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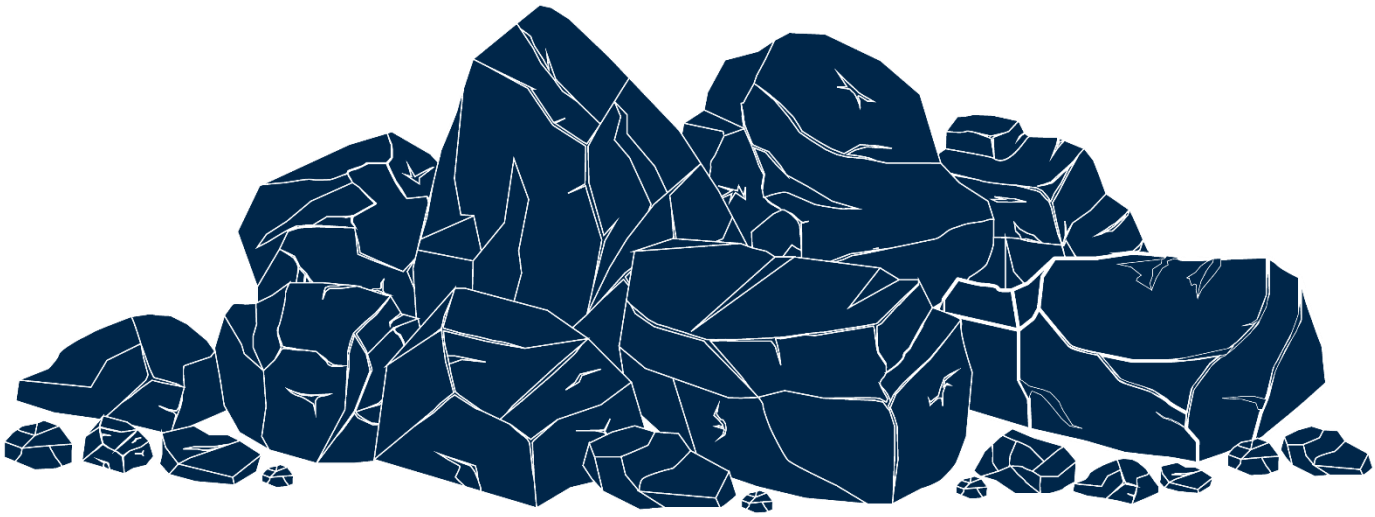
Karuah East Quarry

Landscape & Rehabilitation Management Plan

October 2024



Revision History

Version	Date Reviewed	Author	Status	Amendment Details
1A	September 2015	GSSE	Draft for Consultation	Original Landscape and Rehabilitation Management Plan developed to satisfy Schedule 3, Condition 32 of the Project Approval.
1B	November 2015	GSSE	Approved	Updated for OEH, MCC and DPE comments.
2A	October 2018	SLR	Draft for Consultation	Comprehensive review incorporating: ▪ findings of 2017 IEA; ▪ approval of MOD1 to the Project Approval; and ▪ status update on construction of the KEQ site.
2B	January 2019	SLR	Approved	Update for DPIE comments.
3A	May 2019	SLR	Draft for Consultation	Comprehensive review following approval of MOD2 to the Project Approval.
3B	July 2019	SLR	Approved	Update for DPE comments.
4A	January 2020	SLR	Draft for Consultation	Minor review to include details of material (overburden, subsoil and topsoil) to be transport from Karuah East Quarry to be used in rehabilitation (including final landform development) at Karuah Hard Rock Quarry.
4B	March 2020	SLR	Approved	Update for DPE comments to include quantity estimates of material to be transported.
5A	May 2024	IEMA & WPC	Draft for Consultation	Comprehensive review following approval of Modification 8, 9 and 10; and the findings of the 2023 Independent Environmental Audit. Update for new Karuah East Quarry document template.
5B	June 2024	IEMA & WPC	Draft for Submission	Update following consultation with BCD (PAE-71007767), NSW DCCEEW (PAE-71007764) and MidCoast Council (PAE-71007761).
5C	October 2024	IEMA & WPC	Approved	Update following NSW Planning comments.

Contents

Terms, Definitions and Abbreviations

Abbreviation / Term	Meaning
ACARP	Australian Coal Association Research Program
AR	Annual Report
BC Act	NSW *Biodiversity Conservation Act 2016*
BCS	Biodiversity Conservation and Science Group of NSW Department of Climate Change, Energy, the Environment and Water
BDAR	Biodiversity Development Assessment Report
BOA	Biodiversity Offset Area
BOAMP	Biodiversity Offset Area Management Plan
BOS	Biodiversity Offset Strategy
CCC	Community Consultative Committee
DA	Development Application
EA	Environmental Assessment
EC	Electrical Conductivity
EIS	Environmental Impact Statement
ELA	Ecological Australia
EMP	Environmental Monitoring Program
EMS	Environmental Management Strategy
EPBC Act	Commonwealth *Environment Protection & Biodiversity Conservation Act 1999*
EPL	NSW Environment Protection Licence
Ha	Hectare
HQPL	Hunter Quarries Pty Ltd
IEMA	Integrated Environmental Management Australia
IPC	Independent Planning Commission
KEQ	Karuah East Quarry (MP09-0175)
KEQPL	Karuah East Quarry Pty Ltd
KHRQ	Karuah Hard Rock Quarry (DA 265-10-2004)
km	Kilometre
L	Litre
LRMP	Landscape and Rehabilitation Management Plan
MCC	MidCoast Council
NSW Planning	NSW Department of Planning, Housing and Infrastructure
POEO Act	NSW *Protection of the Environment Operations Act 1997*
TFD	Total Fund Deposit
tpa	tonnes per annum
WMP	Water Management Plan
WoNS	Weeds of National Significance
WPC	Wedgetail Project Consulting

1.0 Introduction

Integrated Environmental Management Australia (IEMA) have been engaged by Karuah East Quarry Pty Limited (KEQPL) to prepare this Landscape and Rehabilitation Management Plan (LRMP) to satisfy the requirements outlined in Schedule 3, Condition 32 of the Project Approval (MP09_0175).

Wedgetail Project Consulting (WPC) has additionally reviewed ecology components of this LRMP.

1.1 Overview

KEQPL operate the Karuah East Quarry (KEQ), located approximately 5km northeast of the township of Karuah, in the Mid Coast Local Government Area. KEQ supplies hard rock quarry products to the construction industry, with markets in the Lower and Upper Hunter, Mid Coast, New England and Greater Sydney Regions.

Project Approval (MP09_0175) was granted for the KEQ on 17 June 2014 by the Independent Planning Commission (IPC) (formerly the NSW Planning Assessment Commission) on behalf of the Minister for Planning and Public Spaces (formerly Minister for Planning). Federal Approval (EPBC 2014/7282) was granted for KEQ under the Environment Protection and Biodiversity Conservation Act (EPBC Act 1999) on 20 March 2015.

The KEQ has approval to extract, process, stockpile and transport up to 1.5 million tonnes of andesite material annually until 2034.

1.2 Project Site

The KEQ is located off the Pacific Highway (via Blue Rock Close) and is situated on the following lands:

- Lot 12 and 13 DP 1024564 (the KEQ site); and
- Lot 14 and part Lot 13 DP 1024564 and Lot 5 DP 838128 (biodiversity offset area).

The KEQ is well separated from any substantial residential areas and is located adjacent to the existing Karuah Hard Rock Quarry (KHRQ) (approved in June 2005 under DA 265-10-2004). The KHRQ is operated by Hunter Quarries Pty Ltd (a company affiliated with KEQPL) however the KEQ and the KHRQ are standalone quarry operations.

Figure 1 below presents the site locality and regional context.

1.3 Summary of Project Approval (MP09_0175)

The key features of the Project Approval include the following key elements:

- The extraction (excluding overburden), processing, stockpiling, and transport of quarry products is limited to 1.5 million tonnes in any calendar year;
- Quarrying operation is permitted on the site until 31 December 2034;
- Establishment and use of quarry plant and associated infrastructure;
- Vegetation removal;
- A total permitted disturbance area of 40.18ha on Lots 12 and 13 DP 1024564;
- Roadworks to secure access to the site including upgrade and extension of Blue Rock Close, realignment of the Andersite Road and Blue Rock Close intersection and adjust road markings at Branch Lane and Andersite Road intersection;
- Establishment of a biodiversity offset area;
- Conditions apply to manage / mitigate potential impacts associated with a range of environmental conditions including noise, blasting, air quality, soil and water, transport, biodiversity, heritage, emergency and hazards management and waste; and
- Progressive rehabilitation of the subject site.

Quarry Operations

Approved quarrying activities undertaken on the site generally include:

- drilling and blasting of rock material within the quarry pit;
- collection and transportation of blasted material to the crushing & processing area using mobile equipment;
- crushing, processing and screening of quarried material is undertaken using fixed and mobile equipment;
- stockpiling of processed material; and
- stockpiled material is loaded onto trucks and exits the site to market via the weighbridge.

Existing and Approved Site Improvements

Existing and approved site improvements include:

- quarry pit (extraction area);
- crushing plant and processing infrastructure;
- wash plant and workshops;
- stockpiling areas;
- internal haulage roads;
- weighbridge office;
- weighbridge (two weighbridges approved);
- stormwater management infrastructure including three (3) dams;
- parking areas for light and heavy vehicles;
- administration office;
- amenity facilities;
- other minor structures; and
- fencing and access gates.

Figure 2 presents the currently approved project site plan and layout.


406000
406500
407000
407500
408000
6390000
6389500
6389000
TAMWORTH
BROKEN HILL
Karuah East Quarry
NEWCASTLE
LITHGOW
SYDNEY
GRIFFITH
CANBERRA
Karuah East Quarry
Karuah Quarry
12
DP1024564
13
DP1024564
LEGEND
Site Boundary
Lot Boundary
0 70 140 210 280
m
Scale: 1:10,000
GDA 1994 MGA Zone 56
8/03/2024
Karuah East Quarry
Landscape and Rehabilitation Management Plan
FIGURE 1 - Regional and Local Context Plan
INTEGRATED ENVIRONMENTAL MANAGEMENT AUSTRALIA
www.iema.com.au
Sheet Size : A4
I:\A01_Clients_GIS\HQP_Hunter_Quarries\HQP02_Karuah_East\HQP02_004_Karuah_East_MP\HQP02_004_Karuah_East_MP_01.aprx

Karuah East Quarry

Landscape and Rehabilitation Management Plan

FIGURE 2 - Locality Plan

1.4 Modifications to Project Approval (MP09_0150)

The Project Approval has been modified five times as summarised by **Table 1**.

Table 1 Summary of Modifications to the Project Approval.

MOD	Approval Date	Summary
1	27/04/2018	MOD 1 approved a nominal expansion to the approved area of disturbance by 2,500 m² to allow for improved vehicle manoeuvring in proximity of the crushing plant and processing area.
2	19/12/2018	MOD 2 approved a 1.133 Ha increase to the site disturbance area to allow for improved environmental management and improved operational safety (for quarry vehicles).
3 – 7 withdrawn		
8	22/12/2020	MOD 8 approved revised operational acoustic criteria in line with the *NSW Noise Policy for Industry 2017.* MOD 8 also formalised a number of industry best practice acoustic mitigation measures that have been installed at the quarry. No change to disturbance footprint occurred.
9	02/12/2021	MOD 9 extended the approved operating hours of the KEQ. No change to disturbance footprint occurred.
10	18/05/2023	MOD 10 provides approval to increase the disturbance area of the KEQ by 7.17 Ha (bringing the total disturbance area of the KEQ to 40.18 Ha). The purpose of MOD 10 is to increase the approved disturbance area to establish additional stockpiling areas, facilitate improved surface water management, construct a new administrative building and expand the vehicle manoeuvring and parking at site.

1.5 Purpose

This document has been prepared to provide KEQPL with a consistent approach to the management of landscape and rehabilitation practices and sets out the minimum standards and processes to achieve this intended level of management. The Landscape and Rehabilitation Management Plan (LRMP) applies only to the area within the approved disturbance boundary described in **Section 1.2** and illustrated in **Figure 2**.

1.6 Authorship

In accordance with Schedule 3, Condition 32 of the Project Approval, this LRMP has been prepared by Chris Jones and Simon Kirgis of IEMA on behalf of KEQPL, who have been endorsed by the Planning Secretary as suitably quality and experienced persons (refer to **Appendix B**).

Samara Schulz of Wedgetail Project Consulting (WPC) has reviewed and ecology components of this LRMP.

1.7 Agency Consultation for this Management Plan

This LRMP has been prepared in accordance with the requirements of the Project Approval, including the requirement for consultation with MidCoast Council (MCC) and the Biodiversity, Conservation and Science Group of NSW Department of Climate Change Energy, the Environment and Water (BCS of NSW DCCEEW) [formerly Biodiversity Conservation Division (BCD) within the NSW Department of Planning and Environment].

Previous consultation with these agencies was conducted 15 September 2015 as part of the development of the original LRMP as summarised by **Table 2**. Further consultation was undertaken May 2024 as part of the Version 5 comprehensive update.

Table 2 Summary of Agency Consultation.

Date	Agency	Agency Comment	Response from KEQPL
15/09/2015	Draft LRMP (version 1B) submitted to OEH and MCC for comment.		
23/09/2015	Office of Environment & Heritage	No comments in relation to LRMP.	–
01/10/2015	MidCoast Council	The LRMP does not deal with how the final rehabilitated landform would be secured (that is, that the restoration achieved would be consolidated in the long-term). Perhaps a s88B instrument or Conservation Agreement is required to ensure that the progressive and closure rehabilitation outcomes are secured.	Further details regarding conservation agreements and post quarrying management will be outlined in future updates to the Landscape and Rehabilitation Management Plan.
		Further, there is no calculation of the quantum of a conservation bond to ensure that the rehabilitation is achieved in the event that the current or future registered proprietor fails to deliver on the outcomes. An adequate conservation bond is imperative to ensuring a suitable outcome. We understand that there is a separate process for the determination of this bond.	The Karuah East Quarry rehabilitation bond (Schedule 3, Condition 34) is required to be submitted to the DPIE within six months of approval of this Plan. Initial calculations have been completed and the bond will be sent to the DPIE prior to this timeframe.
		Obviously, the Plan is only as good as its implementation. We would appreciate being provided copies of any implementation reports for progressive landscaping and rehabilitation of this landform.	KEQPL will report on the implementation of the management plan in the Annual Review.
20/05/2024	Draft LRMP (version 5A) submitted to BCS of NSW DCCEEW and MCC for comment via the NSW Major Projects Portal under RFI requests BCD (PAE-71007767), NSW DCCEEW (PAE71007764), and MCC (PAE-71007761).		
17/06/2024	BCS of NSW DCCEEW	No response was received.	–
17/06/2024	MidCoast Council	No response was received.	–

2.0 Regulatory Requirements

2.1 Requirements of the Project Approval (MP09_0175)

The requirements of the Project Approval are summarised by **Table 3**.

Table 3 Summary of Relevant Conditions of the Project Approval.

<table>
<tr><th>No.</th><th colspan="2">Requirements</th><th>Section</th></tr>
<tr><td colspan="4">Schedule 3 – Environmental Performance Conditions</td></tr>
<tr><td rowspan="8">Condition 30</td><td colspan="2"><u>Rehabilitation Objectives</u>
The Applicant must rehabilitate the site to the satisfaction of the Planning Secretary. This rehabilitation must:
a) be consistent with the rehabilitation strategy as described in the EA and shown conceptually in Figure 1 in Appendix 5; and
b) comply with the objectives in Table 11.
Table 11: Rehabilitation Objectives</td><td rowspan="8">Section 4.0</td></tr>
<tr><td>Feature</td><td>Objective</td></tr>
<tr><td>Site (as a whole)</td><td>Safe, stable & non-polluting.</td></tr>
<tr><td>Surface Infrastructure</td><td>To be decommissioned and removed, unless the Planning Secretary agrees otherwise.</td></tr>
<tr><td>Quarry Wall Benches</td><td>Landscaped and revegetated utilising native tree and understorey species, ensuring that the tree canopy is restored and integrated with the surrounding tree canopy.</td></tr>
<tr><td>Quarry Pit Floor</td><td>Landscaped and revegetated with wetland vegetation.</td></tr>
<tr><td>Other land affected by the development</td><td>Restore ecosystem function, including maintaining or establishing self sustaining ecosystems comprised of:
▪ native endemic species; and
▪ a landform consistent with the surrounding environment.</td></tr>
<tr><td>Community</td><td>Ensure public safety.
Minimise the adverse socio-economic effects associated with quarry closure.</td></tr>
<tr><td>Condition 31</td><td colspan="2"><u>Progressive Rehabilitation</u>
The Applicant must:
a) 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.</td><td>Section 8.2</td></tr>
<tr><td rowspan="3">Condition 32</td><td colspan="2"><u>Landscape and Rehabilitation Management Plan</u>
Within 6 months of the date of approval of Modification 1, the Applicant must prepare a Landscape and Rehabilitation Management Plan for the development to the satisfaction of the Planning Secretary. This Plan would relate to the area of the quarry and all perimeter lands. This plan must:</td><td>Whole document</td></tr>
<tr><td colspan="2">a) be prepared by a suitably qualified expert whose appointment has been approved by the Planning Secretary;</td><td>Section 1.6</td></tr>
<tr><td colspan="2">b) be prepared in consultation with BCD and Council, and submitted to the Planning Secretary for approval prior to the commencement of construction activities;</td><td>Section 1.7</td></tr>
</table>

No.	Requirements	Section
Condition 32 cont.	c) *describe how the implementation of the Tetratheca juncea Translocation Program would be integrated with the overall rehabilitation of the site;*	**Section 8.4**
	d) *describe the short medium & 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 consent.*	**Section 8.0**
	e) *Include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, including triggers for any remedial action;*	**Section 11.0**
	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 consent;* ▪ *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 preclearing 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.*	**Section 5.0, 8.0, 13.0 & 15.2**
	g) *Include a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;*	**Section 13.0**
	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;*	**Section 14.0**
	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;*	**Section 15.3**
	j) *Include details of who would be responsible for monitoring, reviewing, and implementing the plan; and*	**Section 17.0**
	k) *Include details as to the timing of actions set-out in the plan.*	**Section 15.0**
	The Applicant must implement the plan as approved by the Planning Secretary.	**Whole document**

No.	Requirements	Section
Condition 34	***Conservation Rehabilitation Bond*** *The Applicant must lodge a Conservation and Rehabilitation Bond with the Department 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 must 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 Planning Secretary.* *Notes:* ▪ *If capital and other expenditure required by the Landscape and Rehabilitation Management Plan is largely complete, the Planning Secretary may waive the requirement for the lodgment 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 Planning Secretary, then the Planning Secretary will release the bond. If the Biodiversity Offset Strategy and rehabilitation of the site are not completed to the satisfaction of the Planning Secretary, then the Planning 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 Applicant and BCD which satisfactorily replaces that component, to the satisfaction of the Planning Secretary.*	**Section 12.0**
Condition 35	*Within 3 months of each Independent Environmental Audit (see Condition 9 of Schedule 5), the Applicant must review, and if necessary, revise the sum of the Conservation and Rehabilitation Bond to the satisfaction of the Planning 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).*	**Section 12.0**

No.	Requirements	Section
Schedule 5 – Environmental Management, Reporting and Auditing		
Condition 3	***Management Plan Requirements*** *The Applicant must ensure that the Management Plans required under this consent are prepared in accordance with any relevant guidelines, and include:*	**Whole document**
	a) Detailed baseline data;	**Section 3.0**
	b) A description of: ▪ *The relevant statutory requirements (including any relevant approval, licence or lease conditions);* ▪ *Any relevant commitments or recommendations identified in the documents listed in condition 2(d) of Schedule 2;* ▪ *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 development or any management measures;*	**Section 2.0**
	c) A description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	**Section 5.0, 8.0 & 13.0**
	d) A program to monitor and report on the: ▪ *Impacts and environmental performance of the development; and* ▪ *Effectiveness of any management measures (see (c) above);*	**Section 13.0, 14.0 & 16.0**
	e) A contingency plan to manage any unpredicted impacts and their consequences;	**Section 16.0**
	f) A program to investigate and implement ways to improve the environmental performance of the project over time;	**Section 16.0**
	g) A protocol for managing and reporting any: ▪ *Incidents;* ▪ *Complaints;* ▪ *Non-compliances with statutory requirements; and* ▪ *Exceedances of the impact assessment criteria and/or performance criteria; and*	**Section 16.0**
	h) A protocol for periodic review of the plan.	**Section 16.0**
Condition 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 consent, (unless the conditions require otherwise),* *the Applicant must review the strategies, plans, and programs required under this consent, to the satisfaction of the Planning 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 Planning 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 development.*	**Section 16.0**

Condition 11	The Applicant must: a) make the following information publicly available on its website: ▪ the documents referred to in condition 2(d) of Schedule 2 of this consent; ▪ any statutory approvals for the development; ▪ approved strategies, plans and/ programs; ▪ a summary of the monitoring results of the development, which have been reported in accordance with the various plans and programs approved under the conditions of this consent; ▪ a complaints register, updated quarterly; ▪ minutes of CCC meetings; ▪ annual reviews; ▪ any independent environmental audit, and the Applicant's response to the recommendations in any audit; and ▪ any other matter required by the Planning Secretary; and b) keep this information up-to-date, to the satisfaction of the Planning Secretary.	**Section 16.0**

2.2 Requirements of the Environment Protection Licence (EPL 20611)

There are no requirements of relating to landscape management or rehabilitation and closure matters within the site's Environment Protection Licence (EPL), EPL 20611.

3.0 Existing Environment

3.1 Land Use

Pre-Quarrying Land Use

A description of the relevant land capability classes is provided in **Table 4**.

Table 4 Pre-Quarrying Rural Land Capability Classes.

Land Class	Area (Ha)	Area (%)
Class IV	13.2	44
Class VII	16.4	56
Total	**29.6**	**100**

Class IV Land

Class IV land consists of Soil Type 1 and 2 (Brown Chromosol and Red Dermosol) and covers an area of 13.2 Ha. This classification indicates that the land is suitable for grazing with only occasional cultivation and is the best class of grazing land. The majority of Class IV land occurs within the established infrastructure area.

Class VII Land

Class VII land consists of Soil Type 3 (Leptic Tenosol) and covers an area of 16.4 Ha. This land is considered unsuitable for rural production and is best protected by green timber to control erosion. The majority of Class VII land occurs within the quarry extraction area. Constraints associated with these soil types include its slope, heavy subsoil clay content, shallow topsoil depth and susceptibility to erosion.

3.2 Soil

GSSE completed an assessment of soils as part of the Soil Survey and Land Resource Assessment for the Environmental Assessment in July 2011.

The soil landscapes within the site have been mapped by the Land & Water Conservation incorporating the Soil Conservation Service of NSW at the scale of 1:100,000 by Matthei (1995). The soil landscape units described by these publications are “areas of land that have recognisable and specific topographies and soils that can be presented on maps and described by concise statements”. The soil landscape units that occur within the site are as follows

North Arm Cove unit is the most common and is present extensively throughout the eastern and central areas of the site;

- Gan Gan unit occurs in the north western area of the site;
- Gan Gan variant A occurs small pocket in the project site north-west; and
- Nungra unit small pockets in the site’s southern area.

The North Arm Cove soil landscape occurs as undulating to rolling rises on Nerong Volcanics in the Karuah Mountains and Medowie Lowlands, east of the Karuah River. Local relief up to 50 m and slope gradient of <15%. Common soil occurrences of this landscape include a weakly structured light sandy clay loam, bleached hardsetting sandy clay loam and mottled blocky clay. Limitations include high erosion hazard and seasonal waterlogging on lower slopes.

The Gan Gan soil landscape occurs on the steep hills of the Nerong Volcanics on the Karuah Mountains. Slope gradients >25%, local relief 100 – 200 m, elevation 60 – 260 m. The main soils are stony brownish black weakly pedal sandy loam; bleached stony hard setting light sandy clay loam; and whole coloured well-structured light clay. This soil landscape occurs throughout the northern development area.

Gan Gan variant A is found on lower footslopes and includes imperfectly drained soils that have sharp boundaries between soil materials and a depth of >200 cm. Limitations include mass movement associated with steep slopes, shallow soils with rock outcrops and an extreme water erosion hazard.

The Nungra soil landscape occurs on widespread gently inclined footslopes and drainage plains of the Medowie Lowlands and Karuah Mountains physiographic regions. Slope gradient <3%, local relief <10 m and elevation to 40 m. The main soils are greyish yellow brown weakly pedal silty loam; bleached hardsetting silty clay loam; and greyish yellow brown mottled silty clay. This soil landscape occurs throughout parts of the central and southern development area Limitations include localised salinity, water erosion hazard, high run on, seasonal water logging and flood hazards.

3.3 Biodiversity

RPS Australia Pty Ltd (2013) conducted an Ecological Assessment of the approved KEQ Project Approval Area and adjoining lands (including Lots 12, 13 and 14 DP1024564) as part of the Environmental Assessment. Additional ecological surveys were also conducted by Eco Logical Australia (ELA) across Lots 12-14 and Lot 5 DP 838128 to inform the preparation of the Biodiversity Offset Strategy (ELA 2013) and EPBC Act Assessment Report (ELA 2014). Kleinfelder prepared a Flora and Fauna Impact Assessment for approved MOD 1 (27/10/2017) located in Lot 12 DP 1024564 and Kleinfelder also produced a Flora and Fauna Impact Assessment for approved MOD2 (11/09/2018) located in Lots 12 and 13 DP 1024564.

The most recent ecological study completed is the Biodiversity Development Assessment Report (BDAR) (05/05/2023) prepared by Kleinfelder that informed the most recent Modification Approval (MOD10).

The following sections provide a summary of the biodiversity values identified within the Project Disturbance Area and outline the potential biodiversity impacts of the development to be mitigated by measures detailed in this plan.

Vegetation

A total of four native vegetation communities were recorded and mapped within the Project Disturbance Area (RPS 2013, Kleinfelder 2017 and Kleinfelder 2023). ELA (2013) identified and mapped five biometric vegetation types in the Biodiversity Offset Area, with this being managed under the Biodiversity Offset Area Management Plan. The area of each vegetation community recorded in the approved Disturbance Boundary is provided in **Table 5**.

A summary of the structure and floristics of each vegetation type within the Disturbance Area is provided in **Table 5**, and the distribution of these vegetation communities are shown in **Figure 3**. None of the vegetation types recorded in the Project Disturbance Area is listed as threatened ecological communities under the NSW *Biodiversity Conservation Act 2016* (BC Act) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The construction and development of KEQ, including the MOD10 disturbance area, directly impacts 40.17 Ha of land. Of this, 35.33 Ha consists of native vegetation. The biodiversity offset area, which is to be managed under an updated Biodiversity Offset Area Management Plan (BOAMP), would protect, and enhance a minimum of 130.36 Ha of native vegetation.

Table 5 Vegetation Communities within the approved Disturbance Boundary.

Vegetation Community	Description		Approved Disturbance Area (Ha)
PCT 3433: Hunter Coast Foothills Spotted Gum – Ironbark Grassy Forest *(Equivalent to Spotted Gum-Grey Ironbark-Grey Gum-White Mahogany Moist Sclerophyll Forest)*	Remnant open forest, with a distinct sub-canopy and an understory, scattered shrubs and predominantly native perennial grasses and forbs. Dominant Species:		20.38
	Canopy:	Corymbia maculata (Spotted Gum), Eucalyptus paniculata subsp. paniculata (Grey Ironbark), Eucalyptus propinqua (Small-fruited Grey Gum), Eucalyptus acmenoides (White Mahogany).	
	Midstory:	Allocasuarina torulosa (Forest Oak).	
	Ground-cover:	Imperata cylindrica (Blady Grass), Themeda australis (Kangaroo Grass).	
PCT 3581: Hunter Coast Foothills Apple Forest *Equivalent to Smooth barked Apple-Red Bloodwood-Brown Stringybark Dry Sclerophyll Forest)*	Remnant open forest vegetation with a sparse sub-canopy. A distinct but variable shrub layer was present, sometimes moderately dense. The groundcover layer was generally dominated by native grass species. Dominant species:		14.24
	Canopy:	*Angophora costata* (Smooth-barked Apple), *Corymbia gummifera* (Red Bloodwood), *Eucalyptus piperita* (Sydney Peppermint).	
	Midstory:	*Allocasuarina littoralis* (Black She-oak).	
	Ground-cover:	*Imperata cylindrica* (Blady Grass), *Entolasia stricta* (Wiry Panic), *Themeda australis* (Kangaroo Grass).	
PCT 3248: Northern Blackbutt-Turpentine Shrub Forest *(Equivalent to Blackbutt-Turpentine-Tallowwood-Wet Sclerophyll Forest)*	Shrubby open forest of the coastal foothills of the central NSW North Coast Bioregion. Wet Sclerophyll Forest with groundcover dominated by grasses, ferns, and small shrubs. Dominant Species:		0.30
	Canopy:	*Syncarpia glomulifera* (Turpentine), *Eucalyptus pilularis* (Blackbutt) [occasional], *Eucalyptus acmenoides* (White Mahogany), *Eucalyptus microcorys* (Tallowwood), *Eucalyptus saligna* (Sydney Blue Gum).	
	Midstory:	*Allocasuarina torulosa* (Black She-oak), *Leptospermum polygalifolium* (Tantoon), *Breynia oblongifolia* (Coffee Bush), *Callistemon salignus* (Weeping Bottlebrush), *Melaleuca styphelioides* (Prickly-leaved Paperbark)	
	Ground-cover:	*Blechnum cartilagineum (Gristle Fern)* *Dianella caerulea (Blue Flax-lily)* *Lomandra longifolia (Spiny-headed Mat Rush)*	

Vegetation Community	Description		Approved Disturbance Area (Ha)
PCT 3086: Lower North Hinterland Riparian Dry Rainforest *(Equivalent to Grey Myrtle Dry Rainforest)*	Remnant closed forest with a dense canopy layer and emergents. Contains a sparse shrub layer and groundcover is predominately comprised of ferns, grasses and forbs. Dominant species:		0.40
	Canopy:	*Diospyros australis* (Black Plum), *Cryptocarya microneura* (Murrogun), *Backhousia myrtifolia* (Grey Myrtle).	
	Midstory:	*Ficus coronata* (Sandpaper Fig), *Eupomatia laurina* (Bolwarra).	
	Ground-cover:	I*mperata cylindrica* (Blady Grass), *Themeda australis* (Kangaroo Grass).	
Cleared Land	Highly disturbed, non-native community was recorded in the central portion of the subject site within an existing powerline easement, along vehicle access tracks and a small section of Yalimbah Creek. The community generally comprised a mosaic of exotic grasses and shrubs, 'garden plantings' and bare ground. Some scattered native trees and shrubs occur.		4.85
		TOTAL AREA (Ha):	**40.17**

Threatened Flora

A total of three threatened flora species listed as Vulnerable under both the NSW BC Act and the Commonwealth EPBC Act were recorded during surveys of the study area, including:

- *Tetratheca juncea* (Black-eyed Susan),
- *Grevillea parviflora subsp. parviflora* (small-flower grevillea), and
- *Asperula asthenes* (Trailing Woodruff).

A summary of the population sizes and habitats in which these species occur within the approved Disturbance Area and adjoining lands is provided in **Table 6**. The locations of these threatened flora species are provided in **Figure 3**.

Table 6 Recorded Threatened Flora Species.

Species	Habitat	Population Size
Tetratheca juncea	▪ PCT 3581: Hunter Coast Foothills Apple Forest (Smooth-barked Apple - Red Bloodwood open forest and Sydney Peppermint – Smooth barked Apple shrubby open forest); and ▪ PCT 3248: Northern Blackbutt – Turpentine Shrub Forest (Blackbutt - Turpentine - Tallowwood shrubby open forest).	▪ 7,163 clumps across the site. ▪ Of these, 2,358 clumps occur in the project disturbance area, and 4,805 occur in the offset area.
Grevillea parviflora subsp. parviflora	▪ PCT 3581: Hunter Coast Foothills Apple Forest (Smooth-barked Apple - Red Bloodwood open forest and Sydney Peppermint – Smooth barked Apple shrubby open forest).	▪ 242 stems recorded within the MOD10 Study Area. Additionally, at least 100 stems occur within Lot 14 (full population assessment not conducted). ▪ Of these, one stem occurred within the MOD10 disturbance area.

Species	Habitat	Population Size
Asperula asthenes	▪ PCT 3248: Northern Blackbutt – Turpentine Shrub Forest (Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal foothills of the central North Coast); and ▪ PCT 3433: Hunter Coast Foothills Spotted Gum – Ironbark Forest (Spotted Gum – Grey Ironbark open forest on the foothills).	▪ 60 individuals occurred within the project disturbance area. ▪ 399 individuals occur in the biodiversity offset area. ▪ 200+ individuals occur on Lot 12 outside the project disturbance area.

Threatened & Migratory Fauna

A total of 13 threatened fauna species listed as Vulnerable under the BC Act (two of which are listed as Vulnerable under the EPBC Act; Glossy-black Cockatoo and Grey-headed Flying-fox) have been recorded within the site, as listed in **Table 7**. An additional 15 threatened fauna species and four EPBC-listed migratory species were considered to potentially occur in the existing approved disturbance area.

The ecological assessments concluded that the project is unlikely to have a significant impact on local populations of threatened or migratory species provided appropriate mitigation measures are implemented.

Table 7 Recorded Threatened Fauna Species

Species	Common Name
Calyptorhynchus lathami	Glossy Black-Cockatoo
Daphoenositta chrysoptera	Varied Sittella
Falsistrellus tasmaniensis	Eastern Falsistrelle
Glossopsitta pusilla	Little Lorikeet
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat
Miniopterus australis	Little Bent-winged Bat
Miniopterus orianae oceanensis	Eastern Bent-winged Bat
Myotis macropus	Southern Myotis
Ninox strenua	Powerful Owl
Petaurus norfolcensis	Squirrel Glider
Pteropus poliocephalus	Grey-headed Flying-fox
Rhipidura rufifrons	Rufous Fantail
Vespadelus troughtoni	Eastern Cave Bat

The majority of the site consists of remnant native vegetation providing habitat for a range of fauna species. Key fauna habitat features present include multiple vegetation strata, hollow-bearing trees, flowering trees, fallen logs and timber, bush rock, and leaf litter; these resources offer sheltering, foraging, nesting and roosting habitat to a variety of fauna occurring within the locality.

The project, including the MOD10 disturbance area would directly impact 40.18 Ha of forested habitat. The biodiversity offset area would protect and enhance at total of a minimum of 130.36 Ha of forested fauna habitat. Management of this offset area is outlined by the **BOAMP**.

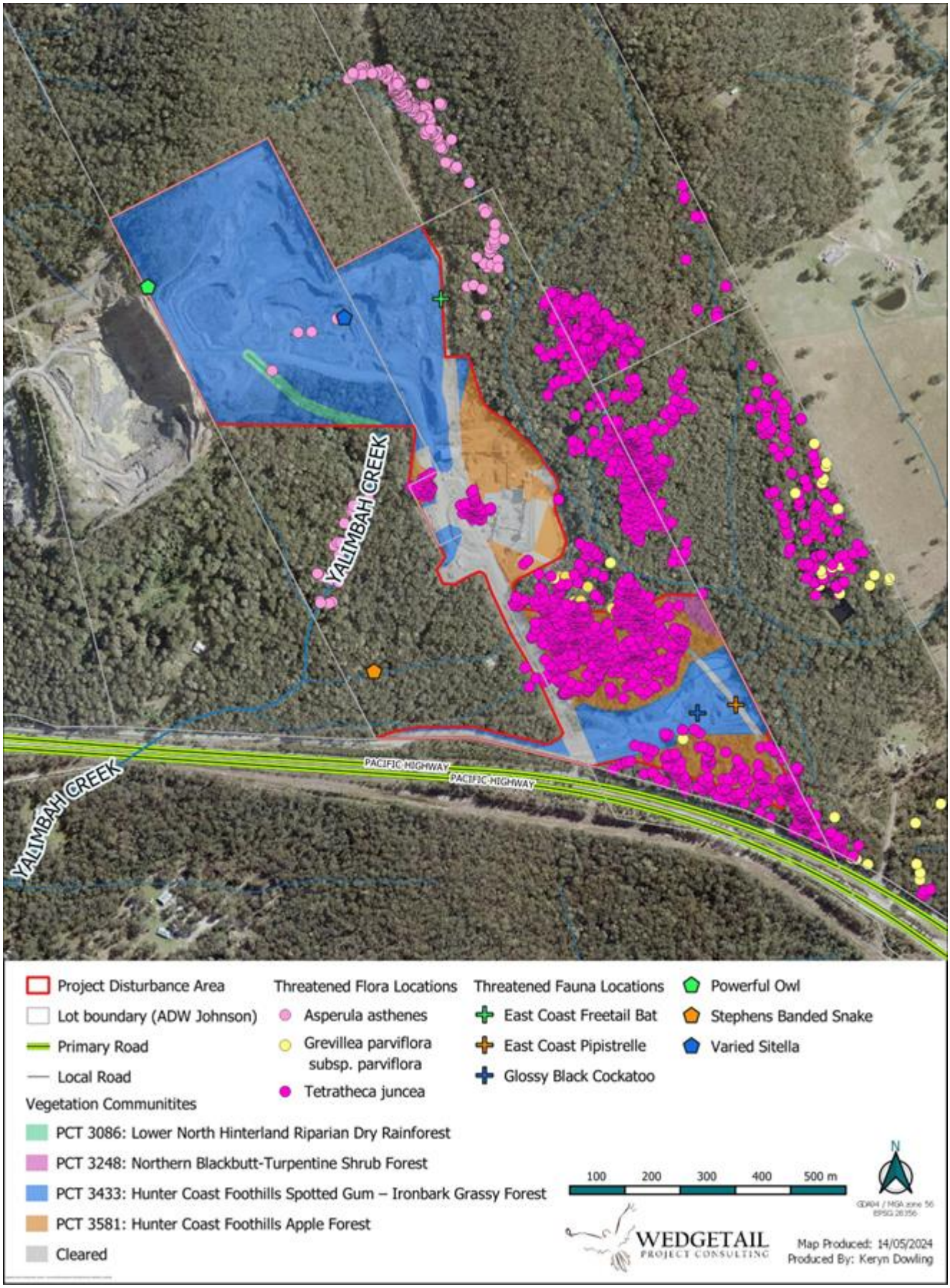


Figure 3 – Vegetation Types and Threatened Species Record (Wedgetail 2022)

Indirect Impacts

The site has the potential to have the following indirect impacts on retained and adjacent vegetation, threatened flora species and fauna habitats:

- habitat fragmentation;
- erosion and sedimentation;
- use of herbicides/pesticides;
- hydrocarbon/chemical spills;
- dust impacts;
- increased noise;
- increased light spill;
- weed invasion, transfer of pathogensand edge effects;
- downstream modification of hydrology;
- inadvertent disturbance of vegetation; and
- rubbish dumping and increased human activity.

Further, as a result of consideration of potential environmental impacts, improvements were made to the MOD10 throughout the design phases to minimise potential environmental impacts and to reduce potential impact on biodiversity values:

- Four significant design iterations have occurred prior to arriving at the proposed layout which has resulted in significant reduction in the impact on biodiversity values.
- Measures to protect threatened flora and fauna will be implemented, including the provision of compensatory biodiversity offsets to:
    - Replace the existing offset area being directly impacted by proposed MOD10 with like-for-like biodiversity values.
    - Offset the impact of MOD10.
    - Environmental Management / ongoing Monitoring will be required to ensure the mitigation measures continue to be effective and continuous improvement is promoted.

These indirect impacts will be prevented and/or mitigated through implementation of the management actions detailed in this plan.

Weeds

A total of twenty-four exotic species have been recorded within the site during the baseline surveys and subsequent annual monitoring of the Biodiversity Offset Area (BOA). Three of these species have specific control orders within the MidCoast Council control area under the Biosecurity Act 2015, as listed in **Table 8**. Lantana is also listed as a Weed of National Significance (WoNS).

Table 8 Exotic Species recorded in the study area during baseline surveys and annual monitoring.

Scientific Name	Common Name	MidCoast Council Control Area
Ageratina riparia	Creeping Crofton Weed	-
Anagallis arvensis	Scarlet Pimpernel	-
Andropogon virginicus	Whisky Grass	-
Asparagus aethiopicus	Ground Asparagus	Prohibition on dealings
Axonopus fissifolius	Narrow-leafed Carpet Grass	-
Bidens pilosa	Cobblers Pegs	-
Briza maxima	Quaking Grass	-
Chloris gayana	Rhodes Grass	-
Hypochaeris radicata	Catsear	-

Scientific Name	Common Name	MidCoast Council Control Area
Lantana camara	Lantana	Prohibition on dealings
Lolium perenne	Perennial Ryegrass	-
Melinis repens	Red Natal Grass	-
Paspalum dilatatum	Paspalum	-
Paspalum mandiocanum	Broadleaf Paspalum	-
Pennisetum clandestinum	Kikuyu	-
Plantago lanceolata	Lamb's Tongues	-
Senecio madagascariensis	Fireweed	Prohibition on dealings
Senna pendula var. glabrata	Cassia	-
Setaria sphacelata	South African Pigeon Grass	-
Solanum nigrum	Black-berry Nightshade	-
Stellaria media	Common Chickweed	-
Trifolium repens	White Clover	-
Tradescantia fluminensis	Wandering Jew	
Verbena bonariensis	Purpletop	-
Vulpia myuros	Rat's Tail Fescue	-

3.4 Baseline Rehabilitation Data

Baseline monitoring of the 18 monitoring locations was undertaken in 2016, annual monitoring has continued at the same time each year. All rehabilitation and ecological monitoring reports are included in the Annual Reviews.

4.0 Landscape and Rehabilitation Objectives

Landscape management objectives for the Karuah East Quarry site include the following:

- Protect and enhance the quality of remnant vegetation and fauna habitat to be retained within the site;
- Maximise the salvage of environmental resources within the approved disturbance area for beneficial reuse in the enhancement of the rehabilitation area;
- Minimise impacts on native fauna on site;
- Ensure minimal environmental consequences for threatened species and their habitats; and
- Minimise impacts on fauna movement between undisturbed areas of the site and nearby vegetation.

Schedule 3, Condition 30 of the Project Approval provide rehabilitation objectives for the Karuah East Quarry site as summarised by **Table 9.**

Table 9 Rehabilitation Objectives outlined by the Project Approval.

Feature	Objective
Site (as a whole)	Safe, stable & non-polluting.
Surface Infrastructure	To be decommissioned and removed, unless the Planning Secretary agrees otherwise.
Quarry Wall Benches	Landscaped and revegetated utilising native tree and understory 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 development	Restore ecosystem function, including maintaining or establishing self-sustaining eco-systems compromised of: ▪ Native endemic species; and ▪ A landform consistent with the surrounding environment.
Community	Ensure public safety. Minimise the adverse socio-economic effects associated with quarry closure.

Other key landscape and rehabilitation objectives include:

- Minimise the environmental impact of the operation during the development and operational phases, ensuring that protection of water quality and erosion control works are key priorities, and to ensure progressive rehabilitation is completed as soon as possible.
- Ensuring operations do not have a negative impact on remnant vegetation. This includes only disturbing within the approved footprint and managing weeds and feral animals in the adjacent remnant areas.
- Ensure that site drainage and sedimentation structures remain stable and functional; and maintain sufficient quality of surface runoff at all times.
- Ensure that vegetative matter and topsoil is made available for the site rehabilitation as required.
- Undertake rehabilitation in a manner consistent with that of the existing adjacent quarry.
- Produce a final landform that is geotechnically stable that blends aesthetically into the surrounding landforms, yet as far as possible does not limit possible future land uses.
- Minimise visual impact of the operation during the operational phase as well as post-quarrying.

5.0 Landscape and Biodiversity Management

The landscape and biodiversity management program provided in the following section only applies to the approved Disturbance Area and associated perimeter lands not located within the defined BOA. Management of the BOA is addressed by the Biodiversity Offset Area Management Plan as required under Schedule 3, Condition 33 of the Project Approval.

5.1 General Management Measures

Inductions

All persons must undergo a site-specific induction before entering the site. Induction material relating to landscape and biodiversity management is to be delivered as part of all site inductions, and will be prepared by a suitably qualified staff member, and will include the following:

- All staff and contractors entering the site will be made aware of environmentally sensitive habitats and surrounding vegetation at the site, including threatened species.
- All site personnel will be made aware of vegetation clearing limits, signed 'no-go areas' and their purpose (i.e., protection of vegetation, fauna habitat and threatened species), and that access to any areas outside the project disturbance area is restricted to authorised persons only.
- All clearing contractors will be informed of clearing protocols outlined in this plan, including those relating hollow-bearing tree removal, resource salvage, and threatened species protection.
- Staff and contractors will be made aware of the possibility of encountering koalas during work activities. All staff and contractors will be made aware of the identified koala habitat within and adjacent to the site, the locations of potential koala movement on the site, and the potential risk of koala vehicle strike. This will be achieved through the site induction.
- Staff and contractors will be made aware of noxious weeds present on the site and procedures to reduce weed spread will be detailed.
- Domestic fauna, such as dogs, will be prohibited from entering the subject site with staff or contractors.

Control of Site Access

- Only authorised personnel are allowed to enter the site. All contractors must undergo a site induction prior to entering/working on the site.
- Road access into KEQ is via the internal access road that adjoins Blue Rock Close on the southern end of Lot 12.
- Unauthorised access outside the project disturbance areas is prevented through the installation of permanent fencing around the perimeter of the project disturbance area, as far as reasonably practicable, and locked gates at all access points. Any vegetation to be retained within the project disturbance area will be delineated and protected through installation of temporary fencing as outlined by **Section 5.2**. Monitoring and maintenance of boundary fencing, and gates will occur during regular inspections of the site.

Fauna Fencing

Permanent chain wire metal exclusion fencing has been installed around the entire perimeter of the quarry footprint, as far as reasonably practicable. The permanent perimeter fencing will be installed to the following specifications, as illustrated by **Figure 4**:

- The fencing would be constructed from chain wire metal fencing. The top of the fence will not have sharp edges to avoid injury to wildlife (i.e. gliders).
- 'No-Go Area' (or similar) signs will be installed approximately every 100 m along the perimeter fencing such that they are visible to staff and contractors working onsite; and,
- The fencing has incorporated two 'drop-out' ramps (two on either side of the fencing at the aerial fauna crossing location along the new haul road). These ramps will deter animals from entering the site but will allow any trapped fauna to self-relocate from the project disturbance area.

Aerial Fauna Crossing

The existing fauna crossing of the haul road will be maintained throughout the life of the KEQ, as illustrated by **Figure 4**.

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. Data will be collected from the cameras periodically, and the results will be presented in the annual monitoring report. The monitoring will be used to evaluate the effectiveness of the crossings and to inform any modifications or improvements to the crossings.

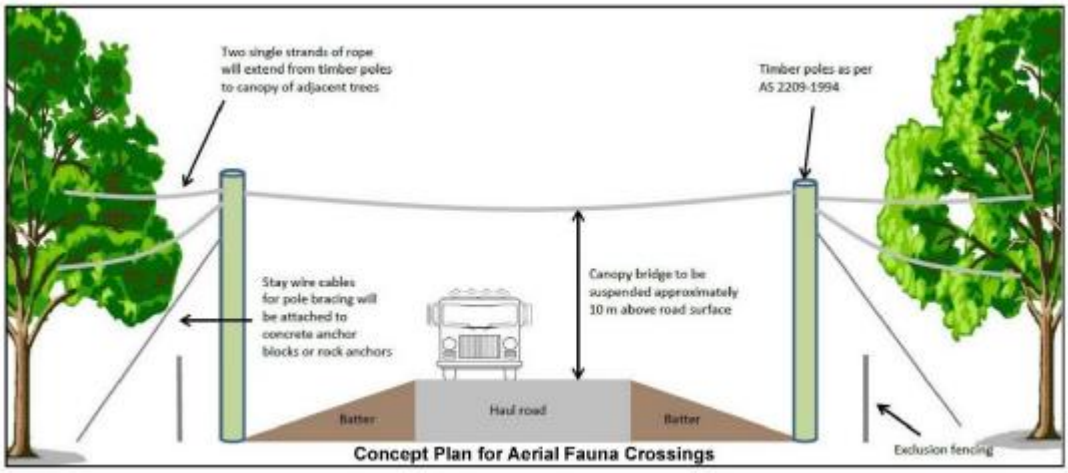


Figure 4 Schematic of Aerial Fauna Crossing and Perimeter Fencing.

5.2 Pre-Clearing Survey Protocol

Protection of Vegetation and Threatened Flora

- Permanent chain wire metal exclusion fencing will be installed around the entire perimeter of the quarry footprint prior to clearing, to the following specifications:
    - The fencing will be constructed from chain wire metal fencing. The top of the fence will not have sharp edges to avoid injury to wildlife (i.e. gliders);
    - 'No-Go Area' (or similar) signs will be installed approximately every 100 m along the perimeter fencing such that they are visible to staff and contractors working onsite;
    - The fencing will incorporate two 'drop-out' ramps (two on either side of the fencing at the aerial fauna crossing location along the new haul road). These ramps will deter animals from entering the site but will allow any trapped fauna to self-relocate from the project disturbance area; and
    - All machinery and vehicles are to be clean on entry of the site (i.e. free of soil, seeds or plant material) to reduce the potential for introduction or spread of invasive weeds and fungal pathogens.

Fauna Surveys

- Approximately one week prior to any vegetation clearing, a survey of habitat trees will be conducted in the planned clearing area by a suitably qualified ecologist.
- Habitat trees (containing hollows or nests) will be clearly marked using flagging tape or spray paint. The location of each habitat tree will also be recorded using a hand-held GPS, and a map showing these will be produced for each planned cleared area and provided to the supervising ecologist and clearing contractor.
- The fencing is to be designed not to allow fauna into the site, including fauna that lives on the ground and in trees.
- Targeted Surveys for koalas: Within 48 hours prior to vegetation clearing, pre-clearing surveys must be undertaken by a suitably qualified ecologist to ensure the absence of koalas within each planned clearing area. Any trees identified as containing koalas will be clearly marked to indicate occupation so that this can be communicated to the tree felling operator and ecologist supervising their removal; and
- If any koalas are found to be present within a planned clearing area during the pre-clearing surveys, the relevant steps detailed in **Section 5.3** must be followed.

Weed Management

- During pre-clearing surveys, areas of major weed infestation (including noxious invasive species listed in Section 3.3) will be delineated with flagging tape to allow for separate stockpiling of this soil and vegetative material. This will reduce the spread and establishment of weed infestations in rehabilitated areas post construction.

Project Timing

Where possible, vegetation clearing will be timed to avoid the following breeding periods for hollow-dependent fauna:

- October – February (microbats); and
- June – August (large forest owls; microbats in torpor).

If clearing is to occur within these periods, the additional pre-clearing surveys will be undertaken for each planned clearing area:

- Within one week prior to vegetation clearing, searches for signs of threatened fauna species will be undertaken, including (but not limited to) searches for signs of roosting or nesting threatened raptors and forest owl species (i.e. Powerful Owl and Masked Owl) such as whitewash and owl pellets (regurgitated hair and bone).
- Within one week prior to vegetation clearing, stag watching and spotlighting of habitat trees will be conducted over a two-night period to determine whether any of the hollows are in use by fauna. In particular, these surveys will be undertaken to identify potential microchiropteran bat roost trees.
- If the above surveys identify any nesting or potentially roosting threatened species within the planned clearing area during their respective breeding period, no clearing will be undertaken within 50 m of the occupied tree(s) until the nest/roost sites are vacated or until after the breeding season is completed. Monitoring would be required to determine if fledglings or juveniles have vacated the nests or hollows through stag watching and/or physical inspection of the nests/ hollows.
- Within one week prior to vegetation clearing, Elliot trapping will be undertaken over a four-night period, targeting the Brush-tailed Phascogale (Phascogale tapoatafa) and Squirrel Glider (Petaurus norfolcensis).

Any fauna captured during the pre-clearing trapping will be relocated to a suitable location within the biodiversity offset area. The following trapping effort will be conducted:

- For staged clearing, a trapping effort of eight arboreal Elliot trap nights per hectare and 16 terrestrial Elliot trap nights per hectare shall be applied to each planned clearing area.
- Any trees identified as containing fauna (including threatened species) during the pre-clearing surveys will be clearly marked to indicate occupation so that this can be communicated to the clearing contractor and supervising ecologist.

5.3 Vegetation Clearing Works Protocol

Clearing Protocol and Salvage of Resources

- A fully qualified and experienced ecologist will supervise the felling of habitat trees that were identified during the pre-clearing surveys. Refer to below for habitat tree removal methodology.
- Prior to the commencement of vegetation clearing, an allocated vet will be notified of the possibility of receiving injured animals.
- Clearing will be undertaken predominantly by bulldozer and excavator and will be conducted in conjunction with topsoil removal.

- Vegetation will be cleared in a way that maintains habitat linkages and allows fauna living in or near the clearing site to move safely from the site to adjacent areas without additional human intervention.
    - Clearing will occur towards connecting vegetation.
    - The direction of clearing will ensure that fauna are directed away from threats such as roads and developed or disturbed areas (i.e. existing quarry to the west).
    - Sequential clearing will not create an 'island' of habitat that is isolated from adjoining habitat by roads or cleared and disturbed areas.
- Ideally, no clearing will occur during the early evening or at night (i.e. when most fauna species are active and likely to be on the move and are more vulnerable to injury).
- Trees shall be felled away from retained vegetation towards cleared areas.
- Where possible, the vegetation to be cleared will be mulched on site with the exception of hollows, logs and large limbs that will be salvaged and incorporated into the rehabilitation or offset areas as fauna habitat.
- Native seed or plant material suitable for brush matting will be collected prior to or during clearing of the project disturbance area, stored, and spread over rehabilitation areas and/or utilised within the offset areas requiring revegetation. Refer to the **BOAMP** for further details.
- Hollow logs and other large organic debris cleared from the project disturbance area will be stockpiled and either spread on rehabilitated areas immediately after re-distribution of topsoil or reinstated within the adjacent offset area. Logs and large debris will only be salvaged and redistributed into the adjoining offset area where the transfer process will have minimal disturbance to the recipient area (i.e. placed along the project disturbance area/offset area boundary, and where there are no threatened flora species present in the recipient area).
- Hollows will be salvaged from felled habitat trees by cutting at least 100 mm beyond the deepest point of the hollow and then stored in a dry safe place or transported directly to the offset areas for installation.
- Procedures for salvage and stockpiling of topsoil (including the native soil seedbank) are detailed in **Section 8.0**.

Protection of Threatened Fauna

The KEQ site contains and/or adjoins known or potential habitat for a number of threatened fauna species as detailed in **Section 3.3**. The following measures will be implemented to minimise impacts to these species during vegetation clearing:

- During pre-clearing surveys, active searches for koalas will be conducted and any trees containing Koalas will be marked (as described in **Section 5.2**). If prior to clearing commencing the koala(s) have not self-relocated from the planned clearing area the following procedure will be followed:
    - A 30 m exclusion zone around occupied trees will be maintained during clearing. In-order to encourage self-relocation all other surrounding vegetation, apart from that within 30 m of the occupied tree, will be cleared. No vegetation will be felled onto the occupied tree and vegetation links to adjacent retained vegetation will be maintained.

- The occupied tree (and vegetation within the 30 m exclusion zone) will be left standing for a minimum of two nights to encourage self-relocation to vegetation outside the project disturbance area.
- If after this period the koala(s) have not self-relocated, they may be retrieved from the tree by a suitably qualified ecologist prior to felling and relocated to a safe location within the adjacent biodiversity offset area. If it is not considered safe or practical to retrieve the koala(s) from the tree, the occupied tree will be left standing until self-relocation occurs.
- Should injury to Koalas occur during clearing, advice from a wildlife expert (i.e. veterinarian) must be sought and action taken in accordance with that advice. Records of any Koala injury within the site must be documented and maintained.

- Where possible vegetation clearing will be timed to avoid breeding periods for hollow-dependent fauna (October-February and June-August).
- The habitat tree removal protocol below will serve to mitigate impacts on other threatened fauna species (Microchiropteran bats, birds, and arboreal mammals) that may potentially occur within the approved disturbance area.

Habitat Tree Removal Protocol

- Hollow-bearing trees identified during the pre-clearing surveys will be left standing for two nights after the surrounding vegetation has been cleared to encourage any native fauna species utilising the habitat hollows to self-relocate.
- The felling of all habitat trees will be attended by a suitably qualified and experienced ecologist in order to ensure the safety of any fauna found to be in the hollows.
- On all occasions, trees having potential habitat hollows or nests will be 'soft felled' by an experienced machine operator. The recommended soft felling procedure is as follows:
  - The hollow-bearing tree is given several moderate nudges with an excavator to give a warning to any occupying native fauna.
  - The hollow-bearing tree is then carefully watched, and any native fauna present is given an opportunity to self-relocate before the tree is felled.
  - The hollow-bearing tree is soft felled with the rate of the trees fall controlled by the machinery operator to minimise impact.
  - All hollows will be inspected for native fauna species and if any are found, the animal will be relocated at an appropriate time of day (i.e. dusk for nocturnal species). If the animal is injured, it will be taken to a local veterinarian.
- The number of hollows present within each habitat tree will be counted and recorded once the tree has been felled. Unless the hollows are salvaged and erected within the offset area, a nest box will be installed for each hollow lost (1:1 ratio) within the offset areas in accordance with the Nest Box Installation and Monitoring Protocol detailed in the **BOAMP**.

Fauna Displacement & Relocation Protocol

Displacement of fauna will occur as part of the clearing process. The following protocol will be followed to ensure minimal impacts to native fauna during clearing:

- Any fauna fleeing the clearing area will be directed to a safe area outside the project disturbance area or captured and relocated if necessary.
- All fauna are to be handled in such a way as to prevent injury to the animal or the handler.
- Once the animal has been safely captured, it will be relocated or caged in a hessian bag or box and released at an appropriate time of day.
- All fauna that are captured during the clearing operations that are uninjured will be relocated to a safe and appropriate location within the adjacent biodiversity offset area on the same day as capture.
- Any microbats or other nocturnal species captured during the tree removal process will be held in cotton or hessian bags and released at dusk.
- If any animal is injured during the vegetation clearing works, a veterinarian will be contacted immediately for professional advice on the best course of action.
- If any native animal is injured during other construction or operational processes while an ecologist, environmental representative or animal handler is not present, they must be contacted immediately. The procedure and relevant contacts for wildlife injuries will be communicated to all staff during the site induction.

Vehicle Collision with Fauna

- A maximum speed limit of 30 km/h will be signposted (10 km/h in plant/processing areas) and adhered to in the vicinity of potential fauna, and in crossing areas.
- This limit should be communicated in site inductions.

Noise, Light, Vibration, Waste and Air Pollution Impacts

- Apart from lighting within the proposed administration building, no permanent lighting infrastructure is proposed to be installed within the MOD10 footprint during construction or operation.
- Temporary mobile lighting equipment may be used, on occasion within the approved daily operation hours of the quarry which is between 5am – 9pm Mon-Fri (and 10 pm on 50 occasions per year) and 6am to 6pm Saturday.

Weed Management

- All invasive or environmental weed infestations will be delineated with flagging tape during the pre-clearing surveys as outlined by **Section 5.2**. All topsoil and vegetative material (excluding large trees and logs that can be salvaged) from within these delineated areas shall be either:
    - Immediately transported offsite and disposed of to a licenced landfill facility; or
    - Processed and stockpiled separately onsite. Separate stockpiling and storage will aim to prevent contamination and subsequent spread of weed propagules in topsoil or mulch to be used in rehabilitation areas within the project disturbance area and/or areas requiring revegetation in the biodiversity offset area. These separate stockpiles must be clearly signed as 'weed contaminated' to avoid mixing of clean and weed contaminated materials.
- Stockpiled topsoil, mulch and other vegetative material will be routinely inspected for weed regrowth during the construction and operation phases. Any weed outbreaks will be treated through manual and/or chemical control methods as outlined by **Section 5.4**.
- Weed and pest management will be undertaken within KEQ to minimise habitat degradation, encourage growth of native species, and protect native fauna within retained vegetation and rehabilitation areas through the following process:
    - Weed control will generally be undertaken using a combination of manual removal and targeted chemical application using an appropriate herbicide. Chemical methods will only be used for larger weed outbreaks and/or where there is negligible risk for indirect impacts on native vegetation.
    - Any vertebrate pest control will be conducted in accordance with Humane Pest Animal Control: Codes of Practice (DPI 2014).
    - If pest control is required, it would generally involve a routine (six monthly) baiting program. Other control methods such as shooting or trapping can also be used if deemed necessary or appropriate with advice from DPE or the Local Land Service.
    - Weeds will be monitored within areas of remnant vegetation within the Project Approval. Weed management programs will focus on disturbed areas, areas of rehabilitation and areas adjacent to the Project Approval area (remnant areas).
    - All weed and pest control works will be undertaken by a suitably qualified contractor.
    - Appropriate wash down facilities will be available to clean vehicles and equipment prior to arrival on-site and prior to departure.
    - Weed infestations within the construction footprint are to be identified and mapped prior to construction.

Reporting

The following records will be maintained by the supervising ecologist(s) for each planned clearing area:

- Methods and results of pre-clearing surveys, including fauna surveys, habitat tree marking, and weed mapping.
- Dates and person hours spent undertaking clearing supervision.
- Area of vegetation cleared each day.
- Number of hollow-bearing trees, including number and size class of hollows removed each day.
- Number/quantity of hollows, logs or other habitat features salvaged for reuse.
- Number, species, and release location of any fauna that required relocating.
- Any fauna injuries or deaths.
- All other incidental fauna observations during clearing.

5.4 Post-Clearing Management Measures

A number of measures will be implemented post-clearing, including:

- Maintenance of fauna crossings as outlined by **Section 5.1**;
- Completion of seed collection and propagation as outlined by **Section 8.3** and the **BOAMP**;
- Weed and pest management as outlined by **Section 8.0** and the **BOAMP**;
- Implementation of speed limits and vehicle parking restrictions as outlined by the **Transport Management Plan (TMP)**;
- Implementation of ESC measures as outlined by the **Water Management Plan (WMP);**
- Implementation of environmental management measures as outlined by the **Environmental Management Strategy (EMS)**;
- Implementation of bushfire risk reduction measures as outlined by the **EMS** and **BOAMP**.

5.5 Management Access Trails

Upon completion of quarry operations with particular quarry domains, management access trails will be provided for as part of the site preparation process and topsoil spreading process.

These roadways will be constructed wherever possible along existing haul roads and quarry access tracks to minimise the required earthworks. Drainage infrastructure, such as culverts, and erosion control measures will be implemented to ensure long-term stability and minimise required maintenance.

5.6 Bushfire Management Strategy

Upon commencement of revegetation activities, the Bushfire Management Strategy for the adjacent Biodiversity Offset Area will be reviewed and applied to the rehabilitation works completed to-date to ensure any proposed bushfire activities assists with achieving the relevant closure objectives and rehabilitation criteria.

However, at this stage of the quarry life, no bushfire management activities will be undertaken for the foreseeable future (i.e. beyond the current works period as outlined by **Section 15.2**).

6.0 Decommissioning and Demolition

6.1 Site Audit

Prior to closure, KEQPL will undertake an audit of all remaining structures and infrastructure items remaining at the site.

This audit will include:

- Type, location and extent of underground services such as conduits, cables and pipe work;
- Type, location, and extent of overhead services and structures such as power cables, the plant, light poles and/or pipe work;
- Type, location and condition of all tanks and vessels (with emphasis on remaining combustible materials and methods required for their removal);
- Presence of contaminated and hazardous materials and the classification and disposal of these materials;
- General condition of adjacent structures;
- Any infrastructure to remain (including roads and tracks) following decommissioning; and
- Feasibility of removal of site infrastructure and services.

This audit will also include a preliminary investigation into potential sources of contamination including additional Phase 1 sampling and analysis. This will be used to determine whether a detailed assessment, such as Phase 2 sampling and analysis, is required to quantify the amount of any contaminated material that may require remediation.

All identified sources of contamination will be remediated during the operational phase of the site where practical. In some cases, this may not be possible and in these circumstances the remediation will be undertaken following closure and during the decommissioning phase.

6.2 Removal of Site Infrastructure and Services

Once operations have ceased across the site all buildings and infrastructure will be removed from site, unless adaptive re-use projects are identified and endorsed by the Planning Secretary in accordance with Schedule 3, Condition 30 of the Project Approval.

The hierarchy of waste management will be applied to all remaining structures and infrastructure, including:

- Opportunities for the sale and re-use of assets;
- Recycling of scrap steel and waste concrete at licenced resource recovery facilities;
- Disposal of non-contaminated waste material at the licenced waste management facility.

Concrete footings and in-ground services will be removed to at least 500 mm below the finished ground surface, as far as reasonably practicable.

7.0 Minimising Socio-Economic Effects of Closure

Consideration of social impacts will be undertaken by KEQPL as part of a detailed quarry closure plan at least three years prior to the planned closure date. Key issues that will be considered include:

- A detailed assessment of KEQPL's contributions and expenditure within the community and local area; the location of staff residences; and local businesses and suppliers that are likely to be affected. The purpose of this task is to determine how dependent the local community is upon the operations of KEQ.
- The level of dependence of the employees upon the local community and infrastructure, for example, whether their children attend local schools.
- The proportion of sales by local businesses and suppliers that is from KEQ.
- Potential impacts on local services, such as schools and health facilities, as a result of quarry closure and possible relocation of staff.
- The views of the community and stakeholders on the closure options.
- Identification of potential industries that will see future growth and thus, provide possible employment for staff upon closure.

KEQPL will consider results of this exercise to investigate whether there is potential to minimise the impacts of quarry closure upon employees and the local community.

8.0 Rehabilitation Management

A staged approach to site rehabilitation will be utilised to ensure revegetation works have been progressively implemented, where practicable to do so, over the life of the quarry. The works, include:

- On-going measures, including regular reviews of the landform design incorporating adaptive management measures following rehabilitation monitoring results and integration with the rehabilitation works at the neighbouring Karuah Hard Rock Quarry (KHRQ) as outlined by **Section 8.1**.
- Short-term rehabilitation measures to temporarily stablise areas, including benches, steep batters or bunds and may include hydromulching and/or straw mulching as outlined by **Section 8.2**.
- Medium to long-term measures to develop the final landform and associated secondary revegetation works following the implementation of short-term measures, such as top soil management and spreading earthworks and deep ripping site preparation as outlined by **Section 8.3**; on-going management and rehabilitation of existing sedimentation dams as outlined by **Section 8.5**; and seed selection and application methodologies as outlined by **Section 8.6**.

8.1 Landform Design and Planning

The topography of the final landform will consist of a large number of stepped benches formed in an amphitheatre configuration, each with a revegetated bench similar to that photographed by **Figure 5**. The final landform layout is provided by **Figure 6**.

The area currently supports an open eucalyptus woodland forest. The broad rehabilitation objective for the post-quarry landform is to establish a similar land use on the disturbed areas, with the exception of the final void.

The void will be some approximately 3 Ha in area. Until such time that extraction has ceased, rehabilitation will occur around the perimeter of the pit only along the benches and will not involve the pit floor. The primary purpose of rehabilitation during the operational phase is to mitigate any visual impacts.

An integrated and coordinated rehabilitation approach will be undertaken to ensure consistency with regards to rehabilitation of the KEQ site and the adjacent KHRQ site. The selection of similar and consistent species and timing of rehabilitation will be coordinated such that revegetation works will provide habitat value over a wider geographical area inclusive of both quarry sites.

The Rehabilitation and Closure Plan for the KHRQ notes that the area surrounding the quarry consists of native forest vegetation and proposes to re-establish a similar cover to the majority of the post-quarrying landform. The revegetation program of this quarry will therefore involve the re-establishment of native forest/shrub/groundcover on the stabilised benched areas of the quarry. This same approach will be applied to revegetation of the post-quarrying landform at the KEQ site.

8.2 Progressive Rehabilitation

Disturbed areas which are not available for final rehabilitation will be temporarily rehabilitated. Additional erosion control measures such as the application of hydromulch will be considered, particularly in drainage lines and areas of temporary rehabilitation. Sugar cane (or other) mulch as slurry provides cover for the soil to improve pasture growth and/or modifying the soil surface to control erosion. The mulch also has the effect of protecting the soil surface against raindrop impact, improving the micro-environment for seed, reducing evaporation losses and assisting in the control of surface erosion caused by overland water flow.

Where benches are not required for future operations (i.e. access or quarrying) then KEQ will rehabilitate the benches where safely possible. Disturbed areas which are no longer required for operational purposes will be progressively rehabilitated.

Opportunities for the use of potential soil ameliorants to accelerate the revegetation process will also be considered.

Figure 5 Example of Bench Rehabilitation.

8.3 Soil and Vegetation Management

Topsoil stripping within the disturbed area will be undertaken when the soil is in a slightly moist condition to reducing damage to soil structure. Where possible stripped material will be placed directly onto the disturbed areas and spread immediately if excavation sequences, equipment scheduling and weather conditions permit.

A maximum stockpile height of 3 m will be maintained to preserve viability and reduce soil deterioration. 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.

Where the stockpile is not wholly contained within the "closed loop" water management system, temporary sediment control measures such as sand bags, hay bales, and silt fences will be used to prevent sediment from leaving the disturbed areas.

Topsoil will be re-spread in the reverse sequence to its removal, so that the organic layer, containing any seed or vegetation, is returned to the surface. Topsoil will be spread to a minimum depth of 50 mm on 3:1 or steeper slopes and to a minimum depth of 150 mm on flatter slopes. Re-spread topsoil will be levelled to achieve an even surface, avoiding a compacted or an over-smooth finish.

When topsoil is to be used for rehabilitation programs, soil testing will be undertaken to determine the quality of the soil for rehabilitation. The results will be used to determine specific ameliorant techniques that will be applied to the soil material in order for rehabilitation to be sustainable. Ameliorants may include gypsum, lime, fertiliser and biosolids. The use of soil ameliorants is designed to balance pH, prevent surface crusting, increase moisture and organic content, and buffer surface temperatures to improve germination.

Site Preparation

Thorough site preparation will be undertaken to ensure rapid establishment and growth of seedlings. All areas proposed for seeding will be deep ripped to an approximate depth of 400 – 500 mm. In areas of constant heavy vehicle use, further ripping may be required during the landform establishment phase.

Where ripping on slopes is required, the ripping will be undertaken around the contour of the land at right angles to water flow. Benches will be deep ripped to actively promote infiltration of water which will enhance soil moisture requirements for direct tree seeding and minimise surface runoff to underlying benches and the pit floor dirty water control system. Revegetation will also visually screen disturbed areas and will re-establish habitat for native fauna.

Rehabilitation of the Adjacent Karuah Hard Rock Quarry Site

Due to limited available material and soil at the KHRQ site for final rehabilitation, overburden material and soil will be imported from the KEQ site, to assist in landform shaping of the highwall/benches.

Side-casting of material over the KHRQ face of the residual highwall between the two quarry sites was completed in 2020. It is expected further side casting of material over remaining benches will progress as final bench positions are reached and suitable material becomes available at KEQ. Material will continue to be transported by haul trucks using internal roadways directly between the two sites.

8.4 *Tetratheca juncea* Translocation Plan

A *Tetratheca juncea* Translocation Program (TjTP) was prepared for the project with all Tetratheca juncea clumps within the original disturbance footprint being translocated to the recipient site within the biodiversity offset area prior to the commencement of clearing.

The TjTP ceased in 2020 with results being published in the relevant Annual Reviews.

The site of the TjTP is located wholly within a small enclave within the southern portion of Lot 14, that has been revegetated and now contains an established and continuous canopy within adjacent areas of the Biodiversity Offset Area. As such, the site is considered to now be integrated with the site and no further measures are considered necessary.

8.5 Water Management and ESC Measures for Rehabilitation Areas

The following principles will be used for Erosion and Sediment Control (ESC) on site throughout the operation and during rehabilitation as outlined by the **Water Management Plan**.

Key ESC measures at site in rehabilitation areas include:

- drainage channels;
- Contour banks;
- sediment basins; and
- sediment fencing.

Rehabilitated activities will be undertaken within the dirty water catchment, with water draining from rehabilitated areas to sediment dams on site.

8.6 Species Selection

The **BOAMP** outlines the potential for seed collection and propagation from the BOA. Where seed cannot be propagated from the adjoining offset area or only a small area of rehabilitation is required, a seed mix containing locally endemic species will be purchased from a local seed supplier.

Direct seeding (via broadcasting) is preferred over tube stock planting as it enables a far greater success rate, limits the need for ongoing maintenance (e.g., watering) and is the most effective method in achieving a successful rehabilitation outcome. Notwithstanding this, tube stock will be utilised in landscape planting around the site if required. Not all native trees and shrubs are suited to direct seeding due to their innate germination requirements, therefore, it will be required to supplement with some tubestock to increase biodiversity.

Native open woodland currently occurs over most of the KEQ site. It is proposed to re-establish a similar cover to the majority of the post-quarrying landform (excluding the void). Native vegetation will largely be established using direct seeding and from the seed store within re-spread topsoil. Supplementary native pasture and/or tubestock seeding will be undertaken where specific species combinations are required.

Final rehabilitation of the site will be undertaken once extraction is complete.

A mixture of native trees and shrubs endemic to the area will be sown onto the majority of the reshaped and benched pit areas following topdressing and site preparation. This tree and shrub seed will complement natural regeneration from seed contained within the soil seed bank. The seed mix used for revegetation of the disturbed quarry area will include many of the major tree and shrub species shown in **Table 10**. This species list is consistent with the recommended species for rehabilitation presented in the Rehabilitation and Closure Plan for the adjacent KHRQ site.

Table 10 Recommended Species Mix for Quarry Rehabilitation.

Genus	Species	Seeding Rate (kg/Ha)
Acacia	*falcate*	0.4
	longifolia	0.6
	terminalis	0.4
	irrorata	0.3
	decurrens	0.4
Eucalyptus	*globoidea*	0.4
	resinifera	0.2
	paniculata	0.4
	tereticornis	0.6
	punctata/propinqua	0.5
	moluccana	0.5
	crebra	0.3
Angophora	*costata*	0.1
Allocasuria	*torulosa*	0.1
Corymbia	*macultata*	0.8
	gummifera	0.3
	Total	**6.3**

The seed(s) will be sourced from reputable seed supply agents or collected and propagated as per the **BOAMP**. Some native species have difficult dormancy mechanisms that need to be broken before germination can occur. Native seed for revegetation of the quarry will be appropriately pre-treated in order to break dormancy restrictions. Subject to sufficient follow up rain, high initial tree densities can be expected. These high densities will quickly help stabilise and screen the site and will result in healthy mature tree stands over time. It is intended to create, over time, a mosaic of variable native species and plant densities representative of that currently occurring in the area. Growth rates of between 1 and 2 m/year can be initially expected for many of the more dominant trees and shrubs.

The correct treatment and application of seed in the appropriate ratios is important in controlling emerging weeds and in allowing the tree stand to develop in a positive direction. The native tree and shrub seed mix will be sown at a total combined rate of approximately 6.3 kg/Ha. Seed will be broadcast evenly onto top-dressed areas. Care will be taken to ensure it will not be buried. Seeding will be conducted in late spring, summer and early autumn giving superior results due to higher ground temperatures.

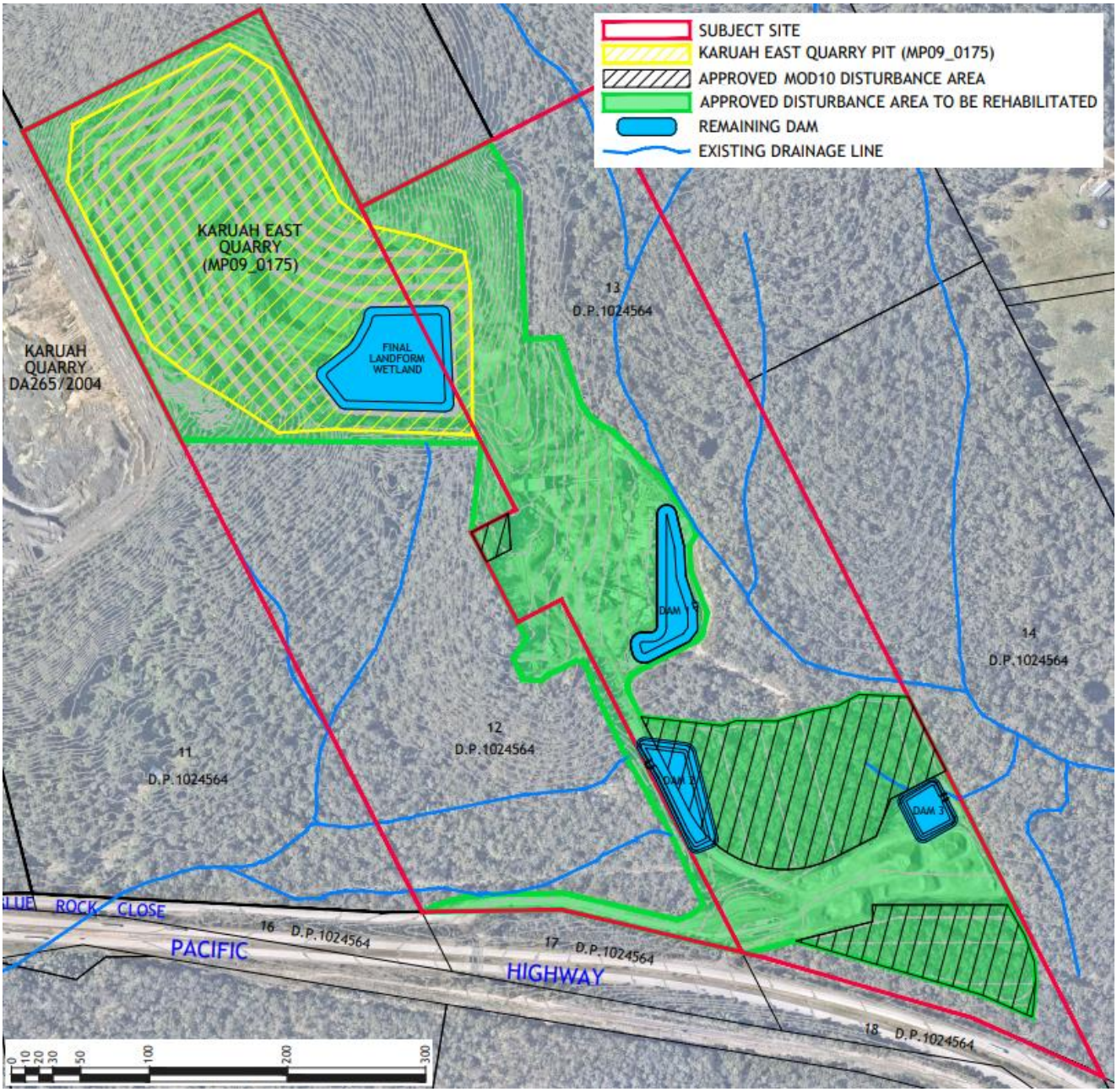


Figure 6 Final Rehabilitation of KEQ

9.0 Rehabilitation and Closure Domains

9.1 Domain 1 – Undisturbed Woodland

A large section of the site area will continue to be managed as remnant woodland when the site is fully operational. Operations at the site will be managed to ensure the remnant woodland is not impacted. Exclusion fencing will be established to reduce access to remnant vegetation.

9.2 Domain 2 – Haul Road and Site Access Road

The site access road is the main route, where rock is hauled from the stockpile area to offsite for sale. This is an extension of the existing Blue Rock Close. A haul road has been constructed from the intersection of the site access road to the top of the pit. Other smaller access roads have also been constructed around the quarry.

It is envisaged that the site access road and main haul road will remain post closure as they will be used for firefighting access. Rehabilitation will be completed to smaller access roads and the batters of the main haul road and site access road.

9.3 Domain 3 – Plant Area and Stockpiles

At closure this area will not be required for post quarrying. All product in the stockpile area will be hauled offsite for sale. The plant area will be decommissioned and removed from site at closure. Plant and machinery will be sold or recycled at closure. Once all plant and stockpiles have been removed, the area will be shaped and rehabilitated with a woodland seed mix.

9.4 Domain 4 – Quarry Pit and Emplacement Areas

Areas around the quarry pit (including overburden) will be shaped, topsoiled and rehabilitated using a woodland seed mix. A section of the quarry pit will remain as the final void.

The potential options for the management of the final void are listed below, subject to final feasibility studies:

- water storage;
- wetlands or wildlife habitat;
- recreation;
- aquaculture;
- waste facility; and/or
- backfilling the void and woodland rehabilitation.

ACARP (2000) investigated the use of final voids as wetlands, with one successful example of the rehabilitation of mine sites using wetlands at Capel in Western Australia.

- The benefits of a final void being used as a wetland or wildlife habitat includes:
- Potential enhancement of water quality (if required);
- Potential increase in habitat and a subsequent increase in local biodiversity values;
- Enhancement of environmental and community values;
- Potential location of long-term environmental studies; and
- This has been completed successfully at other mines sites in Australia and internationally.

Currently this is the proposed final land use for the void. Detailed designs of the proposed wetland and associated key management and maintenance requirements will be determined closer to the time of closure, subject to approval by NSW Planning prior to the commencement of final rehabilitation works.

Section 10.0 provides further detail regarding void management.

9.5 Domain 5 – Water Management Infrastructure

There are three (3) dams located on the KEQ site which will remain on site following closure, as illustrated by **Figure 6**. Minor reshaping may be required to provide safe access for native fauna and to satisfy public safety requirements.

Further details of these dams are outlined by the **Water Management Plan**.

10.0 Final Void Design and Management

10.1 Water Quality of the Final Void Wetland

Water will only be permitted to accumulate in the void if it maintains a quality that does not compromise its intended final use or surrounding groundwater systems. The aim is to provide a biologically viable water resource for the surrounding environment. The following aspects need to be considered with respect to managing final void water quality:

- Concentration of elements resulting from the quarrying of material;
- Control of surface flow into the void; and
- Rainfall and evaporation.

Post closure, a water monitoring program will need to remain in place to closely monitor any changes to chemistry within the void.

10.2 Slope Stability of the Final Void

To ensure the safety of the final void, the surrounding final slopes will be left in a condition where the risk of slope failure is minimised. This may require the benches to be battered back from the vertical to enable a stable overall slope angle.

The following will need to be considered when assessing the geotechnical stability of highwalls, including:

- long term final void water levels;
- height and inclination of slope and number and spacing of intermediate benches;
- shear strength of the highwall soils and rocks;
- density and orientation of fractures, faults, bedding planes, and any other discontinuities, and the strength along them; and
- the effects of the external factors, such as surface runoff.

Prior to closure, investigations will be undertaken to confirm the criteria above.

10.3 Safety of the Final Void

At quarry closure, one of the main priorities for the void will be to render it safe in terms of access by humans, livestock, and wildlife. The following will be considered at the time of closure to ensure that the void is left in a safe manner. These include:

- Instability of the highwall can induce failures or mass movement. All highwalls are to be left geotechnically stable.

- A barrier at a safe distance from the perimeter of the void to prevent human access will be constructed. Suitable signs, clearly stating the risk to public safety and prohibiting public access will be erected at 50 m intervals outside the safety fence.

- Surface runoff from land surrounding the void will be diverted from entering the void so as to prevent the instability of the walls.

- Shrub and/or tree planting along the outside edge of the bund wall will be implemented where practicable to lessen the visual impact of the wall and will be in accordance with the agreed post-quarrying rehabilitation criteria and land use.

11.0 Rehabilitation Completion Criteria

Rehabilitation completion criteria have been developed to provide long-term performance goals for rehabilitation activities. The rehabilitation completion criteria presented in this section are considered conceptual and will be developed further following consultation with the relevant stakeholders during the detailed mine closure planning stage. Criteria will be reviewed during the updates to this management plan and will take into account rehabilitation performance at the site. Criteria which were outlined by GSSE (2012) for the Project's Environmental Assessment are outlined in **Table 11**.

Table 11 Quarry Rehabilitation and Closure Completion Criteria.

Element	Indicator	Criteria
Benches and Final Void		
Landform Stability	Slope Gradient	▪ Highwall faces exhibit long-term geotechnical stability, and a geotechnical report has been completed. ▪ Competent rock high wall to have slope of <70° to the horizontal. ▪ Ramp walls not backfilled exhibit long-term geotechnical stability and a geotechnical report has been completed.
	Erosion Control	▪ Gully or tunnel erosion is less than 200 mm. ▪ Average soil loss per annum per domain unit is <40 tonnes/Ha/year. (sheet erosion). ▪ Erosion mitigation measures have been applied to ensure slope stability.
	Surface Water Drainage	▪ Use of contour banks and diversion drains to direct water into stable areas, sediment control basins or final void.
Water Quality	Salinity (EC)	▪ Electrical conductivity of any void water may not exceed 900 µS/cm.
Topsoil Material	Salinity (EC)	▪ Soil salinity content is <0.6 dS/m.
	pH	▪ Soil pH is between 5.5 and 8.5.
	Sodium Content	▪ Soil Exchange Sodium Percentage (ESP) is <15%.
	Nutrient Cycling	▪ Nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts. Adequate macro and micro-nutrients are present.
Vegetation	Land use	▪ Where in-pit spoil allows, area accomplishes and remains as a healthy working bushland ecosystem (although pasture grasses will be used as required).
	Surface Cover	▪ Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). ▪ No bare surfaces >20 m^2 in area or >10 m along the benches.
	Species Composition	▪ Establishment of vegetation comprise a mixture grasses, shrubs / trees suitable for establishment on steeper slopes.
	Resilience to Disturbance	▪ Established species survive and/or regenerate after disturbance. Weeds do not dominate native species after disturbance or after rain. Pests do not occur in substantial numbers or visibly affect the development of native plant species.
	Sustainability	▪ More than 75% of individual grasses and shrubs/trees are healthy when ranked healthy, sick or dead.
Safety	Risk Assessment	▪ Risk assessment has been completed and risk mitigation measures have been implemented, such as bunds, safety fences or warning signs, in accordance with relevant guidelines and Australian Standards.

Element	Indicator	Criteria
Quarry Plant and Stockpile Areas		
Landform Stability	Slope Gradient	▪ Areas have gradients of <2°.
	Erosion Control	▪ Erosion mitigation measures have been applied, with average soil loss per annum per domain unit is <40 tonnes/Ha/year (sheet erosion).
	Surface Water Drainage	▪ Use of contour banks and diversion drains to direct water into stable areas or sediment control basins.
Water Quality	Salinity (EC)	▪ Electrical conductivity of any void water may not exceed 900 µS/cm.
Topsoil Material	Salinity (EC)	▪ Soil salinity content is <0.6 dS/m.
	pH	▪ Soil pH is between 5.5 and 8.5.
	Sodium Content	▪ Soil Exchange Sodium Percentage (ESP) is <15%.
	Nutrient Cycling	▪ Nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts. Adequate macro and micro-nutrients are present.
Vegetation	Land use	▪ Buildings, water storage, roads (except those used by the public) and other infrastructure have been removed unless stakeholders have entered into formal written agreements for their retention. ▪ Areas are readily accessible and conducive to safe management activities. Predicted economics and /or benefits have been defined and agreed by the stakeholders.
	Surface Cover	▪ Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). ▪ No bare surfaces >20 m^2 in area or >10 m along the benches.
	Species Composition	▪ Subject to proposed land use, comprise a mixture of native trees, shrubs and grasses representative of regionally occurring native woodland.
	Resilience to Disturbance	▪ Established species survive and/or regenerate after disturbance. Weeds do not dominate native species after disturbance or after rain. Pests do not occur in substantial numbers or visibly affect the development of native plant species.
	Sustainability	▪ More than 75% of individual grasses and trees / shrubs are healthy when ranked healthy, sick or dead.
Fauna	Vertebrate Species	▪ Representation of a range of species characteristics from each faunal assemblage group (e.g., reptiles, birds, mammals), present in the ecosystem type, based on pre-quarry fauna lists and sighted within the three-year period preceding quarry closure. ▪ The number of vertebrate species does not show a decrease over several successive seasons prior to quarry closure.
	Invertebrate Species	▪ Presence of representatives of a broad range of functional indicator groups involved in different ecological processes.
	Habitat Structure	▪ Typical food, shelter and water sources required by the majority of vertebrate and invertebrate inhabitants of that ecosystem type are present, including: a variety of food plants; evidence of active use of habitat provided during rehabilitation such as nest boxes, and logs and signs of natural generation of shelter sources including leaf litter.
Safety	Risk Assessment	▪ Risk assessment has been undertaken in accordance with relevant guidelines and Australian Standards and risks reduced to levels agreed with the stakeholders.

12.0 Rehabilitation Bond

Schedule 3, Condition 34 of the Project Approval requires the preparation of the Conservation and Rehabilitation Bond, to be lodged with NSW Planning within 6 months of approval of the Landscape and Rehabilitation Management Plan. Separate Conservation and Rehabilitation Bonds were originally lodged in July 2016.

Schedule 3, Condition 35 of the Project Approval requires the Conservation and Rehabilitation to be reviewed every three years following the Independent Environmental Audit (IEA) with consideration given to:

- Performance of the Biodiversity Offset Strategy (BOS) and rehabilitation of the site to-date;
- Effects to of inflation;
- Cost of implementing the BOS and rehabilitating the disturbed areas and forecast surface disturbance over the next three years of quarrying operations.

The Rehabilitation Bond was reviewed in March 2024 following the submission of the 2023 IEA and was subsequently reapproved by the Planning Secretary on 22 April 2024.

The Conservation Bond will be replaced by Total Fund Deposit (TFD) following the finalisation of establishment of the approved Biodiversity Stewardship Site. Upon establishment and lodgement of the TFD the existing approval of the Planning Secretary to extinguish the Conservation Bond will be sought.

13.0 Ecological and Rehabilitation Monitoring

13.1 Ecological Monitoring

The following key parameters will require monitoring to inform ongoing maintenance works:

- weed regrowth and outbreaks;
- vegetation protection measures, including perimeter fencing and erosion/sediment controls;
- indirect impacts of the development on adjoining vegetation and threatened flora;
- measures to facilitate fauna movement across the site (i.e., aerial fauna crossings); and
- rehabilitation (**Section 13.3**).

The findings of the ecological monitoring and subsequent recommended management actions will be documented through the preparation of annual reports. These reports will provide the basis for and guide future management and monitoring of the site.

Weeds

Target weed species will be mapped on an annual basis within the site and BOA:

- Inspections of the BOA and adjoining vegetation will be undertaken during monitoring to identify weeds and evidence of pest species, focusing on rehabilitation areas and retained vegetation.
- The locations and specific methods for weed and pest management will be directed by monitoring inspections (i.e. recommendations from monitoring reports).
- Weeds will be monitored within areas of remnant vegetation within the MOD10 subject land. Weed management programs will focus on disturbed areas, areas of rehabilitation and areas adjacent to the approved disturbance area (remnant areas).

Additionally, weed mapping along Yalimbah Creek will also be undertaken as part of the ecological monitoring program. This monitoring will assess the effectiveness of ongoing weed control works and whether the target weeds species are being eradicated and controlled at an appropriate rate. In addition, these monitoring events will identify any new significant weed species present on the site and recommend appropriate management procedures for these species.

Baseline weed mapping was undertaken prior to the commencement of the major clearing program in 2016. Further weed mapping will be carried out prior to the clearing for MOD10.

Vegetation Protection Measures

ESC structures, perimeter fencing, and any temporary fencing installed within the site to protect retained vegetation will be inspected as part of annual ecological monitoring. These inspections will ensure vegetation protection measures are effective and comply with relevant management plans. Any necessary repairs or modifications will be detailed in the monitoring report.

In addition, air quality monitoring constitutes a significant vegetation protection measure, in combination with monitoring edge effects. The Air Quality Management Plan has been updated to cover MOD10, detailing methods for monitoring and minimising the potential for stigma clogging of all plant populations in retained bushland habitats. Emphasis is on threatened flora including *Tetratheca juncea, Asperula asthenes* and *Grevillea parviflora subsp*. *parviflora*. Current monitoring within the BOA indicate abundance of these species has remained relatively stable since quarry establishment and implementation of mitigation measures. Thus, edge effects remain minimal provided mitigation measures are implemented.

Vegetation Condition and Threatened Flora Monitoring

Potential indirect impacts from the project (i.e. dust, stormwater run-off, weed invasion) may adversely affect the condition of retained and/or adjoining native vegetation (including threatened flora populations). A total of 13 monitoring points have been established (with a capped star picket) within 50 m of the project disturbance area in the retained vegetation on Lots 12 and 13. An additional five monitoring points have also been established along Yalimbah Creek (Lot 12).

A qualitative assessment of vegetation condition and photo monitoring is undertaken at each monitoring point (18 monitoring points in total) at each survey event. At each monitoring point, the following data is collected and compared to the previous survey event:

- Vegetation type and structure, including dominant species in each stratum;
- General health of vegetation, including evidence of foliage die-off;
- Weed species and abundance; and
- Any management issues or indirect impacts from the project disturbance area.

At nine of the 18 monitoring points, threatened flora species monitoring will be also conducted. At these sites, all threatened flora individuals within 10 m of the monitoring point will be recorded. The bearing and distance of each clump / individual from the star picket during the survey is recorded to accurately re-locate known individuals in the survey area.

Baseline monitoring of the 18 monitoring locations was undertaken in October 2015, and annual monitoring has continued at the same time each year. The **BOAMP** details continued monitoring of existing ecological and threatened species monitoring plots, and the establishment of new ecological and threatened species monitoring plots in close proximity to the MOD 10 disturbance area. This will allow for the quantification of any indirect impacts (as well as a mechanism to implement a response) should they occur.

Maintenance

Following completion of annual ecological monitoring, maintenance will be undertaken as directed in the monitoring reports. These reports will include information on the location, timing, species and preferred methods for weed management, and whether any repairs to vegetation protection measures are required (e.g., perimeter fencing). Maintenance would generally be undertaken on an annual basis unless otherwise specified in the monitoring reports or other management plans, and would generally entail:

- Control of weed regrowth and outbreaks;
- Maintaining and repairing fencing; and
- Maintaining and repairing erosion/sediment control structures.

Revegetation Performance Criteria

Performance criteria are provided in **Table 12** to measure the effectiveness of the ecological monitoring and maintenance program. Specific criteria are provided for each of the key monitoring parameters. Where performance criteria are not achieved, potential causes will be investigated; corrective actions required to achieve the criteria and/or justification why criteria have not been achieved must then be provided as part of annual reporting.

Table 12 Re-vegetation Performance Criteria.

Parameter	Monitoring Method	Performance Criteria
Weed regrowth and outbreaks	▪ Weed mapping; ▪ Qualitative assessment (monitoring points); ▪ Photo monitoring.	▪ Weed abundance equal to or less than baseline levels; and ▪ Any new noxious or environmental weed species recorded (as compared to the baseline) are eradicated within 12 months.
Vegetation protection	▪ Inspection of fencing and erosion control structures; ▪ Qualitative assessment (monitoring points); ▪ Photo monitoring.	▪ No breaks in permanent or temporary fencing; ▪ No erosion or sedimentation outside the project disturbance area; and ▪ No evidence of human disturbance, unauthorised access or vegetation management outside of project disturbance area.
Vegetation condition	▪ Qualitative assessment (monitoring points); ▪ Photo monitoring.	▪ No major changes in vegetation health or condition.
Threatened flora	▪ *Tetratheca juncea*; ▪ *Asperula asthenes* population monitoring (at monitoring points); ▪ *Grevillea parviflora* subsp. *parviflora*.	▪ Less than 10% decline in *Tetratheca juncea*, *Asperula asthenes* and *Grevillea parviflora* subsp. *parviflora* population sizes (at monitoring sites) within five years, as outlined by the **BOAMP**; and ▪ No significant decline in population health within five years.

13.2 Rehabilitation Monitoring

GSSE (2012) prepared the original rehabilitation monitoring program for the original Environmental Assessment for the Karuah East Quarry project.

Regular monitoring of the revegetated areas will be required to demonstrate that the objectives of the rehabilitation strategy are being achieved and that a sustainable, stable landform has been provided. **Table 13** presents the monitoring program, including the specific aspects and elements to be monitored and frequencies for those various aspects. It should be noted that only 'final rehabilitation' will be monitored with temporary rehabilitation inspected for stabilisation.

Monitoring will be conducted periodically suitably qualified persons at locations which will be representative of the range of conditions on the rehabilitating areas. Annual rehabilitation monitoring will be conducted to assess trends and monitoring program effectiveness. The outcome of these reviews will be included in the Annual Review.

In addition to the rehabilitated areas, at least two reference sites will be monitored to allow a comparison of the development and success of the rehabilitation against a control. Reference sites indicate the condition of surrounding undisturbed areas.

In developing the rehabilitation monitoring program, the following aspects will be taken into consideration.

- Sites will be monitored 12 months after establishment and then every 2 years.
- A standard monitoring plot design for areas rehabilitated with trees includes:
  - 2 m x 2 m quadrates – these will provide some estimate of statistical variance, so that if required, statistical analyses can be undertaken to objectively compare different rehabilitation treatments and changes over time;
  - a 20 m x 10 m plot overlying the 2 m quadrats and located 5 m either side of the centerline, for ease of monitoring; and
  - a 50 m erosion monitoring transect on contour, running through the centre of the plot.

Figure 7 illustrates the typical woodland monitoring plot design that is to be adopted for the monitoring an area revegetated with trees.

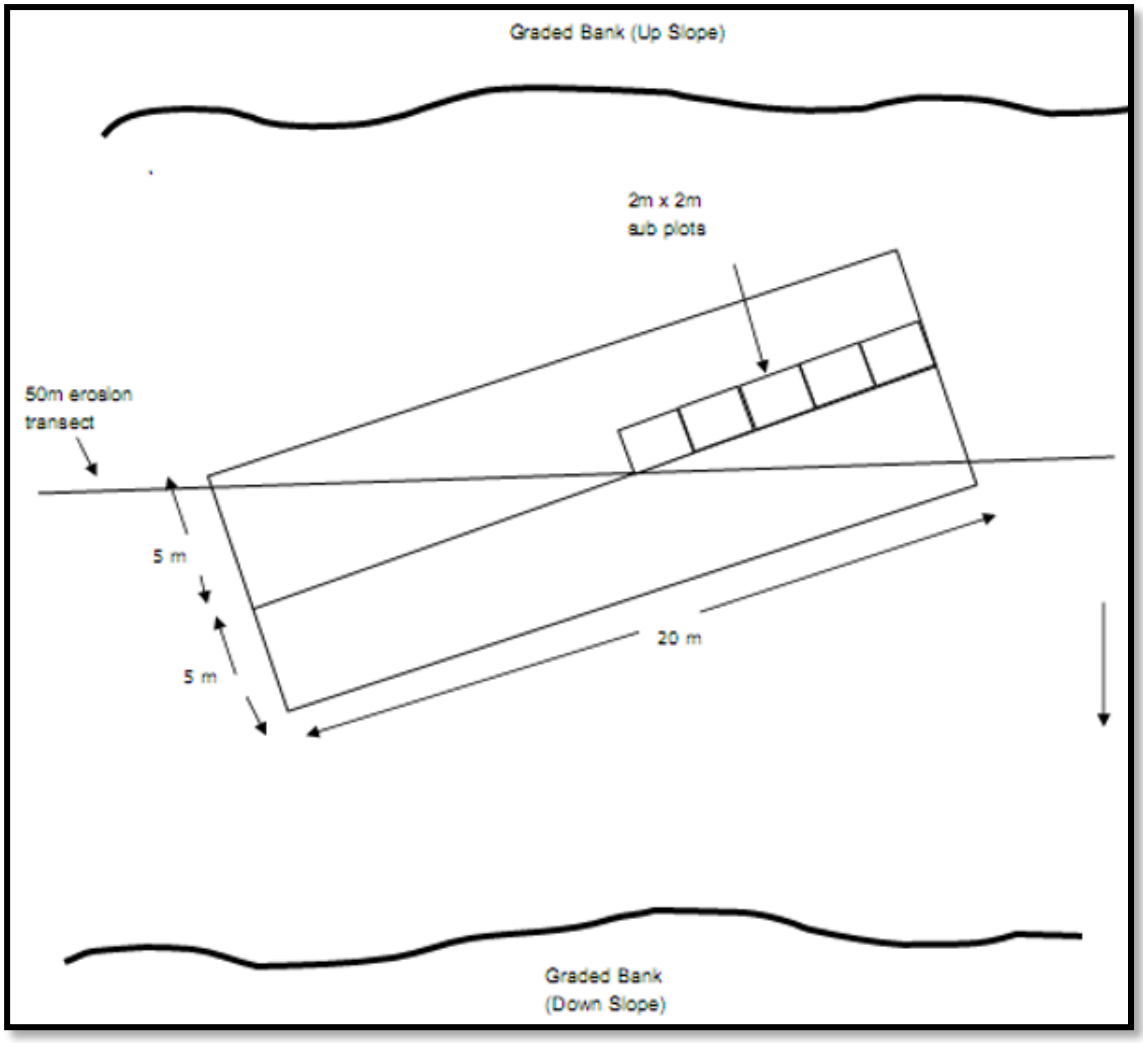


Figure 7 Typical Monitoring Plot Design (Woodland).

Monitoring outcomes identified during the quarry's operating life will enable improved rehabilitation methods to be implemented as additional knowledgebases develop from the monitoring data collected through these programs.

Table 13 Rehabilitation Monitoring Program.

Aspect of Rehabilitation	Elements to be Monitored	Monitoring Frequency
Ecosystem Establishment		
General Description	▪ Describe the vegetation in general terms, i.e. mixed eucalypt woodland with grass understory and scattered shrubs, dense Acacia scrub, etc.	12 months after establishment of final rehabilitation and then every 2 years.
2 m x 2m quadrats	▪ Count the number of plants of all species, excluding grass. ▪ Measure live vegetation cover for understory and grasses (separately) using a line intercept method. ▪ Record details of ground cover (litter, logs, rocks etc.)	12 months after establishment of final rehabilitation and then every 2 years.
20 m x 10 m plots	▪ Count, by species, all trees >1.6 m tall. ▪ Tag and measure DBH of trees >1.6 m tall, to a maximum of 10 for any one species. ▪ Record canopy cover over the whole 20 m centerline when trees are tall enough. ▪ Subjectively describe tree health, by species if relevant, noting signs of drought stress, nutrient deficiencies, disease and severe insect attack. Where health problems are noted, record the percentage of unhealthy trees. ▪ Record any new plant species do not present in the smaller plots, including any problem and declared noxious weeds ▪ Take five surface soil samples (i.e. at approx. 5 m intervals along the centerline) and bulk these for analyses of: pH, EC, chloride and sulfate; exchangeable Ca/Mg/K/Na; cation exchange capacity; particle size analysis and R1 dispersion index; 15 bar and field capacity moisture content; organic carbon; total and nitrate nitrogen; total and extractable phosphorus; Cu, Mn and Zn.	12 months after establishment of final rehabilitation and then every 2 years.
50 m transect	▪ Along the 50 m erosion monitoring transect, record the location, number and dimension of all gullies >30 cm wide and/or 30 cm deep. ▪ Erosion pins will be established in plots located in newer rehabilitation to record sheet erosion if present.	12 months after establishment of final rehabilitation and then every 2 years.
Rehabilitation in general	▪ When traversing between monitoring plots, note the presence of species of interest not previously recorded (i.e. key functional or structural species, protected species, noxious weeds), as well as obvious problems including any extensive bare areas (i.e. those greater than 0.1 Ha). ▪ Observations such as this can provide useful, broad scale information on rehabilitation success and problems.	12 months after establishment of final rehabilitation and then every 2 years.

Aspect of Rehabilitation	Elements to be Monitored	Monitoring Frequency
Photographic record	▪ For each 20 x 10 m plot, a photograph will be taken at each end of the plot, along the centerline looking in.	12 months after establishment of final rehabilitation and then every 2 years.
Habitat	▪ General observations relating to the availability and variety of food sources (i.e. flowering/fruiting trees, presence of invertebrates etc.). ▪ Availability and variety of shelter (i.e. depth of leaf litter, presence of logs, hollows etc.). ▪ Presence/absence of free water in the rehabilitated areas	12 months after establishment of final rehabilitation and then every 2 years.
Fauna	▪ General observations of vertebrate species (including species of conservation significance). ▪ Detailed fauna surveys including presence and approximate abundance and distribution of vertebrate species (focusing on species of conservation significance).	After final rehabilitation is three years old undertake monitoring in every 2 years after establishment in both Autumn and Spring.
Weeds and pests	▪ Species identity. ▪ Weed spraying and pest management.	Quarterly during the first two years of final rehabilitation and biennially after that. Inspections will be opportunistic after significant rainfall events.
Geotechnical Stability		
Final Landform	▪ Assessment of the stability of batters and settlement of backfilled surfaces, in-particular where these features could impact on the performance of any surface water management system. ▪ Surface integrity of landform cover/capping (measurement of exntent of integrity failure). ▪ Landform slumping.	Annually for final rehabilitation.
Surface and Groundwater		
Water Management System	▪ Groundwater quality and depth. ▪ Efficiency of landform surface water drainage systems (integrity of banks and drains). ▪ Water quality include pH, EC and TSS of water in water storages, pits and sedimentation dams.	Quarterly or following rainfall events. Monitoring of receiving waters during a rainfall event which results in in runoff.

14.0 Contingency Trigger Action Response Plan

Schedule 5, Condition 3(e) of the Project Approval requires the preparation of a contingency plan; which has been developed in the form of a Trigger Action Response Plan (TARP) as summarised by **Table 14**.

Table 14 Rehabilitation Contingency Plan.

Indicator	L1 TARP		L2 TARP	
	Trigger:	**Response:**	**Trigger:**	**Response:**
Landform Stability				
Slope Gradient	Slopes <1:3 V: H.	No action.	Slopes >1:3 V:H, unless agreed by the Secretary.	Undertake a review of the landform design, including survey Undertake re-grading and revegetation of the area.
Erosion Control	Minor gully or tunnel erosion present and/or minor rilling up to 200 mm.	An inspection of the site will be undertaken by a suitably trained person. Investigate opportunities to install water management infrastructure to address erosion. Remediate.	Slumping and /or significant gully or tunnel erosion present and/or significant rilling.	Engage a specialist to assist with the management of erosion and sedimentation at the site and provide recommendations to remediate the erosion. Remediate within 48 hours. Review, and update the *Erosion and Sediment Control Plan*.
Free Draining Landform	Landforms exhibiting minor ponding.	An inspection of the site will be undertaken by a suitably trained person. Investigate opportunities to address issues. Remediate as appropriate.	Landforms exhibiting significant drainage issues.	Undertake a review of the landform design, including survey. Undertake re-grading and re-vegetation of the area.
Water Management Structures	Water management structures in rehabilitation areas (sediment dams, channels, contour banks) minor erosion and/or scouring.	An inspection of the site will be completed. Identify remedial actions such as amelioration, re-vegetation or alternative scour protection.	Water management structures in rehabilitation areas fail or display significant scouring / erosion.	Engage specialist consultant to develop a site-specific remediation plan and review water management structure design criteria.

Indicator	L1 TARP		L2 TARP	
	Trigger:	Response:	Trigger:	Response:
Material Quality				
Salinity	Increasing salinity levels in material used in rehabilitation (overburden material).	Undertake material testing for EC and recommend further amelioration.	Presence of salt scalds in rehabilitation.	Engage a specialist consultant to develop a site-specific management report to be implemented to remediate salinity scalds.
Chemical characteristics	Increasing trend in soil dispersity.	Undertake testing to determine required amelioration and undertake amelioration as required.	Soil is moderately to highly dispersive.	Ameliorate dispersive spoils (for example with coarse gypsum). Re-vegetate.
Stockpile Height	Stockpile height greater than 2 m and not set out in windrows.	Reshape topsoil stockpiles.	Stockpile height greater than 3 m and not set out in windrows.	Reshape topsoil stockpiles.
Soil pH in rehabilitation	Soil pH in the following ranges: 4.5 < pH < 5.5 OR 8.5 < pH < 9.5.	Engage a specialist to recommend appropriate measures to increase/reduce pH to within rehabilitation guidelines. Undertake consultants' recommendations. Complete recommendations within 2 weeks.	Soil pH is <4.5 or >9.5.	Engage a specialist to recommend appropriate measures to increase/reduce pH to within rehabilitation guidelines. Undertake consultants' recommendations. Complete recommendations within 1 week.
Soil depth in rehabilitation	Soil depth (topsoil and ameliorates) is less than 100 mm in rehabilitation areas.	Top dress with additional suitable topsoil resource and /or ameliorates.	Soil depth (topsoil and ameliorates) in rehabilitation areas is less than 50 mm in the rehabilitation areas.	Assess revegetation growth. Undertake a review of the topsoil balance to confirm sufficient material to meet minimum depth requirements. Investigate suitable topsoil resource substitutes (ameliorates). Additional topsoil will be required.

Indicator	L1 TARP		L2 TARP	
	Trigger:	Response:	Trigger:	Trigger:
Rehabilitation success	<75% but >55%of shrubs and/or trees are healthy when ranked healthy, sick or dead during rehabilitation inspections in rehabilitation areas.	Undertake a field survey to identify likely causes of vegetation sickness and/or death rates. Re-seed or re-plant tube stock in areas with high sickness or death rates. Review seeding and/or planting procedures.	<55% of shrubs and/or trees are healthy when ranked healthy, sick or dead during rehabilitation inspections in rehabilitation areas.	Engage a suitably qualified specialist to investigate causes for vegetation sickness and death. Implement appropriate management actions.
Weed Presence	> 10% but <25% cover of undesirable species present in rehabilitation areas.	Review and manage the presence of weeds. Engage weed management contractor. Implement agreed actions e.g., Weed spraying and removal.	>25% cover of undesirable species present in rehabilitation areas.	Engage weed management contractor to remove introduced weed species. Investigate management measures to reduce weeds including additional soil amelioration, establishment and retention of cover crops until weed presence is at acceptable levels. Implement recommendations as appropriate. Implement agreed actions e.g., Weed spraying and removal.
Temporary Rehabilitation	<70% but >55% of vegetation cover is present on areas where hydromulching has been applied within 6 months.	An inspection of the site will be undertaken by a suitably trained person. Investigate opportunities to address issues. Revegetate as appropriate. Review seed mix and application rates.	<55% of vegetation cover is present on areas where hydromulching has been applied within 6 months.	Engage a specialist consultant to develop a site-specific plan to improve temporary rehabilitation success. Revegetate site as appropriate.

Indicator	L1 TARP		L2 TARP	
	Trigger:	Response:	Trigger:	Trigger:
Pest animal species presence	Pest animal species presence and density increased in annual monitoring events.	Consult with relevant government agencies (including BCD) to recommend and implement appropriate pest animal control campaign.	Significant numbers of pest animals causing widespread damage to rehabilitation.	Consult with relevant government agencies (including BCD) to recommend and implement appropriate pest animal control campaign. Update to *BOA Management Plan.*
Void Water Quality				
Void Water Quality	Electrical conductivity in the void water exceeds 600 µS/cm	Additional water testing.	Electrical conductivity in the void water exceeds 900 µS/cm	Additional water testing. Liaison with specialist to reduce EC levels.

15.0 Indicated Closure Timeframe

15.1 Closure Schedule

Schedule 5, Condition 11 of the Project Approval requires all significant documents to be published to the Hunter Quarries website, including this Management Plan.

Rehabilitation work will be undertaken progressively as soon as reshaped, benched, and topsoiled areas become available. Where possible seeding will be undertaken during spring where the best possible rehabilitation result can be expected.

As outlined earlier, minimal rehabilitation can be completed at the quarry until the operation ceases, as the current disturbed areas are required for safe and efficient operation. Most rehabilitation undertaken at the site during operations will be temporary rehabilitation for stabilisation. **Table 15** outlines the conceptual rehabilitation schedule based upon the approval lapse date of 31 December 2034.

This timeframe is assuming that once closure occurs, all infrastructure not required for the post closure land use will be removed, with rehabilitation of the site being undertaken in the first year of closure. Following rehabilitation, the site will be managed through a series of rehabilitation phases.

Specific timings for biodiversity management are set out in the **BOAMP**.

Table 15 Proposed Rehabilitation and Closure Schedule.

Years from Closure:	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10
Closure Planning															
Stakeholder consultation regarding closure															
Agreed final Detailed Rehabilitation & Closure Plan															
Develop an infrastructure demolition plan															
Rehabilitation and Closure Activities															
Decommissioning															
Landform establishment															
Growth media establishment															
Ecosystem establishment															
Ecosystem development															
Relinquished Land															
Post-Closure Activities															
Maintenance of Rehabilitated Areas															
Monitoring and Inspections															

15.2 Next 3-Year Plan (2024-2027)

Rehabilitation works planned for the next three-year period (2024-2027) are directly related to the stage of the project with the life of quarry planning sequence.

As such, the key work package expected to be completed during this works period are associated with the stockpile extension works approved by the KEQ MOD10 Project. This will include:

- Pre-clearance surveys as outlined by **Section 5.2;**
- Salvage and storage of restorative resources, such as, habitat trees as outlined by **Section 5.3**;
- Top-soil stripping and storage as outlined by **Section 8.3**; and
- Continued seed collection will be conducted to service both the KEQ and KHRQ sites in accordance with the **BOAMP**.

Other smaller projects consisting of short-term temporary measures (hydromulching and straw mulching) as outlined by **Section 8.2**, and other ESC measures (silt fencing, coir logs, native grass seeding) will be conducted in accordance with the **WMP** focused on reducing erosion due to limited opportunities for progressive rehabilitation at this stage of the quarry life, as final benches are yet to be reached and cease operation within the quarry pit.

All other quarry domains will remain in full operation during this works period.

15.3 Long-Term Land Use

Consultation with NSW Planning regarding the long-term land use of the rehabilitated site will be conducted during the Stakeholder Consultation phase of the closure planning process as outlined by **Table 15**.

The aim of the long-term land use arrangements will be to:

- Conserve and integrate rehabilitated land with the adjacent Biodiversity Offset Area;
- Provide economic value to fund the on-going management and maintenance of the site and minimise any socio-economic impacts of the sites closure; and
- Consider administrative arrangements required, such as conservation mechanisms, further development consents or land rezonings within the Draft MidCoast LEP (2024).

16.0 Monitoring and Reporting

16.1 Public Reporting

Schedule 5, Condition 11 of the Project Approval requires all significant documents to be published to the Hunter Quarries website, including this Management Plan.

Schedule 5, Condition 4 of the Project Approval outlines the requirement for annual reporting through the Annual Reviews which includes an update on rehabilitation activities completed each reporting period.

As such, the Annual Review will include details of any rehabilitation and land management completed as well as any results of rehabilitation and ecological monitoring. Rehabilitation and land management performance will be assessed through the review of rehabilitation and ecological monitoring results and through environmental inspections. Proposed changes/improvements to the rehabilitation and land management program are outlined in the Annual Review.

16.2 Periodic Management Plan Reviews

Consistent with Condition 5 of Schedule 3, the LRMP will be reviewed and revised / updated in accordance with Schedule 5, Condition 5 of the Project Approval within 3-months of any of the following:

- The submission of an annual review;
- The submission of an incident report;
- The submission of an audit report; and
- Any Modification to the Project Approval that necessitates an update to the LRMP.

A review of the LRMP will also take place if monitoring records indicate that it is warranted or in the event of any significant change to operations at KEQ.

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

16.3 Complaints Handing and Incident Response

Complaints Handling

All complaints regarding ecology, landscape management and rehabilitation from the Project will be acknowledged within 24 hours by appropriate personnel and investigated as soon as reasonable practicable. The complainant will be kept updated at key milestones of the investigation and will be notified of the outcome once available.

KEQ will operate a telephone complaints line for the purposes receiving complaints from members of the public in relation to activities conducted at the premises as outlined in the KEQ Environmental Management Strategy (EMS).

KEQ will keep a record of any complaints made to the quarry in relation to the Project site for at least four years after the complaint was made. Additionally, the record will be available to any authorised officer of the EPA or NSW Planning who wishes to view them.

Records will include:

- date and time of complaint;
- method by which the complaint was made;
- personal details of the complainant (if provided);
- nature of the complaint;
- weather conditions corresponding to the time of the complaint;
- action taken by the quarry and any follow up actions; and
- if no action was taken, the reason why no action was taken.

Non-Compliance and Incident Response

Schedule 5, Condition 7 of the Project Approval requires:

> *The Applicant must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must be in writing via the Major Projects Website and identify the development (including the development application number and name) and set out the location and nature of the incident.*

Schedule 5, Condition 7A of the Project Approval requires:

> *Within seven days of becoming aware of a non-compliance, The Applicant must notify the Department of the non-compliance. The notification must be in writing via the Major Projects Website and identify the development (including the development application number and name), set out the condition of this consent that the development is non-compliant with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance.*
>
> *Note: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.*

It should be noted that an exceedance of the ecology, landscape management and rehabilitation matters will be typically classified as a non-compliance rather than an incident.

Where a significant pollution incident occurs which causes an impact or material harm, reference will be made to the KEQ Pollution Incident Response Management Plan (PIRMP).

17.0 Roles and Responsibilities

It is the responsibility of Quarry Manager for the implementation of the LRMP. **Table 16** outlines the responsible positions and accountable tasks.

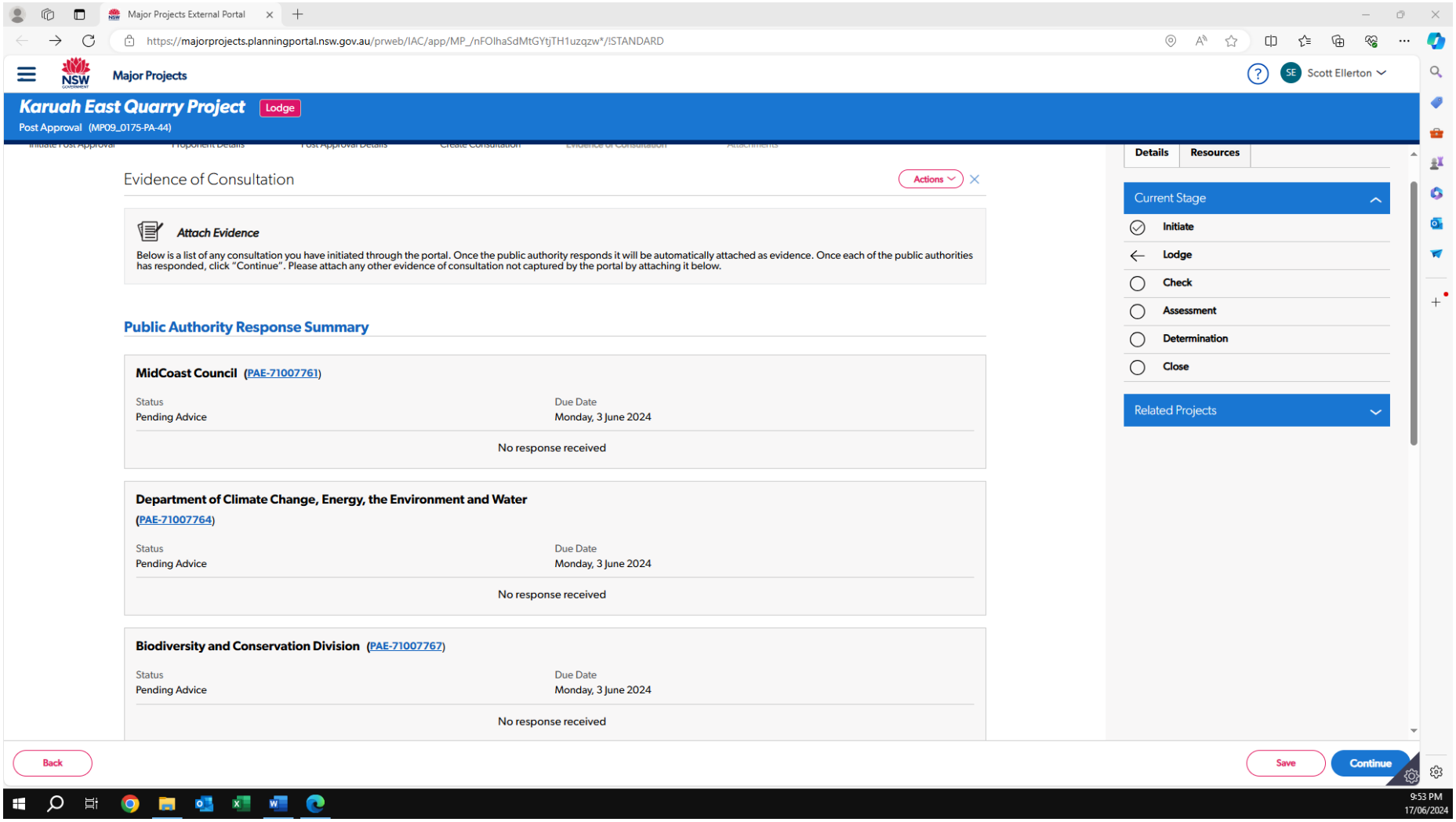
Table 16 Roles & Responsibilities.

Position	Responsibility
Quarry Manager	▪ Ensure all relevant personnel are aware of rehabilitation procedures. ▪ Ensure all rehabilitation procedures are followed. ▪ Ensure sufficient resources are available to meet rehabilitation criteria and schedule.
Environment & Development Manager (or suitable delegate)	▪ Coordinate progressive rehabilitation. ▪ Provide advice and support for the Quarry Manager in relation to this Plan. ▪ Ensure all rehabilitation is undertaken in accordance with the rehabilitation procedures presented in this plan. ▪ Review and analyse rehabilitation monitoring and advise on rehabilitation maintenance. ▪ Conduct regular review of this Plan. ▪ Advise on best management practice techniques for the site.
Quarry Supervisors & Quarry Operators	▪ Ensure clearing remains within the area nominated by the Manager and identified on plans. ▪ Vehicles to remain on established roads and tracks unless otherwise authorised. ▪ Notify Quarry Manager of any disturbance in native vegetation or rehabilitated sites.

18.0 References

- Environmental Assessment Report – Proposed Karuah East Hard Rock Quarry prepared by ADW Johnson Pty Ltd dated 31 January 2013 (hereafter referred to as the EA);
- Proposed Karuah East Quarry Project, Pacify Highway, Karuah – Life of Project, Quarry Closure and Rehabilitation Plan prepared by SLR dated November 2012;
- Karuah East Quarry Section 75W Application (MOD 1) to amend Part 3A Project Approval 09_0175 Minor Increase to Approved Disturbance Area prepared by ADW Johnson Pty Ltd dated March 2018 (hereafter referred to as MOD 1);
- Karuah East Quarry 75W Application (MOD 2) to amend Part 3A Project Approval 09_0175 Minor Increase to Approved Disturbance Area prepared by ADW Johnson Pty Ltd dated October 2018 (hereafter referred to as MOD 2);
- Karuah East Quarry S4.55 (1A) Modification Report Proposed Modification to Operational Noise Criteria and Implementation of Improved Acoustic Mitigation Measures MP 09_0175. Prepared by ADW Johnson Pty Ltd June 2019 (hereafter referred to as MOD 8);
- Karuah East Quarry Modification 9(MP09_0175-MOD-9) Proposed Extended Hours of Operation. Prepared by ADW Johnson Pty Ltd August 2021 (Hereafter referred to as MOD 9);
- Karuah East Quarry Modification 10 (MP09_0175-MOD-10) Increase disturbance area. Prepared by ADW Johnson Pty Ltd July 2022 (Hereafter referred to as MOD 10);
- Terrestrial Ecology Survey and Assessment Report – Karuah East Quarry prepared by RPS Australia East Pty Ltd dated July 2013;
- Biodiversity Offset Strategy – Karuah East Quarry prepared by Eco Logical Australia Pty Ltd dated July 2013;
- EPBC Act Assessment Report – Karuah East Quarry – EPBC 2014/7282 prepared by Eco Logical Australia Pty Ltd dated October 2014;
- Biodiversity Offset Area Management Plan – Karuah East Quarry prepared by Kleinfelder Australia dated July 2018;
- Humane pest animal control: Codes of Practice. Department of Primary Industries (2014). (Website: http://www.dpi.nsw.gov.au/agriculture/pests-weeds/vertebrate-pests);
- Karuah East Quarry – Rehabilitation and Closure Strategy for MOD 10 (MP 09_0175) prepared by IEMA Pty Ltd dated February 2023
- Biodiversity Development Assessment Report – Karuah East Quarry – MP 09_0175 Modification 10 Application. Prepared by Kleinfelder. Dated 2023
- Biodiversity Development Assessment Report – Karuah East Quarry – MP 09_0175 Modification 10 Application. Prepared by Kleinfelder. Dated 2023.

Appendix A: Agency Consultation


Major Projects External Portal
https://majorprojects.planningportal.nsw.gov.au/prweb/IAC/app/MP_/nFOlhaSdMtGYtjTH1uzqzw*/!STANDARD
Major Projects
Scott Ellerton
Karuah East Quarry Project
Lodge
Post Approval (MP09_0175-PA-44)
Evidence of Consultation
Actions
Attach Evidence
Below is a list of any consultation you have initiated through the portal. Once the public authority responds it will be automatically attached as evidence. Once each of the public authorities has responded, click "Continue". Please attach any other evidence of consultation not captured by the portal by attaching it below.
Public Authority Response Summary
MidCoast Council (PAE-71007761)
Status
Pending Advice
Due Date
Monday, 3 June 2024
No response received
Department of Climate Change, Energy, the Environment and Water
(PAE-71007764)
Status
Pending Advice
Due Date
Monday, 3 June 2024
No response received
Biodiversity and Conservation Division (PAE-71007767)
Status
Pending Advice
Due Date
Monday, 3 June 2024
No response received
Details
Resources
Current Stage
Initiate
Lodge
Check
Assessment
Determination
Close
Related Projects
Back
Save
Continue
9:53 PM
17/06/2024

Appendix B: Correspondence with the NSW Planning

Department of Planning and Environment

Our ref: MP09_0175-PA-24

Scott Ellerton
Environment and Development Manager
Karuah East Quarry Pty Limited
PO Box 23
Karuah, NSW, 2324

23/06/2023

Subject: Appointment of suitably qualified persons to update environmental management plans

Dear Mr Ellerton

I refer to your request dated 16 June 2023 for the Planning Secretary's endorsement of Chris Jones and Simon Kirgis of Integrated Environmental Management Australia (IEMA) as suitably qualified persons to update the following management plans in accordance with Project Approval MP 09_0175 for the Karuah East Quarry:

- Landscape and Rehabilitation Management Plan (condition 32 of Schedule 3);
- Water Management Plan (condition 21 of Schedule 3);
- Air Quality and Greenhouse Gas Management Plan (condition 16 of Schedule 3);
- Blast Management Plan (condition 12 of Schedule 3); and
- Noise Management Plan (condition 7 of Schedule 3).

The Department has reviewed the nominations and information you have provided and is satisfied that Chris Jones and Simon Kirgis are suitably qualified and experienced. Accordingly, I can advise that the Planning Secretary endorses the appointment of these nominees.

If you wish to discuss the matter further, please contact James McDonough on (02) 9585 6313.

Yours sincerely

JEvans

Jessie Evans
Director, Resource Assessments
Resource Assessments

As nominee of the Planning Secretary

Department of Planning, Housing & Infrastructure

Our ref: MP09_0175-PA-44

Scott Ellerton
Environment and Development Manager
Hunter Quarries
PO Box 23
Karuah, NSW, 2324

10/03/2025

Subject: Landscape and Rehabilitation Management Plan

Dear Mr Ellerton

I refer to the Landscape and Rehabilitation Management Plan submitted in accordance with condition 32, Schedule 3 of the approval for the Karuah East Quarry Project (MP09_0175). I also acknowledge your response to the Department's review comments and request for additional information.

The Department has carefully reviewed the document and is satisfied that it meets the requirements of the relevant conditions in consent (MP09_0175).

Accordingly, as nominee of the Planning Secretary, I approve the Landscape and Rehabilitation Management Plan (version 5C, dated 31 October 2024).

You are reminded that if there are any inconsistencies between the Plan and the conditions of approval, the conditions prevail.

Please ensure you make the document publicly available on the project website at the earliest convenience.

If you wish to discuss the matter further, please contact Kristina Robinson on 02 9860 1543 or at Kristina.Robinson@dpie.nsw.gov.au.

Yours sincerely

Jarrod Blane
A/Team Leader
Resource Assessments

As nominee of the Planning Secretary