project was subject to an assessment under part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The project was approved by the Planning Assessment Commission on 17 June 2014 subject to conditions set out in Schedules 2 to 5 of the Project Approval (09\_0175). A referral under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for the project was also lodged with the Department of the Environment (DotE) on 29 July 2014 (EPBC 2014/7282). On 25 August 2014 the project was determined as a Controlled Action under the EPBC Act requiring further assessment subject to the controlling provision 'listed threatened species and communities'. The action was approved by DotE on 20 March 2015 subject to 17 conditions of approval.

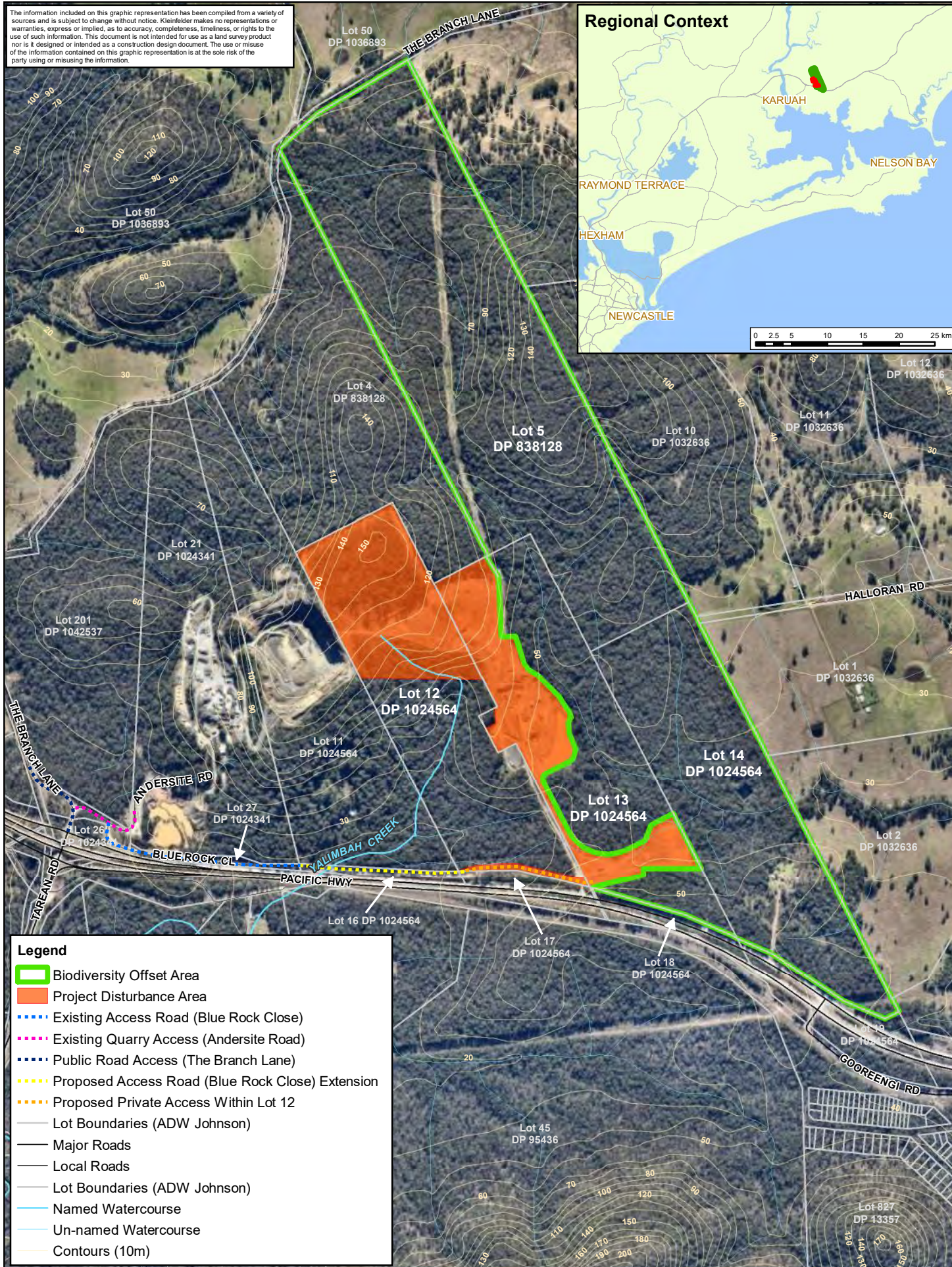
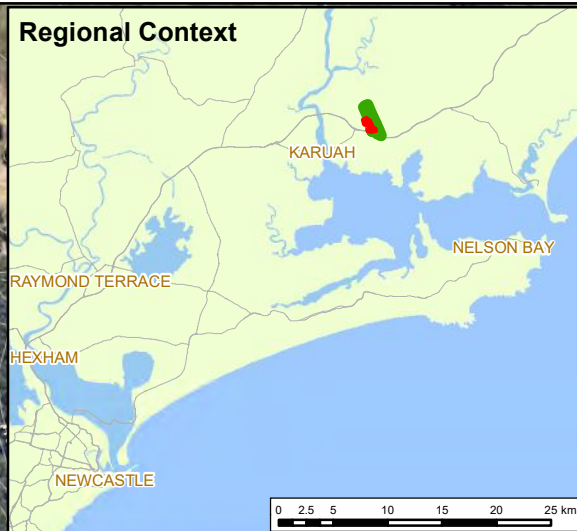
Condition 33 of the NSW Project Approval and Condition 9 of the EPBC Act approval require the implementation of a Biodiversity Offset Area Management Plan (BOAMP) for the KEQ biodiversity offset area (BOA), which is a 138.22 ha consolidated land parcel adjoining the western boundary of the project disturbance area (Error! Reference source not found.). The BOAMP was prepared by Kleinfelder (2015) and subsequently approved by the NSW Department of Planning and Environment (DP&E) on 14 December 2015, and approved by the DotE on 16 March 2016.

Baseline ecological surveys and monitoring were undertaken in October 2015 prior to commencement of clearing and construction as required under Section 3 of the BOAMP. The baseline monitoring surveys involved the establishment of 13 permanent monitoring sites within the Karuah East BOA in accordance with the BOAMP. An additional five permanent monitoring sites were also established on the adjoining Lot 12 DP 1024564 as per Sections 3.2 and 4.1 of the Statement of Commitments in accordance with Section 11.1.3 of the Landscape and Rehabilitation Management Plan (L&RMP) (SLR 2015). In addition to establishing the permanent monitoring sites, the surveys also involved baseline assessment of fencing, access tracks, erosion, weeds and vertebrate pests in accordance with Section 3 of the BOAMP. The baseline ecological surveys and monitoring report (Kleinfelder 2016) was submitted as an addendum to the BOAMP in January 2016 (available from <http://hunterquarries.com.au/karuah-east-documents/>).



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## Regional Context



### Legend

- █ Biodiversity Offset Area
- █ Project Disturbance Area
- Existing Access Road (Blue Rock Close)
- Existing Quarry Access (Andersite Road)
- Public Road Access (The Branch Lane)
- Proposed Access Road (Blue Rock Close) Extension
- Proposed Private Access Within Lot 12
- Lot Boundaries (ADW Johnson)
- Major Roads
- Local Roads
- Lot Boundaries (ADW Johnson)
- Named Watercourse
- Un-named Watercourse
- Contours (10m)

Metres  
0 50 100 200 300 400 500



PROJECT REFERENCE: 20182544

DATE DRAWN: 15/02/2018 11:11 Version 1

DRAWN BY: gjoyce

DATA SOURCE:  
LPI - 2015  
ADW Johnson - 2015  
nearmap - 2017

## Karuah East Quarry and Biodiversity Offset Area

FIGURE:

1



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2017 Annual Monitoring Report  
Karuah East Quarry Project



The first year of annual monitoring of the BOA and Lot 12 was undertaken in October 2016. This report provides the results of the second annual monitoring event undertaken in October 2017. Monitoring including analysis of monitoring data to date to evaluate changes in vegetation condition and threatened flora populations in the BOA. This report also provides a summary of management actions completed within the BOA to date, and recommendations for implementation of management actions in Year 3 of the BOAMP implementation to ensure compliance with relevant performance criteria.

## 1.2 SCOPE

Section 3 of the BOAMP details the annual monitoring requirements for the Karuah East BOA. Additionally, Section 12.1 of the L&RMP details the ecological monitoring requirements for the Karuah East Quarry project area, adjoining vegetation within 50 m of the project area boundary on Lots 12 and 13, and along Yalimbah Creek (Lot 12). A summary of the Karuah East annual ecological monitoring requirements are provided in **Table 1**. It is noted that not all monitoring activities listed in **Table 1** are required for the 2017 monitoring (refer to the timing / frequency).

**Table 1: Summary of annual monitoring requirements for Karuah East Quarry BOA and Lot 12**

Monitoring Requirements	BOAMP / L&RMP Section(s)	Timing / Frequency	Completed in 2017?
<b>Vegetation and Threatened Flora Monitoring</b> <ul style="list-style-type: none"> <li>The 18 permanent monitoring sites established in the BOA and Lot 12 during the baseline are to be surveyed annually in accordance with Section 3.13 of the BOAMP and Section 12.1.3 of the L&amp;RMP.</li> <li>Monitoring is to be undertaken during spring to coincide with the flowering times of threatened flora species in the BOA.</li> </ul>	Section 3.13 of BOAMP  Section 12.1.3 of L&RMP	Annually for life of quarry (LOQ)	Completed
<b>Fencing</b> <ul style="list-style-type: none"> <li>Inspections of boundary fencing will be undertaken as part of annual monitoring to identify maintenance requirements and record fencing activities undertaken in previous year.</li> <li>The effectiveness of fencing in excluding stock and unauthorised activities (e.g. rubbish dumping) will also be evaluated during annual monitoring and any additional controls will be identified if required.</li> </ul>	Section 3.2 of BOAMP  Section 12.1.2 of L&RMP	Annually for (LOQ)	Fencing contractor has been engaged and installation is has commenced. Contractor will continue as per the baseline plan.
<b>Tracks</b> <ul style="list-style-type: none"> <li>Inspections of retained and redundant access tracks will be undertaken as part of annual monitoring to identify maintenance requirements and record maintenance activities undertaken in previous year.</li> </ul>	Section 3.3 of BOAMP	Annually for LOQ	Completed
<b>Erosion</b> <ul style="list-style-type: none"> <li>Inspections of erosion sites will be undertaken as part of annual monitoring to identify maintenance requirements and record maintenance activities undertaken in previous year.</li> <li>Erosion and sediment control structures installed within the project disturbance area to protect retained vegetation will be inspected as part of annual ecological monitoring.</li> </ul>	Section 3.4 of BOAMP  Section 12.1.2 of L&RMP	Annually for LOQ	Completed

Monitoring Requirements	BOAMP / L&RMP Section(s)	Timing / Frequency	Completed in 2017?
<b>Existing Dwellings</b> <ul style="list-style-type: none"> <li>Inspections of the dwellings, access tracks, and asset protection zones (APZs) will be undertaken as part of annual monitoring to identify maintenance requirements. These inspections will focus on fencing, weeds, and unauthorised access / disturbance.</li> </ul>	Section 3.5 of BOAMP	Annually for LOQ	Completed
<b>Habitat Augmentation and Nest Boxes</b> <ul style="list-style-type: none"> <li>Nest boxes will be inspected and maintained (or replaced) every two years following installation.</li> </ul>	Section 3.8 of BOAMP	Every two years following installation for LOQ	N/A – Monitoring Required in April 2018 of boxes 1-30
<b>Weeds</b> <ul style="list-style-type: none"> <li>Target weed species will be mapped on an annual basis within the Project Disturbance Area and adjoining vegetation on Lots 12 and 13 (within 50 m of the project disturbance area boundary). Additionally, weed mapping along Yalimbah Creek will also be undertaken as part of the ecological monitoring program.</li> <li>Weed mapping for the BOA will be undertaken every two years and compared to the previous mapping to assess changes in the extent and density of target weeds. Monitoring results will be used to develop a control strategy for the following two years, identifying target locations and timing for primary and follow-up control.</li> </ul>	Section 12.1.1 of L&RMP  Section 3.10 of BOAMP	Annually (KEQ, 50 m buffer and Yalimbah Creek)  Every 2 years from baseline survey for LOQ (BOA)	Completed (KEQ, 50 m buffer, Yalimbah Creek and BOA)
<b>Vertebrate Pest Assessment</b> <ul style="list-style-type: none"> <li>Monitoring of vertebrate pests will be undertaken using the same methods, locations and effort as the baseline assessment unless otherwise recommended in the annual monitoring reports. This will enable results to be accurately compared to the baseline assessment.</li> </ul>	Section 3.11	Every 2 years from baseline survey for LOQ (BOA)	<b>Outstanding</b>
<b>Aerial Fauna Crossings</b> <ul style="list-style-type: none"> <li>A 12-month monitoring program of the two aerial fauna crossings will be undertaken using remote motion sensing cameras mounted on each pole (four cameras in total) once the crossings have been installed.</li> </ul>	Section 12.1.4 of L&RMP	12 months from installation of the crossings	N/A – aerial fauna crossing not installed as Haul Road not completed
<b>Threatened Flora Translocation – refer to <i>Tetratheca juncea</i> Translocation Management Plan (TJMP; Firebird 2015).</b>	Refer to TJMP	Refer to TJMP	Completed – refer to Tj Translocation Monitoring Report (Firebird 2017)

## 1.3 KARUAH EAST QUARRY PROGRESS

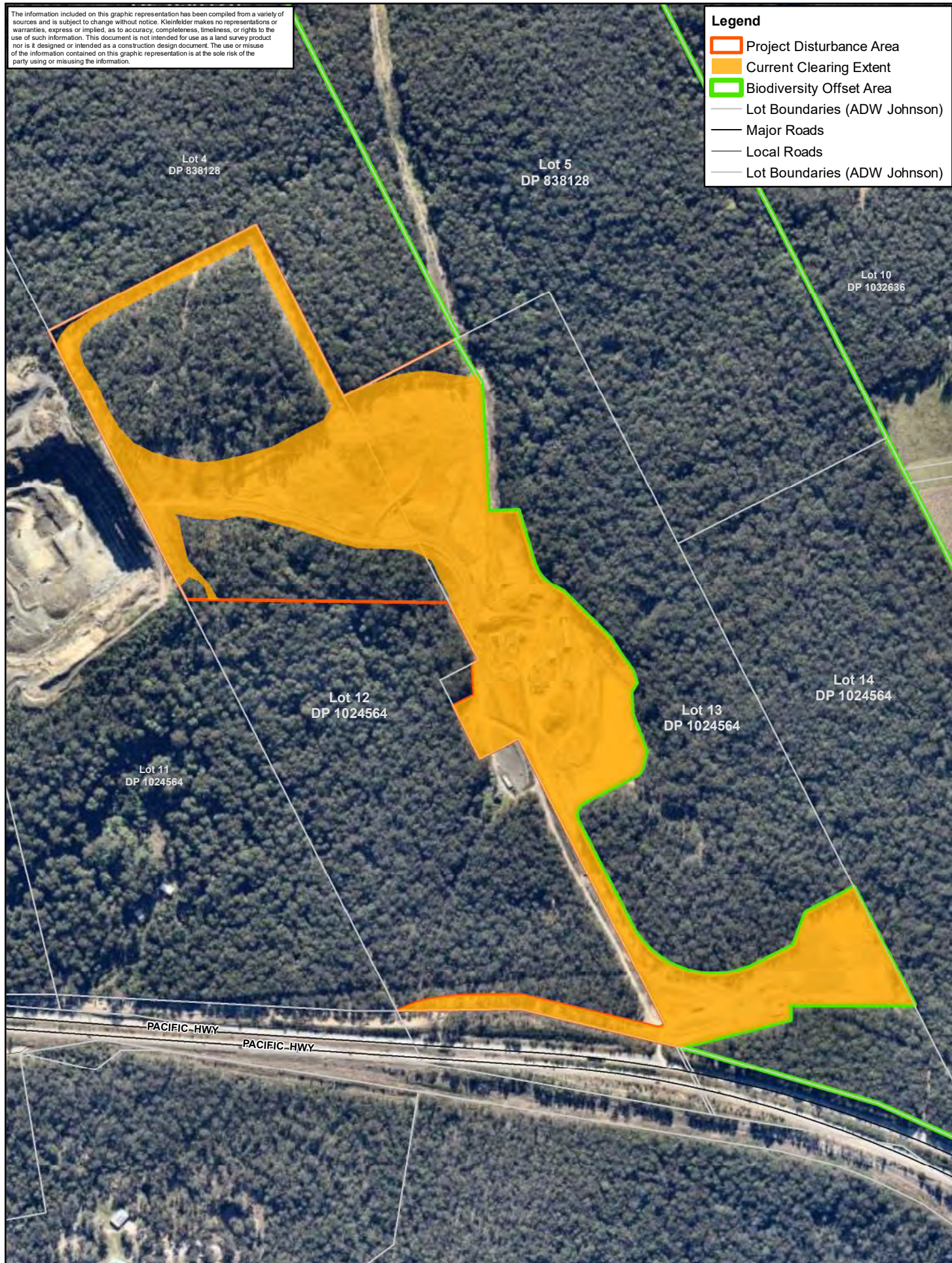
The Karuah East Quarry (KEQ) Project was still under construction at the time of monitoring (October 2017). Vegetation clearing commenced in April 2016 and the majority of the KEQ project area was primarily cleared between April and June 2016, with some clearing also occurring in November 2016. Clearing completed to date represents completion of the first stage of clearing for the project. Major earthworks have also been completed including construction of the haul road, detention basins, and other infrastructure areas. The current extent of clearing within the KEQ project area is shown in **Figure 2**.



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# Legend

- Project Disturbance Area
- Current Clearing Extent
- Biodiversity Offset Area
- Lot Boundaries (ADW Johnson)
- Major Roads
- Local Roads
- Lot Boundaries (ADW Johnson)



Metres  
0 25 50 100 150 200 250



PROJECT REFERENCE: 20182544

DATE DRAWN: 15/02/2018 11:18 Version 1

DRAWN BY: gjoyce

DATA SOURCE:  
LPI - 2015  
ADW Johnson - 2015  
nearmap - 2017

Current Extent of Clearing  
within the Karuah East  
Quarry Project Area

FIGURE:

2



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Karuah East Quarry Project



The remaining vegetation within the northern part of the project area is unlikely to be cleared for some time as the areas cleared to date contain andesite resources that will take at least several years to extract.

## 1.4 BIODIVERSITY VALUES

Section 2.3 of the BOAMP provides a detailed description of the biodiversity values identified in the Karuah East BOA during previous assessments (RPS Australia Pty Ltd 2013; Eco Logical Australia (ELA) 2013, 2014). Additional baseline ecological surveys were also undertaken within the BOA in October 2016 (Kleinfelder 2016). A summary of the key biodiversity values present (or previously recorded) within the site are provided in **Table 2**. The locations of threatened flora species and the distribution of vegetation communities across the BOA are shown in **Figure 3**.

**Table 2: Key biodiversity values recorded within the Karuah East BOA**

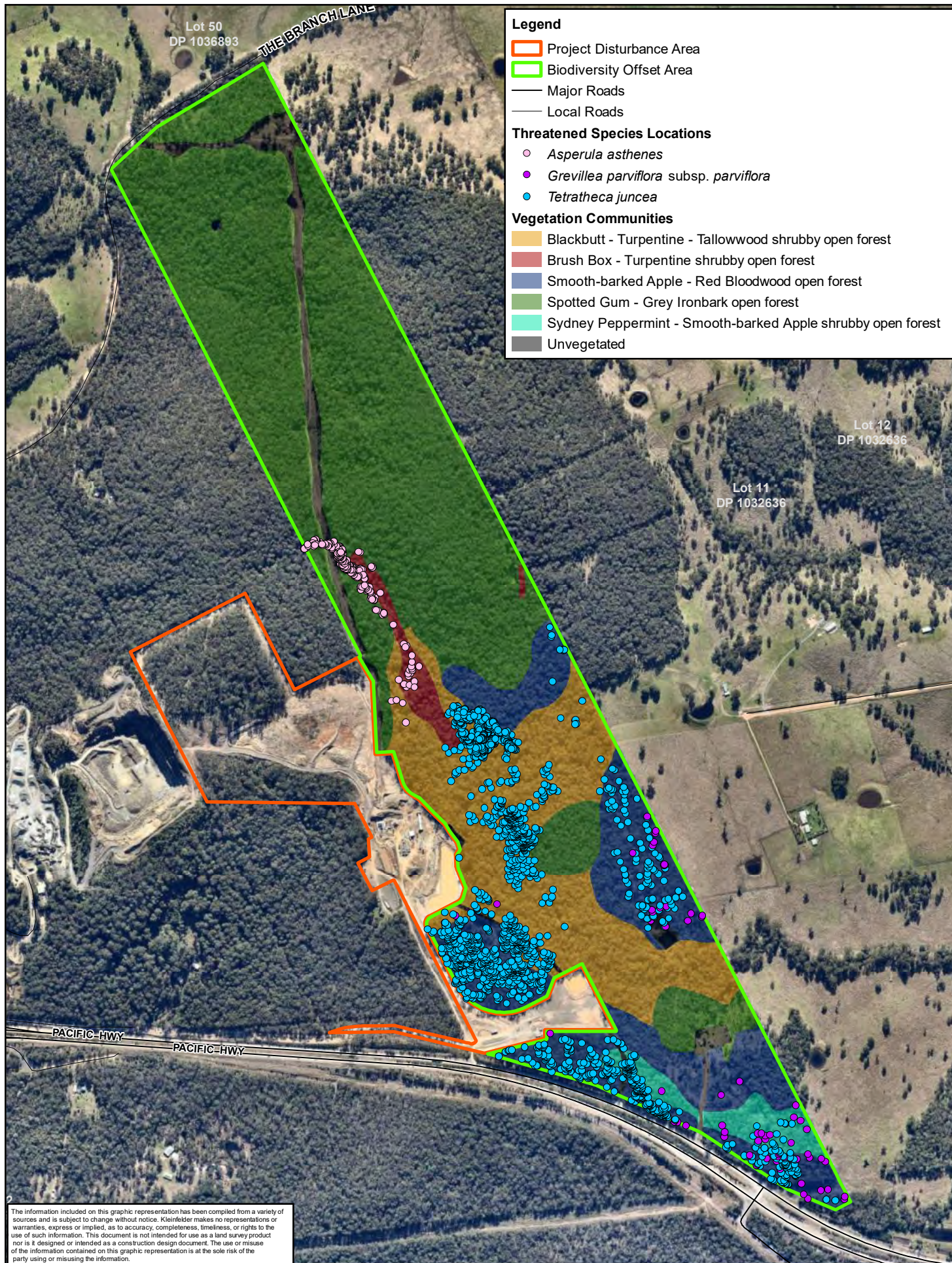
Biodiversity Values		Area (ha) / No. of individuals
Vegetation Communities	Spotted Gum – Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin.	69.98
	Sydney Peppermint – Smooth barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin.	3.96
	Smooth-barked Apple - Red Bloodwood open forest on coastal plains on the Central Coast, Sydney Basin.	26.58
	Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal foothills of the central North Coast.	28.30
	Brush Box - Turpentine shrubby open forest of the coastal ranges of the North Coast.	2.62
Threatened Flora Species	* <sup>^</sup> <i>Tetradlea juncea</i> (Black-eyed Susan)	6,907
	* <sup>^</sup> <i>Grevillea parviflora</i> subsp. <i>parviflora</i> (Small-flower Grevillea)	100+
	* <sup>^</sup> <i>Asperula asthenes</i> (Trailing Woodruff)	399
Threatened and Migratory Fauna Species	*Eastern Falsistrelle ( <i>Falsistrellus tasmaniensis</i> )	-
	*Little Bent-winged Bat ( <i>Miniopterus australis</i> )	-
	*Eastern Bent-winged Bat ( <i>Miniopterus orianae oceanensis</i> )	-
	*Eastern Coastal Free-tailed Bat ( <i>Mormopterus norfolkensis</i> )	-
	*Southern Myotis ( <i>Myotis macropus</i> )	-
	*Eastern Cave Bat ( <i>Vespadelus troughtoni</i> )	-
	*Glossy Black-Cockatoo ( <i>Calyptorhynchus lathamii</i> )	-
	*Varied Sittella ( <i>Daphoenositta chrysoptera</i> )	-
	*Powerful Owl ( <i>Ninox strenua</i> )	-
	+Rufous Fantail ( <i>Rhipidura rufifrons</i> )	

\* = listed as Vulnerable under the BC Act 2016

<sup>^</sup> = listed as Vulnerable under the EPBC Act 1999

+ = listed as Migratory under the EPBC Act 1999





<p>Metres</p> <p>0 50 100 200 300 400 500</p> <p><b>KLEINFELDER</b> Bright People. Right Solutions. www.kleinfelder.com</p>	<p>PROJECT REFERENCE: 20182544</p> <p>DATE DRAWN: 15/02/2018 13:06 Version 1</p> <p>DRAWN BY: gjoyce</p> <p>DATA SOURCE: LPI - 2015 ADW Johnson - 2015 nearmap - 2017</p>	<p><b>Vegetation Types and Threatened Flora Locations</b></p> <p>Karuah East Quarry Pty Ltd 2017 Annual Monitoring Report Karuah East Quarry Project</p>	<p>FIGURE:</p> <p><b>3</b></p>
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## 2. METHODS

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### 2.1 VEGETATION AND THREATENED FLORA MONITORING

Thirteen vegetation monitoring sites were established and surveyed within the BOA in October 2015 as per Section 3.1.3 of the BOAMP. An additional five vegetation monitoring sites were also established and surveyed within 50 m of the project disturbance area and along Yalimbah Creek on Lot 12 DP 1024564 as per Section 11.1.3 of the L&RMP. The location of each monitoring site was recorded with a handheld GPS (Trimble™ Juno 5S unit) and permanently marked with a capped star picket. As such, a total of 18 vegetation monitoring sites were established and surveyed within the BOA and Lot 12 in October 2015. These permanent monitoring sites have been surveyed in October 2016 and again in October 2017 using the same methods as the baseline survey, which are described in the following subsections.

#### Vegetation Monitoring

A qualitative assessment of vegetation condition and photo monitoring was undertaken at each of the 18 monitoring points, involving collection of the following data:

- Vegetation type and structure, including dominant species and estimated percentage foliage cover of each stratum (within 20 m radius of monitoring point);
- General health and condition of vegetation, including evidence of foliage die-off;
- Weed species and abundance; and
- Any management issues or indirect impacts from the project area or adjoining lands.

Additionally, four photographs (north, south, east and west) were taken at each of the monitoring points. The locations of the vegetation monitoring points are shown on **Figure 4**.

#### Threatened Flora Monitoring

Monitoring of threatened flora species was also undertaken at nine of the monitoring sites as per the BOAMP and L&RMP. At these sites, all threatened flora individuals within 10 m of the monitoring point were recorded. The bearing and distance of each clump / individual from the star picket recorded during the baseline survey was used to accurately re-locate known individuals in the survey area. The bearing (degrees) for each clump was measured using a Suunto compass and the distance was determined using a tape measure attached to the star picket. Additionally, each clump / individual was permanently marked with a steel peg (positioned 20 cm to the south of each clump / individual to avoid damaging plants); a metal tag was attached to each peg which provides a unique ID number.

*Tetratheca juncea* individuals or 'clumps' were delineated and counted in accordance with the standardised method described by Payne *et al.* (2002), in which individual clumps occurring

30 cm or more apart are considered separate, individual plants. A 30 cm separation distance between *Grevillea parviflora* subsp. *parviflora* stems was also used to identify separate individuals. *Asperula asthenes* were delineated based on the methodology used by ELA (2014) during previous targeted surveys to ensure a consistent approach for population surveys and monitoring across the BOA. Based on this method, stems (or groups of stems) of *Asperula asthenes* occurring 40 cm or more apart are considered separate individuals.

For each individual identified in the survey area, the following information was recorded:

- Clump number;
- Distance and bearing from centre star-picket to the clump;
- The size of the clump measured across the widest and narrowest points (cm) (for *A. asthenes* and *T. juncea*) or max height (for *G. parviflora* subsp. *parviflora*);
- Presence or absence of flowers (for *A. asthenes* and *G. parviflora* subsp. *parviflora*). The number of flowers and fruit on *T. juncea* plants were recorded to enable monitoring of reproductive output of this species; and
- Notes on general health of the plant, including any die-back or disease.

Following assessment of all previously recorded individuals, an additional survey of the area was performed at each site to identify any new individuals. For all new individuals identified within the survey area, the above listed information was collected. A summary of the vegetation and threatened flora monitoring sites within the BOA and Lot 12 is provided in **Table 3**.

**Table 3: Summary of vegetation and threatened flora monitoring sites**

Monitoring Point	Site	Threatened Flora Species Monitored
1	BOA – Lot 5	-
2	BOA – Lot 5	-
3	BOA – Lot 5	<i>Asperula asthenes</i>
4	BOA – Lot 13	<i>Asperula asthenes</i>
5	BOA – Lot 14	-
6	BOA – Lot 13	-
7	BOA – Lot 13	<i>Tetradlea juncea</i>
8	BOA – Lot 13	<i>Tetradlea juncea</i> and <i>Grevillea parviflora</i> subsp. <i>parviflora</i>
9	BOA – Lot 13	-
10	BOA – Lot 14	-
11	BOA – Lot 14	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>
12	BOA – Lot 14	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>
13	BOA – Lot 14	-
14	Lot 12	-
15	Lot 12	<i>Tetradlea juncea</i>
16	Lot 12	-
17	Lot 12	<i>Asperula asthenes</i>
18	Lot 12	<i>Asperula asthenes</i>

## 2.2 SITE WALKOVER AND INSPECTION

Inspection of key management features was undertaken across the BOA and Lot 12 (within 50 m of the project area and along Yalimbah Creek) in October 2017 in accordance with Section 3 of the BOAMP. The following features were inspected and assessed:

- Internal and external fencing;
- Access tracks and gates;
- Areas of active erosion and sedimentation;
- Areas surrounding the two existing dwellings within the BOA;
- Redistribution of habitat resources salvaged during clearing for the KEQ Project;
- Extent and density of priority and environmental weeds within the project disturbance area, adjoining vegetation within 50 m of the disturbance area boundary on Lots 12 and 13, and along Yalimbah Creek.

### Weed Mapping

Weeds for which detailed mapping was undertaken (i.e. target weed species) are those:

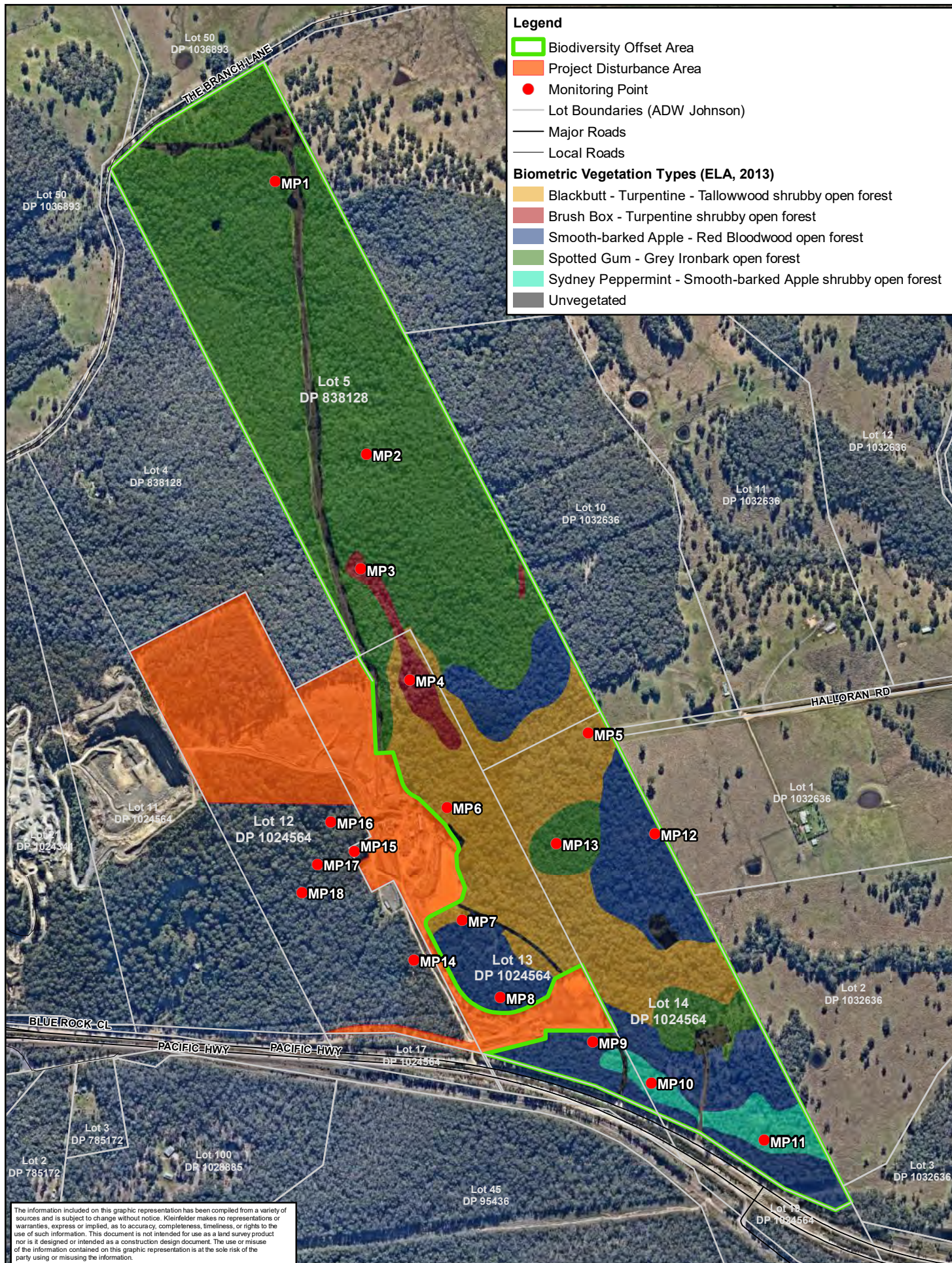
- Listed under the Biosecurity Act 2015 as priority weeds within the Mid Coast Council control area;
- Identified as a Weed of National Significance (WoNS); and / or
- Environmental weeds which represent major infestations and / or have the potential to adversely affect ecological values within the BOA.

The most widespread and abundant weed species across the site is *Lantana camara* (Lantana). Four categories were used during field surveys to map areas of different Lantana density based on the percentage foliage cover:

- Nil: no Lantana observed;
- Scattered: ≤20% Lantana cover;
- Moderate: 21-60% Lantana cover; and
- High: >60% Lantana cover.

Other target weed species occurring outside moderate to high Lantana areas were mapped separately (i.e. weeds which may not be identified and treated as part of Lantana control).





<p>0 50 100 200 300 400 500</p> <p>Metres</p> <p></p> <p><b>KLEINFELDER</b> Bright People. Right Solutions. www.kleinfelder.com</p>	<p>PROJECT REFERENCE: 20182544</p> <p>DATE DRAWN: 15/02/2018 13:07 Version 1</p> <p>DRAWN BY: gjoyce</p> <p>DATA SOURCE: LPI - 2015 ADW Johnson - 2015 nearmap - 2017</p>	<p><b>Vegetation and Threatened Flora Monitoring Locations</b></p> <p>Karuah East Quarry Pty Ltd 2017 Annual Monitoring Report Karuah East Quarry Project</p>	<p>FIGURE:</p> <p><b>4</b></p>
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## 3. RESULTS AND DISCUSSION

### 3.1 VEGETATION AND THREATENED FLORA MONITORING

The results of the vegetation and threatened flora monitoring within the BOA are summarised in **Table 4**. The data from the 2015 (baseline), 2016 and 2017 surveys of threatened flora monitoring and vegetation structure/cover is provided in **Appendix 1 and 2**, respectively. Photo monitoring points (north) taken at each of the sites in 2015, 2016 and 2017 are also provided in **Appendix 3**. Due to the large number of photos, only the photos taken from the northern direction at each monitoring site are presented in this report; the remaining photos from the south, east and west directions have been provided as separate files with the report.

**Table 4: Summary of 2017 vegetation and threatened flora monitoring results**

Monitoring site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP1	Spotted Gum – Grey Ironbark open forest	<ul style="list-style-type: none"> <li>No evidence of foliage die-back</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>High fallen logs / timber</li> <li>Dense ground cover</li> <li>Low rock cover</li> <li>There was a reduction in <i>Lantana camara</i> by five percent within MP1 (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP1.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP1.</p>	N/A



Monitoring site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP2	Spotted Gum – Grey Ironbark open forest	<ul style="list-style-type: none"> <li>No evidence of foliage die-back</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>High fallen logs / timber</li> <li>Moderate to dense ground cover</li> <li>Rocky areas present</li> <li>Hollow-bearing trees present</li> <li>There was a reduction in <i>Lantana camara</i> to one percent within MP2 (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP2.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP2.</p>	N/A
MP3	Brush Box – Turpentine shrubby open forest	<ul style="list-style-type: none"> <li>No evidence of foliage die-back</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>High structural complexity of vegetation</li> <li>High fallen timber</li> <li>Ephemeral pools within stream</li> <li>High weed invasion (Lantana)</li> <li>A minor increase (10%) in estimated shrub caused by an increase in <i>Pittosporum multiflorum</i> was recorded within the survey area since the previous survey (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP3.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP3.</p>	<ul style="list-style-type: none"> <li>A total of 12 <i>Asperula asthenes</i> individuals were recorded at MP3 in 2017. The number of individuals has declined from 17 individuals in 2016, and 16 in 2015 (25% reduction from baseline): <ul style="list-style-type: none"> <li>Six individuals recorded at MP3 in 2016 were absent in 2017.</li> <li>Two new individuals, and one individual not recorded in 2016 (3B) was recorded in 2017.</li> <li>Three individuals from 2016 were merged into one large clump (stems within 30 cm).</li> </ul> </li> <li>All recorded <i>A. asthenes</i> plants at MP3 were observed to be in healthy condition, five individuals had buds, three had flowers, and three had fruit at the time of survey.</li> </ul>

Monitoring site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP4	Brush Box – Turpentine shrubby open forest	<ul style="list-style-type: none"> <li>No evidence of foliage die-back</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>High structural complexity of vegetation</li> <li>Dense ground cover</li> <li>High fallen timber</li> <li>Weed invasion (Lantana)</li> <li>A minor reduction (10%) in estimated exotic was recorded within the survey area since the previous survey (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP4.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP4.</p>	<ul style="list-style-type: none"> <li>A total of 18 <i>Asperula asthenes</i> individuals were recorded at MP4 in 2017 compared to 17 individuals recorded in 2016, and 15 in 2015 (13% increase from Baseline):               <ul style="list-style-type: none"> <li>Four individuals recorded at MP4 were not recorded in 2017.</li> <li>Five additional individuals were recorded at new locations in 2017.</li> </ul> </li> <li>All <i>A. asthenes</i> plants at MP4 were observed to be in healthy condition. Four plants had buds, and one had flowers.</li> </ul>
MP5	Blackbutt – Turpentine – Tallow wood shrubby open forest	<ul style="list-style-type: none"> <li>No evidence of foliage die-back</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>Moderate fallen logs / timber</li> <li>Dense ground cover</li> <li>A minor increase (5%) in estimated shrub was recorded within the survey area since the previous survey (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP5.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP5.</p>	N/A
MP6	Blackbutt – Turpentine – Tallow wood shrubby open forest	<ul style="list-style-type: none"> <li>No evidence of foliage die-back</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>High fallen logs / timber</li> <li>Moderately dense ground cover</li> <li>Standing pools within creek</li> <li>A minor reduction (10%) in estimated midstorey caused by the die-off of <i>Zieria smithii</i> was recorded within the survey area since the previous survey (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP6.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>Disturbance from tree falling (<i>Glochidion ferdinandi</i>) within western half of MP6</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal or dust was observed.</li> <li>No signs of recent fire</li> </ul> <p><b>Conclusion:</b> One tree fall was observed since the previous survey (2016) at MP6</p>	N/A

Monitoring site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP7	Smoot h-barked Apple - Red Bloodwood open forest	<ul style="list-style-type: none"> <li>No evidence of foliage die-back</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>Regrowth vegetation to the north and east (previously cleared)</li> <li>Low fallen timber</li> <li>Dense ground cover</li> <li>No changes in estimated foliage cover for each vegetation stratum (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP7.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP7.</p>	<ul style="list-style-type: none"> <li>A total of 14 <i>Tetratheca juncea</i> individuals were recorded at MP7 in 2017 compared to 15 individuals recorded in 2016, and 14 in 2015 (no change since Baseline): <ul style="list-style-type: none"> <li>One individuals recorded at MP7 in 2016 was absent in 2017.</li> </ul> </li> <li>The majority of the <i>T. juncea</i> plants at MP7 were observed to be in healthy condition, however, two plants were observed to have some die-off with one of them declining in size. Conversely, two individuals were recorded as having new growth. Ten of the plants had flowers, while four had fruit.</li> </ul>
MP8	Smoot h-barked Apple - Red Bloodwood open forest	<ul style="list-style-type: none"> <li>One <i>Eucalyptus eugenioides</i> had some die back (approximately 20%) and some evidence of die back in <i>Leptospermum polygalifolium</i>.</li> <li>Evidence of some die back in midstorey strata, other vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>Moderate fallen timber</li> <li>Dense ground cover and midstorey</li> <li>No changes in estimated foliage cover for each vegetation stratum (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP8.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> <li>Old track to north-east</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP8.</p>	<ul style="list-style-type: none"> <li>A total of 10 <i>Tetratheca juncea</i> clumps were recorded at MP8 in 2017, which is the same number as 2016 and two more than 2015 (25% increase from Baseline): <ul style="list-style-type: none"> <li>One <i>T. juncea</i> clump recorded in 2016 was not recorded in 2017.</li> <li>One additional clump was recorded in 2017.</li> </ul> </li> <li>One <i>Grevillea parviflora</i> subsp. <i>parviflora</i> individual was recorded at MP8 in 2017, 2016 and 2015 (no change from baseline),</li> <li>All <i>T. juncea</i> and <i>G. parviflora</i> plants at MP8 were observed to be in healthy condition. Five <i>T. juncea</i> clumps were in flower, and all clumps had fruit. The <i>G. parviflora</i> individual did not have flowers or fruit, but buds were present.</li> </ul>

Monitoring site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP9	Smooth-barked Apple - Red Bloodwood open forest	<ul style="list-style-type: none"> <li>No evidence of foliage die-back</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>High fallen timber</li> <li>Dense ground cover and midstorey</li> <li>A minor increase (10%) in estimated ground cover (other) was recorded within the survey area since the previous survey (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP9.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> <li>Old track to south</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP9.</p>	N/A
MP10	Sydney Pepper mint - Smooth-barked Apple shrubby open forest	<ul style="list-style-type: none"> <li>No evidence of foliage die-back</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>High fallen timber</li> <li>Dense ground cover</li> <li>No changes in estimated foliage cover for each vegetation stratum (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP10.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> <li>Several old dead stags present</li> <li>Some canopy gaps (from past clearing/logging)</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP10.</p>	N/A

Monitoring site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP11	Sydney Pepper mint - Smooth-barked Apple shrubby open forest	<ul style="list-style-type: none"> <li>No evidence of foliage die-back</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>Low fallen timber</li> <li>Dense ground cover</li> <li>A minor increase (5%) in estimated ground cover (grass) was recorded within the survey area since the previous survey (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP11.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>Disturbance from tree falling along North-North/East 20 metre buffer boundary</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> </ul> <p><b>Conclusion:</b> One tree fall was observed since the previous survey (2016) at MP11.</p>	<ul style="list-style-type: none"> <li>A total of 12 <i>Grevillea parviflora</i> subsp. <i>parviflora</i> individuals were recorded at MP11 in 2017 compared with 16 individuals in 2016, and 2015 (25% reduction from Baseline): <ul style="list-style-type: none"> <li>Four individuals recorded at MP11 in 2016 were absent in 2017.</li> </ul> </li> <li>It was noted in 2016 that a number of <i>G. parviflora</i> at MP11 were dying-off / senescing. In 2017 the health of half these same individuals has improved whilst the other half stems have died. The remaining <i>G. parviflora</i> were observed to be in healthy condition in 2017, which is consistent with the 2016 observations. In 2017 it was observed that three individuals had new growth / shoots. Additionally, some herbivory was observed.</li> <li>In 2017 one individual was observed to have a fruit (11H had one green swollen fruit). No other plants were flowering or had fruit.</li> </ul>
MP12	Smooth-barked Apple – Red Bloodwood open forest	<ul style="list-style-type: none"> <li>No evidence of foliage die-back</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>High fallen timber</li> <li>Dense ground cover</li> <li>No changes in estimated foliage cover for each vegetation stratum (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP12.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> <li>Cleared grazing land 20 m to east adjacent to BOA with exotic grasses, but no weeds within BOA in this area.</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP12.</p>	<ul style="list-style-type: none"> <li>A total of five <i>Grevillea parviflora</i> subsp. <i>parviflora</i> individuals were recorded at MP12 in 2017, compared to eight individuals recorded in 2016, and seven in 2015 (29% reduction from Baseline): <ul style="list-style-type: none"> <li>Three individuals recorded at MP12 in 2016 was absent in 2017.</li> </ul> </li> <li>All recorded <i>G. parviflora</i> plants at MP12 were observed to be in healthy condition. Two of the <i>G. parviflora</i> no longer present were recorded in 2016 to be flattened by a fallen tree. Three individuals were observed to be in flower at the time of survey.</li> </ul>



Monitoring site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP13	Spotted Gum – Grey Ironbark open forest	<ul style="list-style-type: none"> <li>Some natural die-back present in canopy trees</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>High fallen logs / timber</li> <li>Dense ground cover</li> <li>Moderate rock cover</li> <li>A minor increase (10%) in estimated ground cover (other) was recorded within the survey area since the previous survey (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP13.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP13.</p>	N/A
MP14	Smooth-barked Apple - Red Bloodwood open forest	<ul style="list-style-type: none"> <li>No evidence of foliage die-back</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>Low fallen/ timber</li> <li>Dense ground cover</li> <li>No changes in estimated foliage cover for each vegetation stratum (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP14.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> <li>Exotic grasses around dam to south and along access track</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP14.</p>	N/A

Monitoring site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP15	Blackbutt - Turpentine - Tallowwood shrubby open forest	<ul style="list-style-type: none"> <li>Some evidence of foliage die-back in <i>Acacia irrorata</i> towards edge of disturbance area</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>Regrowth vegetation to the north and east (previously cleared)</li> <li>High fallen timber</li> <li>Very dense ground cover and leaf litter</li> <li>Rocky areas present</li> <li>A minor decrease (5%) in estimated midstorey and exotic (4%) was recorded within the survey area since the previous survey (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP15.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> <li>Several trees and large limbs fallen (mostly likely during recent storm)</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP15.</p>	<ul style="list-style-type: none"> <li>A total of 17 <i>Tetratheca juncea</i> individuals were recorded at MP15 in 2017 compared to 31 individuals recorded in 2016, and 30 in 2015 (43% decline from Baseline): <ul style="list-style-type: none"> <li>14 individuals recorded at MP15 in 2016 was absent in 2017.</li> </ul> </li> <li>All <i>T. juncea</i> plants that were recorded at MP15 were observed healthy with a number of plants having new growth. However, there was a lack of flowers and fruit, with only six of the recorded 17 plants having flowers, and three had fruit (only one on each plant). The significant decline in the <i>T. juncea</i> at MP15 is most likely due to the lower than average rainfall during the past year, exacerbated by the location of the monitoring point; upper slopes of exposed hill side.</li> </ul>
MP16	Spotted Gum – Grey Ironbark open forest	<ul style="list-style-type: none"> <li>No evidence of foliage die-back</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>Moderate fallen timber</li> <li>Dense ground cover and leaf litter</li> <li>Low rock cover</li> <li>A minor decrease (10%) in estimated ground cover (grass) and increase (10%) in estimated ground cover (other) was recorded within the survey area since the previous survey (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP16.</p>	<ul style="list-style-type: none"> <li>No evidence of erosion and sedimentation</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> <li>Several old dead stags present</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP16.</p>	N/A

Monitoring site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP17	Brush Box - Turpentine shrubby open forest	<ul style="list-style-type: none"> <li>No evidence of foliage die-back</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>High fallen timber</li> <li>Dense ground cover</li> <li>Rocky areas along ephemeral creek</li> <li>No changes in estimated foliage cover for each vegetation stratum (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP17.</p>	<ul style="list-style-type: none"> <li>Very minor scouring along creek bank</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> <li>Several trees and large limbs fallen (noted in 2016)</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP17.</p>	<ul style="list-style-type: none"> <li>A total of two <i>Asperula asthenes</i> individuals were recorded at MP17 in 2017 compared to 11 individuals recorded in 2016 and 2015 (82% decline from Baseline): <ul style="list-style-type: none"> <li>Nine individuals recorded at MP17 in 2016 was absent in 2017.</li> </ul> </li> <li>The remaining <i>A. asthenes</i> were observed to be in good health, both plants had buds. There was some reduction in size in one individual recorded (70% reduction in size), while the other individual increased in size by 50% the decline in <i>A. asthenes</i> in 2017 most likely due to lower than average rainfall over the previous year and MP17 being positioned on a rocky area on the periphery of the creek (less protected than other monitoring locations).</li> </ul>
MP18	Brush Box - Turpentine shrubby open forest	<ul style="list-style-type: none"> <li>No evidence of foliage die-back</li> <li>All vegetation strata in healthy condition</li> <li>Canopy and midstorey regeneration present</li> <li>High fallen timber</li> <li>Dense ground cover</li> <li>Rocky areas along ephemeral creek</li> <li>No changes in estimated foliage cover for each vegetation stratum (<b>Appendix 2</b>)</li> </ul> <p><b>Conclusion:</b> No significant or notable changes in vegetation and habitat condition since the previous survey (2016) at MP18.</p>	<ul style="list-style-type: none"> <li>Very minor scouring along creek bank</li> <li>No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust</li> <li>No signs of recent fire</li> </ul> <p><b>Conclusion:</b> No new disturbance or changes in existing disturbance severity were observed since the previous survey (2016) at MP18.</p>	<ul style="list-style-type: none"> <li>A total of four <i>Asperula asthenes</i> individuals were recorded at MP18 in 2017 compared to 13 individuals recorded in 2016 and 2015 (69% decline from Baseline): <ul style="list-style-type: none"> <li>10 individuals recorded at MP18 in 2016 were absent in 2017.</li> <li>One additional <i>A. asthenes</i> was recorded since the previous survey in 2016.</li> </ul> </li> <li>The remaining <i>A. asthenes</i> were observed to be in healthy condition, however, no plants were observed to have flowers or fruit. The decline in <i>A. asthenes</i> in 2017 is most likely due to the below average rainfall in the previous year, compounded by the site being positioned high on the creek bank in a less protected area than other monitoring locations.</li> </ul>

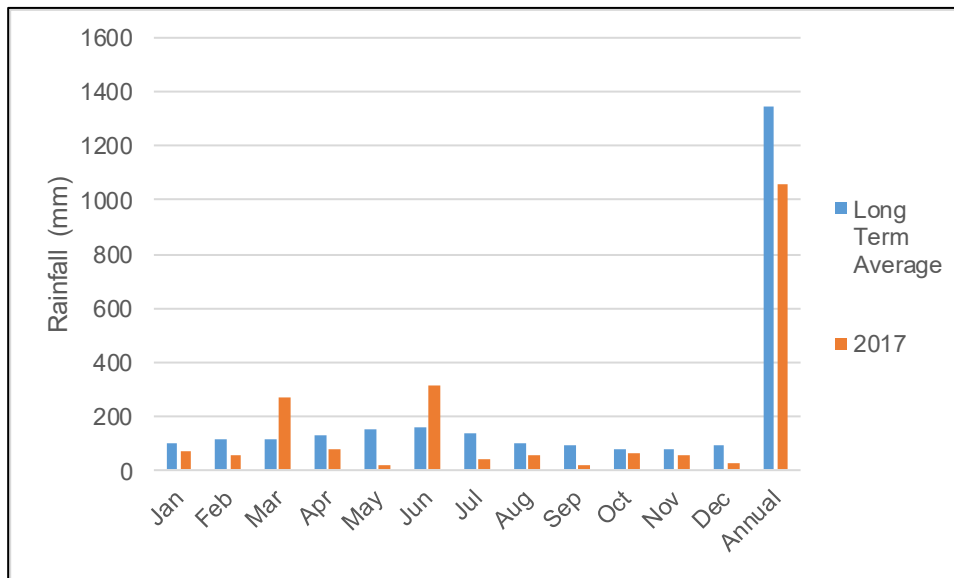
The 2017 threatened species monitoring identified a decrease in threatened flora abundance at the majority of the monitoring locations. **Table 1** illustrates the percentage of decline in threatened flora from the baseline to the current surveys. It should be noted that monitoring points: MP4, MP7, MP8, MP15 and MP17 are considered close to the impact area (as per BOAMP) and MP3, MP11, MP12 and MP18 are located further away from the impact area within the BOA.

**Table 5: Threatened species percentage change from baseline survey.**

Monitoring Point	Species	Change from Baseline (%)	Average Change
3 (Away from Impact Area)	<i>Asperula asthenes</i>	-25%	41% Decline
4 (Close to Impact Area)		13%	
17 (Close to Impact Area)		-82%	
18 (Away from Impact Area)		-69%	
7 (Close to Impact Area)	<i>Tetradlea juncea</i>	0%	6% Decline
8 (Close to Impact Area)		25%	
15 (Close to Impact Area)		-43%	
8 (Close to Impact Area)	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	0%	18% Decline
11 (Away from Impact Area)		-25%	
12 (Away from Impact Area)		-29%	

Decline in threatened species abundance cannot be confidently attributed to the quarry disturbance as there is no correlation between monitoring points with higher percentage of decline and proximity to the quarry; high levels of decline (>10%) was observed at both sites close to and away from the impact area. A likely cause for the decrease in threatened species abundance is the below average rainfall experienced throughout 2017 in the region as shown in the graph below illustrating 2017 rainfall against the average rainfall from 1881 to 2018 (**Chart 1**). Rainfall for the year was 281.9 mm below average at the Nelson Bay weather station and vegetation in the region is showing signs of drought stress. This was evident within the BOA during the 2017 survey event. *Asperula asthenes* is particularly vulnerable to climatic change with preferred habitat is damp sites often along river banks on the east coast from Bulahdelah to Kempsey in scattered clumps (OEH 2017). It has also been noted by Kleinfelder during other surveys of *Tetradlea juncea* within the Hunter Region that flower production and

overall detectability of the species was lower than normal during the 2017 flowering season. Continued ecological monitoring is required to ensure that the species recover as conditions become more favourable.



**Chart 1: 2017 monthly rainfall compared to average rainfall at Nelson Bay weather station (source BOM)**

While there was decline the populations of threatened species across the BOA at the monitoring locations, some sites did exhibit growth and had healthy plants. Typically, these sites were more protected, occurring lower areas and along protected creek lines. Increases in threatened species was observed at MP 4, 7 and 8. While flowering and fruiting was generally lower than the previous survey events, flowers and fruit were observed at a number of locations, including one *Grevillea parviflora* subsp. *parviflora* fruit, which has not been observed on-site during the two previous survey events (**Plate 1**).



**Plate 1: *Grevillea parviflora* subsp. *parviflora* with fruit at MP11**



## 3.2 WEEDS

**Figure 5** shows the distribution of weeds mapped across the BOA, within the project disturbance area, within 50 m of the project disturbance area, and along Yalimbah Creek on Lot 12. *Lantana camara* (Lantana) (Priority Weed within the Mid Coast LGA) is the most abundant weed species across the site, with the majority of infestations occurring on the northern part of the BOA. Dense infestations of Lantana were primarily observed along the drainage lines in Lot 5. Two other Priority Weed species were also identified in the BOA: *Asparagus aethiopicus* (Ground Asparagus) and *Senecio madagascariensis* (Fireweed) are both listed as Priority Weeds within the Mid Coast LGA. These two species only occur as small discrete patches in a few locations in the BOA.

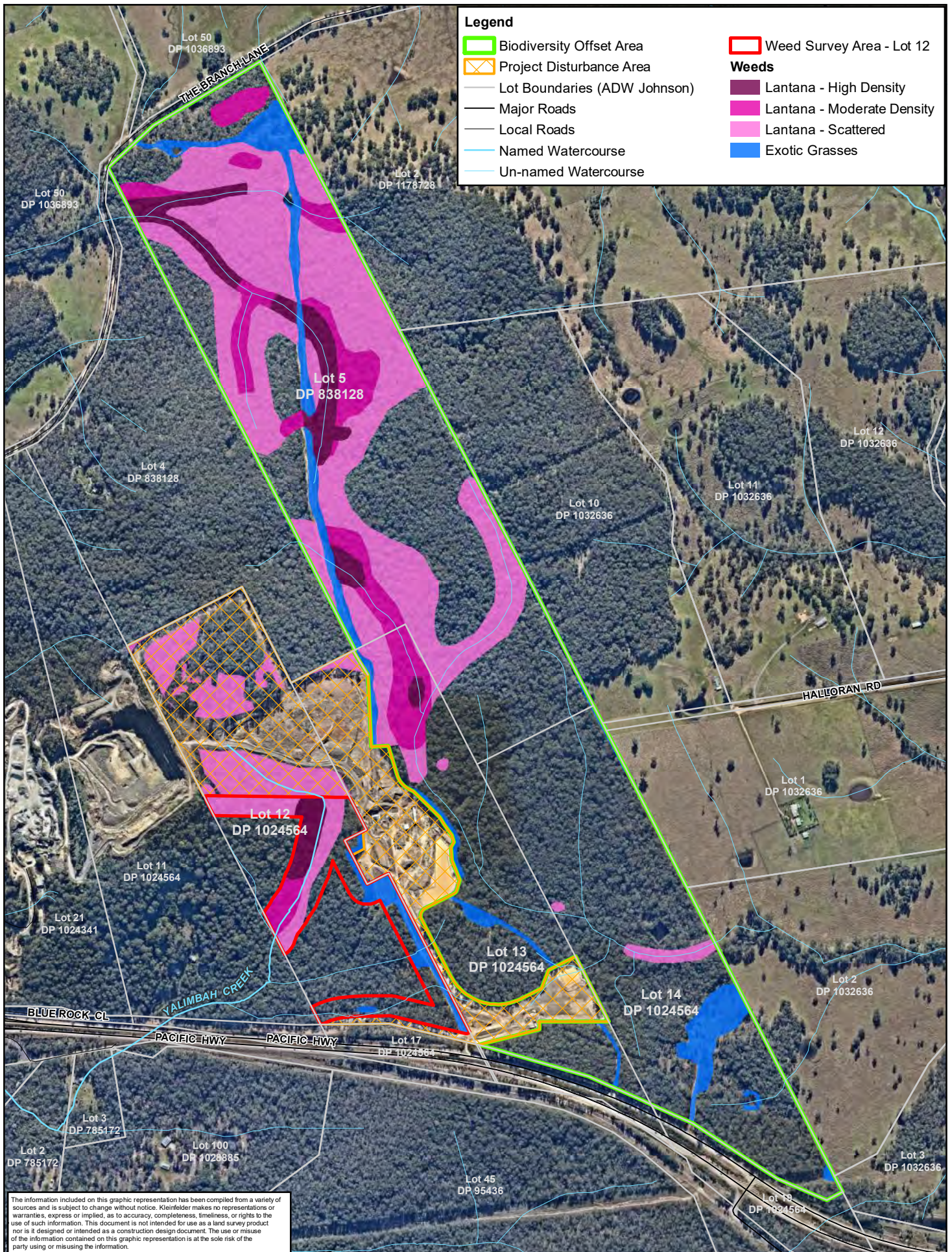
Notable areas of exotic perennial grasses have also been mapped (**Figure 5**). The dominant exotic grass species in these areas include *Setaria sphacelata* (South African Pigeon Grass), *Andropogon virginicus* (Whisky Grass), and *Axonopus fissifolius* (Narrow-leafed Carpet Grass), as well as a variety of annual and perennial exotic herbs. The areas dominated by exotic grasses are primarily restricted to the power line easement, around existing dwellings, track edges, perimeter of quarry disturbance area and previously cleared regrowth areas on the southern part of Lot 14. While the dense areas of exotic grasses have been mapped, they are not considered target weed species at this stage as they represent a relatively low threat to the integrity of ecological values within the site. The exotic grasses occurring in the areas of native regrowth are also likely to be shaded out over time as the canopy and midstorey cover continue to regenerate. However, the distribution of exotic grasses will continue to be monitored, and any increases will be evaluated to determine if management is required.

Weed Control efforts in 2017 focused largely on Lot 12, 13 and 14. It was observed during the 2017 annual monitoring event that weed density had reduced with signs of stress evident at monitoring point 1, 2 and 4 and the surrounding area. This is most likely due to the dry conditions experienced onsite and the location of the above mentioned monitoring sites on higher poor soils when compared with monitoring sites further south.

It is recommended weed control works for the next 12 months should focus on the Lantana infestations in the south-west portion of Lot 5 and north-east part of Lot 13. Additionally, manual control of exotic grasses within 10 m of the *Asperula asthenes* individuals in the powerline easement on Lot 5 should also be undertaken. These weed control activities must be undertaken in spring in accordance with the procedures detailed in Section 3.10 of the BOAMP due to the presence of threatened flora (*Asperula asthenes*) in these areas.

A combined list of weed species from the surveys completed by ELA (2013) and Kleinfelder (2017) across the BOA is provided in **Appendix 4**.





<p>Metres</p> <p>0 50 100 200 300 400 500</p>	<p>PROJECT REFERENCE: 20182544</p> <p>DATE DRAWN: 15/02/2018 13:27 Version 1</p> <p>DRAWN BY: gjoyce</p> <p>DATA SOURCE: LPI - 2015 ADW Johnson - 2015 Nearmap - 2017</p>	<h2 style="margin: 0;">Weed Mapping</h2> <p style="margin-top: 10px;">Karuah East Quarry Pty Ltd 2017 Annual Monitoring Report Karuah East Quarry Project</p>	<p>FIGURE:</p> <h1 style="font-size: 2em; margin: 0;">5</h1>
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### 3.3 FENCING AND TRACKS

**Figure 6** shows the layout of existing and required fencing, gates and tracks across the BOA. Boundary fencing is required around the entire KEQ project area. Fencing of KEQ project area / BOA boundary has commenced (approximately 70% completed in 2017). A new fence was installed along the eastern boundary of the BOA adjoining Lot 10 in 2017. Fencing along the remaining 30% of project area / BOA boundary, and Lot 5 / Lot 14 boundary is required. Internal fencing is also required around the existing dwellings on Lot 5 and Lot 14. It is noted that the dwelling in Lot 5 is not currently occupied. This internal fencing must be installed prior to this dwelling being occupied. All fencing works shall be undertaken in accordance with Section 3.2 of the BOAMP.

Several access tracks occur throughout the BOA. The majority of these tracks are important for facilitating access for management activities across the BOA, and as such it is recommended that these tracks be maintained. Several sections of tracks on the southern part of the BOA are not considered critical for ongoing management. These sections have been rehabilitated with branches, hollow logs / sections and other organic debris salvaged from the KEQ disturbance area during vegetation clearing.

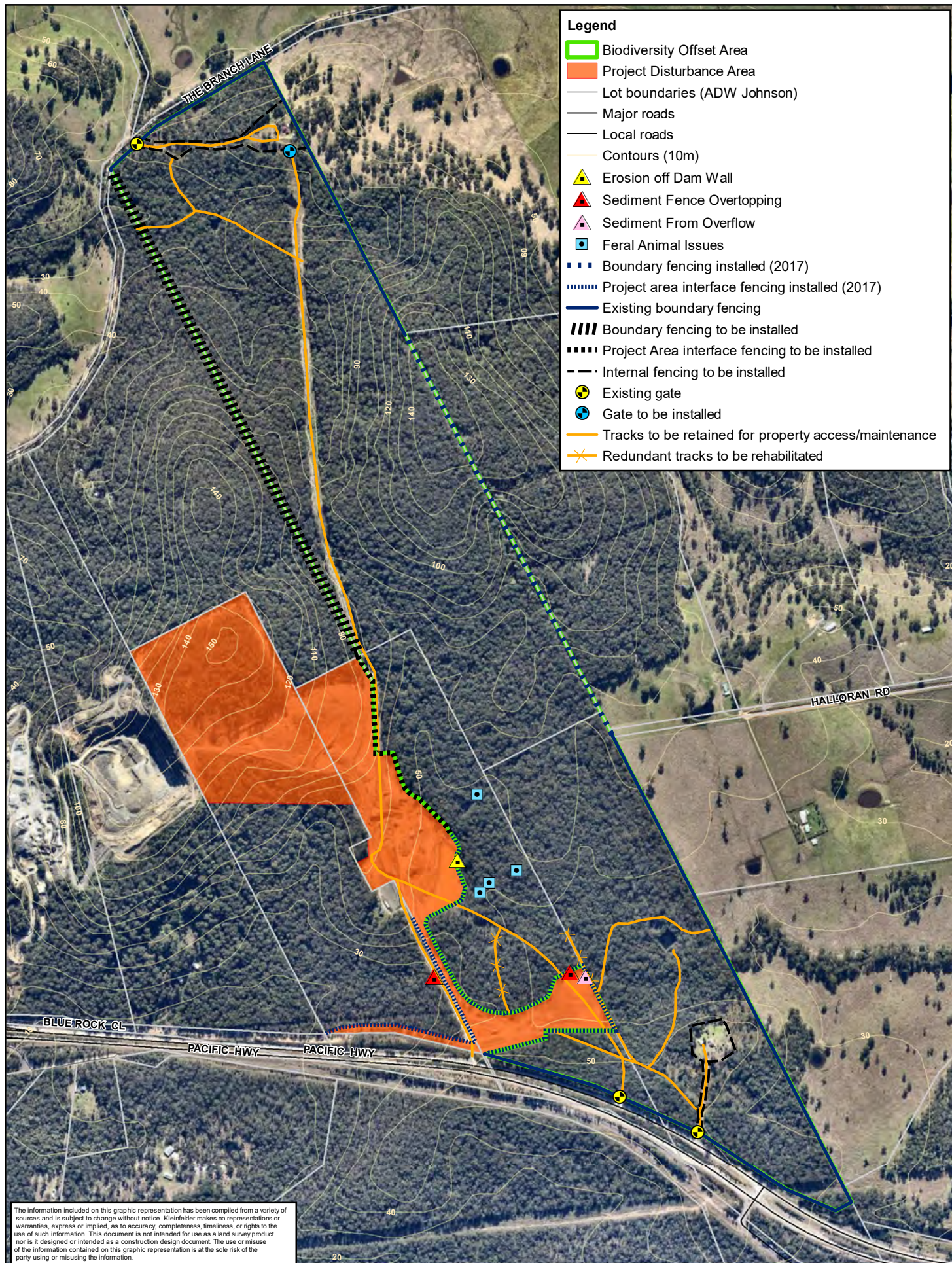
The existing tracks to be retained in the BOA were assessed as being in adequate condition for 4WD access during the 2017 surveys and no maintenance is recommended at this stage. However, it is noted that some initial repairs may be required for the tracks to be suitable for emergency fire-fighting vehicles. The need for initial repairs will be determined during development of the Fire Management Strategy as per Section 3.12 of the BOAMP.

### 3.4 EROSION

No areas of major active erosion were identified within the BOA during the 2017 monitoring. Minor scouring was observed in several locations along the drainage lines within Lot 5. However, this scouring is considered to be natural stream bank erosion as there was no evidence of unnatural disturbance in these areas, and overall the streams have relatively high ground vegetation cover and appear stable. There are also some areas of bare ground on the access tracks within the BOA; however, these areas also appeared to be stable and no substantial active erosion or sedimentation was observed in these areas.

Certain areas of the BOA (primarily the steep slopes on Lot 5) have the potential to develop erosion following Lantana control works. The need for erosion or soil stabilisation measures following initial treatment of moderate and high density Lantana areas on steep slopes will be assessed at each maintenance / monitoring event.





<div> <div>0 50 100 200 300 400 500</div> <div>Metres</div> <div> </div> <div> <div> <div>Bright People. Right Solutions.</div> <div>www.kleinfelder.com</div> </div> </div> </div>	<div>PROJECT REFERENCE: 20182544</div> <div>DRAWN BY: G.Joyce</div> <div>DATE DRAWN: 21/03/2018 10:34 Version 1</div> <div>DATA SOURCE: LPI - 2015 ADW Johnson - 2015 nearmap - 2017</div>	<div>Fencing, Track, Erosion, and Pest Issues</div> <div>Karuah East Quarry Pty Ltd 2017 Annual Monitoring Report Karuah East Quarry Project</div>	<div>FIGURE:</div> <div>6</div>



Sediment fencing and bund walls / diversion drains were in place in all areas downslope of disturbed areas except for the area downstream of the large sedimentation dam at the northern end of the Haul Road, within the Karuah East Quarry project area at the time of the 2017 inspection. Erosion issues were observed at four areas surrounding the quarry disturbance area:

- In two locations the installed sediment fencing was overtopping and therefor no longer providing active sediment control (**Figure 6**). It was observed in these areas some sediment has been deposited in the BOA and Lot 12 respectively. Tim Grugeon of Hunter Quarries communicated in a phone call on the 23<sup>rd</sup> March 2018 that both sediment fences have been re-erected and replaced as necessary to ensure the sediment fences are actively controlling sediment movement into the BOA.
  - One along the northern boundary of the stockpile area.
  - A second along the haul road.
- The overflow for the sediment dam in the stockpile area was observed to be depositing small amounts of sediment into the receiving environment with water being retained in the bushland east of the basin for a period. This may create unnatural waterlogging and a change in vegetation structure and composition. Ongoing annual monitoring is required to ensure no die-back or change in vegetation structure and composition occurs.
- One area of unmanaged active erosion, was observed along the south-eastern bank of the detention basin at the northern end of the Haul Road. The bank is actively eroding due to a lack of ground cover and / or erosion control devices, and with no sediment control installed the sediment is depositing along the fringe of the adjacent bushland (BOA) as shown in **Plate 2**. Tim Grugeon of Hunter Quarries communicated in a phone call on the 23<sup>rd</sup> March 2018 that ground cover is developing on this bank with favourable weather conditions allowing for seeded oat and millet to germinate along with natural germination of native species. This continued development of ground cover will reduce the risk and occurrence of active erosion along the bank therefor reducing risk of sedimentation into the BOA.





**Plate 2:** Erosion along the south-eastern bank of detention basin

### 3.5 VERTEBRATE PESTS

A number of diggings were observed in the southern half of the BOA area during the site inspection (**Figure 6**). These disturbances were identified as Feral Pig diggings. Karuah East Quarry, have engaged a contractor to undertake feral animal control in the BOA.

### 3.6 HABITAT RESOURCES

#### Salvage and Redistribution of Habitat Resources

Section 6.3.1 of the L&RMP and Section 3.8 of the BOAMP detail the protocol and requirements for salvaging habitat resources (i.e. logs, hollows and other large organic debris) during the KEQ project, and redistributing into the rehabilitation or offset areas. Vegetation clearing undertaken in 2016 for the KEQ project has included the salvage of a large quantity of organic material (primarily large trees and logs). These resources are currently stockpiled on the boundaries of the KEQ project area (**Figure 7**), which will be respread across rehabilitation areas as the project progresses.

In addition to this, a number of hollows and hollow log sections (total of 77) have been salvaged and are in the process of being prepared for redistribution into the BOA (**Plate 3**). The location of the hollow logs to be redistributed throughout the BOA is shown on **Figure 7**. The quantity and locations of hollows and other salvaged organic materials that are redistributed in the BOA will be recorded as part of future monitoring. As clearing for the first stage of the KEQ project

has been completed as of November 2016, the salvaged hollows will need to be installed to offset loss of hollows at a 1:1 ratio as per Section 3.8 of the BOAMP

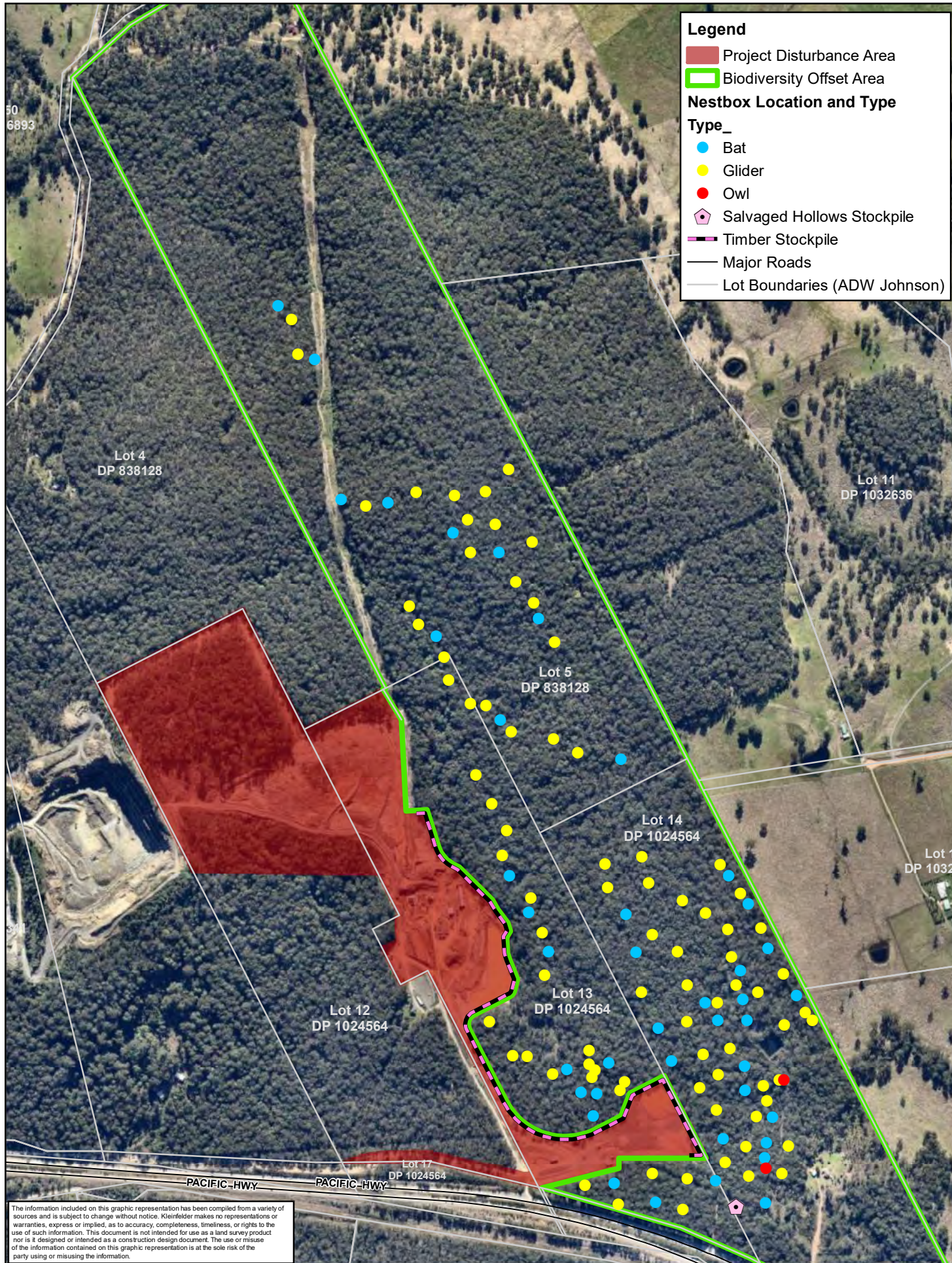


**Plate 3: Hollow sections salvaged for redistribution into the BOA**

### **Nest Boxes**

A total of 30 nest boxes were installed within the BOA prior to commencement of vegetation clearing as per Section 3.8 of the BOAMP. A further 95 nest boxes were installed in February, 2018 (totalling 127) offsetting the original clearing works and loss of hollows at a 1:1 ratio assuming the 77 salvaged hollows are distributed throughout the BOA. The locations of these nest boxes are shown in **Figure 7**.





<p>0 50 100 200 300 400 500</p> <p>Metres</p> <p>N</p> <p><b>KLEINFELDER</b> Bright People. Right Solutions. www.kleinfelder.com</p>	<p>PROJECT REFERENCE: 20172280</p> <p>DATE DRAWN: 14-Mar-18 11:43 Version 1</p> <p>DRAWN BY: SSchulz</p> <p>DATA SOURCE: LPI - 2015 ADW Johnson - 2015 Nearmap - 2017</p>	<p><b>Habitat Resources and NestBox Locations</b></p> <p>Karuah East Quarry Pty Ltd 2017 Annual Monitoring Report Karuah East Quarry Project</p>	<p>FIGURE:</p> <p><b>7</b></p>
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## 4. PERFORMANCE CRITERIA EVALUATION

**Table 5** details the management actions and associated BOAMP performance criteria relevant to Years 1-3 of the BOAMP implementation. This provides an evaluation of the current status of each relevant management action, and indicates if further works are required to complete the action (priority actions in **bold text**).

It is noted that the BOAMP was endorsed by all consent authorities (i.e. Council, NSW DP&E and Commonwealth DotE) as of March 2016. As such, all Year 1 management actions should be completed before March 2017 to ensure compliance with the relevant performance criteria.

**Table 6: Current status of BOAMP performance criteria**

Action	Performance Criteria (Years 1-3)	Current Status (2017)
<b>FENCING, GATES AND SIGNAGE</b>		
Fence mapping	Completed by end of year 1	Baseline fence mapping completed in October 2015.
Boundary fencing, gates and signage installation / repairs	Completed by end of year 1	<b>Outstanding</b> <b>Installation and repair of boundary fencing, gates and signage required.</b>
Redundant fencing removal	Completed by end of year 3	N/A – no redundant fencing identified during baseline fence mapping.
Fencing inspections	Completed annually	Annual inspection completed in October 2016.
Fencing maintenance	Boundary fencing in place and signage present by end of year 1	<b>Outstanding</b> <b>Installation and repair of boundary fencing, gates and signage required.</b>
<b>ACCESS TRACKS</b>		
Access track mapping and assessment	Completed by end of year 1	Baseline track mapping and assessment completed in October 2015.
Access track repairs	Completed by end of year 3 Track repair does not impact on ecological values and is restricted to defined limits	No track repair requirements identified. Access tracks assessed as being in suitable condition for 4WD access during the 2016 monitoring.
Redundant access track rehabilitation	Completed by end of year 3	Rehabilitation of redundant tracks identified in Section 3.3 of this report required prior to end of Year 3.
Access track inspections	Completed annually	Annual inspection completed in October 2016.
<b>EROSION, SEDIMENTATION AND SOIL MANAGEMENT</b>		
Erosion and sedimentation mapping	Completed by end of year 1	Baseline assessment completed in October 2015.
Erosion repair and management	Completed by end of year 3 Repair of erosion within BOA does not impact on ecological values	<b>During the 2017 survey four areas were identified as requiring repair or management, these actions should be undertaken immediately. The effectiveness of erosion and sediment control measures within the Karuah East Quarry project area such as silt fencing and diversion drains should be inspected and maintained regularly and after rain events.</b>
Erosion inspections	Completed annually	Annual inspection completed in October 2017.

Action	Performance Criteria (Years 1-3)	Current Status (2017)
<b>EXISTING DWELLINGS</b>		
Exclusion of existing dwellings from Conservation Agreement	Completed by end of year 1	The survey plan excluded the two existing dwellings.
Fencing and signage installation	Completed by end of year 1	<b>Outstanding</b> <b>Installation of fencing, gates and signage required.</b>
Inspections	Completed annually	Annual inspection completed in October 2017.
Maintenance and weed control	No noxious weeds present within excised areas. No unauthorised disturbance outside of excised areas in the BOA.	No environmental weeds impacting on the integrity of the BOA were identified in excised areas during 2017 monitoring. No unauthorised disturbance observed outside of excised areas in the BOA during 2017 monitoring.
<b>REVEGETATION AND REGENERATION*</b>		
Confirm extent of revegetation areas	Completed by end of year 1	Completed. No revegetation works were assessed as being required within the BOA during the 2015, 2016 or 2017 monitoring. The requirement for revegetation works within the BOA will be reassessed each year.
<b>HABITAT AUGMENTATION</b>		
Salvage and redistribution of habitat resources	Redistribution of salvaged resources by end of Year 3 Redistribution of salvaged resources does not impact on ecological values of BOA, including threatened flora	<b>Salvage and redistribution of habitat resources in progress (refer to Section 3.5).</b>
Nest box installation	30 nest boxes installed in BOA prior to commencement of clearing. Remaining nest boxes installed within three months following completion of clearing.	The 30 nest boxes were installed in the southern part of the BOA in April 2015 prior to commencement of clearing. An additional 95 were installed in February 2018.
Nest box monitoring and maintenance	Nest boxes inspected every two years. Repairs / maintenance implemented within 6 months of biennial inspection.	N/A – monitoring of nest boxes 1-30 due in April 2018, monitoring of boxes 31-125 due in February 2020.
<b>THREATENED FLORA TRANSLOCATION</b>		
<i>Tetratheca juncea</i> translocation	Translocation completed by end of year 1 Maintenance and monitoring undertaken in accordance with the TJMP	Refer to TJ Translocation Monitoring Report (Firebird 2017).
<b>WEED CONTROL</b>		
Baseline weed mapping	Completed by end of year 1	Baseline assessment completed in October 2015 (Kleinfelder 2015).



Action	Performance Criteria (Years 1-3)	Current Status (2017)
Delineation of threatened flora prior to weed control works	No impacts on threatened flora populations within BOA from weed control activities.	N/A – no weed control works undertaken surrounding threatened species locations to date.
Weed control	20% reduction in extent or density (cover) of target weeds per year compared to baseline mapping by end of Year 3. Weed control activities do not impact on ecological values.	<b>It is recommended that weed control works are commenced as soon as possible to meet weed reduction targets prior to the end of Year 3.</b>
Weed monitoring	Completed biennially (every two years) (for BOA). Completed annually (KEQ, 50 m buffer and Yalimbah Creek).	Weed mapping revisited for KEQ project area, adjoining vegetation within 50 m of the project area boundary on Lots 12 and 13, along Yalimbah Creek (Lot 12), and BOA in October 2017.
<b>VERTEBRATE PEST MANAGEMENT</b>		
Baseline vertebrate pest assessment	Completed by end of year 1	Baseline assessment completed in October 2015 (Kleinfelder 2015).
Vertebrate pest control	No non-target species affected by control works. Reduction in abundance of target species across BOA compared to baseline assessment.	<b>Vertebrate pest control required (contractor engaged to conduct Feral Pig Control).</b>
Monitoring	Completed biennially (every two years).	<b>Outstanding</b> <b>2017 biennially vertebrate pest monitoring required.</b>
<b>FIRE MANAGEMENT</b>		
Fire management strategy	Completed by end of year 1	<b>Outstanding</b> <b>A fire management strategy is to be prepared for the BOA.</b>
Bushfire mitigation	Bushfire mitigation measures in the L&RMP adhered to at all times	Refer to KEQ Annual Environmental Report.
<b>ECOLOGICAL MONITORING</b>		
Additional baseline surveys	Completed prior to clearing	Baseline surveys completed (refer to Kleinfelder 2016).
Vegetation and threatened flora monitoring	Baseline ecological monitoring undertaken prior to clearing in year 1. Less than 10% decline in <i>Tetratheca juncea</i> , <i>Grevillea parviflora</i> subsp. <i>parviflora</i> and <i>Asperula asthenes</i> population sizes (at monitoring sites) compared to baseline assessment. No major changes in vegetation health or condition across BOA.	Baseline ecological monitoring completed (refer to Kleinfelder 2016). No reduction in threatened flora populations recorded at the monitoring sites in 2016. No major changes in vegetation health or condition were observed in the BOA in 2016. <b>An average of 33% decline in threatened flora species at monitoring sites was observed during 2017 survey.</b>

\*Criteria relating to revegetation within the project area is outlined in the Landscape and Rehabilitation Management Plan (L&RMP).

## 5. CONCLUSION

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The results from the 2017 monitoring indicate that the vegetation and fauna habitats within the Karuah East Biodiversity Offset Area (BOA) and Lot 12 while some species are stressed from dry conditions are in high condition and remain relatively unchanged since the baseline survey in 2016.

A significant change was recorded within the threatened flora populations sampled at some of the monitoring sites. It is likely these declines are a result of a dry year with below average rainfall. There was not obvious association between the monitoring site proximity to the disturbance area and the level of decline in threatened species; decline was observed both close to and away from the disturbance area. Continued annual monitoring is required to ensure the species respond as conditions become more favourable.

Some of the management and monitoring actions required prior to the end of Year 1 (i.e. March 2016) and Year 2 (i.e. March 2017) have not been completed. The 2017 monitoring has identified several key management actions that are required to be completed, which have been highlighted in **Section 4** of this report. These include fence installation, salvaged habitat installation, weed control, fire management plan and vertebrate pest monitoring. These actions should be undertaken in accordance with the relevant sections of the BOAMP and this monitoring report.

## 6. REFERENCES

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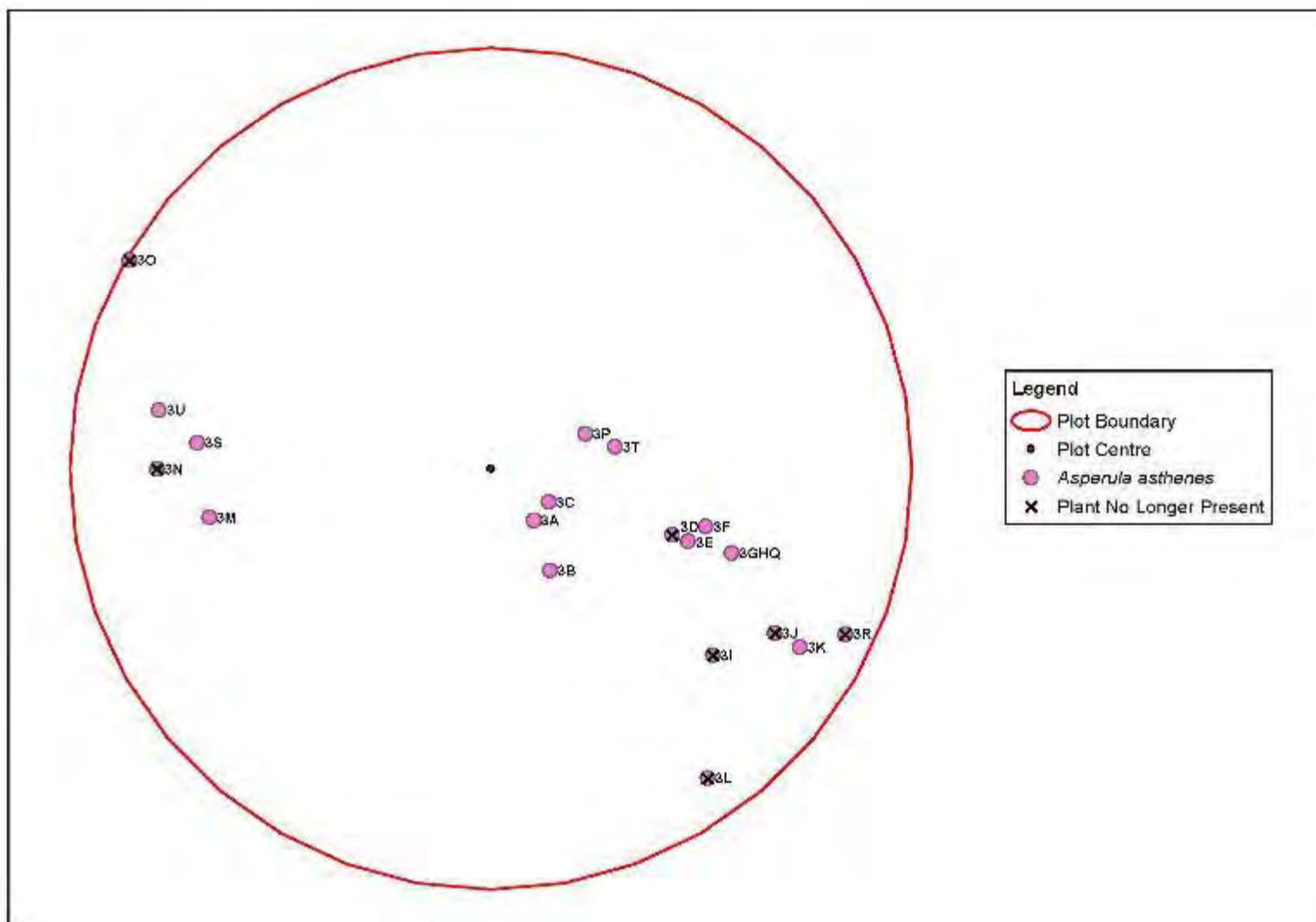
## APPENDIX 1. THREATENED FLORA MONITORING

### Appendix 1.1 – Biodiversity Offset Area Monitoring Sites

#### Monitoring Point 3 - *Asperula asthenes* monitoring results

Number	Distance (cm)	Bearing (degrees)	Clump Size (cm)			Flowers / Fruit Present (2017)	Comments
			2015	2016	2017		
3A	160	140	30 x 25	70 x 40	10 x 5	-	-
3B	280	150	20 x 25	-	5 x 5	-	Individual rerecorded
3C	160	120	40 x 30	40 x 30	170 x 90	Fruit	Clump consists of several stems some with buds and fruit
3D	460	110	50 x 20	30 x 20	-	-	Not found
3E	500	110	55 x 30	30 x 30	45 x 40	-	Buds present. Clump to NNW of peg
3F	530	105	50 x 10	30 x 30	60 x 20	-	Clump consists of several small seedlings within 30 cm of each other
3G	590	115	25 x 35	25 x 40	170 x 80	Flower / fruit	Buds present. Merged 3G, 3H and 3Q
3H	650	110	20 x 20	40 x 20	-	-	Merged 3G, 3H and 3Q, stems present within 30 cm.
3I	690	130	40 x 25	30 x 20	-	-	Not found
3J	780	120	35 x 20	20 x 20	-	-	Not found
3K	850	120	30 x 30	30 x 30	60 x 15	-	Buds present
3L	900	145	35 x 45	20 x 10	-	-	Not found
3M	680	260	40 x 35	40 x 35	25 x 30	Flower	-
3N	790	270	30 x 25	30 x 20	-	-	Not found
3O	990	300	55 x 25	-	-	-	Not found
3P	240	70	40 x 20	40 x 15	40 x 15	-	Buds present
3Q	590	105	-	40 x 10	-	-	Merged 3G, 3H and 3Q, stems present within 30 cm.
3R	930	115	-	30 x 30	-	-	Not found
3S	700	275	-	20 x 30	5 x 5	-	-
3T	300	80			5 x 25	-	-
3U	800	280			30 x 20	Flower	-

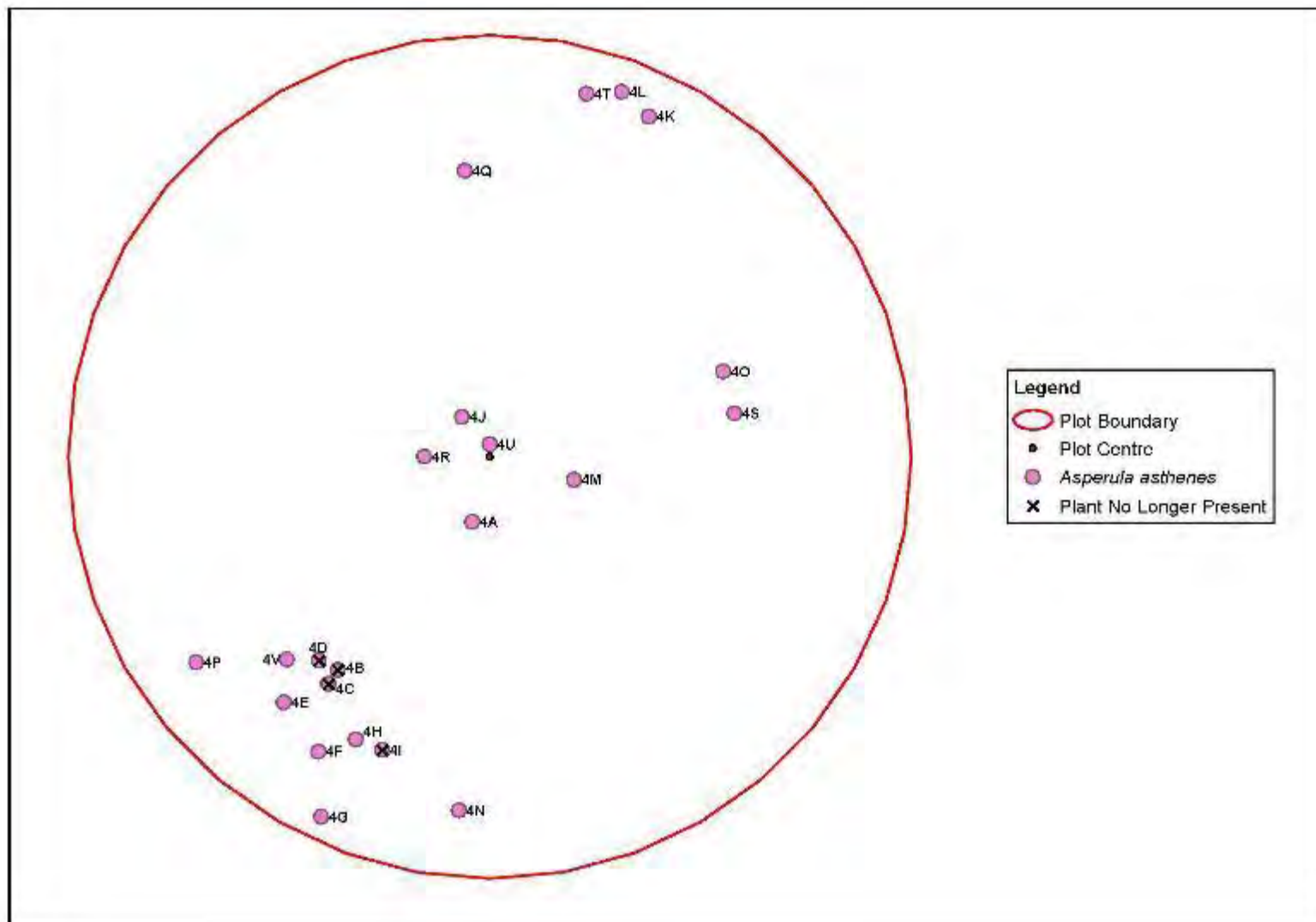




**Figure A1-1: *Asperula asthenes* locations – monitoring point 3**

**Monitoring Point 4 - *Asperula asthenes* monitoring results**

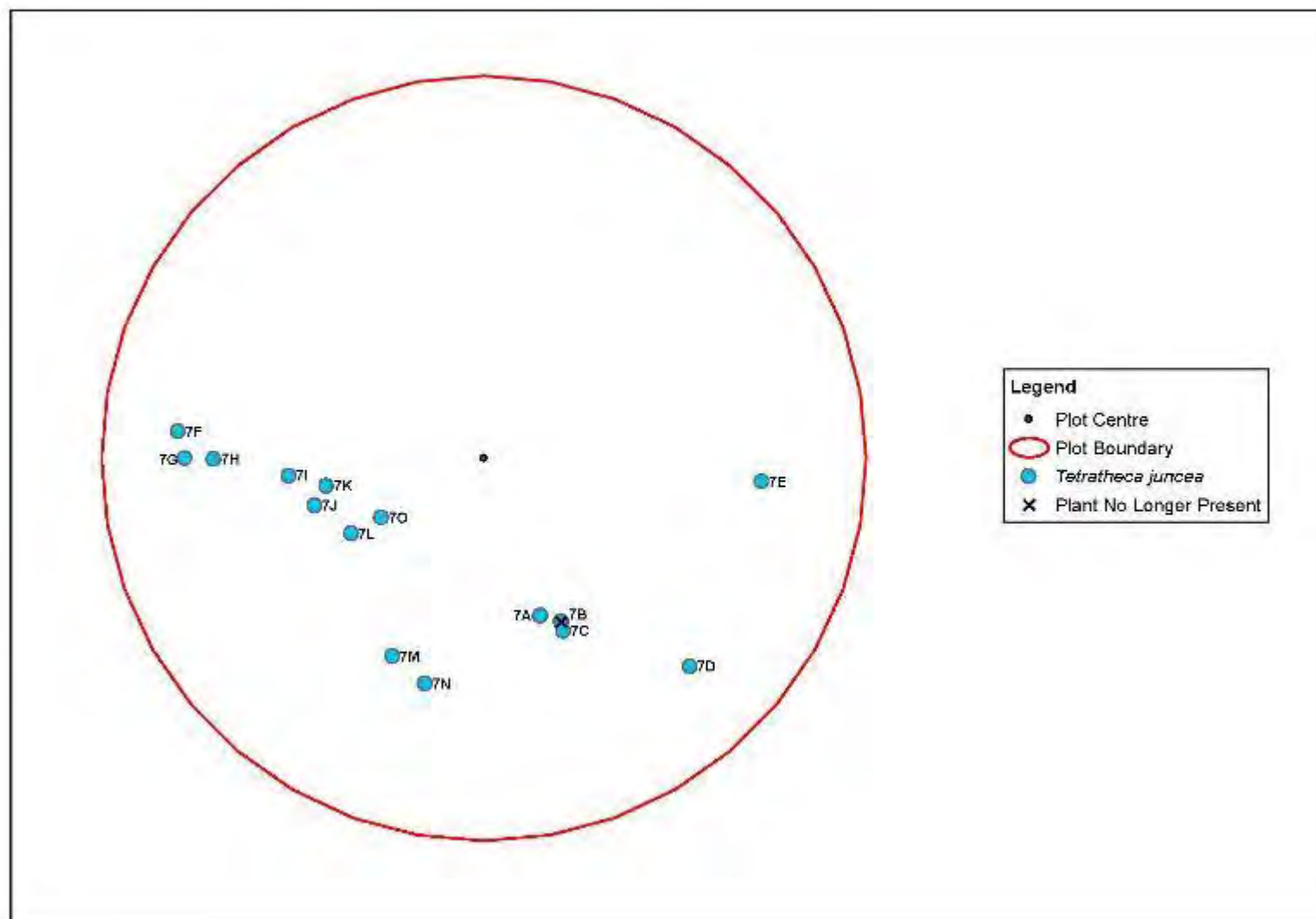
Number	Distance (cm)	Bearing (degrees)	Clump Size (cm)			Flowers / Fruit Present (2017)	Comments
			2015	2016	2017		
4A	160	195	30 x 20	30 x 20	5 x 5	-	Located to the E/SE of the peg
4B	620	215	55 x 20	45 x 25	-	-	Not found
4C	660	215	30 x 15	30 x 30	-	-	Not found
4D	630	220	20 x 20	20 x 20	-	-	Not found
4E	760	220	65 x 20	40 x 20	10 x 5	-	-
4F	810	210	70 x 45	70 x 40	10 x 5	-	Small portion left approximately 50 cm from peg
4G	940	205	40 x 15	50 x 10	30 x 10	-	-
4H	740	205	50 x 30	50 x 30	20 x 10	-	-
4I	740	200	80 x 15	60 x 40	-	-	Not found
4J	110	325	80 x 30	60 x 30	70 x 10	Buds	Two clumps separated by approximately 40 cm
4K	890	25	30 x 30	40 x 30	60 x 60	Buds	Multiple stems within 40 cm
4L	920	20	55 x 35	50 x 25	50 x 30	-	Multiple stems within 40 cm
4M	210	105	115 x 30	90 x 40	90 x 10	Buds	Multiple stems within 40 cm
4N	840	185	110 x 30	100 x 40	50 x 10	-	-
4O	590	70	40 x 25	50 x 50	80 x 5	-	-
4P	850	235	-	20 x 20	40 x 2	-	-
4Q	680	355	-	20 x 30	180 x 80	Flower	Multiple clumps
4R	155	270	-	-	20 x 5		New individual recorded in 2017
4S	590	80	-	-	10 x 15		New individual recorded in 2017
4T	890	15	-	-	10 x 5		New individual recorded in 2017
4U	30	0	-	-	20 x 10		New individual recorded in 2017
4V	680	225	-	-	80 x 50		New individual recorded in 2017, multiple stems



**Figure A1-2: *Asperula asthenes* locations – monitoring point 4**

**Monitoring Point 7 - *Tetralochea juncea* monitoring results**

Number	Distance (cm)	Bearing (degrees)	Clump Size (cm)			Flowers (2017)	Fruit (2017)	Comments
			2015	2016	2017			
7A	440	160	70 x 40	60 x 40	60 x 50	6	1	-
7B	470	155	5 x 5	10 x 5	-	-	-	Not found
7C	500	155	35 x 15	40 x 15	70 x 30	1	-	-
7D	770	135	50 x 20	60 x 40	90 x 50	3	-	Buds present some die off evident
7E	730	95	60 x 50	90 x 40	100 x 70	12	3	Buds present
7F	800	275	60 x 10	70 x 20	20 x 5	-	-	Small amount of living stem with a large amount of die off
7G	780	270	40 x 40	40 x 40	60 x 20	-	-	-
7H	710	270	50 x 10	50 x 10	90 x 20	9	9	-
7I	510	265	30 x 10	30 x 10	20 x 5	-	-	Only two stems remain
7J	460	255	40 x 20	40 x 30	90 x 30	3	-	New growth
7K	420	260	70 x 45	80 x 40	70 x 70	7	-	New Growth
7L	400	240	45 x 10	50 x 10	55 x 10	1	-	-
7M	570	205	110 x 70	110 x 70	110 x 80	2	7	Multiple clumps within 30cm
7N	610	195	45 x 35	45 x 35	35 x 50	2	-	-
7O	310	240	-	20 x 20	20 x 15	--	-	Only couple of stems

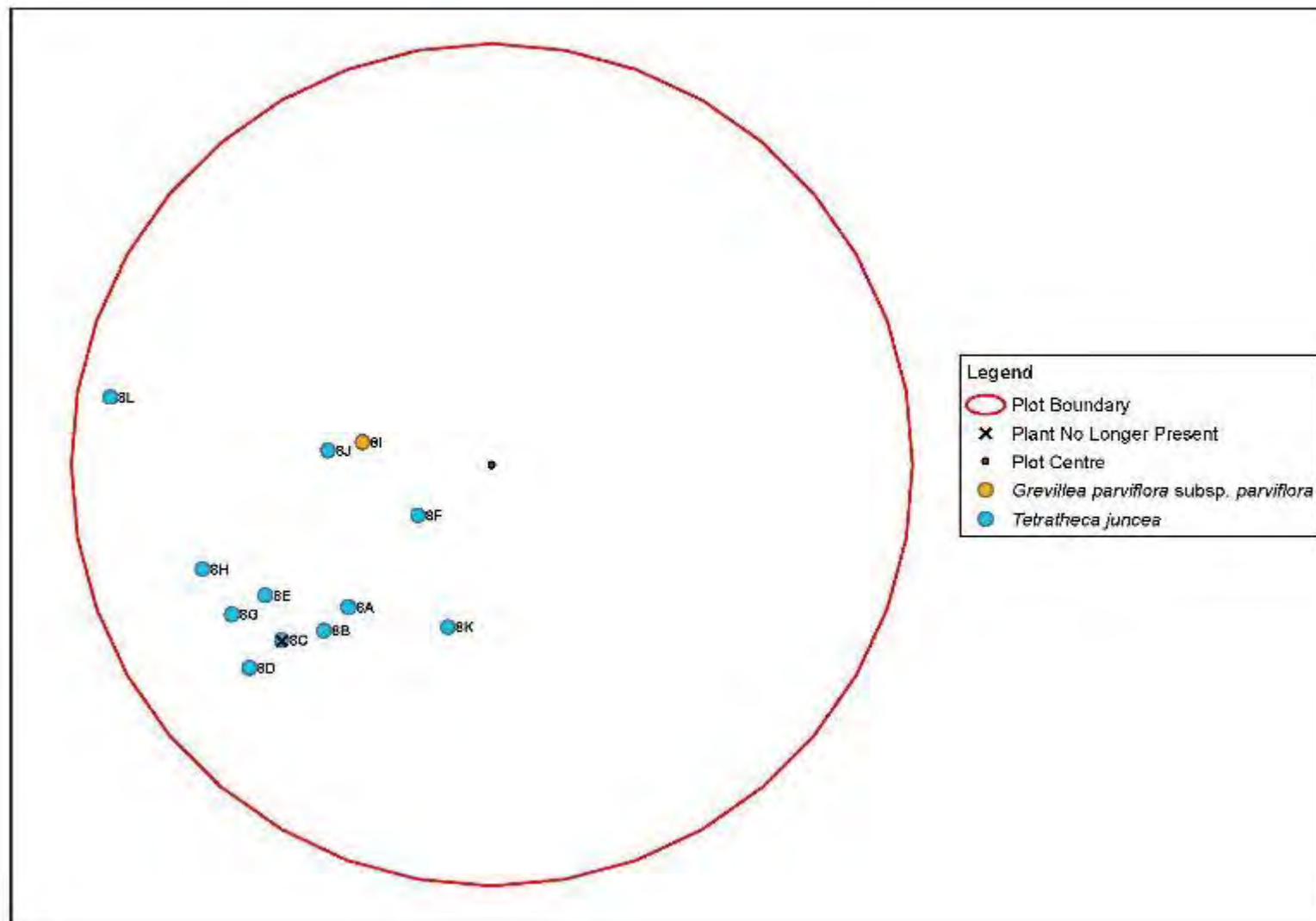


**Figure A1-3: *Tetratheca juncea* locations – monitoring point 7**



**Monitoring Point 8 - *Tetratheca juncea* and *Grevillea parviflora* monitoring results**

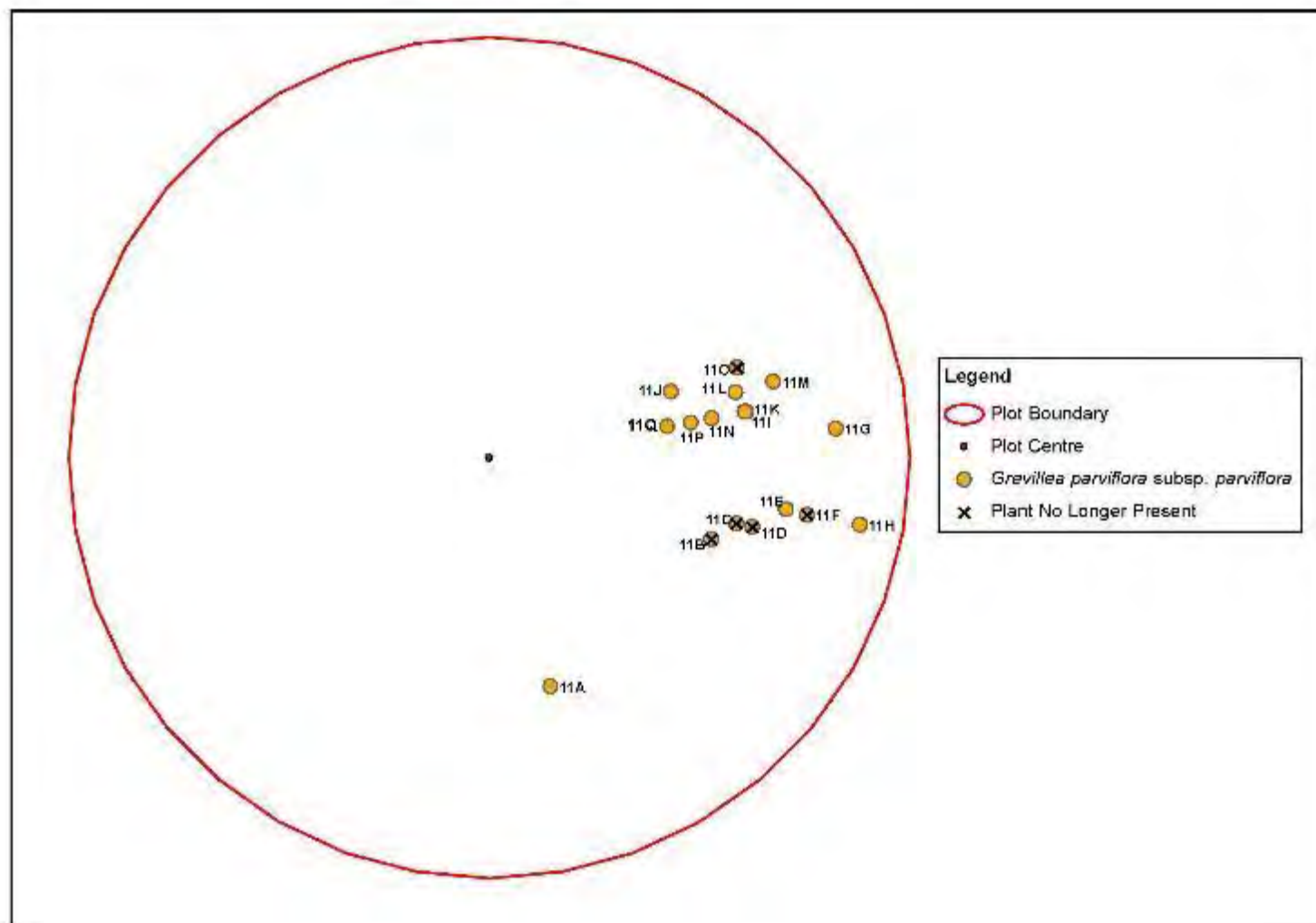
Number	Species	Distance (cm)	Bearing (degrees)	Clump Size (cm) / Maximum Stem Height			Flowers (2017)	Fruit (2017)	Comments
				2015	2016	2017			
8A	<i>Tetratheca juncea</i>	210	235	110 x 70	110 x 80	130 x 80	4	6	-
8B	<i>Tetratheca juncea</i>	480	225	40 x 30	60 x 30	90 x 20	-	3	Buds present
8C	<i>Tetratheca juncea</i>	560	225	120 x 110	120 x 100	-	-	-	Not found
8D	<i>Tetratheca juncea</i>	650	230	110 x 110	110 x 110	120 x 60	-	3	Three buds present
8E	<i>Tetratheca juncea</i>	750	230	65 x 30	65 x 30	40 x 80	-	2	-
8F	<i>Tetratheca juncea</i>	620	240	80 x 30	90 x 30	120 x 50	2	6	New growth, three groups of stems all within 30cm of each other
8G	<i>Tetratheca juncea</i>	710	240	100 x 50	100 x 50	80 x 50	-	1	Covered in leaf litter
8H	<i>Tetratheca juncea</i>	730	250	60 x 50	60 x 50	100 x 40	8	18	New growth
8I	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	310	280	30	30	30	-		Buds present
8J	<i>Tetratheca juncea</i>	390	275	50 x 10	50 x 10	65 x 10	-	5	
8K	<i>Tetratheca juncea</i>	400	195	60 x 20	60 x 20	90 x 90	2	20	
8L	<i>Tetratheca juncea</i>	920	280	-	-	70 x 70	5	5	New individual recorded in 2017



**Figure A1-4: *Tetratheca juncea* locations – monitoring point 8**

**Monitoring Point 11 - *Grevillea parviflora* monitoring results**

Number	Distance (cm)	Bearing (degrees)	Maximum Stem Height (cm)			Flowers / fruit (2017)	Comments
			2015	2016	2017		
11A	560	165	90	90	50	-	Flattened by <i>Glochidion</i> sp., new shoots present within 30cm
11B	565	110	20	45	-	-	Dead stem present
11C	610	105	55	-	-	-	Not present
11D	650	105	100	65	-	-	Dead stem present
11E	720	100	75	75	41	-	Main stem dead, new shoot present and measured
11F	770	100	20	10	-	-	Not present
11G	830	85	110	110	80	-	Some senescence, multiple stems within 30 cm, one new shoot
11H	900	100	60	60	30	Fruit	One fruit present, main stem fallen over, under grass still growing
11I	620	80	50	50	60	-	-
11J	460	70	45	35	40	-	Herbivory noted
11K	620	80	40	40	40	-	-
11L	610	75	45	55	55	-	-
11M	700	75	65	70	65	-	-
11N	540	80	35	40	45	-	-
11O	630	70	20	30	-	-	Not found
11P	490	80	45	70	50	-	Herbivory noted
11Q	430	80	-	20	60	-	Senescence/die off on top stem

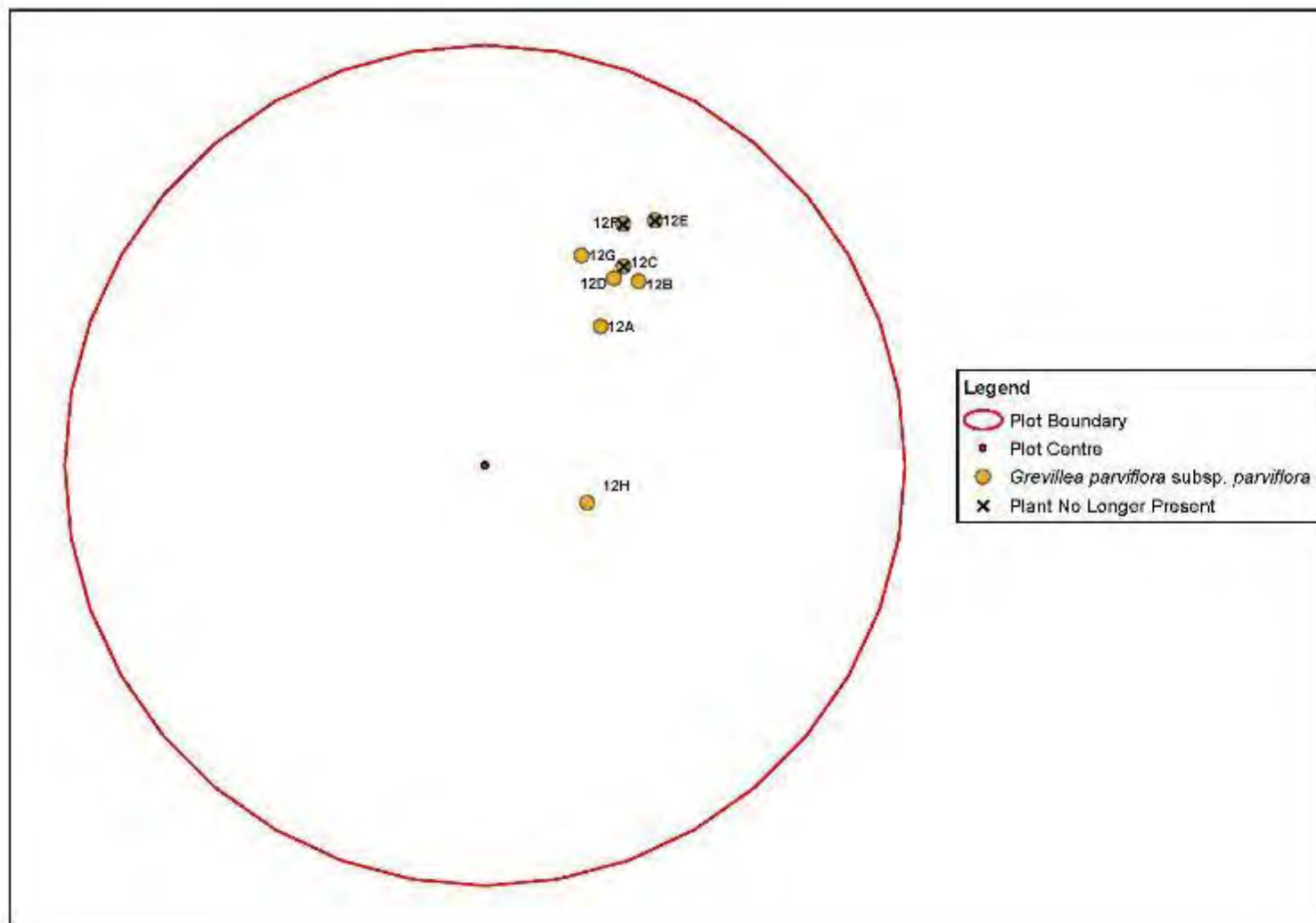


**Figure A1-5** *Grevillea parviflora* locations – monitoring point 11

**Monitoring Point 12 - *Grevillea parviflora* monitoring results**

Number	Distance (cm)	Bearing (degrees)	Maximum Stem Height (cm)			Flowers / fruit (2017)	Comments
			2015	2016	2017		
12A	430	40	80	80	80	Flowers	-
12B	570	40	80	90	60	Flowers	Pushed over from falling vegetation/sticks
12C	580	35	65	70	-	-	Dead stem present
12D	540	35	20	25	40	Flowers	Trampled along animal track new shoot present next to tag
12E	710	35	25	30	-	-	Not found/Flattened by fallen branch (noted in 2015)
12F	660	30	25	25	-	-	Not found/Flattened by fallen branch (noted in 2015)
12G	550	25	50	50	40	-	Pushed over from falling vegetation/sticks
12H	260	110	-	25	55	-	-



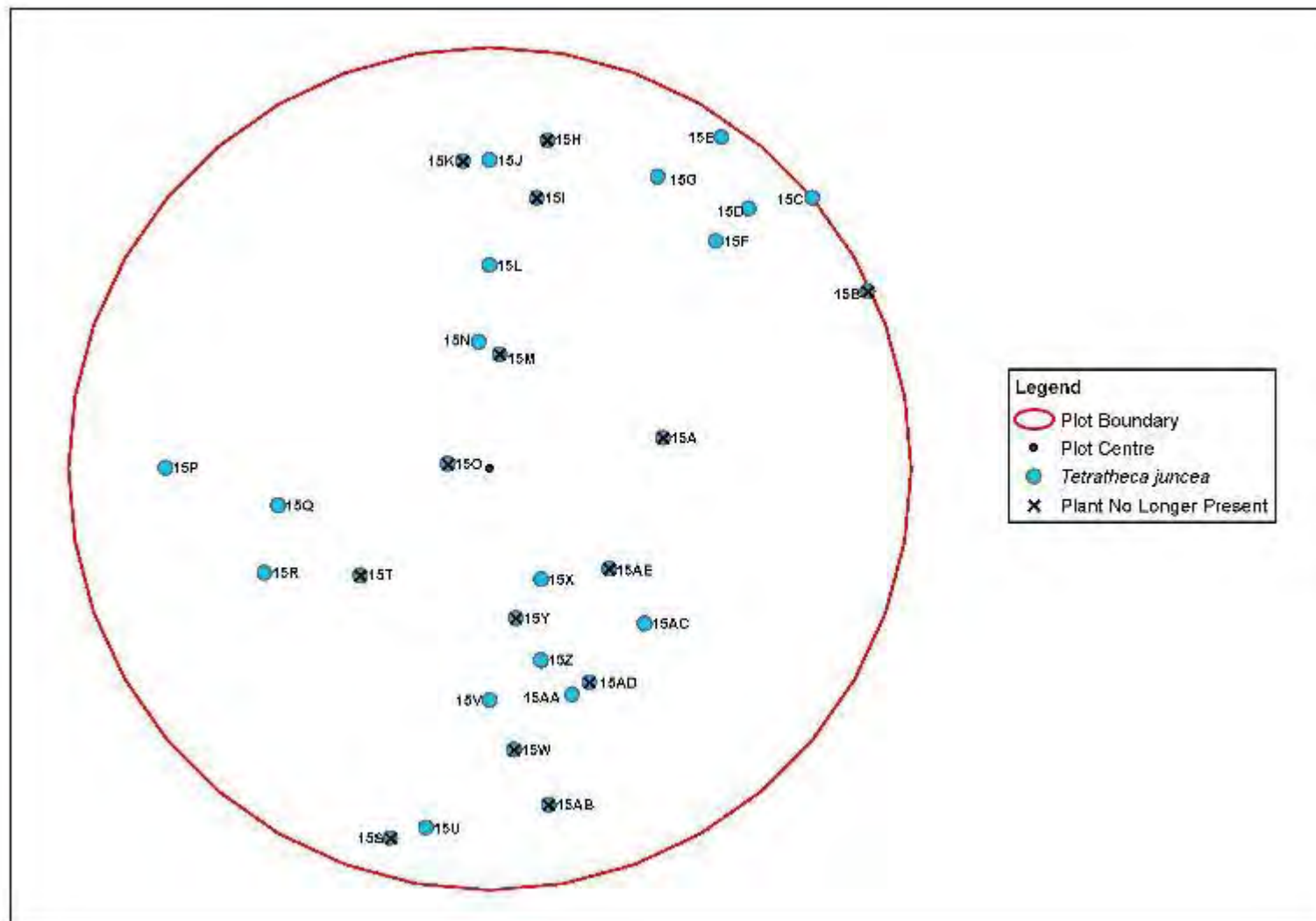


**Figure A1-6** *Grevillea parviflora* locations – monitoring point 12

## Appendix 1.2 – Lot 12 Monitoring Sites

### Monitoring Point 15 - *Tetradlea juncea* monitoring results

Number	Distance (cm)	Bearing (degrees)	Clump Size (cm)			Flowers (2017)	Fruit (2017)	Comments
			2015	2016	2017			
15A	420	80	20 x 10	30 x 10	-	-	-	Not found
15B	990	65	5 x 5	10 x 5	-	-	-	Not found
15C	1000	50	50 x 50	60 x 40	100 x 30	-	1	-
15D	870	45	40 x 40	40 x 40	65 x 20	-	-	-
15E	960	40	75 x 20	80 x 20	90 x 20	3	-	-
15F	780	45	30 x 15	40 x 15	40 x 15	-	-	-
15G	800	35	40 x 25	50 x 25	40 x 20	-	-	-
15H	790	10	5 x 5	10 x 5	-	-	-	Not found
15I	620	10	60 x 30	60 x 30	-	-	-	Not found
15J	730	0	20 x 30	40 x 20	40 x 10	-	-	-
15K	730	355	50 x 20	40 x 20	-	-	-	Not found
15L	480	0	30 x 10	30 x 10	15 x 10	-	-	-
15M	270	5	40 x 10	50 x 10	-	-	-	Not found
15N	300	355	40 x 10	40 x 10	50 x 10	-	-	-
15O	100	275	20 x 5	20 x 40	-	-	-	Not found
15P	770	270	60 x 20	50 x 30	50 x 30	-	-	No tag found, partially flattened under branch, new shoots
15Q	510	260	60 x 50	70 x 50	90 x 50	2	-	New growth
15R	590	245	70 x 50	70 x 50	80 x 15	1	1	-
15S	910	195	20 x 10	20 x 10	-	-	-	Not found
15T	400	230	30 x 10	30 x 10	-	-	-	Not found
15U	870	190	10 x 10	30 x 10	30 x 5	-	-	-
15V	550	180	30 x 15	40 x 20	40 x 10	1	-	-
15W	670	175	5 x 5	10 x 5	-	-	-	Not found
15X	290	155	40 x 10	40 x 10	30 x 5	-	-	-
15Y	360	170	5 x 5	30 x 5	-	-	-	Not found
15Z	470	165	30 x 40	50 x 30	60 x 70	2	-	New growth
15AA	570	170	25 x 20	50 x 20	20 x 50	-	-	New growth
15AB	810	170	5 x 5	10 x 5	-	-	-	Not found
15AC	520	135	40 x 10	50 x 15	15 x 50	1	1	-
15AD	560	160	20 x 30	20 x 30	-	-	-	Not found
15AE	370	130	-	20 x 10	-	-	-	Not found



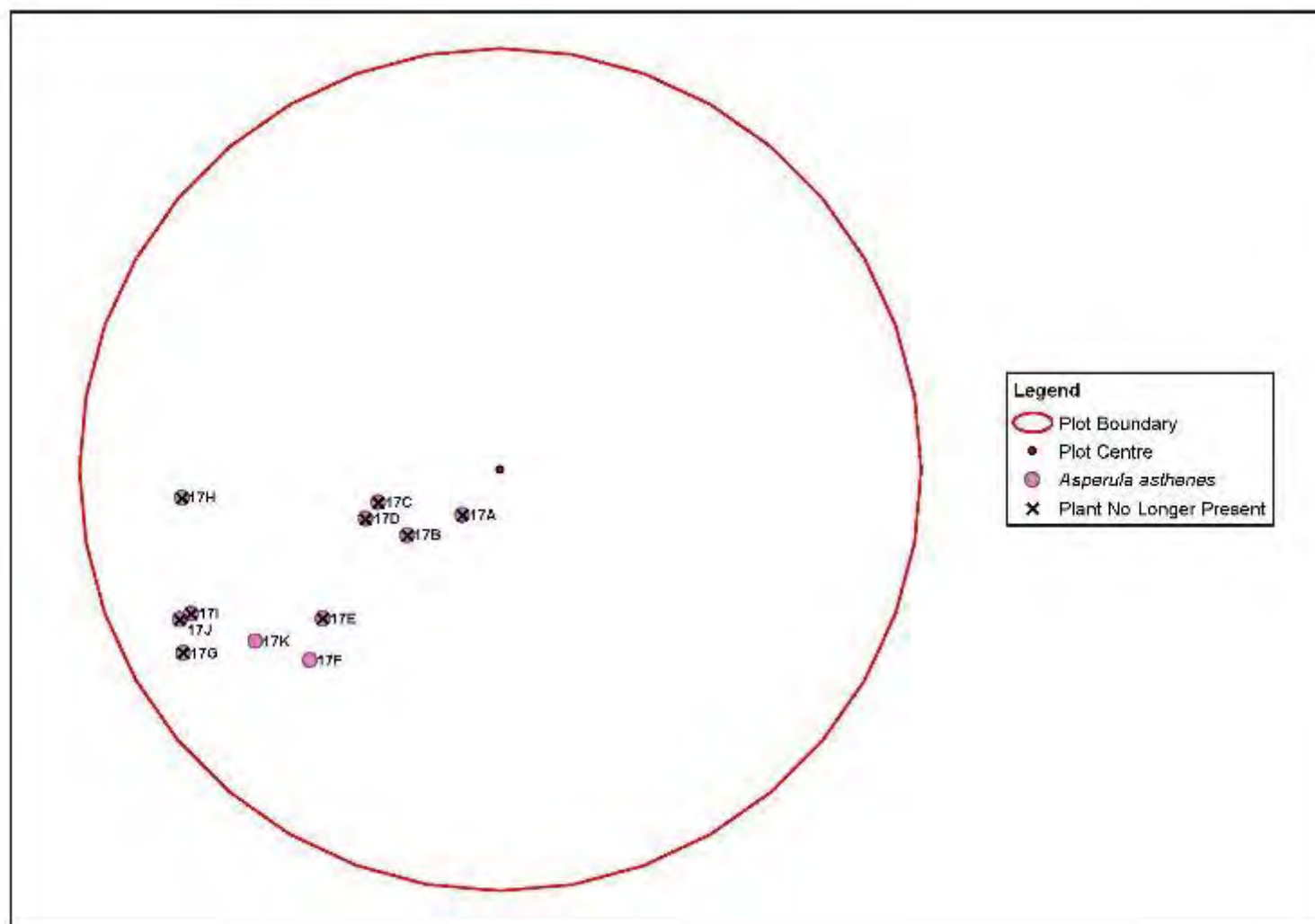
**Figure A1-7** *Tetratheca juncea* locations – monitoring point 15

**Monitoring Point 17 - *Asperula asthenes* monitoring results**

Number	Distance (cm)	Bearing (degrees)	Clump Size (cm)			Flowers / fruit present (2016)	Comments
			2015	2016	2017		
17A	140	220	20 x 5	20 x 5	-	-	Not found
17B	270	235	35 x 15	20 x 10	-	-	Not found
17C	300	255	40 x 5	30 x 5	-	-	Not found
17D	340	250	5 x 5	10 x 5	-	-	Not found
17E	550	230	80 x 80	80 x 80	-	-	Not found
17F	640	225	20 x 25	20 x 25	30 x 5	-	Buds present
17G	870	240	20 x 10	20 x 10	-	-	Not found
17H	760	265	90 x 35	90 x 35	-	-	Not found
17I	810	245	35 x 20	25 x 10	-	-	Not found
17J	840	245	40 x 60	40 x 50	-	-	Not found
17K	710	235	20 x 5	20 x 10	30 x 10	-	Buds present

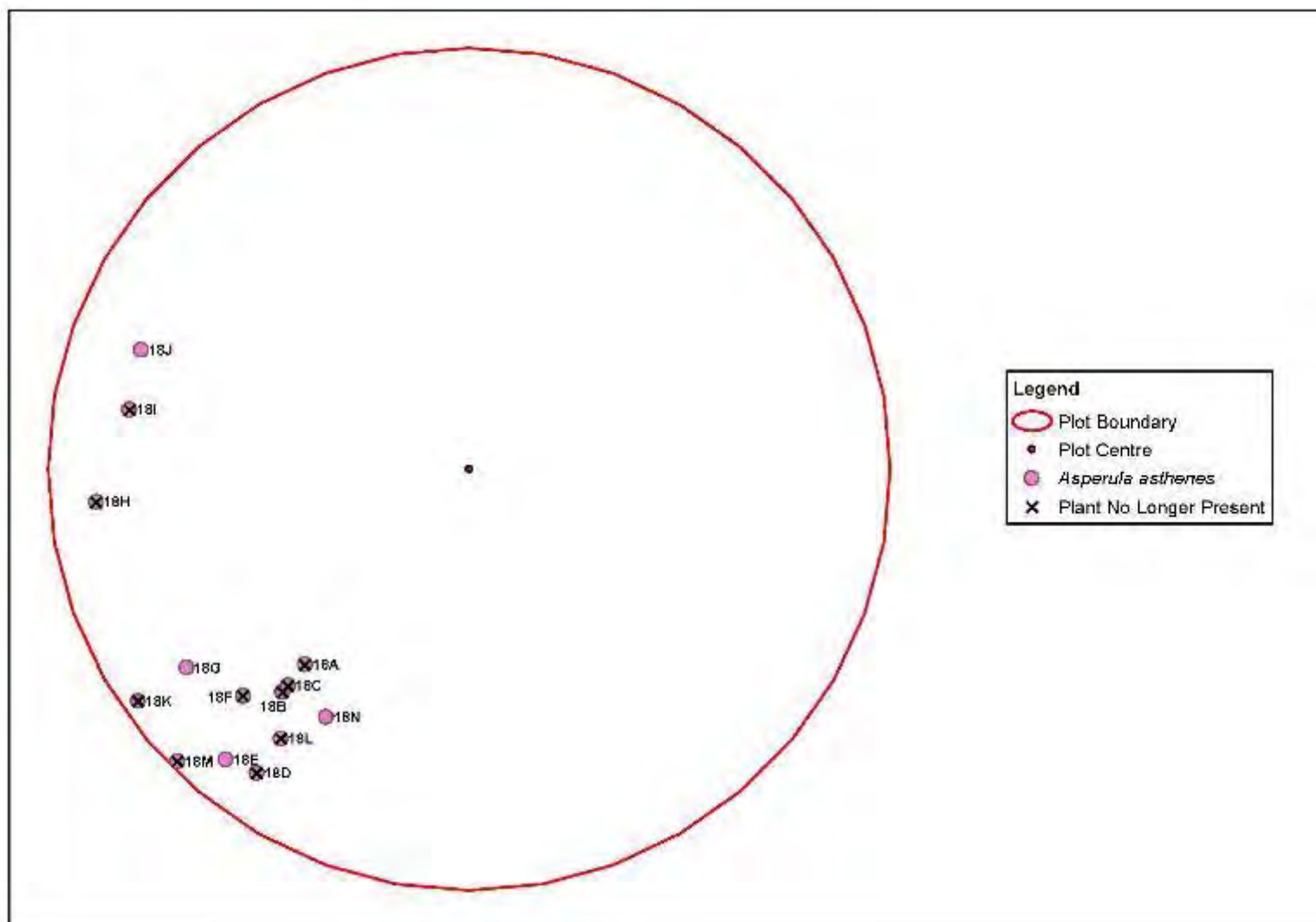
**Monitoring point 18 - *Asperula asthenes* monitoring results**

Number	Distance (cm)	Bearing (degrees)	Clump Size (cm)			Flowers / fruit present	Comments
			2015	2016	2017		
18A	610	220	40 x 30	40 x 30	-	-	Not found
18B	690	220	100 x 60	100 x 50	-	-	Not found
18C	670	225	30 x 20	30 x 20	-	-	Not found
18D	880	215	20 x 40	20 x 40	-	-	Not found
18E	900	220	100 x 90	90 x 90	10 x 5	-	Single stem
18F	760	225	70 x 80	70 x 90	-	-	Not found
18G	820	235	70 x 30	70 x 40	10 x 5	-	-
18H	890	265	5 x 10	20 x 10	-	-	Not found
18I	820	280	30 x 40	30 x 30	-	-	Not found
18J	830	290	55 x 30	50 x 30	5 x 5	-	Higher section of bank
18K	960	235	50 x 10	40 x 15	-	-	Not found
18L	780	215	10 x 10	20 x 20	-	-	Not found
18M	980	225	30 x 10	20 x 10	-	-	Not found
18N	680	210	-	-	40 x 10	-	New individual recorded in 2017



**Figure A1-8: *Asperula asthenes* locations – monitoring point 17**





**Figure A1-9: *Asperula asthenes* locations – monitoring point 18**

## APPENDIX 2. VEGETATION MONITORING DATA

Monitoring site	Dominant species in each stratum		Estimated % cover		
			2015	2016	2017
MP1	Canopy	<i>Eucalyptus propinqua</i> (Small-fruited Grey Gum), <i>E. microcorys</i> (Tallowwood), <i>E. acmenoides</i> (White Mahogany) and <i>Corymbia maculata</i> (Spotted Gum)	50%	50%	50%
	Midstorey	<i>Allocasuarina torulosa</i> (Forest Oak), <i>Glochidion ferdinandi</i> var. <i>ferdinandi</i> (Cheese Tree) and <i>Breynia oblongifolia</i> (Coffee Bush)	40%	40%	40%
	Shrub	<i>Leucopogon juniperinus</i> (Prickly Beard-heath), <i>Hibbertia aspera</i> (Rough Guinea Flower) and <i>Breynia oblongifolia</i> (Coffee Bush)	5%	5%	5%
	Ground (grass)	<i>Imperata cylindrica</i> (Blady Grass), <i>Oplismenus aemulus</i> (Australian Basket Grass), <i>Poa labillardierei</i> (Tussock) and <i>Themeda triandra</i> (Kangaroo Grass)	60%	60%	60%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Carex longibrachiata</i> and <i>Adiantum aethiopicum</i> (Common Maidenhair)	50%	50%	50%
	Exotic	<i>Lantana camara</i> (Lantana)	30%	30%	25%
MP2	Canopy	<i>Corymbia maculata</i> (Spotted Gum), <i>Eucalyptus microcorys</i> (Tallowwood), <i>E. canaliculata</i> (Grey Gum) and <i>E. paniculata</i> subsp. <i>paniculata</i> (Grey Ironbark)	40%	40%	40%
	Midstorey	<i>Allocasuarina torulosa</i> (Forest Oak), <i>Bursaria spinosa</i> (Blackthorn) and <i>Exocarpos cupressiformis</i> (Cherry Ballart)	40%	35%	35%
	Shrub	<i>Leucopogon juniperinus</i> (Prickly Beard-heath) and <i>Acacia ulicifolia</i> (Prickly Moses)	5%	5%	5%
	Ground (grass)	<i>Themeda triandra</i> (Kangaroo Grass) and <i>Poa labillardierei</i> (Tussock)	50%	50%	50%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Gonocarpus tetragynus</i> and <i>Eustrephus latifolius</i> (Wombat Berry)	20%	20%	20%
	Exotic	<i>Lantana camara</i> (Lantana)	5%	5%	1%
MP3	Canopy	<i>Lophostemon confertus</i> (Brush Box), <i>Syncarpia glomulifera</i> (Turpentine), <i>Eucalyptus propinqua</i> (Small-fruited Grey Gum) and <i>E. microcorys</i> (Tallowwood)	40%	40%	40%
	Midstorey	<i>Melaleuca styphelioides</i> (Prickly-leaved Tea Tree), <i>Livistona australis</i> (Cabbage Palm), <i>Allocasuarina torulosa</i> (Forest Oak) and <i>Elaeocarpus obovatus</i> (Hard Quandong)	60%	60%	60%
	Shrub	<i>Pittosporum multiflorum</i> (Orange Thorn) and <i>Diospyros australis</i> (Black Plum)	40%	40%	50%
	Ground (grass)	<i>Oplismenus aemulus</i> (Australian Basket Grass)	<5%	<5%	<5%
	Ground (other)	<i>Doodia aspera</i> (Prickly Rasp Fern), <i>Carex longibrachiata</i> , <i>Adiantum hispidulum</i> (Rough Maidenhair Fern) and <i>Cissus antarctica</i> (Kangaroo Vine)	90%	90%	90%
	Exotic	<i>Lantana camara</i> (Lantana)	50%	50%	50%

Monitoring site	Dominant species in each stratum		Estimated % cover		
			2015	2016	2017
MP4	Canopy	<i>Lophostemon confertus</i> (Brush Box), <i>Syncarpia glomulifera</i> (Turpentine), and <i>Eucalyptus propinqua</i> (Small-fruited Grey Gum)	30%	30%	30%
	Midstorey	<i>Glochidion ferdinandi</i> var. <i>ferdinandi</i> (Cheese Tree), <i>Melaleuca styphelioides</i> (Prickly-leaved Tea Tree), <i>Acmena smithii</i> (Lilly Pilly) and <i>Elaeocarpus obovatus</i> (Hard Quandong)	60%	60%	60%
	Shrub	<i>Pittosporum multiflorum</i> (Orange Thorn)	5%	5%	3%
	Ground (grass)	<i>Oplismenus aemulus</i> (Australian Basket Grass)	5%	5%	5%
	Ground (other)	<i>Doodia aspera</i> (Prickly Rasp Fern), <i>Morinda jasminoides</i> (Sweet Morinda) and <i>Carex longibrachiata</i>	90%	90%	90%
	Exotic	<i>Lantana camara</i> (Lantana) and <i>Asparagus aethiopicus</i> (Ground Asparagus)	35%	35%	25%
MP5	Canopy	<i>Eucalyptus pilularis</i> (Blackbutt), <i>E. microcorys</i> (Tallowwood), <i>Angophora costata</i> (Smooth-barked Apple) and <i>E. globoidea</i> (White Stringybark)	40%	40%	40%
	Midstorey	<i>Allocasuarina torulosa</i> (Forest Oak), <i>Glochidion ferdinandi</i> var. <i>ferdinandi</i> (Cheese Tree), <i>Persoonia linearis</i> (Narrow-leaved Geebung) and <i>Melaleuca linariifolia</i> (Flax-leaved Paperbark)	60%	60%	60%
	Shrub	<i>Leptospermum polygalifolium</i> (Tantoon), <i>Breynia oblongifolia</i> (Coffee Bush) and <i>Phyllanthus hirtellus</i> (Thyme Spurge)	5%	5%	10%
	Ground (grass)	<i>Entolasia stricta</i> (Wiry Panic) and <i>Oplismenus imbecillis</i> (Creeping Beard Grass)	60%	60%	60%
	Ground (other)	<i>Doryanthes excelsa</i> (Gynea Lily), <i>Pteridium esculentum</i> (Common Bracken) and <i>Lomandra longifolia</i> (Spiny-headed Mat-rush)	50%	50%	50%
	Exotic	Nil	-	-	-
MP6	Canopy	<i>Eucalyptus microcorys</i> (Tallowwood), <i>E. propinqua</i> (Small-fruited Grey Gum), <i>Corymbia gummifera</i> (Red Bloodwood) and <i>Eucalyptus pilularis</i> (Blackbutt)	50%	50%	50%
	Midstorey	<i>Callistemon salignus</i> (Willow Bottlebrush), <i>Melaleuca styphelioides</i> (Prickly-leaved Tea Tree), <i>Allocasuarina torulosa</i> (Forest Oak), <i>Acmena smithii</i> (Lilly Pilly), <i>Zieria smithii</i> (Sandfly Zieria) and <i>Backhousia myrtifolia</i> (Grey Myrtle)	60%	60%	50%
	Shrub	<i>Hibbertia aspera</i> (Rough Guinea Flower)	<5%	<5%	<5%
	Ground (grass)	<i>Imperata cylindrica</i> (Blady Grass), <i>Oplismenus imbecillis</i> (Creeping Beard Grass) and <i>Poa labillardierei</i> (Tussock)	20%	20%	20%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Doryanthes excelsa</i> (Gynea Lily), <i>Adiantum aethiopicum</i> (Common Maidenhair) and <i>Morinda jasminoides</i> (Sweet Morinda)	30%	30%	30%
	Exotic	Nil	-	-	-
MP7	Canopy	<i>Angophora costata</i> (Smooth-barked Apple), <i>Eucalyptus eugenioides</i> (Thin-leaved Stringybark) and <i>Corymbia gummifera</i> (Red Bloodwood)	35%	35%	35%
	Midstorey	<i>Allocasuarina littoralis</i> (Black She-oak), <i>Leptospermum polygalifolium</i> (Tantoon) and <i>Allocasuarina torulosa</i> (Forest Oak)	40%	40%	40%
	Shrub	<i>Pultenaea euchila</i> (Orange Pultenaea)	5%	5%	5%
	Ground (grass)	<i>Themeda triandra</i> (Kangaroo Grass) and <i>Entolasia stricta</i> (Wiry Panic)	50%	50%	50%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush) and <i>Gahnia radula</i>	70%	60%	60%
	Exotic	<i>Setaria sphacelata</i> (South African Pigeon Grass)	5%	5%	5%

Monitoring site	Dominant species in each stratum		Estimated % cover		
			2015	2016	2017
MP8	Canopy	<i>Angophora costata</i> (Smooth-barked Apple), <i>Eucalyptus eugenioides</i> (Thin-leaved Stringybark) and <i>Corymbia gummifera</i> (Red Bloodwood)	30%	30%	30%
	Midstorey	<i>Allocasuarina littoralis</i> (Black She-oak), <i>Leptospermum polygalifolium</i> (Tantoon) and <i>Acacia longifolia</i> (Sydney Golden Wattle)	50%	50%	50%
	Shrub	<i>Pultenaea paleacea</i> (Chaffy Bush-pea), <i>Pultenaea euchila</i> (Orange Pultenaea), <i>Phyllanthus hirtellus</i> (Thyme Spurge), <i>Hibbertia riparia</i> (Erect Guinea-flower) and <i>Hibbertia aspera</i> (Rough Guinea Flower)	20%	20%	20%
	Ground (grass)	<i>Entolasia stricta</i> (Wiry Panic) and <i>Themeda triandra</i> (Kangaroo Grass)	50%	50%	50%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Ptilothrix deusta</i> , <i>Patersonia sericea</i> (Silky Purple-flag) and <i>Lomandra obliqua</i>	50%	50%	50%
	Exotic	Nil	-	-	-
MP9	Canopy	<i>Angophora costata</i> (Smooth-barked Apple), <i>Corymbia gummifera</i> (Red Bloodwood), <i>Eucalyptus microcorys</i> (Tallowwood) and <i>E. eugenioides</i> (Thin-leaved Stringybark)	40%	40%	40%
	Midstorey	<i>Allocasuarina littoralis</i> (Black She-oak), <i>Dodonaea triquetra</i> (Large-leaf Hop-bush) and <i>Persoonia linearis</i> (Narrow-leaved Geebung)	50%	50%	50%
	Shrub	<i>Leptospermum polygalifolium</i> (Tantoon), <i>Pultenaea euchila</i> (Orange Pultenaea), <i>Logania albiflora</i> and <i>Polyscias sambucifolia</i> (Elderberry Panax)	10%	10%	10%
	Ground (grass)	<i>Imperata cylindrica</i> (Blady Grass), <i>Entolasia stricta</i> (Wiry Panic) and <i>Themeda triandra</i> (Kangaroo Grass)	30%	30%	40%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Pteridium esculentum</i> (Common Bracken) and <i>Ptilothrix deusta</i>	60%	60%	60%
	Exotic	Nil	-	-	-
MP10	Canopy	<i>Eucalyptus piperita</i> (Sydney Peppermint), <i>Angophora costata</i> (Smooth-barked Apple), <i>Corymbia gummifera</i> (Red Bloodwood) and <i>Eucalyptus microcorys</i> (Tallowwood)	40%	40%	40%
	Midstorey	<i>Allocasuarina littoralis</i> (Black She-oak), <i>Persoonia linearis</i> (Narrow-leaved Geebung) and <i>A. torulosa</i> (Forest Oak)	10%	10%	10%
	Shrub	<i>Pultenaea euchila</i> (Orange Pultenaea), <i>Leptospermum polygalifolium</i> (Tantoon), <i>Pultenaea paleacea</i> (Chaffy Bush-pea) and <i>Acacia ulicifolia</i> (Prickly Moses)	5%	5%	5%
	Ground (grass)	<i>Entolasia stricta</i> (Wiry Panic), <i>Themeda triandra</i> (Kangaroo Grass) and <i>Imperata cylindrica</i> (Blady Grass)	40%	40%	40%
	Ground (other)	<i>Gahnia radula</i> , <i>Doryanthes excelsa</i> (Gymea Lily), <i>Lomandra longifolia</i> (Spiny-headed Mat-rush) and <i>Ptilothrix deusta</i>	60%	60%	60%
	Exotic	Nil	-	-	-
MP11	Canopy	<i>Angophora costata</i> (Smooth-barked Apple), <i>Corymbia gummifera</i> (Red Bloodwood) and <i>Eucalyptus capitellata</i> (Brown Stringybark)	35%	35%	35%
	Midstorey	<i>Allocasuarina littoralis</i> (Black She-oak), <i>Glochidion ferdinandi</i> var. <i>ferdinandi</i> (Cheese Tree), <i>Leptospermum polygalifolium</i> (Tantoon) and <i>Banksia spinulosa</i> (Hairpin Banksia)	40%	40%	40%
	Shrub	<i>Pultenaea paleacea</i> (Chaffy Bush-pea) and <i>Boronia pinnata</i>	5%	5%	5%
	Ground (grass)	<i>Entolasia stricta</i> (Wiry Panic), <i>Imperata cylindrica</i> (Blady Grass) and <i>Themeda triandra</i> (Kangaroo Grass)	35%	35%	40%

Monitoring site	Dominant species in each stratum		Estimated % cover		
			2015	2016	2017
	Ground (other)	<i>Xanthorrhoea latifolia</i> , <i>Pteridium esculentum</i> (Common Bracken) and <i>Ptilothrix deusta</i>	60%	60%	60%
	Exotic	Nil	-	-	-
MP12	Canopy	<i>Eucalyptus pilularis</i> (Blackbutt), <i>Angophora costata</i> (Smooth-barked Apple), <i>E. globoidea</i> (White Stringybark), <i>Corymbia gummifera</i> (Red Bloodwood), <i>E. microcorys</i> (Tallowwood) and <i>E. piperita</i> (Sydney Peppermint)	40%	40%	40%
	Midstorey	<i>Leptospermum polygalifolium</i> (Tantoon), <i>Allocasuarina littoralis</i> (Black She-oak), <i>Glochidion ferdinandi</i> var. <i>ferdinandi</i> (Cheese Tree) and <i>Exocarpos cupressiformis</i> (Cherry Ballart)	30%	30%	30%
	Shrub	<i>Pultenaea euchila</i> (Orange Pultenaea), <i>Boronia pinnata</i> and <i>Banksia spinulosa</i> (Hairpin Banksia)	10%	10%	10%
	Ground (grass)	<i>Themeda triandra</i> (Kangaroo Grass), <i>Entolasia stricta</i> (Wiry Panic), and <i>Austrostipa</i> sp.	40%	40%	40%
	Ground (other)	<i>Xanthorrhoea latifolia</i> and <i>Ptilothrix deusta</i>	40%	40%	40%
	Exotic	Nil	-	-	-
MP13	Canopy	<i>Eucalyptus sparsifolia</i> (Narrow-leaved Stringybark), <i>Corymbia maculata</i> (Spotted Gum), <i>E. paniculata</i> (Grey Ironbark) and <i>E. microcorys</i> (Tallowwood)	40%	40%	40%
	Midstorey	<i>Allocasuarina torulosa</i> (Forest Oak), <i>Syncarpia glomulifera</i> (Turpentine) and <i>Callistemon salignus</i> (Willow Bottlebrush)	40%	40%	40%
	Shrub	<i>Hibbertia aspera</i> (Rough Guinea Flower) and <i>Pultenaea euchila</i> (Orange Pultenaea)	5%	5%	5%
	Ground (grass)	<i>Imperata cylindrica</i> (Blady Grass), <i>Poa labillardierei</i> (Tussock), <i>Themeda triandra</i> (Kangaroo Grass) and <i>Oplismenus imbecillis</i> (Creeping Beard Grass)	60%	60%	60%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Doryanthes excelsa</i> (Gynea Lily), <i>Lepidosperma laterale</i> and <i>Patersonia sericea</i>	30%	30%	40%
	Exotic	Nil	-	-	-
MP14	Canopy	<i>Angophora costata</i> (Smooth-barked Apple), <i>Eucalyptus eugenioides</i> (Thin-leaved Stringybark), <i>E. microcorys</i> (Tallowwood), and <i>E. paniculata</i> subsp. <i>paniculata</i> (Grey Ironbark)	35%	40%	40%
	Midstorey	<i>Allocasuarina torulosa</i> (Forest Oak), <i>Callistemon salignus</i> (Willow Bottlebrush) and <i>Glochidion ferdinandi</i> (Cheese Tree)	25%	25%	25%
	Shrub	<i>Leucopogon juniperinus</i> (Prickly Beard-heath), <i>Pultenaea villosa</i> (Hairy Bush-pea), <i>Leptospermum polygalifolium</i> (Tantoon) and <i>Hibbertia aspera</i> (Rough Guinea Flower)	10%	15%	15%
	Ground (grass)	<i>Themeda triandra</i> (Kangaroo Grass), <i>Poa labillardierei</i> (Tussock) and <i>Entolasia stricta</i> (Wiry Panic)	80%	80%	80%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Doryanthes excelsa</i> (Gynea Lily) and <i>Brunoniella pumilio</i> (Dwarf Blue Trumpet)	30%	30%	30%
	Exotic	<i>Setaria sphacelata</i> (South African Pigeon Grass)	5%	5%	5%
MP15	Canopy	<i>Eucalyptus pilularis</i> (Blackbutt), <i>Angophora costata</i> (Smooth-barked Apple), <i>Corymbia gummifera</i> (Red Bloodwood) and <i>E. microcorys</i> (Tallowwood)	45%	45%	45%
	Midstorey	<i>Allocasuarina littoralis</i> (Black She-oak) and <i>Acacia irrorata</i> (Green Wattle)	20%	20%	15%
	Shrub	<i>Hibbertia vestita</i> (Hairy Guinea Flower), <i>Breynia oblongifolia</i> (Coffee Bush) and <i>Phyllanthus gunnii</i> (Scrubby Spurge)	10%	10%	10%



Monitoring site	Dominant species in each stratum		Estimated % cover		
			2015	2016	2017
	Ground (grass)	<i>Themeda triandra</i> (Kangaroo Grass), <i>Entolasia stricta</i> (Wiry Panic) and <i>Imperata cylindrica</i> (Blady Grass)	30%	30%	30%
	Ground (other)	<i>Doryanthes excelsa</i> (Gynea Lily), <i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Pteridium esculentum</i> (Common Bracken), <i>Lepidosperma laterale</i> and <i>Xanthorrhoea macronema</i>	60%	60%	60%
	Exotic	<i>Lantana camara</i> (Lantana)	5%	5%	1%
MP16	Canopy	<i>Eucalyptus pilularis</i> (Blackbutt), <i>E. propinqua</i> (Small-fruited Grey Gum), <i>E. microcorys</i> (Tallowwood) and <i>Angophora costata</i> (Smooth-barked Apple)	50%	50%	50%
	Midstorey	<i>Allocasuarina torulosa</i> (Forest Oak), <i>Syncarpia glomulifera</i> (Turpentine) and <i>Glochidion ferdinandi</i> var. <i>ferdinandi</i> (Cheese Tree)	30%	30%	30%
	Shrub	<i>Leucopogon juniperinus</i> (Prickly Beard-heath) and <i>Acacia floribunda</i> (White Sally Wattle)	10%	10%	10%
	Ground (grass)	<i>Poa labillardierei</i> (Tussock), <i>Imperata cylindrica</i> (Blady Grass), and <i>Oplismenus imbecillis</i> (Creeping Beard Grass)	50%	50%	40%
	Ground (other)	<i>Carex appressa</i> (Tall Sedge), <i>Doodia aspera</i> (Prickly Rasp Fern), <i>Lomandra longifolia</i> (Spiny-headed Mat-rush) and <i>Calochlaena dubia</i> (Rainbow Fern)	30%	30%	40%
	Exotic	<i>Lantana camara</i> (Lantana)	30%	30%	30%
MP17	Canopy	<i>Eucalyptus pilularis</i> (Blackbutt), <i>E. microcorys</i> (Tallowwood), <i>Syncarpia glomulifera</i> (Turpentine), <i>E. acmenoides</i> (White Mahogany) and <i>E. propinqua</i> (Small-fruited Grey Gum)	40%	40%	40%
	Midstorey	<i>Backhousia myrtifolia</i> (Grey Myrtle), <i>Lophostemon confertus</i> (Brush Box), <i>Livistona australis</i> (Cabbage Palm), <i>Acmena smithii</i> (Lilly Pilly) and <i>Allocasuarina torulosa</i> (Forest Oak)	50%	50%	50%
	Shrub	<i>Wilkiea huegeliana</i> (Veiny Wilkiea), <i>Acacia maidenii</i> (Maiden's Wattle), <i>Eupomatia laurina</i> (Bolwarra) and <i>Pittosporum multiflorum</i> (Orange Thorn)	5%	5%	5%
	Ground (grass)	<i>Poa labillardierei</i> (Tussock), <i>Themeda triandra</i> (Kangaroo Grass) and <i>Entolasia marginata</i> (Bordered Panic)	40%	40%	40%
	Ground (other)	<i>Doodia aspera</i> (Prickly Rasp Fern), <i>Lomandra longifolia</i> (Spiny-headed Mat-rush) and <i>Gymnostachys anceps</i> (Settlers' Twine)	50%	50%	50%
	Exotic	<i>Lantana camara</i> (Lantana)	10%	15%	15%
MP18	Canopy	<i>Eucalyptus saligna</i> (Sydney Blue Gum), <i>E. microcorys</i> (Tallowwood), <i>Syncarpia glomulifera</i> (Turpentine), and <i>E. acmenoides</i> (White Mahogany)	45%	45%	45%
	Midstorey	<i>Lophostemon confertus</i> (Brush Box), <i>Backhousia myrtifolia</i> (Grey Myrtle), <i>Cryptocarya glaucescens</i> (Jackwood), <i>Allocasuarina torulosa</i> (Forest Oak) and <i>Acacia irrorata</i> (Green Wattle)	25%	25%	25%
	Shrub	<i>Acacia maidenii</i> (Maiden's Wattle) and <i>Denhamia silvestris</i> (Narrow-leaved Orangebark)	5%	5%	5%
	Ground (grass)	<i>Poa labillardierei</i> (Tussock), <i>Imperata cylindrica</i> (Blady Grass), and <i>Oplismenus imbecillis</i> (Creeping Beard Grass)	50%	50%	50%
	Ground (other)	<i>Doodia aspera</i> (Prickly Rasp Fern), <i>Lomandra longifolia</i> (Spiny-headed Mat-rush) and <i>Gymnostachys anceps</i> (Settlers' Twine)	50%	50%	50%
	Exotic	<i>Lantana camara</i> (Lantana)	10%	15%	15%

## **APPENDIX 3. PHOTO MONITORING POINTS**

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### **Appendix 3.1 – Biodiversity Offset Area Monitoring Sites**

#### **Monitoring Point 1 (MP1)**



**Monitoring point 1 (north) – 2015**



**Monitoring point 1 (north) – 2016**





**Monitoring point 1 (north) – 2017**

**Monitoring Point 2 (MP2)**



**Monitoring point 2 (north) – 2015**





**Monitoring point 2 (north) – 2016**



**Monitoring point 2 (north) – 2017**



**Monitoring Point 3 (MP3)**



**Monitoring point 3 (north) – 2015**



**Monitoring point 3 (north) – 2016**





**Monitoring point 3 (north) – 2017**

**Monitoring Point 4 (MP4)**



**Monitoring point 4 (north) – 2015**





**Monitoring point 4 (north) – 2016**



**Monitoring point 4 (north) – 2017**



**Monitoring Point 5 (MP5)**



**Monitoring point 5 (north) – 2015**



**Monitoring point 5 (north) – 2016**





Monitoring point 5 (north) – 2017

**Monitoring Point 6 (MP6)**



Monitoring point 6 (north) – 2015





**Monitoring point 6 (north) – 2016**



**Monitoring point 6 (north) – 2017**



**Monitoring Point 7 (MP7)**



**Monitoring point 7 (north) – 2015**



**Monitoring point 7 (north) – 2016**





Monitoring point 7 (north) – 2017

**Monitoring Point 8 (MP8)**



Monitoring point 8 (north) – 2015





**Monitoring point 8 (north) – 2016**



**Monitoring point 8 (north) – 2017**



**Monitoring Point 9 (MP9)**



**Monitoring point 9 (north) – 2015**



**Monitoring point 9 (north) – 2016**





Monitoring point 9 (north) – 2017

**Monitoring Point 10 (MP10)**



Monitoring point 10 (north) – 2015





**Monitoring point 10 (north) – 2016**



**Monitoring point 10 (north) – 2017**



**Monitoring Point 11 (MP11)**



**Monitoring point 11 (north) – 2015**



**Monitoring point 11 (north) – 2016**





Monitoring point 11 (north) – 2017

**Monitoring Point 12 (MP12)**



Monitoring point 12 (north) – 2015





**Monitoring point 12 (north) – 2016**



**Monitoring point 12 (north) – 2017**



### Monitoring Point 13 (MP13)



Monitoring point 13 (north) – 2015



Monitoring point 13 (north) – 2016





Monitoring point 13 (north) – 2017

## Appendix 1.2 – Lot 12 Monitoring Sites

### Monitoring Point 14 (MP14)



Monitoring point 14 (north) – 2015





**Monitoring point 14 (north) – 2016**



**Monitoring point 14 (north) – 2017**



**Monitoring Point 15 (MP15)**



**Monitoring point 15 (north) – 2015**



**Monitoring point 15 (north) – 2016**





**Monitoring point 15 (north) – 2017**

**Monitoring Point 16 (MP16)**



**Monitoring point 16 (north) – 2015**





**Monitoring point 16 (north) – 2016**



**Monitoring point 16 (north) – 2017**



**Monitoring Point 17 (MP17)**



**Monitoring point 17 (north) – 2015**



**Monitoring point 17 (north) – 2016**





**Monitoring point 17 (north) – 2017**

**Monitoring Point 18 (MP18)**



**Monitoring point 18 (north) – 2015**





**Monitoring point 18 (north) – 2016**



**Monitoring point 18 (north) – 2017**

## APPENDIX 4. EXOTIC SPECIES RECORDED IN THE OFFSET AREA

Scientific Name	Common Name	Priority Weeds (Biosecurity Act 2015) in Mid Coast Council control area
<i>Ageratina riparia</i>	Creeping Crofton Weed	-
<i>Anagallis arvensis</i>	Scarlet Pimpernel	-
<i>Andropogon virginicus</i>	Whisky Grass	-
<i>Asparagus aethiopicus</i>	Ground Asparagus	Prohibition on dealings
<i>Axonopus fissifolius</i>	Narrow-leafed Carpet Grass	-
<i>Bidens pilosa</i>	Cobblers Pegs	-
<i>Briza maxima</i>	Quaking Grass	-
<i>Chloris gayana</i>	Rhodes Grass	-
<i>Hypochaeris radicata</i>	Catsear	-
<i>Lantana camara</i>	Lantana	Prohibition on dealings
<i>Lolium perenne</i>	Perennial Ryegrass	-
<i>Melinis repens</i>	Red Natal Grass	-
<i>Paspalum dilatatum</i>	Paspalum	-
<i>Paspalum mandiocanum</i>	Broadleaf Paspalum	-
<i>Pennisetum clandestinum</i>	Kikuyu	-
<i>Plantago lanceolata</i>	Lamb's Tongues	-
<i>Senecio madagascariensis</i>	Fireweed	Prohibition on dealings
<i>Senna pendula</i> var. <i>glabrata</i>	Cassia	-
<i>Setaria sphacelata</i>	South African Pigeon Grass	-
<i>Solanum nigrum</i>	Black-berry Nightshade	-
<i>Stellaria media</i>	Common Chickweed	-
<i>Trifolium repens</i>	White Clover	-
<i>Verbena bonariensis</i>	Purpletop	-
<i>Vulpia myuros</i>	Rat's Tail Fescue	-

## APPENDIX 5. STAFF CONTRIBUTIONS

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The following staff were involved in the compilation of this report.

Name	Qualification	Title/Experience	Contribution
Samara Schulz	BEnv Sc & Mgt (Hons)	Senior Ecologist	Field surveys and report review
Jason Mark	BSc. MEnv. Mgt	Ecologist	Field surveys and report writing
Philippa Fagan	BEnvSc (Bio. & Cons.) MEnv. & Bus. Mgt	Ecologist	Field surveys
Gayle Joyce	BSc (Forestry) (Hons)	GIS Specialist	GIS and figure preparation

## **APPENDIX 6 – Water Monitoring Data**



### Surface Water - Dam 1

	Criteria	Date											Min	Max	Average
		22 Feb	01 Mar	21 Apr	19 May	16 Jun	14 Jul	18 Aug	22 Sept	23 Oct	21 Nov	15 Dec			
pH (pH unit)	6.5 - 8.5	<b>5.9</b>	<b>5.3</b>	<b>6.5</b>	6.8	<b>5.9</b>	6.5	6.8	7.0	6.8	6.9	6.6	5.3	7.0	6.5
TSS (mg/L)	40	<b>145</b>	40	21	11	<b>220</b>	<b>82</b>	<b>47</b>	18	<b>90</b>	<b>71</b>	5	5	220	68
TDS (mg/L)	-	678	363	468	450	845	836	864	862	654	548	484	363	864	641
EC (µS/cm)	125-2200	349	533	586	907	457	462	515	492	438	511	580	349	907	530
Nitrogen (Nitrate) (mg/L)	0.35	0.1	<b>3.8</b>	<b>4.4</b>	<b>4.4</b>	<b>5.8</b>	<b>5.5</b>	<b>5.6</b>	<b>5.7</b>	<b>5.2</b>	<b>5.7</b>	<b>5.7</b>	0.1	5.8	4.7
Total Phosphorous (mg/L)	0.025	0.01	<b>0.1</b>	<b>0.7</b>	0.02	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.2</b>	<b>0.03</b>	<b>0.04</b>	0.01	0.7	0.1
Ammonia (mg/L)	0.02	<b>0.05</b>	<b>0.1</b>	0.02	<b>0.07</b>	<b>0.05</b>	<b>0.1</b>	<b>0.2</b>	<b>0.1</b>	<b>0.3</b>	<b>0.1</b>	<b>0.02</b>	0.02	0.3	0.1
Oil and Grease (mg/L)	5	<b>8.0</b>	5.0	5.0	5.0	<b>22.0</b>	<b>5.0</b>	<b>8.0</b>	<b>10.0</b>	5.0	<b>39.0</b>	5.0	5.0	39.0	10.6
Calcium (mg/L)	-	1.6	0.6	10.0	10.0	4.0	6.0	6.6	5.7	5.3	4.3	3.5	0.6	10.0	5.2
Magnesium (mg/L)	-	2.7	3.1	4.2	4.1	6.3	6.7	7.0	6.7	6.9	6.3	5.2	2.7	7.0	5.4
Sodium (mg/L)	-	46	79	110	96	81	79	94	91	90	99	100	46.0	110.0	87.7
Potassium (mg/L)	-	1.4	1.6	1.9	1.9	2.5	3.2	3.3	2.8	2.7	2.4	1.7	1.4	3.3	2.3
Total Hardness (as CaCO <sub>3</sub> )	-	15.0	14.0	43.0	42.0	36.0	42.0	45.0	42.0	42.0	37.0	30.0	14.0	45.0	35.3
Arsenic (mg/L)	0.024	0.002	0.001	0.001	0.001	0.002	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.003	0.002
Cadmium (mg/L)	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Chromium (mg/L)	0.001	<b>0.008</b>	<b>0.002</b>	0.001	0.001	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.004</b>	0.001	0.011	0.01
Copper (mg/L)	0.001	<b>0.003</b>	<b>0.002</b>	<b>0.01</b>	0.001	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.01</b>	<b>0.003</b>	0.001	0.01	0.01
Nickel (mg/L)	0.011	0.002	0.001	0.001	0.001	0.004	0.005	0.005	0.004	0.004	0.004	0.002	0.001	0.005	0.003
Lead (mg/L)	0.003	<b>0.006</b>	0.002	0.001	0.002	<b>0.008</b>	<b>0.009</b>	<b>0.007</b>	<b>0.006</b>	<b>0.006</b>	0.003	0.003	0.001	0.009	0.01
Manganese (mg/L)	1.9	0.04	0.04	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.04	0.3	0.2
Vanadium (mg/L)	-	0.02	0.05	0.005	0.006	0.04	0.04	0.05	0.03	0.03	0.02	0.01	0.005	0.05	0.03
Zinc (mg/L)	0.021	0.02	0.008	0.02	0.009	<b>0.2</b>	<b>0.06</b>	<b>0.05</b>	<b>0.06</b>	<b>0.06</b>	<b>0.29</b>	<b>0.02</b>	0.008	0.3	0.1

## Surface Water - Dam 2

	Criteria	Date				Min	Max	Average
		22 Sept	23 Oct	21 Nov	15 Dec			
pH (pH unit)	6.5 - 8.5	6.6	6.7	<b>6.1</b>	<b>5.6</b>	5.6	6.7	6.2
TSS (mg/L)	40	26	<b>336</b>	18	7	7	366	96.8
TDS (mg/L)	-	486	731	302	256	256	731	443.8
EC (µS/cm)	125-2200	444	382	490	455	382	490	442.8
Nitrogen (Nitrate) (mg/L)	0.35	<b>1.9</b>	<b>1.5</b>	<b>0.9</b>	<b>0.5</b>	0.5	1..9	1.2
Total Phosphorous (mg/L)	0.025	<b>0.1</b>	<b>0.2</b>	0.0	0.0	0.0	0.2	0.1
Ammonia (mg/L)	0.02	<b>0.1</b>	<b>0.2</b>	<b>0.2</b>	0.0	0.0	0.2	0.1
Oil and Grease (mg/L)	5	<b>8.0</b>	<b>15.0</b>	5.0	5.0	5.0	15.0	8.3
Calcium (mg/L)	-	1.8	4.9	12.0	2.0	1.8	12.0	5.2
Magnesium (mg/L)	-	4.6	11.0	6.9	4.2	4.2	11.0	6.7
Sodium (mg/L)	-	83.0	82.0	85.0	76.0	76.0	85.0	81.5
Potassium (mg/L)	-	2.0	3.7	2.1	1.2	1.2	3.7	2.3
Total Hardness (as CaCO <sub>3</sub> )	-	23.0	57.0	58.0	22.0	22.0	58.0	40.0
Arsenic (mg/L)	0.024	0.001	0.003	0.001	0.001	0.001	0.003	0.002
Cadmium (mg/L)	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Chromium (mg/L)	0.001	<b>0.005</b>	<b>0.01</b>	0.001	0.001	0.001	0.01	0.005
Copper (mg/L)	0.001	<b>0.009</b>	<b>0.01</b>	<b>0.005</b>	0.001	0.001	0.01	0.007
Nickel (mg/L)	0.011	0.003	0.008	0.003	0.001	0.001	0.008	0.004
Lead (mg/L)	0.003	0.004	<b>0.01</b>	0.001	0.001	0.001	0.01	0.004
Manganese (mg/L)	1.9	0.1	0.3	0.1	0.07	0.07	0.3	0.1
Vanadium (mg/L)	-	0.02	0.04	0.001	0.001	0.001	0.04	0.02
Zinc (mg/L)	0.021	<b>0.03</b>	<b>0.09</b>	<b>0.2</b>	0.008	0.008	0.2	0.09

### Surface Water - Dam 3

	Criteria	Date											Min	Max	Average
		22 Feb	01 Mar	21 Apr	19 May	16 Jun	14 Jul	18 Aug	22 Sept	23 Oct	21 Nov	15 Dec			
pH (pH unit)	6.5 - 8.5	<b>5.3</b>	<b>5.3</b>	7.1	7.0	<b>6.0</b>	6.5	6.7	6.8	6.6	7.3	7.1	5.3	7.3	6.5
TSS (mg/L)	40	8	<b>883</b>	<b>54</b>	<b>169</b>	<b>1180</b>	<b>228</b>	<b>190</b>	<b>122</b>	<b>164</b>	15	28	8	1180	276.5
TDS (mg/L)	-	195	1013	448	970	763	1756	1851	1955	1452	835	569	195	1955	1073
EC (µS/cm)	125-2200	323	216	431	500	482	452	487	520	475	694	838	216	838	492.5
Nitrogen (Nitrate) (mg/L)	0.35	0.005	<b>0.5</b>	<b>4.6</b>	<b>5.8</b>	<b>8.3</b>	0.025	<b>6.6</b>	<b>7.3</b>	<b>6.8</b>	<b>8.4</b>	<b>8.9</b>	0.01	8.9	5.2
Total Phosphorous (mg/L)	0.025	0.01	<b>0.27</b>	<b>0.15</b>	<b>0.24</b>	<b>0.49</b>	<b>0.52</b>	<b>0.58</b>	<b>0.61</b>	<b>0.46</b>	<b>0.07</b>	0.02	0.01	0.6	0.3
Ammonia (mg/L)	0.02	0.02	<b>0.04</b>	<b>0.06</b>	<b>0.065</b>	<b>0.027</b>	<b>0.05</b>	<b>0.11</b>	<b>0.069</b>	<b>0.13</b>	<b>0.092</b>	0.02	0.02	0.1	0.06
Oil and Grease (mg/L)	5	5	5	<b>8</b>	<b>14</b>	<b>25</b>	5	<b>12</b>	<b>10</b>	<b>10</b>	<b>31</b>	<b>6</b>	5.0	31	11.9
Calcium (mg/L)	-	0.4	1.9	12	9.8	6.3	9.1	11	9.9	8.7	16	13	0.4	16	8.9
Magnesium (mg/L)	-	1.7	5.9	6	9.5	15	17	17	18	17	11	10	1.7	18	11.6
Sodium (mg/L)	-	40	28	57	56	85	80	93	93	100	130	150	28	150	82.9
Potassium (mg/L)	-	0.5	2.1	1.8	3.2	4.4	4.6	5.3	4.8	4.6	2.9	2.4	0.5	5.3	3.3
Total Hardness (as CaCO <sub>3</sub> )	-	8	29	54	64	79	93	98	97	93	84	74	8	98.0	70.3
Arsenic (mg/L)	0.024	0.001	0.003	0.001	0.003	0.004	0.009	0.007	0.007	0.005	0.002	0.001	0.001	0.009	0.004
Cadmium (mg/L)	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Chromium (mg/L)	0.001	<b>0.003</b>	<b>0.01</b>	<b>0.004</b>	<b>0.006</b>	<b>0.01</b>	<b>0.03</b>	<b>0.02</b>	<b>0.03</b>	<b>0.02</b>	<b>0.008</b>	<b>0.003</b>	0.003	0.03	0.014
Copper (mg/L)	0.001	0.001	0.001	<b>0.004</b>	0.001	<b>0.02</b>	<b>0.03</b>	<b>0.03</b>	<b>0.04</b>	<b>0.03</b>	<b>0.01</b>	<b>0.003</b>	0.001	0.04	0.01
Nickel (mg/L)	0.011	0.001	0.004	0.003	0.006	0.008	<b>0.01</b>	<b>0.01</b>	<b>0.02</b>	<b>0.02</b>	0.006	0.002	0.001	0.02	0.008
Lead (mg/L)	0.003	0.001	<b>0.02</b>	<b>0.004</b>	0.001	<b>0.02</b>	<b>0.03</b>	<b>0.03</b>	<b>0.03</b>	<b>0.02</b>	<b>0.005</b>	0.0020	0.001	0.03	0.01
Manganese (mg/L)	1.9	0.012	0.2	0.3	0.6	1.1	1.3	1.1	0.9	0.6	0.2	0.05	0.01	1.3	0.6
Vanadium (mg/L)	-	0.001	0.06	0.01	0.03	0.05	0.1	0.09	0.1	0.09	0.03	0.009	0.001	0.1	0.05
Zinc (mg/L)	0.021	<b>0.05</b>	<b>0.2</b>	0.02	<b>0.06</b>	<b>0.09</b>	<b>0.2</b>	<b>0.1</b>	<b>0.2</b>	<b>0.2</b>	<b>0.1</b>	0.015	0.02	0.2	0.1

### Surface Water - SW1

	Criteria	Date		Min	Max	Average
		21 Mar	16 Jun			
pH (pH unit)	6.5 - 8.5	<b>4.9</b>	<b>5.5</b>	4.9	5.5	5.2
TSS (mg/L)	40	5	6	5	6	5.5
TDS (mg/L)	-	229	234	229	234	231.5
EC (µS/cm)	125-2200	313	329	313	329	321
Nitrogen (Nitrate) (mg/L)	0.35	0.005	0.005	0.005	0.005	0.005
Total Phosphorous (mg/L)	0.025	<b>0.2</b>	0.02	0.02	0.22	0.1
Ammonia (mg/L)	0.02	0.02	0.07	0.02	0.07	0.04
Oil and Grease (mg/L)	5.0	5	5	5	5	5
Calcium (mg/L)	-	5.2	5.5	5.2	5.5	5.4
Magnesium (mg/L)	-	6.6	7.4	6.6	7.4	7
Sodium (mg/L)	-	35	36	35	36	35.5
Potassium (mg/L)	-	2.9	2.4	2.4	2.9	2.7
Total Hardness (as CaCO <sub>3</sub> )	-	40	44	40	44	42
Arsenic (mg/L)	0.024	0.001	0.001	0.001	0.001	0.001
Cadmium (mg/L)	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001
Chromium (mg/L)	0.001	<b>0.002</b>	0.001	0.001	0.002	0.002
Copper (mg/L)	0.001	0.001	0.001	0.001	0.001	0.001
Nickel (mg/L)	0.011	0.001	0.001	0.001	0.001	0.001
Lead (mg/L)	0.003	0.001	0.001	0.001	0.001	0.001
Manganese (mg/L)	1.9	0.2	0.01	0.01	0.2	0.1
Vanadium (mg/L)	-	0.001	0.001	0.001	0.001	0.001
Zinc (mg/L)	0.021	0.01	0.008	0.008	0.01	0.01



## Surface Water - SW2

	Criteria	Date										Min	Max	Average
		20 Mar	21 Apr	19 May	16 Jun	14 Jul	18 Aug	22 Sept	23 Oct	21 Nov	15 Dec			
pH (pH unit)	6.5 - 8.5	4.8	5.8	5.9	5.5	5.8	6.0	6.3	6.4	6.0	6.1	4.8	6.4	5.9
TSS (mg/L)	40	12	12	7	65	47	22	10	29	33	23	7	65	26
TDS (mg/L)	-	269	292	239	340	542	498	439	333	529	476	239	542	395.7
EC (µS/cm)	125-2200	309	369	414	313	348	385	406	323	466	520	309	520	385
Nitrogen (Nitrate) (mg/L)	0.35	0.008	0.2	0.005	1.7	2.1	0.02	0.03	0.1	0.9	0.01	0.01	2.1	0.5
Total Phosphorous (mg/L)	0.025	0.2	0.02	0.02	0.02	2.0	0.04	0.05	0.04	0.02	0.04	0.02	2.0	0.3
Ammonia (mg/L)	0.02	0.05	0.03	0.03	0.1	0.04	0.07	0.1	0.2	0.1	0.06	0.03	0.2	0.1
Oil and Grease (mg/L)	5	5	5	5	8	5	4	5	6	17	5	4	17	6.5
Calcium (mg/L)	-	48	4.1	4.7	3.4	4.1	4.5	4.6	6	5.1	4.4	3.4	48	8.9
Magnesium (mg/L)	-	70	5.6	5.2	5.3	6.4	6.6	6.3	6.5	6.8	6	5.2	70	12.5
Sodium (mg/L)	-	350	50	40	41	52	53	54	49	85	92	40	350	86.6
Potassium (mg/L)	-	31	2.2	2.3	2.2	2.4	2.8	2.8	3.8	3	2.7	2.2	31	5.5
Total Hardness (as CaCO <sub>3</sub> )	-	410	33	33	30	37	39	37	42	41	35	30	410	73.7
Arsenic (mg/L)	0.024	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium (mg/L)	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Chromium (mg/L)	0.001	0.002	0.001	0.001	0.004	0.006	0.004	0.003	0.003	0.005	0.005	0.001	0.006	0.003
Copper (mg/L)	0.001	0.002	0.001	0.002	0.008	0.007	0.003	0.003	0.002	0.005	0.003	0.001	0.008	0.004
Nickel (mg/L)	0.011	0.001	0.001	0.004	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.004	0.002
Lead (mg/L)	0.003	0.001	0.001	0.001	0.003	0.005	0.002	0.002	0.003	0.003	0.003	0.001	0.005	0.002
Manganese (mg/L)	1.9	0.04	0.05	0.06	0.05	0.1	0.08	0.1	0.2	0.1	0.1	0.04	0.2	0.09
Vanadium (mg/L)	-	0.001	0.003	0.001	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.001	0.02	0.01
Zinc (mg/L)	0.021	0.02	0.02	0.01	0.02	0.04	0.02	0.03	0.03	0.08	0.02	0.01	0.09	0.03

### Surface Water – SW3

	Criteria	Date				Min	Max	Average
		01 Mar	21 Mar	16 Jun	14 Jul			
pH (pH unit)	6.5 - 8.5	5.4	4.8	5.7	5.7	4.8	5.7	5.4
TSS (mg/L)	40	2630	226	269	86	86	2630	802.8
TDS (mg/L)	-	820		362	320	320	820	500.7
EC (µS/cm)	125-2200	200	253	199	237	199	253	222.3
Nitrogen (Nitrate) (mg/L)	0.35	0.1		0.02	0.1	0.02	0.1	0.09
Total Phosphorous (mg/L)	0.025	0.4		0.09	1.9	0.09	1.9	0.8
Ammonia (mg/L)	0.02	0.02		0.03	0.04	0.02	0.04	0.03
Oil and Grease (mg/L)	5	5	16	27.0	5	5	27	13.3
Calcium (mg/L)	-	8.1		3.2	3.2	3.2	8.1	4.8
Magnesium (mg/L)	-	18		5.5	7.1	5.5	18	10.2
Sodium (mg/L)	-	27		27	34	2	34	29.3
Potassium (mg/L)	-	5.4		2.2	2.6	2.2	5.4	3.4
Total Hardness (as CaCO <sub>3</sub> )	-	93		31	37	31	93	53.7
Arsenic (mg/L)	0.024	0.007		0.002	0.002	0.002	0.007	0.004
Cadmium (mg/L)	0.0002	0.0001		0.0001	0.0001	0.0001	0.0001	0.0001
Chromium (mg/L)	0.001	0.04		0.009	0.01	0.009	0.04	0.02
Copper (mg/L)	0.001	0.04		0.009	0.01	0.009	0.04	0.02
Nickel (mg/L)	0.011	0.02		0.005	0.004	0.004	0.02	0.01
Lead (mg/L)	0.003	0.05		0.008	0.009	0.008	0.05	0.02
Manganese (mg/L)	1.9	0.7		0.1	0.1	0.1	0.7	0.3
Vanadium (mg/L)	-	0.1		0.03	0.04	0.03	0.1	0.06
Zinc (mg/L)	0.021	0.2		0.04	0.06	0.04	0.2	0.08

### Surface Water – SW4

	Criteria	Date		Min	Max	Average
		31 Mar	16 Jun			
pH (pH unit)	6.5 - 8.5	<b>5.8</b>	<b>5.3</b>	5.3	5.8	5.5
TSS (mg/L)	40	9	6	6	9	7.5
TDS (mg/L)	-	201	171	171	201	186
EC (µS/cm)	125-2200	263	259	259	263	261
Nitrogen (Nitrate) (mg/L)	0.35	0.005	0.005	0.005	0.005	0.005
Total Phosphorous (mg/L)	0.025	0.02	0.02	0.02	0.02	0.02
Ammonia (mg/L)	0.02	0.01	0.02	0.01	0.02	0.02
Oil and Grease (mg/L)	5	<b>97</b>	<b>24</b>	24	97	60.5
Calcium (mg/L)	-	3.5	3.8	3.5	3.8	3.7
Magnesium (mg/L)	-	4.8	5.8	4.8	5.8	5.3
Sodium (mg/L)	-	26	29	26	29	27.5
Potassium (mg/L)	-	2	1.9	1.9	2	2
Total Hardness (as CaCO <sub>3</sub> )	-	28	33	28	33	30.5
Arsenic (mg/L)	0.024	0.001	0.001	0.001	0.001	0.001
Cadmium (mg/L)	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001
Chromium (mg/L)	0.001	0.001	0.001	0.001	0.001	0.001
Copper (mg/L)	0.001	0.001	0.001	0.001	0.001	0.001
Nickel (mg/L)	0.011	0.001	0.001	0.001	0.001	0.001
Lead (mg/L)	0.003	0.001	0.001	0.001	0.001	0.001
Manganese (mg/L)	1.9	0.01	0.01	0.01	0.01	0.01
Vanadium (mg/L)	-	0.001	0.001	0.001	0.001	0.001
Zinc (mg/L)	0.021	0.007	0.006	0.006	0.007	0.007

### Groundwater - BH 205 and BH 207

	BH 205					BH 207				
	Date		Min	Max	Average	Date		Min	Max	Average
	4 Apr 17	6 Oct 17				4 Apr 17	6 Oct 17			
Chloride (mg/L)	440	490	440	490	465	800	900	800	900	850
Conductivity (at 25Â°C) (µS/cm)	2200	2260	2200	2260	2230	3300	3900	3300	3900	3600
Nitrate & Nitrite (as N) (mg/L)	0.08	0.95	0.08	0.95	0.5	< 0.05	< 0.05	-	-	-
pH	10	7.4	7.4	10	8.7	7.1	7.3	7.1	7.3	7.2
Phosphate total (as P)		0.75	0.75	0.75	0.75		0.85	0.85	0.85	0.85
Sulphate (as S) (mg/L)	60	62	60	62	61	78	75	75	78	76.5
Total Dissolved Solids (mg/L)	1200	1200	1200	1200	1200	1700	1900	1700	1900	1800
Total Kjeldahl Nitrogen (as N) (mg/L)	< 0.2	0.8	0.8	0.8	0.8	< 0.2	0.6	0.6	0.6	0.6
Total Nitrogen (as N) (mg/L)	< 0.2	1.8	1.8	1.8	1.8	< 0.2	0.6	0.6	0.6	0.6
Calcium (mg/L)	4.2	71	4.2	71	37.6	36	58	36	58	47
Magnesium (mg/L)	0.8	26	0.8	26	13.4	48	59	48	59	53.5
Potassium (mg/L)	23	6.8	6.8	23	14.9	2.9	< 5	2.9	2.9	2.9
Sodium (mg/L)	330	420	330	420	375	450	630	450	630	540
Bicarbonate Alkalinity (as CaCO3)	72	320	72	320	196	230	200	200	230	215
Carbonate Alkalinity (as CaCO3)	310	<10	310	310	310	< 10	< 10	-	-	-
Total Alkalinity (as CaCO3)	380	320	320	380	350	230	200	200.00	230.00	215.00
Benzene (µg/L)	<0.001	<0.001	-	-	-	< 0.001	< 0.001	-	-	-
Ethylbenzene (µg/L)	<0.001	<0.001	-	-	-	< 0.001	< 0.001	-	-	-
m&p-Xylenes (µg/L)	<0.002	<0.002	-	-	-	< 0.002	< 0.002	-	-	-
o-Xylene (µg/L)	<0.001	<0.001	-	-	-	< 0.001	< 0.001	-	-	-



	BH 205					BH 207				
	Date		Min	Max	Average	Date		Min	Max	Average
	4 Apr 17	6 Oct 17				4 Apr 17	6 Oct 17			
Toluene (µg/L)	<0.001	<0.001	-	-	-	< 0.001	< 0.001	-	-	-
Xylenes - Total (µg/L)	<0.003	<0.003	-	-	-	< 0.003	< 0.003	-	-	-
4-Bromofluorobenzene (surr)	143	61	61	143	102	84	83	83	84	83.5
TRH C10-C36 (Total)	<0.1	<0.1	-	-	-	<0.1	<0.1	-	-	-
TRH C10-C14 (µg/L)	<0.05	<0.05	-	-	-	<0.05	<0.05	-	-	-
TRH C15-C28 (µg/L)	<0.1	<0.1	-	-	-	<0.1	<0.1	-	-	-
TRH C29-C36 (µg/L)	<0.1	<0.1	-	-	-	<0.1	<0.1	-	-	-
TRH C6-C9 (µg/L)	<0.02	<0.02	-	-	-	<0.02	<0.02	-	-	-
Naphthalene	<0.01	<0.01	-	-	-	<0.01	<0.01	-	-	-
TRH >C10-C16	<0.05	<0.05	-	-	-	<0.05	<0.05	-	-	-
TRH >C10-C16 less Naphthalene (F2)	<0.05	<0.05	-	-	-	<0.05	<0.05	-	-	-
TRH >C16-C34	<0.1	<0.1	-	-	-	<0.1	<0.1	-	-	-
TRH >C34-C40	<0.1	<0.1	-	-	-	<0.1	<0.1	-	-	-
TRH C6-C10	<0.02	<0.02	-	-	-	<0.02	<0.02	-	-	-
TRH C6-C10 less BTEX (F1)	<0.02	<0.02	-	-	-	<0.02	<0.02	-	-	-

### Groundwater - BH 208 and BH 303

	BH 208					BH 303				
	Date		Min	Max	Average	Date		Min	Max	Average
	4 Apr 17	6 Oct 17				4 Apr 17	6 Oct 17			
Chloride (mg/L)	710	880	710	880	795	430	900	430	900	665
Conductivity (at 25Â°C) (µS/cm)	3300	3700	3300	3700	3500	1500	3200	1500	3200	2350
Nitrate & Nitrite (as N) (mg/L)	3.8	3.8	3.8	3.8	3.8	0.35	< 0.05	0.35	0.35	0.35
pH	6.5	6.7	6.5	6.7	6.6	7	6.7	6.7	7	6.85
Phosphate total (as P)	-	0.8	0.8	0.8	0.8		0.6	0.6	0.6	0.6
Sulphate (as S) (mg/L)	320	250	250	320	285	27	28	27	28	27.5
Total Dissolved Solids (mg/L)	1900	1900	1900	1900	1900	750	1600	750	1600	1175
Total Kjeldahl Nitrogen (as N) (mg/L)	0.6	4.8	0.6	4.8	2.7	< 0.2	1.2	1.2	1.2	1.2
Total Nitrogen (as N) (mg/L)	4.4	8.6	4.4	8.6	6.5	0.5	1.2	0.5	1.2	0.85
Calcium (mg/L)	39	40	39	40	39.5	16	61	16	61	38.5
Magnesium (mg/L)	45	41	41	45	43	22	60	22	60	41
Potassium (mg/L)	3.4	< 5	3.4	3.4	3.4	4.6	16	4.6	16	10.3
Sodium (mg/L)	460	570	460	570	515	200	570	200	570	385
Bicarbonate Alkalinity (as CaCO <sub>3</sub> )	54	64	54	64	59	110	79	79	110	94.5
Carbonate Alkalinity (as CaCO <sub>3</sub> )	< 10	< 10	-	-	-	< 10	< 10	-	-	-
Total Alkalinity (as CaCO <sub>3</sub> )	54	64	54	64	59	110	79	79	110	94.5
Benzene (µg/L)	< 0.001	< 0.001	-	-	-	< 0.001	< 0.001	-	-	-
Ethylbenzene (µg/L)	< 0.001	< 0.001	-	-	-	< 0.001	< 0.001	-	-	-
m&p-Xylenes (µg/L)	< 0.002	< 0.002	-	-	-	< 0.002	< 0.002	-	-	-
o-Xylene (µg/L)	< 0.001	< 0.001	-	-	-	< 0.001	< 0.001	-	-	-

	BH 208					BH 303				
	Date		Min	Max	Average	Date		Min	Max	Average
	4 Apr 17	6 Oct 17				4 Apr 17	6 Oct 17			
Toluene (µg/L)	< 0.001	< 0.001	-	-	-	< 0.001	< 0.001	-	-	-
Xylenes - Total (µg/L)	< 0.003	< 0.003	-	-	-	< 0.003	< 0.003	-	-	-
4-Bromofluorobenzene (surr)	80	76	76	80	78	81	85	81	85	83
TRH C10-C36 (Total)	<0.1	<0.1	-	-	-	0.6	0.3	0.3	0.6	0.45
TRH C10-C14 (µg/L)	<0.05	<0.05	-	-	-	< 0.05	< 0.05	-	-	-
TRH C15-C28 (µg/L)	<0.1	<0.1	-	-	-	0.6	0.3	0.3	0.6	0.45
TRH C29-C36 (µg/L)	<0.1	<0.1	-	-	-	< 0.1	< 0.1	-	-	-
TRH C6-C9 (µg/L)	<0.02	<0.02	-	-	-	< 0.02	< 0.02	-	-	-
Naphthalene	<0.01	<0.01	-	-	-	< 0.01	< 0.01	-	-	-
TRH >C10-C16	<0.05	<0.05	-	-	-	< 0.05	< 0.05	-	-	-
TRH >C10-C16 less Naphthalene (F2)	<0.05	<0.05	-	-	-	< 0.05	< 0.05	-	-	-
TRH >C16-C34	<0.1	<0.1	-	-	-	0.7	0.4	0.4	0.7	0.55
TRH >C34-C40	<0.1	<0.1	-	-	-	< 0.1	< 0.1	-	-	-
TRH C6-C10	<0.02	<0.02	-	-	-	< 0.02	< 0.02	-	-	-
TRH C6-C10 less BTEX (F1)	<0.02	<0.02	-	-	-	< 0.02	< 0.02	-	-	-

## **APPENDIX 7 – *Tetratheca juncea* Monitoring**





# TETRATHECA JUNCEA MONITORING REPORT FOR THE KARUAH EAST QUARRY SITE (PROJECT APPROVAL 09-0175)

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<b>Document Status &amp; Date:</b>	December 2017



## ABBREVIATIONS

DA	<i>Development Application</i>
EPA Act	<i>NSW Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
GPS	<i>Global Positioning System</i>
OEH	<i>NSW Office of Environment and Heritage</i>
PA	<i>Project Approval</i>
PPR	<i>Preferred Project Plan</i>
RMS	<i>NSW Roads and Maritime Service</i>
TJMP	<i>Tetratheca juncea Management Plan</i>



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# 1 INTRODUCTION

Firebird ecoSultants has been engaged by Karuah East Pty Ltd to monitor the success of the translocation of the *Tetratheca juncea* in accordance with the Translocation Plan for *Tetratheca juncea* at Kaurah East Quarry prepared by Firebird ecoSultants (July 2015) to satisfy the requirements of the Project Approval (PA 09\_0175) granted on 17 June 2014 for the Karuah East Quarry Project (Karuah East).

The new of the Karuah East Quarry Project required a translocation program to be implemented for threatened species *Tetratheca juncea*. The approved quarry expansion includes a biodiversity offset conservation area adjacent to the existing quarry. This area has been investigated during the approval process and found 6324 clumps of *Tetratheca juncea*. At the time of the original survey it was found that the approved impact area was found to have 243 clumps of *Tetratheca juncea*. However, at the time of translocation 367 individuals were recorded in the May 2016 surveys. It is acknowledged that translocation is not a mitigation measure and is considered as a supplementary action due to low certainty of success. However, in this instance, translocation is being proposed as an additional measure to gain a better biodiversity outcome. Translocation of the individuals to be impacted from within the impact area to the offset site will assist in protecting the genetic diversity of the population. Translocation has been successfully undertaken for *Tetratheca juncea* previously at other sites with a moderate survival rate of 27% after 5 years (Lake Macquarie City Council, 2013).

Alex Picton (Firebird, ecologist) and Nicolas Alexander (Firebird, ecologist) aided in the removal of 367 *T.juncea* individuals during their excavation from the impact site on the 11 May 2016 till the 23<sup>rd</sup> May 2016. The 367 individuals were translocated into pre-prepared areas within the proposed offset site now referred to as the Translocation Site within this report. An area of 2,500m<sup>2</sup> to 3,000m<sup>2</sup> has been identified in Lot 14 as the Translocation Site. Refer to Figure 3-3 showing location of Translocation Site. The Translocation Site has been selected to ensure that an appropriate vegetation community and aspect would be provided. The *Tetratheca juncea* removed from the impact area (being 367 clumps) were placed within this identified Translocation Site to ensure that translocation success is as high as possible, and replicates the source environment as much as practicable.



## 2 TRANSLOCATION PREPARATION

### 2.1 Marking Plants

Three hundred and sixty seven clumps of *Tetradlea juncea* were removed from the impact site that were translocated as part of the development approval. The collection method entailed digging within the Translocation Site before collecting a translocation section from the impact area and placing the section into the hole within the Translocation Site. Site preparation included the removal of threatening processes that may impact upon the success of plant survival. These include weed control, protection from herbivory and management of fire risks. An irrigation system was installed to ensure moisture levels remain adequate for plant survival.

Removal of the plants were undertaken in patches that included numerous clumps. Each of these patches are referred to as a translocation section with Rows A1-A30 and B1-B14 the number of individuals were recorded for each row. Refer to Table 2-1 for results of number of individuals plants in each row.

**Table 2-1 Number of *T. juncea* translocated**

Row	Count of <i>Tetradlea juncea</i>
A1	6
A2	5
A3	5
A4	4
A5	6
A6	8
A7	4
A8	7
A9	5
A10	5
A11	8
A12	7
A13	4
A14	6
A15	6
A16	6
A17	10
A18	11
A19	10
A20	10
A21	8
A22	9

Row	Count of <i>Tetradlea juncea</i>
A23	8
A24	8
A25	12
A26	16
A27	13
A28	11
A29	10
A30	11
B1	11
B2	9
B3	11
B4	7
B5	6
B6	11
B7	9
B8	10
B9	9
B10	11
B11	10
B12	9
B13	12
B14	3
<b>Total</b>	<b>367</b>

The following methods were employed for the translocation program:

- An excavator was used to dig the plants out of the ground in large scoops. This ensured the plant would be removed with large root balls and soil from the source area.
- The excavator operator would carefully slide the plants with the clump of soil from the excavator's bucket onto the bucket of a front end loader.
- Once the front end loader was filled with approximately 6 excavator scoops, the driver would carefully transport the plants to the translocation area. The plants and soil from source area were carefully slid from the loader bucket by a labourer into the prepared holes.
- The area was watered immediately. The translocation sections received follow up watering to ensure establishment.



### 3 MONITORING RESULTS

Monitoring of the *T. juncea* individuals in accordance with the Translocation Plan for *T. juncea* (Firebird, 2015) was undertaken by Firebird consultants in October 2016, then again in October 2017. Monitoring involved the following:

- Flower Counts
- Observe general plant health
- Identify all plants within each Section
- Photo points

The results displayed in Table 3-1 show that of the 367 individuals translocated 187 have survived as of October 2017 and were showing signs of regrowth &/ or in flower. This presents an approximate survival rate of **51%**. Refer to Appendix A for Photos.

**Table 3-1 Monitoring results of *T. juncea* plants recorded during the October 2017 survey**

Row #	No Translocated in May 2016	Monitoring Results October 2016	Monitoring Results October 2017	Flower Count
A1	6	6	5	Plant 1 O/BR, Plant 2 O/BR, plant 3 O/BR, plant 4 budding, plant 5 4 flowers
A2	5	0	0	None
A3	5	5	1	Plant 1: 4 flowers
A4	4	5	2	Plant 1: 2 flowers and budding. Plant 2: 2 flowers.
A5	6	3	3	Plant 1: no flowers. Plant 2: 3 flowers. Plant 3: 2 flowers.
A6	8	8	4	Plant 1: 2 flowers and budding. Plant 2: 1 flower. Plant 3: budding. Plant 4: O/BR.
A7	4	4	2	Plant 1: 4 flowers and budding. Plant 2: 3 flowers.
A8	7	9	9	Plant 1: O/BR. Plant 2: 1 flower and budding. Plant 3: O/BR. Plant 4: 2 flowers. Plant 5: 3 flowers. Plant 6: 1 flower. Plant 7: 1 flower. Plant 8: 2 flowers and budding. Plant 9: 3 flowers.
A9	5	5	3	Plant 1: O/BR. Plant 2: O/BR. Plant 3:
A10	5	3	1	Plant 1: O/BR.
A11	8	7	1	Plant 1: 1 flower.
A12	7	8	4	Plant 1: 1 bud. Plant 2: 15 flowers and budding. Plant 3: 2 flowers. Plant 4: 7 flowers.
A13	4	4	1	Plant 1: 7 flowers and budding.





Row #	No Translocated in May 2016	Monitoring Results October 2016	Monitoring Results October 2017	Flower Count
A14	6	6	0	None
A15	6	6	5	Plant 1: O/BR. Plant 2: 2 flowers. Plant 3: 1 flower. Plant 4: D. Plant 5: D.
A16	6	4	4	Plant : 1 flower. Plant 2: O/BR. Plant 3: 1 flower. Plant 4: 2 flowers.
A17	10	4	10	Plant 1: O/BR. Plant 2: O/BR. Plant 3: O/BR. Plant 4: 2 flowers. Plant 5: 2 flowers. Plant 6: 8 flowers. Plant 7: 3 flowers. Plant 8: 2 flowers. Plant 9: 5 flowers. Plant 10: 1 flower.
A18	11	11	8	Plant 1: O/BR. Plant 2: O/BR. Plant 3: O/BR. Plant 4: 5 flowers. Plant 5: 5 flowers. Plant 6: 4 flowers and budding. Plant 7 : 7 flowers. Plant 8: 16 flowers.
A19	10	8	5	Plant 1: O/BR. Plant 2: 2 flowers. Plant 3: 1 flower. Plant 4: >30 flowers. Plant 5: 1 flower.
A20	10	9	5	Plant 1: O/BR. Plant 2: O/BR. Plant 3: O/BR. Plant 4: O/BR. Plant 5: 4 flowers and budding.
A21	8	8	2	Plant 1: D. Plant 2: 3 flowers.
A22	9	8	7	Plant 1: O/BR. Plant 2: O/BR. Plant 3: O/BR. Plant 4: O/BR. Plant 5: 10 flowers and budding. Plant 6: budding. Plant 7: budding.
A23	8	13	5	Plant 1: >30 flowers. Plant 2: O/BR. Plant 3: O/BR. Plant 4: O/BR. Plant 5: O/BR.
A24	8	7	4	Plants 1-3: O/BR. Plant 4: 13 flowers.
A25	12	6	4	Plant 1: D. Plant 2-4: O/BR.
A26	16	18	7	Plants 1-7: O/BR.
A27	13	7	6	Plants 1-6: O/BR.
A28	11	2	2	Plants 1-2: O/BR.
A29	10	7	5	Plants 1-5: O/BR.
A30	11	10	6	Plants 1-5: O/BR. Plant 6: 3 flowers.
B1	11	12	4	Plant 1: 1 flower. Plants 2-3: O/BR. Plant 3: 1 flower. Plant 4: 6 flowers.
B2	9	8	4	Plant 1: 1 flower and budding. Plant 2: 1 flower and budding. Plant 3: 7 flowers. Plant 4: 1 flower.
B3	11	9	6	Plant 1: 3 flowers. Plant 2: 2 flowers many buds. Plant 3: 1 flower. Plant 4: 1 flower.



Row #	No Translocated in May 2016	Monitoring Results October 2016	Monitoring Results October 2017	Flower Count
				Plant 5: 1 flower. Plant 6: 1 flower.
B4	7	5	5	Plants 1-5: O/BR.
B5	6	6	5	Plants 1-4: O/BR. Plant 5: 1 flower.
B6	11	7	4	Plant1: 3 flowers. Plants 2-4: O/BR.
B7	9	8	7	Plants 1-2: O/BR. Plant 3: 1 flower. Plant 4: 2 flowers. Plants 5-7: O/BR.
B8	10	7	4	Plant 1: 10 flowers. Plants 2-4: O/BR.
B9	9	6	5	Plants 1-4: D. Plant 5: O/BR.
B10	11	11	5	Plants 1-4: O/BR. Plant 5: D.
B11	10	10	6	Plants 1-6: D
B12	9	10	5	Plants 1-2: O/BR. Plant 3: 2 flowers. Plants 4- 5: D.
B13	12	10	5	Plants 1-4: D.
B14	3	9	1	Plant 1: D
<b>Total</b>	<b>367</b>	<b>319</b>	<b>187</b>	

O/BR = Plant has no flowers and is browned off  
however there is fresh regrowth

D = Dead



## 4 CONCLUSION

The monitoring of the *T. juncea* translocation as of October 2017 has shown a flowering rate of 51% for the second year of monitoring. Kleinfelder (2018) also observed a significant decrease in *T. juncea* numbers in the nearby biodiversity offset site during their annual monitoring survey.

It had been observed that some *T. juncea* had commenced flowering earlier in 2017 than in the previous year at the translocation site as well as in other areas around the Hunter Region. It had also been observed that *T. juncea* flowering rate within Karuah East Quarry's biodiversity offset area was lower in October 2017 than what was observed in October 2016 (Klienfedler, 2018). It is therefore considered that the observed decline in *T. juncea* individuals may be a result of sporadic flowering as a response to irregular climatic factors such as high temperatures and low rainfall. The regional increase in temperature may influence *T. juncea* to flower earlier in the year, however the below average rainfall may also result in the *T. juncea* to withhold from flowering until they experience more rainfall. The significance of this is that some *T. juncea* at the translocation site may have already stopped flowering or not yet begun flowering at the time of the October 2017 survey. It is also possible that stress from these climatic factors has led to the death of some individuals.

However, it should also be noted that the translocation site is considerably more overgrown with native vegetation than the previous year. *T. juncea* are quite difficult to find when they are not in flower, particularly in heavily vegetated areas. Thus, it is considered that there was a chance of potentially missing individual *T. juncea* during the survey effort which would result in a lower predicted rate of survival.

A further three (3) years of monitoring will be able to show more certainty of the success of translocation of *T. juncea*.



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## APPENDIX A      PHOTOS

Photo 1: *T.junceae* in flower in October 2017



Photo 2: Unhealthy/browning *T.junceae*





Photo 3: Considerable regrowth of native vegetation in translocation rows



## **APPENDIX 8 – Audit Action Plan**



## Response to Audit Recommendation – Independent Environmental Audit (EMM, July 2017)

Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
<b>PA 09_0175</b>				
<b>Schedule 3 – Environmental Performance Conditions</b>				
19	The Proponent shall comply with the discharge limits in any EPL, or with Section 120 of the POEO Act	<p><b>Non-compliant</b></p> <p>It is recommended that monitoring at SW5 is included in the routine monitoring program.</p> <p>It is recommend that oil and grease concentrations downstream and upstream of the quarry (and potentially in adjacent catchments) are investigated to determine the source of elevated oil and grease concentrations, and whether the quarry is contributing to downstream concentrations.</p> <p>It is recommended that any exceedances of water quality criteria during dam water discharges are reported, in accordance with the project approval conditions and the quarry's EPL.</p>	<p>KEQ is currently revising the Water MP to improve practices and implement better mitigation of potential non-compliant discharges.</p> <p>The following actions will be taken:</p> <ol style="list-style-type: none"> <li>1. SW5 monitoring site will be included in the Water MP to be monitored during any discharge events from Dam 3 (LDP3).</li> <li>2. Oil &amp; grease will be monitored closely. Any exceedances in the total oil &amp; grease content will be further analysed at a NATA laboratory to determine the source of the high oil &amp; grease. Monthly testing as per the Water MP will continue.</li> <li>3. Any future exceedance of the TSS and oil &amp; grease criteria will be reported. KEQ has since reported discharge that did not meet water quality criteria to the DPE and EPA.</li> </ol>	<p>Ongoing</p> <p>SLR have been engaged to develop an updated Water MP.</p> <p>MPs are currently being updated and will be submitted for DPE review following approval of Modification 1.</p>

Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
21	<p>The Proponent shall prepare and implement a Water Management Plan for the project to the satisfaction of the Secretary. This plan must:</p> <p>(c) include:</p> <p>(iii) a Groundwater Monitoring Program that includes:</p> <ul style="list-style-type: none"> <li>• baseline data of groundwater levels surrounding the site;</li> <li>• groundwater impact assessment criteria, to be developed following analysis of baseline data, including trigger levels for investigating any potentially adverse groundwater impacts; and</li> <li>• a program to monitor and/or validate the impacts of the project on groundwater resources</li> </ul>	<p><b>Administrative non-compliance</b></p> <p>It is recommended that groundwater levels are monitored quarterly or that the monitoring frequency is modified in the WMP.</p>	<p>KEQ is currently revising the Water MP. The groundwater levels will be monitored quarterly from October 2017.</p>	<p>Ongoing</p> <p>SLR have been engaged to develop an updated Water MP.</p> <p>Groundwater levels are now being monitored quarterly with October 2017 and January 2018 monitoring completed.</p>
27	<p>The Proponent shall develop and implement a translocation program for <i>Tetrathea juncea</i> to the satisfaction of the Secretary. This program must:</p> <p>..</p> <p>(e) include short and long-term goals and performance criteria to measure the effectiveness of the program; and</p>	<p><b>Administrative non-compliance</b></p> <p>It is recommended that the plan is updated to include performance criteria to ensure the effectiveness of the program can be reviewed and to identify ways to improve the success of future translocation programs.</p>	<p>Noted. As required under Schedule 5, Condition 5 of the Project Approval, the TjTMP will be updated.</p> <p>Please note that this condition is covered in the latest TjTMP (Firebird, 2015) under Section's 8 and 9. However, KEQ acknowledges that the translocation did not commence until May 2016, which was outside of the timeframe shown in Table 9-1 of the TjTMP. Section's 8 and 9 will be revised accordingly.</p>	<p>Ongoing</p> <p>Firebird has been engaged to update the TjTMP.</p> <p>MPs are currently being updated and will be submitted for DPE review following approval of Modification 1.</p>

Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
29	The Proponent shall, within 12 months of the finalisation of the Biodiversity Offset Strategy, make suitable arrangements to provide appropriate long-term security for the offset area, in consultation with OEH and Council, and to the satisfaction of the Secretary. ..	<b>Administrative non-compliance</b>  It is recommended that the conservation agreement is finalised in consultation with OEH and DPE.	A conservation agreement under Part 4 Division 12 of the National Parks & Wildlife Act 1974 was drafted in November 2016. In July 2017, KEQ lodged a Section 75(W) modification with the DPE. Depending on the outcome of this modification, this agreement will be amended to give allowance for any additional offset areas that maybe required.	Ongoing  Waiting on final outcome of the Section 75(W) modification (Modification 1). It is anticipated that this conservation agreement will need to be revised.
32	The Proponent shall prepare and implement a Landscape and Rehabilitation Management Plan for the project to the satisfaction of the Secretary. This Plan would relate to the area of the quarry and all perimeter lands. This plan must: .. d. describe the short, medium and long-term measures that would be implemented to: • manage remnant vegetation and habitat on the site; and • ensure compliance with the rehabilitation objectives and progressive rehabilitation obligations of this approval. ..	<b>Non-compliant</b>  It is recommended that soil is not stockpiled within the quarrying area or that it is stored within discrete stockpiles as opposed to forming parts of benches. This would allow the soil thickness to be verified to be less than 3 m and to ensure that it is easily recovered for use in rehabilitation.	Topsoil stockpiles of less than 3m in height have been created along the project boundary in southern end of the project area. This topsoil is easily accessible and is intended to be utilised for future rehabilitation.	Ongoing  A topsoil stockpile storage area has been allocated in the design of a near haul road leading to the extraction area. It is anticipated that the topsoil will be relocated to this area during 2018 for long term storage.

Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
34	The Proponent shall lodge a Conservation and Rehabilitation Bond with P&I within 6 months of the approval of the Landscape and Rehabilitation Management Plan, to ensure that the Biodiversity Offset Strategy and the rehabilitation of the site is implemented in accordance with the performance and completion criteria set out in the Landscape and Rehabilitation Management Plan.	<b>Administrative non-compliance</b>  The Conservation and Rehabilitation Bond was lodged outside of 6 months of the approval of the Landscape and Rehabilitation Management Plan (14 December 2015).	The Conservation and Rehabilitation Bond was lodged with the DPE in July 2016. No further action is required to comply with this condition.	Complete
<b>Schedule 5 – Environmental Management, Reporting and Auditing</b>				
3	The Proponent shall ensure that the Management Plans required under this approval are prepared in accordance with any relevant guidelines, and include: (f) a program to investigate and implement ways to improve the environmental performance of the project over time; (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 a protocol for periodic review of the plan.	<b>Compliant</b>  As noted within the EMS, the quarry's management team will discuss and review the status of all management plans on an annual basis, but unless required, all site environmental management plans (including the Environmental Management Strategy) will be reviewed and updated every three years. The EMS does not include a adequately detail the program to improve the environmental performance of the project, the reporting protocol or review protocol. It is recommended that a copy of the quarry's Environmental Incident Reporting Form be appended to each of the quarry's management plans and the protocol for managing and reporting all environmental incidents be referenced in the text.	KEQ will be reviewing and updating all MP's by 31 October 2017. Consideration will be given to include a copy of the Environmental Incident Form in the Appendices of each MP's.	Ongoing  MPs are currently being updated and will be submitted for DPE review following approval of Modification 1.



Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
7	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.	<p><b>Non-compliant</b></p> <p>It is recommended that any exceedances of water quality criteria during dam water discharges are reported, in accordance with the project approval conditions and the quarry's EPL.</p>	<p>The non-compliance was given to this condition due to a discharge event that occurred in March 2017. At the time of this discharge, KEQ did not believe this condition applied. It was deemed that this discharge event was not at risk of causing "material harm" as defined under Section 147, POEO Act 1997. As such, KEQ did not treat this as an environmental incident. Surface water was monitored during this discharge event and dam water was treated with a flocculant as per the Water MP. Also, KEQ transferred approximately 0.5ML of dirty water from Dam 3 to Dam 1 to prevent further discharge.</p> <p>For future discharge events where EPL criterion for discharge is exceeded, KEQ will report this to the EPA and DPE. KEQ will also report any environmental incidents as required under the Project Approval, EPL 20611 and the Pollution Incident Response Management Plan (PIRMP).</p>	<p>Ongoing</p> <p>An uncontrolled discharge event in June 2017 was reported to the EPA and DPE.</p>
EPL 20611				
2 Discharge to Air and Water and Application to Land				

Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
P1.3	The following points referred to in the table (refer to Appendix C) are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.	<p><b>Compliant</b></p> <p>As noted within the Annual Review and the environmental monitoring reports, there were no discharge events at Karuah East Quarry during the reporting period for these documents. The discharge points listed in the Water Management Plan are consistent with the licensed discharge points listed as part of this condition (refer to Figure 4 of the Water Management Plan).</p> <p>As noted regarding Schedule 2, Condition 2 of PA 09_0175, Dam 1 has been constructed about 100 m further south than shown on the plan. It is recommended that the proposed surface water management layout in the Water Management Plan (Figure 4) is updated accordingly and the plan is submitted to the EPA with a request to vary the EPL.</p>	<p>Water MP will be revised. Figure 4 of the Water MP will be updated to reflect location changes of the Dams.</p> <p>It is anticipated that the Water MP will be updated by 31 October 2017</p>	<p>Ongoing</p> <p>SLR have been engaged to develop an updated Water MP.</p> <p>MPs are currently being updated and will be submitted for DPE review following approval of Modification 1.</p>
3 Limit Conditions				

Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
L1.1	Except as may be expressly provided in any other condition of this licence, the licensee must comply with Section 120 of the Protection of the Environment Operations Act 1997.	<p><b>Non-compliant</b></p> <p>It is recommended that any exceedances of water quality criteria during dam water discharges are reported, in accordance with the project approval conditions and the quarry's EPL.</p>	<p>Future exceedance in the TSS and oil &amp; grease criterion of discharged water or if it is suspected that the water quality will not meet the EPL criterion, KEQ will report these discharge events.</p> <p>If the TSS and oil &amp; grease do not exceed the EPL criterion but fails to meet the criterion for pH, KEQ will assess whether to report this on a case by case basis. Results from previous monitoring has shown that the pH is naturally lower than the EPL limits in the receiving waters of discharge.</p> <p>All controlled and uncontrolled discharge events will be reported in the annual returns as required under EPL 20611.</p>	<p>Ongoing</p> <p>An uncontrolled discharge event in June 2017 was reported to the EPA and DPE. Discharge monitoring was reported in the 2017 EPL 20611 annual return.</p>

Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
L2.1	For each monitoring/discharge point or utilisation area specified in the table/s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.	<p><b>Non-compliant</b></p> <p>It is recommended that any exceedances of water quality criteria during dam water discharges are reported, in accordance with the project approval conditions and the quarry's EPL.</p>	<p>Future exceedance in the TSS and oil &amp; grease criterion of discharged water or if it is suspected that the water quality will not meet the EPL criterion, KEQ will report these discharge events.</p> <p>If the TSS and oil &amp; grease do not exceed the EPL criterion but fails to meet the criterion for pH, KEQ will assess whether to report this on a case by case basis. Results from previous monitoring have shown that the pH is naturally lower in the receiving waters of the discharge than the EPL limits.</p> <p>All discharge events will be reported in the annual returns as required under EPL 20611.</p>	<p>Ongoing</p> <p>An uncontrolled discharge event in June 2017 was reported to the EPA and DPE. Discharge monitoring was reported in the 2017 EPL 20611 annual return.</p>
L2.2	Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.	<p><b>Non-compliant</b></p> <p>It is noted that the baseline pH of the area was 5.58–6.20 (refer to Table 4 in the Water Management Plan), while the EPL specifies a discharge range of pH 6.5–8.5. So any discharge is expected to be out of compliance unless it is treated to increase the pH above the natural range. The environmental benefit of such treatment is questionable given that it may result in a perturbation from the natural conditions of the receiving waters.</p>	<p>Though this has been non-compliant, previous monitoring results shows that the pH levels across the KEQ site is naturally lower than the EPL limits. At this time, KEQ believes there will be no environmental benefits in treating the discharge water to raise the pH. Monitoring results of discharge events will be reported in the EPL annual returns. Monthly and discharge monitoring will also be reported in the Annual Reviews.</p>	<p>Ongoing</p> <p>More recent monitoring results from the end of 2017 indicate that the pH levels are mostly within the EPL criterion (6.5-8.5) at Dam's 1 and 3.</p>



Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
L4.4	<p>To determine compliance:</p> <p>a) with the Leq(15 minute) noise limits in the Noise Limits table, the noise measurement equipment must be located:</p> <p>i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or</p> <p>ii) within 30 metres of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable;</p> <p>iii) within approximately 50 metres of the boundary of a National Park or a Nature Reserve.</p> <p>b) with the LA1(1 minute) noise limits in the Noise Limits table, the noise measurement equipment must be located within 1 metre of a dwelling façade.</p> <p>c) with the noise limits in the Noise Limits table, the noise measurement equipment must be located:</p> <p>i) at the most affected point at a location where there is no dwelling at the location; or ii) at the most affected point within an area at a location prescribed by part (a) or part (b) of this condition.</p> <p>Note: A non-compliance of the Noise Limits table will still occur where noise generated from the premises in excess of the appropriate limit is measured:</p> <p>i) at a location other than an area prescribed in</p> <p>part (a) and part (b); and/or</p>	<p><b>Compliant</b></p> <p>The Noise Management Plan specifies that all noise measurement procedures employed throughout the monitoring programme will be guided by the requirements of AS 1055 1997 Acoustics - Description and Measurement of Environmental Noise (refer to Section 8). In addition, all acoustic instrumentation employed throughout the monitoring programme will be designed to comply with the requirements of AS IEC 61672.1 2004 Electroacoustics Sound level meters - Specifications. As noted within the Noise Management Plan and the Annual Review, the noise monitoring locations are consistent with the locations listed as part of this EPL. The monitoring requirements specified as part of this condition are not explicitly addressed within the Noise Management Plan.</p> <p>It is recommended that the Noise Management Plan be revised to include reference to the specific measures listed in this condition.</p>	<p>KEQ will review the Noise MP in consultation with an acoustic specialist. Amendments will be made to the Noise MP if required. It is anticipated that the Noise MP will be updated by 31 October 2017.</p>	<p>Ongoing</p> <p>MPs are currently being updated and will be submitted for DPE review following approval of Modification 1.</p>

Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
5 Monitoring and Recording Conditions				
M3.1	Note: The Protection of the Environment Operations (Clean Air) Regulation 2010 requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".	<p><b>Compliant</b></p> <p>The general requirements of the air quality monitoring program are established in Section 8.1.1 of the Air Quality and Greenhouse Gas Management Plan. As noted within Section 8.1.1, all monitoring must be conducted in accordance with the Approved Methods for the Sampling and Analysis of Air Pollutants in NSW. It is recommended that a statement be included within the quarry's monthly environmental monitoring reports and future annual reviews that monitoring has been conducted in accordance with the Approved Methods for the Sampling and Analysis of Air Pollutants in NSW</p>	From August 2017, all future environmental monitoring reports for KEQ will include a brief reference or statement to indicate that the air quality monitoring has been performed to meet the Approved Methods of Sampling and Analysis of Air Pollutants in NSW.	Complete
M6.1	The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.	<p><b>Administrative non-compliance</b></p> <p>It is recommended that the Hunter Quarries website is updated to specify a number to call with complaints - this may be the same number as the general number provided.</p>	The Hunter Quarries website was updated on 14 July 2017. An environmental complaints contact phone number is now listed.	Complete
M6.2	The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.	<p><b>Administrative non-compliance</b></p> <p>It is recommended that the Hunter Quarries website is updated to specify a number to call with complaints - this may be the same number as the general number provided.</p>	The Hunter Quarries website was updated on 14 July 2017. An environmental complaints contact phone number was added.	Complete
Statements of Commitments – Appendix 6, Project Approval PA 09_0175				
Schedule 3 – Environmental Performance Conditions				

Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
2.0	<p>The following management plans will be prepared prior to commencement of construction works:</p> <p>...</p> <p>- Waste Management Plan.</p>	<p><b>Administrative non-compliant</b></p> <p>The quarry's EMS and management plans have been approved by DPE. However, a waste management plan has not been prepared to meet this commitment.</p> <p>It is recommended that a waste management plan is prepared, in accordance with the summary of environmental monitoring provided in Table 6 of the EMS.</p>	<p>Waste management is partially covered in the EMS.</p> <p>It is anticipated that a separate Waste MP will be developed by 31 October 2017.</p>	<p>Ongoing</p> <p>KEQ will seek further advice to whether this will be required. Waste management is partially covered in the EMS.</p>
3.0	<p>Refuelling will be undertaken in a designated non-permeable (compacted clay or concrete) area.</p>	<p><b>Administrative non-compliant</b></p> <p>The site is under construction and re-fuelling areas have not been constructed. Refuelling in the quarry and infrastructure area is currently performed by a mobile tanker. These are temporary arrangements during the project's construction period and will be addressed prior to the commencement of quarrying operations. Obviously, some earthworks need to be completed before a non-permeable refuelling area can be established. It would have been better to recognise this when writing this commitment.</p> <p>It is recommended that a non-permeable refuelling area (or areas) is constructed as soon as practicable.</p>	<p>A temporary refuelling area has been provided near the crushing plant. Area has been filled with compacted clay as subbase and a layer of gravel has been used for capping.</p> <p>It is anticipated that the area used for temporary refuelling will be upgraded to a permanent refuelling area by late 2017. A concrete bunded fuel area with an oil spillage catchment will be constructed. Also, a self bunded "bladder" diesel tank will be installed. A permanent fuel area will be installed before the Quarry becomes operational.</p>	<p>Complete</p> <p>A self bunded diesel tank with a designated refuelling area was constructed in November 2017. The refuelling area was constructed with an oil spillage catchment sump.</p>

Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
3.0	Groundwater samples will be collected for laboratory analysis on a 6-monthly basis. The groundwater quality results will be laboratory analysed for the parameters below and compared to background water quality results. The groundwater sampling will be carried out by an experienced groundwater professional or environmental scientist in accordance with Australian sampling standards. The basic analyte and parameter suite applies to all samples. The additional extended analytic suite should apply annually together with the basic suite.	<p><b>Administrative non-compliant</b></p> <p>There is no evidence that the groundwater sampling was carried out by an experienced professional or environmental scientist in accordance with the Australian sampling standards. It is recommended that the qualifications and experience of the professional undertaking groundwater sampling are provided in monitoring reports.</p> <p>The laboratory results for March 2016 and April 2017 confirmed that the suite of analytes listed as part of this commitment were assessed (with the exception of total iron, which was not assessed as part of the April 2017 monitoring event).</p> <p>It is recommended that total iron concentrations be assessed as part of the 12 monthly suite of analytes or that the Water Management Plan is amended to remove this requirement.</p>	<p>KEQ has reviewed these comments and recommendations. A request will be provided to the groundwater specialists/environmental scientist to ensure that the testing methods and qualifications of the professionals are addressed in their documentation.</p> <p>KEQ will ensure that the chain of custody forms and laboratory reports have included all the analytes as specified in this SoC.</p> <p>The next bi-annual groundwater monitoring will occur in October 2017. These corrective actions will be put in place during this time.</p>	<p>Ongoing/Complete</p> <p>Additional documentation was provided with the October 2017 monitoring results that addresses this administrative non-compliance.</p>
3.0	Additional Analysis – 12 monthly (every second sample only): Nutrient suite: total nitrogen, nitrate, total Kjeldahl nitrogen, total phosphorus, phosphate; Metals (arsenic, cadmium, chromium, copper, lead, zinc, nickel, manganese, mercury, total iron, filterable iron); Polycyclic Aromatic Hydrocarbon (PAH); and Organophosphorus pesticides, phenoxy acid herbicides.	<p><b>Administrative non-compliant</b></p> <p>The laboratory results for March 2016 and April 2017 confirmed that the suite of analytes listed as part of this commitment were assessed (with the exception of total iron, which was not assessed as part of the April 2017 monitoring event).</p> <p>It is recommended that total iron concentrations be assessed as part of the 12 monthly suite of analytes or that the Water Management Plan is amended to remove this requirement.</p>	<p>It appears that the requested analytes provided to the laboratory for testing was in accordance with this SoC but total iron results were not provided in the final laboratory report.</p> <p>KEQ will ensure that the chain of custody forms and laboratory reports have included all the analytes as specified in this SoC.</p> <p>The next bi-annual groundwater monitoring will occur in October 2017. These corrective actions will be put in place during this time.</p>	<p>Ongoing</p> <p>Next 12 monthly groundwater monitoring will be undertaken in April 2018.</p>



Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
3.0	In the event that water is required to be discharged offsite, the water will be tested prior to discharge to ensure appropriate discharge criteria are met, such as Total Suspended Solids (TSS) below a concentration of 50 mg/L. Where this is not the case, water will be treated, for example through the use of chemical flocculation, to achieve a suitable water quality.	<p><b>Non-compliant</b></p> <p>As described above (refer to Schedule 3, Condition 19 of PA 09_0175), the results of the TSS monitoring during the discharge events from Dam 3 in March and April 2017 exceeded the concentration limits (40 mg/L) defined by Condition L2.4 of the quarry's EPL and 50 mg/L. It is recommended that water be treated during all future dam water discharges to achieve a suitable water quality.</p>	Water in Dam's 1 and 3 were flocculated in April 2017 and again in June 2017 to decrease TSS values. Calcium chloride at a dosage recommended by an experienced and qualified engineer was used as the flocculent. Calcium chloride was specifically chosen for its relatively fast reaction time and its low toxicity. Testing results showed a significant improvement in water quality after flocculation. KEQ will continue to monitor and treat the dam water in the future when required.	<p>Ongoing</p> <p>As part of KEQ's water management routine, Calcium Chloride has been added to the dams periodically to reduce TSS.</p>
3.0	In the event that an exceedance in surface water quality criteria is identified, the exceedance will need to be reported to the relevant agencies in accordance with the requirements of the EPL.	<p><b>Non-compliant</b></p> <p>As described above (refer to Schedule 3, Condition 19 of PA 09_0175), the results of the water quality monitoring for pH, TSS and oil and grease during the discharge events from Dam 3 in March and April 2017 exceeded the concentration limits defined by Condition L2.4 of the quarry's EPL. These discharge events should have been reported due to the degraded water quality recorded. It is recommended that any exceedances of water quality criteria during dam water discharges are reported, in accordance with the project approval conditions and the quarry's EPL.</p>	<p>KEQ is currently revising the Water MP to improve practices and implement better mitigation of potential non-compliant discharges. The following actions will be taken:</p> <ol style="list-style-type: none"> <li>1. SW5 monitoring site will be included in the Water MP to be monitored during any discharge events from Dam 3 (LDP3).</li> <li>2. Oil &amp; grease will be monitored closely. Any exceedances in the total oil &amp; grease content will be further analysed at a NATA laboratory to determine the source of the high oil &amp; grease. Monthly testing as per the Water MP will continue.</li> <li>3. Any future exceedance of the TSS and oil &amp; grease criteria will be reported. KEQ has since reported discharge that did not meet water quality criteria to the DPE and EPA.</li> </ol>	<p>Ongoing</p> <p>SLR have been engaged to develop an updated Water MP. MPs are currently being updated and will be submitted for DPE review following approval of Modification 1.</p>

Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
3.0	That controlled discharge of treated (e.g. flocculated) water be undertaken when total site storage levels are above 4.3 ML, which would provide the capacity to contain more rainfall events and reduce wet weather discharges (this assumes the dams are built to the capacities presented in Table 2 – refer to Appendix C).	<p>Not verified</p> <p>It is noted that there was little free-board on Dam 1 and 3 during the site inspection. No water level gauges were observed.</p> <p>It is recommended that water level gauges are installed in the dams and the relationship between water levels and total volume stored is established.</p>	<p>KEQ is investigating options for water level gauges.</p> <p>It is likely that KEQ will install a water level gauge at Dam 1, Dam 2 and Dam 3 for long term monitoring. It is anticipated that water level gauges will be installed before 30 June 2018.</p>	Ongoing
4.0	A report detailing the methods and results of the pre-clearing surveys will be prepared and submitted to OEH immediately prior to the commencement of the clearing operations.	<p><b>Administrative non-compliant</b></p> <p>Correspondence with T. Grugeon on 30 May 2017 confirmed that the pre-clearing surveys were undertaken as per Section 6.2 of the landscape and rehabilitation management plan, which was approved by DPE in accordance with Condition 32 of Schedule 3 of PA 09_0175. However, specific correspondence with OEH to address this commitment did not occur.</p> <p>It is recommended that the report detailing the methods and results of the pre-clearing surveys is submitted to OEH.</p>	The Vegetation Clearing Completion Report for Stage 1 (Kleinfelder, February 2017) will be submitted to the OEH by 31 October 2017. This report includes the methods and results of all the pre-clearing surveys taken during 2016.	<p>Complete</p> <p>Vegetation Clearing Completion Report was submitted to OEH in March 2018.</p>

Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
4.0	<p>Site Survey and Exclusion Fencing</p> <p>The extraction area/forest interface will be delineated to protect retained bushland areas on Lot 12 and 13. To achieve this, the quarry footprint boundary will be surveyed and pegged by a Registered Surveyor prior to the conduct of clearing operations. Plastic mesh fencing or star pickets and flagging tape will be installed along the extraction boundary for use as exclusion fencing. The fencing will function as a clearly marked 'exclusion' boundary for the machinery operations.</p>	<p><b>Compliant</b></p> <p>During the site inspection, evidence of appropriate signage delineating the conservation offset areas from the extraction area/project area was observed. In addition, it was noted that boundary tape and plastic mesh fencing was used during the clearing process. Fencing has not yet been erected to the extent identified in this commitment, which is unclear as to whether it applies to construction as well as to operations. It was noted that long-term exclusion fencing cannot be erected until after construction has been completed. It is recommended that exclusion fencing be installed as soon as practicable after the completion of construction to meet this commitment.</p>	<p>KEQ engaged a fencing contractor in July 2017 to install exclusion fencing. The project boundary was also pegged by a surveyor in July 2017. The install of the exclusion fencing commenced on 14 August 2017. The exclusion fencing will be completed before Quarry operations commence.</p>	<p>Ongoing</p> <p>Approximately 40% of the project boundary perimeter has been fenced.</p>
4.0	<p>Where possible, vegetation clearing activity will be timed so as to avoid the following breeding periods for hollow dependent fauna:</p> <p>i) October – February (microbats); and</p> <p>ii) June – August (large forest owls and microbats in torpor).</p>	<p><b>Compliant</b></p> <p>Vegetation clearing for the project commenced in April 2016 and the majority of the project area was cleared between April and June 2016, with some clearing also occurring in July and November 2016. However, it is noted that the commitment is to avoid these periods "where possible" and that there will be ongoing clearing as part of the project. It is recommended that future clearing is scheduled well in advance to avoid breeding periods for hollow-dependent fauna</p>	<p>KEQ has made all efforts to avoid clearing during these periods and will continue to do so in the future. The majority of the clearing that has been undertaken on the KEQ site occurred in April-May 2016 with more limited clearing taking place from June – November 2016. Additional pre-clearing fauna surveys were undertaken at the end of May/ beginning of June 2016 by qualified ecologists as due diligence and as per Section 6.2.4 of the L&amp;RMP. Microbats and large forest owls (i.e., Powerful Owl) were specifically targeted in these surveys. The targeted species were not found during these additional surveys.</p>	<p>Complete</p> <p>This has been noted.</p>

Condition Number	Condition	Compliance Status and Recommendation	KEQ Comment	Current status
4.0	Seasonal flora and fauna survey of the offset site will be undertaken in accordance with relevant OEH guidelines. In particular, seasonal survey for <i>Tetratheca juncea</i> and <i>Grevillea parviflora</i> ssp <i>parviflora</i> will be undertaken and reported to the NSW OEH.	<p><b>Compliant</b></p> <p>No reduction in threatened flora populations was recorded at the monitoring sites in 2016. It is recommended that the results of all future seasonal surveys for <i>Tetratheca juncea</i> and <i>Grevillea parviflora</i> ssp <i>parviflora</i> be reported to OEH in accordance with this condition.</p>	Annual biodiversity monitoring as per the Biodiversity Offset Area MP is undertaken annually by experienced ecologists. The 2016 monitoring report (Klienfelder, Nov 2016) was submitted to the DPE as Appendix 5 of the 2016 Annual Review (KEQ & SLR, March 2017). KEQ will submit future biodiversity monitoring reports separately to OEH to comply with this SoC.	<p>Ongoing</p> <p>2017 BOA Monitoring Report to be submitted to OEH.</p>
11.0	Stockpiles will be protected with sediment fencing and planted with a sterile cover crop (annual species) to ensure stabilisation. Surface drainage in the vicinity of the stockpiles will be configured so as to direct any runoff around the stockpile.	<p><b>Non-compliant</b></p> <p>Stockpiles are generally protected by sediment fences. A sterile cover crop has not been planted. It is recommended that a sterile cover crop is planted on soil stockpiles in accordance with the Landscape and Rehabilitation Management Plan.</p>	KEQ will be seeding the soil stockpiles with a sterile crop (i.e., ryegrass, oats) as a long term sediment control. It is anticipated that this work will be undertaken by 31 October 2017.	<p>Ongoing</p> <p>Topsoil stockpiles were seeded at the end of 2017 with millet. Stockpiles were seeded again in February 2018 with oats.</p>