



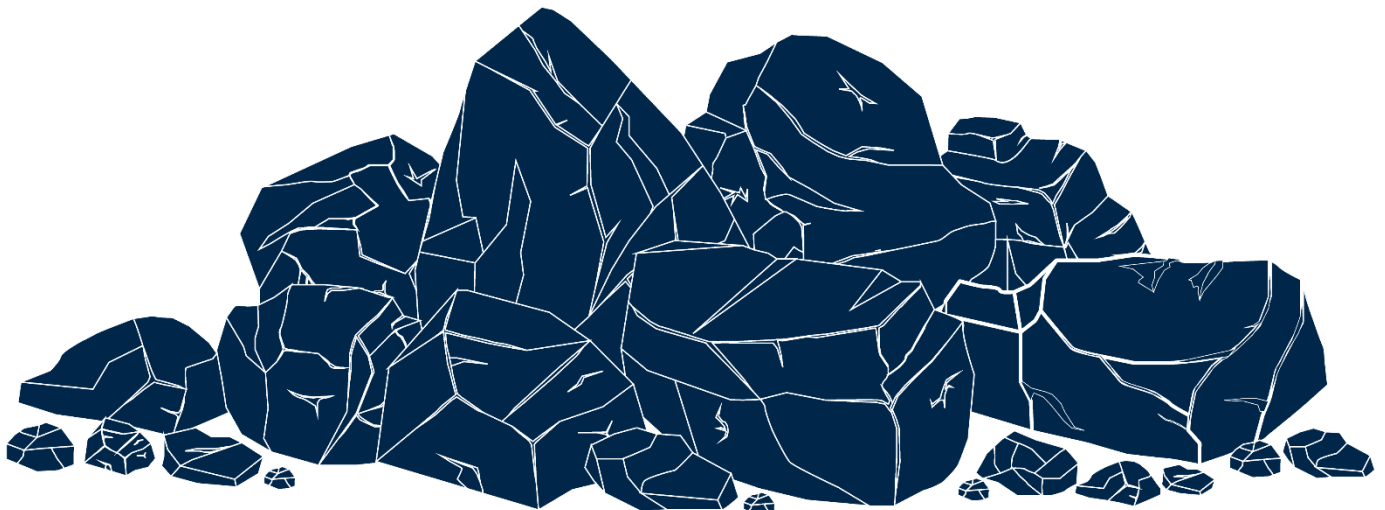
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Karuah Hard Rock Quarry

Flora and Fauna Management Plan

July 2026



Revision History

Version	Date Reviewed	Author	Status	Amendment Details
1	December 2005	HWR Ecological	Approved	Original draft Flora and Fauna Management Plan developed to satisfy the requirements of the Development Consent: - Condition 20 (Vegetation Clearing Protocol) - Condition 21 (Remnant Vegetation Conservation Plan); and - Condition 22 (Conservation Offset Management Plan).
2A	June 2006	GSSE	Draft	Minor review of Karuah Hard Rock Quarry Environmental Management Strategy and associated Management Plans.
2B	August 2006	GSSE	Approved	Updated for DPE comments.
3	August 2008	RPS	Approved	Comprehensive review following variations to the original mining plan presented in the 2004 EIS. Update provided by addendum to management plan.
4	January 2011	SLR	Approved	Minor review of Karuah Hard Rock Quarry Environmental Management Strategy and associated Management Plans. Reconsolidation into single document.
5	June 2014	SLR	Approved	Comprehensive review of Karuah Hard Rock Quarry Environmental Management Strategy and associated Management Plans.
6A	August 2020	SLR	Draft for Consultation	Comprehensive review following 2019 Independent Environmental Audit and DPIE direction incorporating available monitoring records.
6B	September 2020	SLR	Approved	Updated for DPIE comments.
7A	July 2025	Wedgetail	Draft for Consultation	Comprehensive review following 2024 Independent Environmental Audit and correspondence with the National Herbarium of NSW regarding <i>Grevillea parviflora</i> subsp. <i>parviflora</i> . Update for new Hunter Quarries document template.
7B	July 2026	Wedgetail	Approved	Updated for CHPR comments.

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Terms, Definitions and Abbreviations

Abbreviation / Term	Meaning
AR / AEMR	Annual Review / Annual Environmental Management Report
BAM	NSW Biodiversity Assessment Method
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
COA	Conservation Offset Area
COMP	Conservation Offset Management Plan
DA	Development Application
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMM	Ecological Monitoring Module within the NSW BAM
F&FMP	Flora & Fauna Management Plan
Ha	Hectare
HQPL	Hunter Quarries Pty Ltd
KEQ	Karuah East Quarry
KHRQ	Karuah Hard Rock Quarry
LSS	NSW Local Land Services
MCC	MidCoast Council
NSW Planning	NSW Department of Planning, Housing and Infrastructure
RCT	Remote Camera Transect
RFS	NSW Rural Fire Service
RVA	Remnant Vegetation Area
RVCP	Remnant Vegetation Conservation Plan
SAT	Koala Spot Assessment Technique
SEPP44	State Environmental Planning Policy No. 44 – Koala Habitat Protection (repealed)
SEPP (B&C)	State Environmental Planning Policy (Biodiversity & Conservation) 2021
tpa	tonnes per annum
UFP	Unexpected Finds Protocol
WPC	Wedgetail Project Consulting

1.0 Introduction

1.1 Overview

Mountain Industries obtained approval to operate the Karuah Hard Rock Quarry (KHRQ) in 1997, with the site subsequently purchased by Hunter Quarries Pty Ltd (HQPL) in 2002. In October 2004, HQPL applied to the then Department of Infrastructure, Planning and Natural Resources (now known as the Department of Planning, Housing and Infrastructure – NSW Planning) for approval to expand the quarry into adjoining lands (the Stage 2 extraction area) to allow the extraction of further hard rock resources.

Development Consent, DA 265-10-2004, was granted for the KHRQ site by the Minister for Infrastructure, Planning and Natural Resources on 03 June 2005. The approved development consisting of:

- implementing the remainder of the approved Stage 1 quarry operation;
- extending the quarry operations into the Stage 2 area;
- upgrading and using existing infrastructure on site;
- rehabilitating the site by re-contouring and revegetating exposed surfaces; and
- producing up to 500,000 tonnes of andesite product a year over the next 22 years.

1.2 Project Site

The KHRQ site is located approximately five kilometres north-east of the village of Karuah, NSW. The overall site covers an area of approximately 78.5 Ha across the following properties:

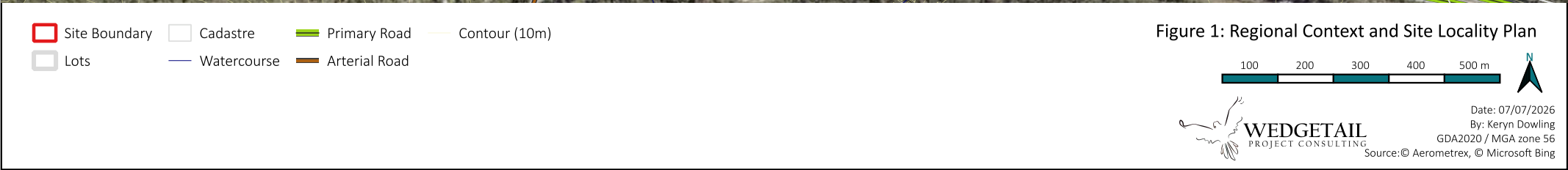
- Lot 21 DP 1024564 consisting of material processing and product stockpiling;
- Lot 11 DP 1024564 consisting of the Stage 2 extraction area; and
- Part Lot 12 DP 1024564 consisting of the Conservation Offset Area (COA).

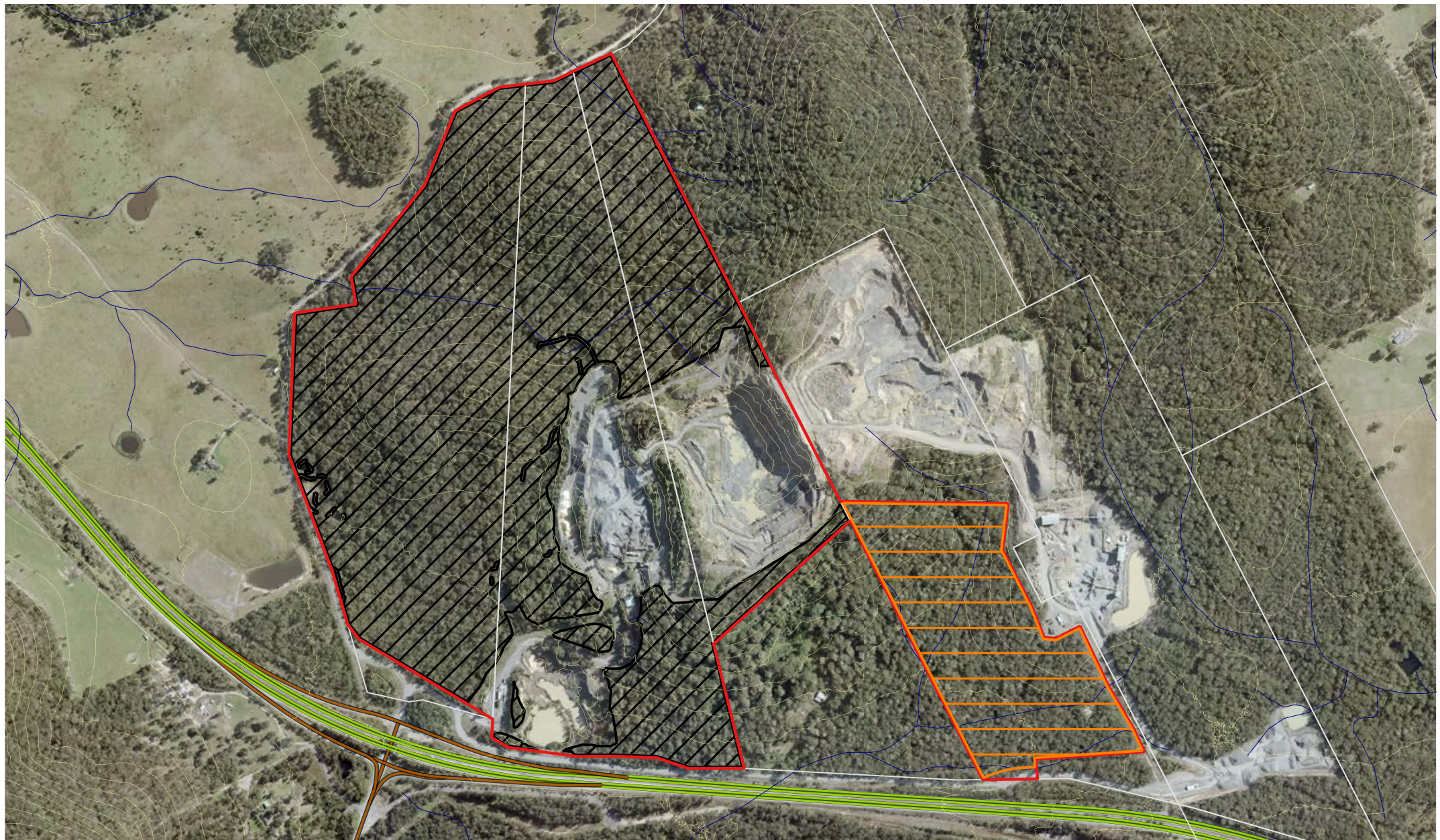
Figure 1 illustrates the site within its broader regional context and site layouts, and **Figure 2** illustrates the boundaries of the COA and the Remnant Vegetation Areas (RVA) consisting of remaining areas vegetation for the purposes of the Remnant Vegetation Conservation Plan (RVCP).

1.3 Purpose

This document has been prepared to provide HQPL with a consistent approach to biodiversity management of remaining vegetation; and sets out the minimum standards and processes to achieve this intended level of management. The Flora & Fauna Management Plan (F&FMP) applies only to the KHRQ site described in **Section 1.2** and illustrated in **Figure 1** and **Figure 2**.

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- | | | | |
|---|--|---|---|
| Site Boundary | Remnant Vegetation | — Watercourse | — Arterial Road |
| Conservation Offset Area | Cadastre | — Primary Road | — Contour (10m) |

Figure 2: Conservation Offset and Remnant Vegetation Areas Plan



Date: 07/07/2026
 By: Keryn Dowling
 GDA2020 / MGA zone 56
 Source: © Aerometrex, © Microsoft Bing

2.0 Regulatory Requirements

2.1 Requirements of the Development Consent (DA 265-10-2004)

The requirements of the Development Consent are summarised by **Table 1**.

Table 1 Summary of Relevant Conditions of the Development Consent.

No	Requirements	Section
Schedule 3 – Specific Environmental Conditions		
Condition 17	<u>Conservation Offset Area</u> <i>The Applicant shall establish, conserve, and maintain the area of vegetation in Lot 12 DP1024564 marked on the map in Appendix 2, to the satisfaction of the Director-General.</i>	Section 5.1
Condition 18	<i>Within 3 years if this consent, the Applicant shall implement suitable arrangements to provide long term security for the conservation offset area, to the satisfaction of the Director-General.</i> <i>Note: The long term security of the offset can be achieved through a combination of the following: Deed of Agreement with the Minister, rezoning the land under the Great Lakes Local Environment Plan 1996, caveats on the title under the Conveyancing Act 1919.</i>	Section 5.1
Condition 19	<u>Flora & Fauna Management Plan</u> <i>Before carrying out any clearing associated with Stage 2 of the development, the Applicant shall prepare, and subsequently implement, a Flora and Fauna Management Plan for the development to the satisfaction of the Director-General. This plan must include:</i>	This Document
	<i>a) a Vegetation Clearing Protocol;</i>	Section 3.0
	<i>b) a Remnant Vegetation Conservation Plan; and</i>	Section 4.0
	<i>c) a Conservation Offset Management Plan.</i>	Section 5.0
Condition 20	<u>Vegetation Clearing Protocol</u> <i>The Vegetation Clearing Protocol shall describe the procedures that would be implemented for:</i>	Section 3.1
	<i>a) minimising the areas of remnant vegetation to be cleared;</i>	Section 3.1
	<i>b) delineating areas of remnant vegetation to be cleared;</i>	Section 3.1
	<i>c) protecting areas outside of the disturbance areas;</i>	Section 3.1
	<i>d) undertaking pre-clearance surveys (including observations/surveys for threatened species);</i>	Section 3.2
	<i>e) identification of fauna management strategies;</i>	Section 3.3
	<i>f) conserving and reusing topsoil;</i>	Section 3.4
	<i>g) collecting seed from the site for rehabilitation works;</i>	Section 3.5
	<i>h) salvaging and reusing material from the site for habitation enhancement; and</i>	Section 3.6
	<i>i) controlling weeds.</i>	Section 3.7

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No	Requirements	Section
Condition 21	<u>Remnant Vegetation Conservation Plan</u> <i>The Remnant Vegetation Conservation Plan shall:</i>	Section 4.0
	a) <i>describe what measures would be implemented to conserve, maintain and enhance the vegetation on the site which will not be cleared as part of the development (in particular sub-populations of <i>Tetratheca juncea</i> [Black-eyed Susan]); and</i>	Section 4.0
	b) <i>describe how the performance of these measures would be monitored over time.</i>	Section 6.0
Condition 22	<u>Conservation Offset Management Plan</u> <i>The Conservation Offset Management Plan shall:</i>	Section 5.0
	a) <i>describe the habitat in the conservation offset area for the following threatened species:</i> ■ <i>Phascogale tapoatafa</i> (Brush-tailed Phascogale); ■ <i>Ninox strenua</i> (Powerful Owl); ■ <i>Phascogale cinereus</i> (Koala); and ■ <i>Tetratheca juncea</i> (Black-eyed Susan).	Section 5.3
	b) <i>justify why this area is suitable as a conservation offset for the species described in (a) above;</i>	Section 5.3
	c) <i>establish baseline data for the existing habitat in the proposed conservation offset area;</i>	Section 5.2 & Section 6.1
	d) <i>describe how the proposed conservation offset area would be managed, including long-term measures for:</i> ■ <i>feral animal control;</i> ■ <i>weed management;</i> ■ <i>stock management; and</i> ■ <i>bushfire management.</i>	Section 5.4
	e) <i>describe how the ecological performance of the conservation offset area would be monitored over time.</i>	Section 6.4 & Section 6.6
Condition 23	<u>Reporting</u> <i>The Applicant shall include a progress report on the implementation and performance of the Flora and Fauna Management Plan and the Conservation Offset Strategy in the AEMR.</i>	Section 7.0

2.2 Relevant Biodiversity Legislation and Other Guidelines

Legislation and guidelines relevant to this FFMP includes:

- NSW Biodiversity Conservation Act 2016;
- NSW Biosecurity Act 2015;
- NSW BCT Ecological Monitoring Module (EMM) (2021) through the application of the BCT EMM Operational Manual (2024);
- SEPP (Biodiversity & Conservation) 2021;
- Arrive Clean, Leave Clean Guidelines (DPE, 2015);
- Hygiene guidelines for invasive plants and pathogens (DPIE, 2020); and
- Weed Management Strategy (NPWS, 2025).

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3.0 Vegetation Clearing Protocol

3.1 Clearing Management

The vegetation clearing protocol aims to:

- Ensure that disturbance to vegetation is minimised;
- Provide procedures for the relocation of unharmed fauna to adjacent habitats;
- Provide procedures for the handling of injured fauna and transportation to a specialist vet for examination and relocation;
- Provide a protocol for collection of seed, topsoil and fauna habitat attributes (hollow logs etc.) for rehabilitation and habitat enhancement; and
- Provide a protocol for controlling the spread of weeds.

To ensure that the aims of the vegetation clearing protocol are achieved, the following tasks are required:

- All areas of vegetation to be retained will be clearly delineated using temporary barrier fencing;
- No clearance is to be completed outside of delineated areas;
- The felling of trees will be supervised to ensure that fauna can be captured and relocated or transported to a vet if injured;
- Seed will be collected from flora within the proposal area and will be used for propagation of plant stock for rehabilitation;
- Fauna habitat attributes such as hollow logs will be saved for future rehabilitation; and
- Weed infestations within the development site will be managed using appropriate techniques prior to earthworks to ensure that weed propagules are not spread.

3.2 Pre-Clearance Surveys

There is no significant additional land disturbance planned as the quarry has reached its maximum extent and has continued to operate on this basis for a number of years. However, minor land disturbances of a residual nature may be required as the quarry reaches final benches ahead of closure and develops and completes rehabilitation of the final landform.

In this scenario, the following processes will be implemented as part of the pre-clearance surveys to determine the most appropriate clearing method.

Mapping

Any areas to be cleared will be mapped for vegetation and weed/pests, including all minor land disturbances, on an as required basis, prior to commencing any site works.

General Searches

Important habitat elements are surveyed within the development site prior to clearing. All hollow bearing trees are flagged or marked with spray paint and contractors are notified of the importance of these trees. Fauna habitats to be relocated such as large fallen timber will be marked and/or relocated into retained areas of bushland or future rehabilitation areas. Other important elements will also be marked such as bird nests and the most appropriate management methods will be implemented.

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Spotlighting & Stag Watching

Hollow bearing trees considered suitable for *Phascogale tapoatafa* (Brush-tailed Phascogale) or *Ninox strenua* (Powerful Owl) and/or that contain evidence of habitation, will be observed at dusk for the presence of fauna. Hollow trees known to be used by particular species such as Brush-tailed Phascogale will be removed in such a way to minimise harm to fauna.

Koala Survey (Tree Inspection)

Prior to tree removal, trees are to be inspected by a qualified fauna ecologist to ensure *Phascolarctos cinereus* (Koalas) are not occupying trees. In the event a Koala is identified, the ecologist will instruct workers as to whether or not works will commence and the prescribed actions to be undertaken to ensure the Koala safety.

Unexpected Finds Protocol

An Unexpected Finds Protocol (UFP) will be implemented, which will include the following core steps in the case of unexpected heritage items (Aboriginal or historical) or contamination are discovered.

Core Steps for Unexpected Finds will be:

1. Stop Work: Immediately halt all work in the vicinity of the find.
2. Cordon Off Area: Secure the area as a “no-go” zone using fence or tape.
3. Notify: Inform the Quarry Manager and Environment & Development Manager. For heritage matters, external reporting and find management will be conducted in accordance with the procedures outlined in the **KEQ Heritage Management Plan**.
4. Identify/Assess: A qualified expert (archaeologist or environmental consultant) should identify the material (e.g. bones, bottles, asbestos, contaminated soil).
5. Record: Photograph and document the finding.

Manage / Resume: Develop and implement a remediation action plan; and then gain clearance to resume work.

3.3 Land Clearing Methodology

All staff involved in clearing activities will be inducted about the ecological issues present and the methods that will be employed for the removal of hollow bearing trees. Fauna likely to be present within hollow bearing trees to be removed comprise Brush-tailed Phascogale, Sugar Glider, Possums and Antechinus.

The procedure for clearing of vegetation is as follows:

1. Suitable hollow logs and boulders found within the proposal area are to be kept on site for use in rehabilitation.
2. All understorey vegetation to be removed. Any suitable logs found within proposal area after under scrubbing are to be kept on site for use in rehabilitation.
3. Weed infestations within the proposal area removed, in accordance with **Section 3.7**.
4. All trees that do not contain hollows removed.

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5. Vegetation clearing should not occur in late winter/spring, to avoid breeding/nesting periods.
6. A hygiene and pathogens protocol, in accordance with the Arrive Clean, Leave Clean Guidelines (DPE, 2015), and Hygiene guidelines for invasive plants and pathogens (DPIE, 2020).
7. 'No-go' areas that are suitably protected with fauna-safe fencing. No-go areas are to be mapped and known to all contractors, with no stockpiling of equipment, soils, or machinery to occur beyond the 'no-go' areas.

Hollow-Bearing Tree Removal

1. Works will only occur during the standard construction hours (07:00 – 18:00), to minimise indirect noise and light impacts to fauna species in adjacent retained vegetation.
2. No sooner than 48 hours prior to clearing, a suitably qualified Ecologist shall undertake pre-clearing surveys to identify fauna habitats present on site that will require attention during clearing works, for example, hollow-bearing and habitat trees (HBTs) including trees with nests, potential shelter sites, ground habitat debris piles, rocks, coarse woody debris, epiphytes, crevices and/ or standing dead trees.
3. All hollow bearing trees within the proposal area will be marked by an ecologist using fluorescent flagging tape and/or spray paint; and counted to indicate the number and type of replacement nest boxes to be identified, obtained, and installed. Hollows cleared are to be replaced with nest boxes at a 1:1 ratio.
4. Any hollow-bearing trees unable to be thoroughly inspected shall be felled in one to two metre sections, beginning at the top of the crown. Lengths cut from the trees shall be in a manner that shall preserve the hollows with each section inspected and appropriately treated to minimise impact to fauna.
5. Tapping/nudging of habitat trees by heavy machinery 24 hours prior to removal, to allow fauna to relocate.
6. Heavy machinery is to remove habit trees using soft felling techniques and be supervised by a suitably qualified Ecologist, to ensure that fauna can be captured and relocated or transported to a vet if injured.
7. Best endeavours will be made to avoid clearing at temperatures greater than 35°C to minimise impact to displaced fauna.
8. If any fauna species, a nest or roost is located during development works, then works should cease until safe relocation can be advised by a contact fauna ecologist.
9. The removal of hollow bearing trees will require the ecologist to work closely with the machinery operator who should be well experienced with tree removal. Trees will be gently pushed a few times to allow any fauna present to escape if willing, then the tree will be gently felled. It is possible for machinery to have some control over the falling tree provided the trunk does not split.
10. Once the tree has been felled and machinery disengaged the ecologist is to inspect hollows for fauna and/or capture any fleeing fauna and relocate to adjacent areas of remnant bushland. If possible, all hollow bearing trees should be removed in a single day to ensure relocated fauna do not take up residency in remaining trees.
11. Hollow bearing trees should be stockpiled separately so hollow limbs etc can be removed and relocated to surrounding vegetation.
12. All fauna captured and relocated will be recorded along with their sex, breeding status, hollow type occupied and point of relocation.

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13. A fauna rescue and release protocol is to be in place, in accordance with the Code of Practice for Injured, Sick and Orphaned Protected Fauna (OEH, 2011).
14. Any injured fauna is to be placed into the hands of a wildlife carer (only appropriately vaccinated personnel are to handle bats) or taken to the nearest veterinary clinic (Tea Gardens Vet Hospital, 2/197 Myall St, Tea Gardens NSW 2324).
15. Any nocturnal fauna found must be captured and re-released to nearby suitable habitat, at a time suitable for the subject species and should not be released during daylight hours.
16. The Environment & Development Manager (or suitable delegate) is to submit a summary report to the consent authority, within 14 days of any vegetation clearing.

3.4 Top-Soil Management

Topsoil management will be completed in accordance with the following:

- Prior to clearing, topsoil and subsoil materials will be characterised to assess potential constraints/opportunities for use in rehabilitation;
- Where practical, measures will be adopted to maintain the viability of any biological resources within the topsoil that may be suitable for use in rehabilitation (e.g. soil seed bank);
- Preference will be given to placing topsoil directly on re-contoured areas.
- Where possible, topsoil will be stripped when moist to help maintain soil structure and to reduce dust generation;
- Topsoil stockpiles are to be located away from extraction, traffic areas and watercourses;
- Appropriate sediment controls will be installed to prevent soil loss;
- Stockpiles to be kept longer than six months will be sown with a suitable cover crop to minimise soil erosion and invasion of weed species;
- Prior to re-spreading, weed growth will be scalped from the top of the stockpiles, if required, to minimise the transport of weeds into rehabilitated areas; and
- Any stockpiles have evidence of any weed growth will be treated prior to the use in rehabilitation.

3.5 Seed Collection

The Florabank Seed Collection Guidelines (Mortlock W, 1998) comprises a detailed range of methods for different species which will be followed for the collection of seeds throughout the proposal area. Where possible, seed will be collected from vegetation being removed including ground covers, shrubs and canopy species.

Collection of seeds for each species will generally occur in the months following flowering. The development of fruits on a flora species is relatively unpredictable and can be influenced by many factors, therefore any seed collection program needs to focus on monitoring the development of fruit/seeds in the area of interest to ensure the seed collected is relatively viable. A suitably qualified bush regenerator will be engaged for seed collection.

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3.6 Material Salvage & Habitat Augmentation

Terrestrial habitat can be degraded by many anthropogenic impacts. Some impacts are direct and easily detected such as clearing and log removal, while other impacts such as past disturbance regimes including grazing and slashing leading to loss of biodiversity and decreased structural complexity are less obvious to the untrained eye but have equally harmful effects. The augmentation of fauna habitat will involve the removal of decaying logs, rocks and hollow branches for placement on the ground and tree hollows where possible will be re-erected or used as habitat in future rehabilitation areas.

The implementation of the fauna habitat augmentation will involve collection of all decaying/hollow fallen logs on the ground with a diameter greater than 15 cm and all rock boulders greater than 30 cm diameter within the proposal area before construction is initialised. Logs from remnant vegetation will be stored at the site, with these to be used in final rehabilitation at the site.

3.7 Weed & Pest Control

The proposed disturbance area will have all weeds and/or weed seeds and propagules removed prior to clearing to ensure that these are not spread into adjacent areas of remnant vegetation.

Weed and pest management will be undertaken within the development site to minimise habitat degradation, encourage growth of native species, and protect native fauna within the RVA and COA through the following process:

- Inspections of the development site and adjoining vegetation will be undertaken periodically to identify weeds and evidence of pest species, focusing on retained vegetation and the COA;
- The locations and specific methods for weed and pest management will be directed by monitoring inspections (i.e. recommendations from monitoring reports);
- 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.
- Weed maintenance and rehabilitation will be conducted by a suitably qualified bush regenerator.

The weeds which will be targeted, based on monitoring results collected between 2008-2011 by RPS, are:

- *Lantana camara* (Lantana), WoNS;
- *Bidens pilosa* (Cobbler's Pegs);
- *Gomphocarpus fruiticosus* (Narrow Leaf Cotton Bush);
- *Cirsium vulgare* (Spear Thistle);
- *Conyza sumatrensis* (Fleabane);
- *Hypochaeris radicata* (Flatweed);
- *Senecio madagascariensis* (Fireweed), WoNS;
- *Stellaria media* (Common Chickweed);
- *Plantago lanceolata* (Ribwort);
- *Andropogon virginicus* (Whisky Grass);
- *Paspalum dilatatum* (Paspalum);
- *Paspalum urvillei* (Vasey Grass);
- *Setaria gracilis* (Slender Pigeon Grass);
- *Solanum mauritianum* (Wild Tobacco); and
- *Verbena bonariensis* (Purpletop).

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Feral Pest Control will consist of the following measures:

- Any vertebrate pest control will be conducted in accordance with the *NSW Codes of Practice and Standard Operating Procedures for the effective and humane management of pest animals*.
- 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, in consultation with Local Land Services (LLS).
- If a baiting program to control feral animals is deemed appropriate, best management practices must be undertaken. A qualified expert must prepare a pest control strategy to be carried out during construction and in accordance with best practice for chemical use to reduce the risk of secondary poisoning.
- Periodic inspections to identify weeds and evidence of pest species will be conducted annually. Where removal of weeds is required, a suitably qualified bush regenerator is to advise on the timing and frequency of works required.
- Pests will be monitored within areas of remnant vegetation within the development site. Pest management programs will focus on disturbance boundaries, the COA and areas adjacent to the development site (RVA).
- All pest control works will be undertaken by suitably trained personnel.

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4.0 Remnant Vegetation Conservation Plan

The aim of the Remnant Vegetation Conservation Plan (RVCP) is to conserve, maintain and enhance the remnant vegetation remaining at the site that is not included in the COA, consisting of Lot 201, Lot 21 and part Lot 11. Particular focus will be given to populations of *Tetratheca juncea* surrounding the quarry site.

This will be achieved through the implementation of the following:

- Establish baseline numbers for all subpopulations of *Tetratheca juncea*;
- Collect quantitative information for all areas of remnant vegetation;
- Establish a monitoring program to record and predict any changes to remnant vegetation;
- Implement adaptive management strategies for remnant vegetation if the condition is shown to be in decline;
- Training of staff (toolbox talks);
- Progressive rehabilitation where possible; and
- Extraction footprint limit.

Monitoring of the remnant vegetation zones will be completed during the life of the quarry. Refer to **Section 6.0** for details regarding the ecological monitoring regime.

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5.0 Conservation Offset Management Plan

The aim of the Conservation Offset Management Plan (COMP) is to:

- Justify the adequacy of the habitat elements within the conservation offset;
- Maintain the habitat qualities for Brush-tailed Phascogale, Powerful Owl, Koala and *Tetratheca juncea*; and
- Provide management strategies to maintain the ecological integrity of the offset with particular focus on weed, pest, stock and bushfire management.

5.1 Conservation Offset Area

Schedule 3, Condition 17 and 18 of the Development Consent required the establishment of a COA consisting of 16 Ha of bushland that is similar to that was originally disturbed to provide an overall improved environmental outcome from the extension of the existing quarry operation, by placing a larger area of vegetation and associated habitat under a formal conservation mechanism.

In 2020, HQPL consulted with NSW Planning regarding establishment of the COA and on 17 November 2021, a delegate of the NSW Planning Secretary approved a Restriction on the Use of Land and Public Positive Covenant. In January 2022, the COA was formally secured in the long-term via a s88B Instrument, on the southern portion of Lot 12 DP1024564, under the NSW Conveyancing Act 1919, as illustrated by **Figure 3**.

This area contains mature trees with adequate hollows that provide potential nesting and roosting and suitable foraging habitat for vulnerable fauna species such as Brush-tailed Phascogale, Koala and Powerful Owl, and suitable habitat for the vulnerable plant species *Tetratheca juncea*. This area is 16 Ha in size, compensating for the approved disturbance of the Stage 2 Extraction Area of 10.8 Ha.

5.2 Approved Vegetation Types

The various biodiversity attributes within the COA are described below and illustrated **Figure 4** (as approved by the original F&FMP – version 1 dated December 2005). Overall, the habitat elements and floral assemblage of the offset area is similar to those recorded in the Stage 2 Extraction Area of the Quarry. The approved COA is 16 Ha in area and consists of 7.02 Ha of Tall Moist Forest, 8.92 Ha of Dry Forest and a 0.06 Ha Dam.

5.2.1 Mixed Tall Moist Forest

This community occurs on the sheltered relatively steep south facing slope and major gully of the COA and represents approximately 7.02 Ha in area. It comprises a tall canopy layer with numerous mature trees and a sub-canopy of rainforest species in areas.

Canopy Species: *Eucalyptus propinqua*, *Eucalyptus microcorys*, *Corymbia maculata*, *Eucalyptus siderophloia*, *Eucalyptus pilularis*, *Eucalyptus deanei*, *Eucalyptus paniculata*, *Syncarpia glomulifera*, *Eucalyptus acmenoides* and *Lophostemon confertus*.

Shrubs and small trees: *Rhodamnia rubescens*, *Guioa semiglaucula*, *Acmena smithii*, *Indigofera australis*, *Acacia irrorata*, *Melaleuca linariifolia* and *Lantana camara*.

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Groundcovers and climbers: *Lomandra longifolia*, *Glycine clandestina*, *Oplismenus* spp., *Plectranthus parviflora*, *Calochlaena dubia*, *Cissus* spp., *Cayratia clematidea*, *Smilax australis*, *Eustrephus latifolius*, *Gymnostachys anceps* and *Rubus moluccanus*.

Fauna Habitat Attributes

Hollows: There are a relatively high number of high-quality habitat trees within this offset area. Some of these trees are very large (up to 30 m high and 1.5 m wide at breast height) and contain numerous hollows and other microhabitat features such as fissures and platforms where leaf litter and bark collects.

Fallen Timber: There is abundant fallen timber in this area of the offset including some large hollow tree trunks as well as numerous large branches. Some of the fallen timber is highly decayed and contains many hollows and fissures.

Rocks/Boulders: There are numerous rocks (10-20 cm diameter) and some areas of larger boulders (1 m diameter).

5.2.1 Dry Forest

This community occurs on the drier slopes of the COA with sandy soils and represents approximately 8.92 Ha in area. It comprises an open canopy layer with an understorey of sclerophyllous shrubs and grasses. This community was subject to bushfires in 2002.

Canopy Species: *Angophora costata* and *Corymbia gummifera* generally dominate the canopy. Other species which may be co-dominate in areas include *Eucalyptus globoidea*, *Eucalyptus microcorys*, *Corymbia maculata*, *Eucalyptus umbra*, and *Allocasuarina torulosa*.

Shrubs and small trees: *Pultenaea villosa*, *Persoonia linearis*, *Pultenaea paleacea*, *Acacia myrtifolia*, *Notelaea longifolia*, *Hibbertia aspera*, *Pultenaea retusa*, *Polyscias sambucifolia*, *Breynia oblongifolia*, *Daviesia ulicifolia* and *Leptospermum polygalifolium*. Surrounding creek lines the following species are present: *Acacia irrorata*, *Melaleuca linariifolia* and *Glochidion ferdinandi*.

Groundcovers and Climbers: *Entolasia stricta*, *Lomandra obliqua*, *Imperata cylindrica*, *Hardenbergia violacea*, *Lomandra longifolia*, *Themeda australis*, *Doryanthes excelsa*, *Pratia purpurascens*, *Patersonia sericea*, *Acianthus fornicatus*, *Caladenia catenata*, *Tetratheca juncea*, *Billardiera scandens*, *Aristida vagans*, *Brunoniella australis* and *Dianella caerulea*.

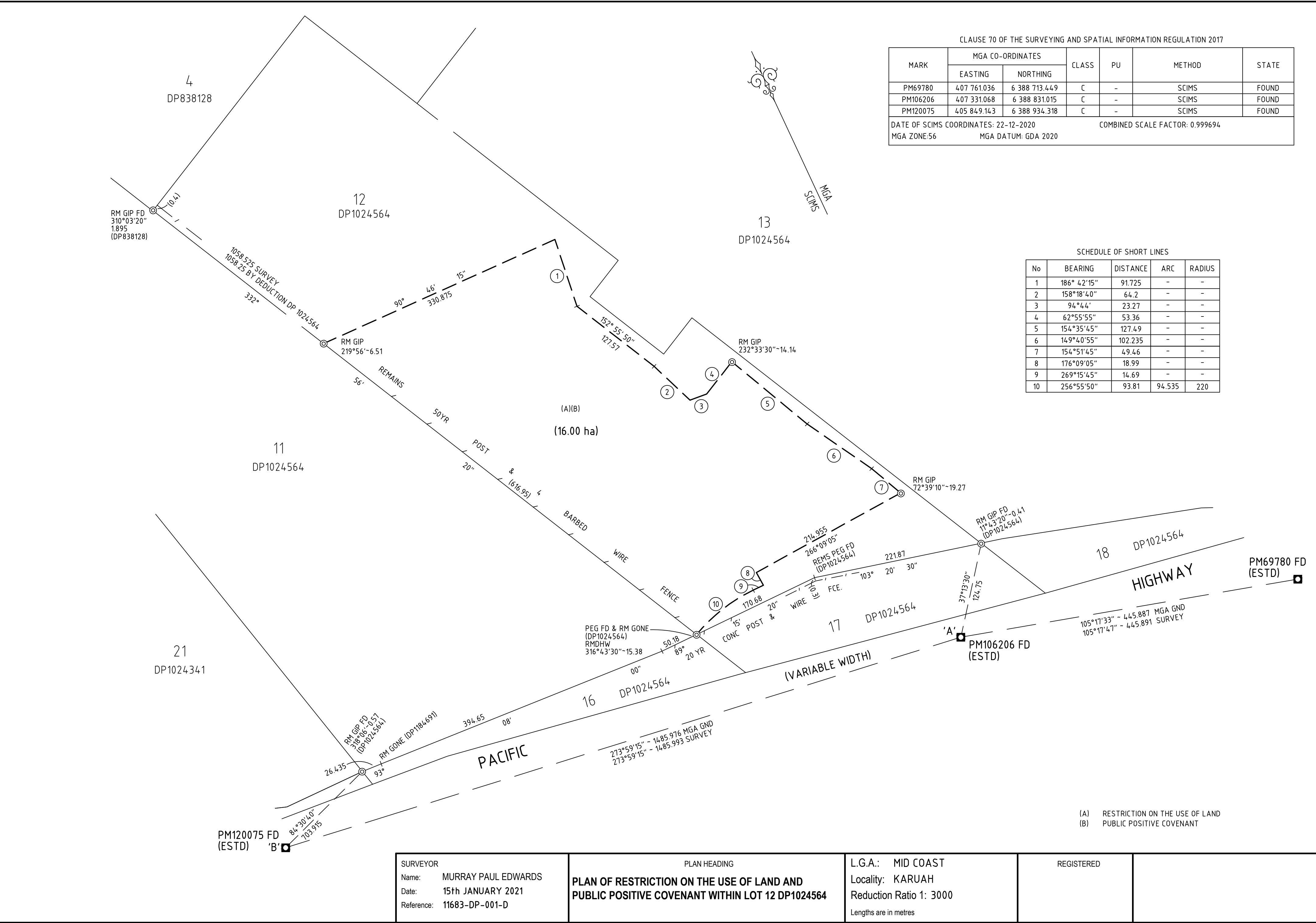
Fauna Habitat Attributes

Hollows: There are low to moderate hollow numbers in this area as it is relatively young, having been cleared in the past. There are some larger mature trees scattered throughout.

Fallen Timber: There is abundant fallen timber in places, particularly along the drainage lines and flatter areas of this community in the southwest of the offset area. Areas of abundant fallen timber most likely attributable to bushfires. Some of the slopes contain very little fallen timber, however, have abundant boulders and rocks.

Rocks/Boulders: There are numerous rocks (10-20 cm diameter) and some areas of larger boulders (1 m diameter) on some of the slopes of this area.

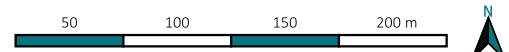
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- | | | | |
|--|--|---|---|
| ▬ Site Boundary | COA Vegetation Mapping
(HWR Ecological - 2005) | ▬ Watercourse | ▬ Contour (10m) |
| ▬ Conservation
Offset Area copy | ▬ Tall moist forest | ▬ NPWS reserve | |
| ▬ Cadastre | ▬ Dry forest | ▬ Primary Road | |
| | ▬ Dam | | |

Figure 4: Approved Vegetation Types of the Conservation Offset Area



5.3 Threatened Species Habitat

5.3.1 Brush-tailed Phascogale

Preferred Habitat

Brush-tailed Phascogale is a small Dasyurid marsupial with a tree climbing habit. It typically dens and nests in tree hollows, and forages on the ground, among fallen tree litter and on trees for insects. It is most commonly associated with drier forests and woodlands with an open grassy understorey or plentiful tree litter (fallen branches, etc).

Preferred habitat is dry sclerophyll open forest and woodlands with sparse ground cover of herbs, grasses and sclerophyllous shrubs where annual rainfall exceeds 500 mm (Triall & Coates, Cuttle 1982, Soderquist, 1994). They are often found in treed habitats which contain rough-barked species preferring open dry foothill forest with little ground cover (DSE, 1997).

Brush-tailed Phascogale require a large number of hollows within their home range as they nest in up to 30 different sites each year (DSE, 1997). Suitable hollows may occur in dead or live trees, with entrance typically 25-40 mm wide and lined with leaves and pungent faeces (DSE, 1997). Given Dasyurids typically produce large litters nursery nests for Brush-tailed Phascogale need to be large secure cavities with small openings, however they are also known to utilise nestboxes for shelter and nursery sites (Soderquist *et al.*, 1996).

Dead or senescent trees within a landscape are relatively uncommon but appear to be important for Brush-tailed Phascogale who show a preference for using dead or senescent trees for their maternal nest sites (Rhind, 2004). However, nest-site choice appears to be influenced not only by hollow availability or proximity to current foraging areas, it is considered likely (Rhind, 2004) that social factors such as maintenance and surveillance of territories by visitation or occupation of nest-sites may explain unusual sites within logged areas of their range.

The diet of Brush-tailed Phascogale typically consists of large invertebrates including insects, spiders and centipedes taken mainly gleaned from the trunks and major branches of large trees especially dead branches and rough-barks (Triall & Coates, 1993; Soderquist, 1995; Scarff *et al.*, 1998).

Scarff *et al.* (1998) identified that while their diet is generalised they exhibit preference and selectivity for larger than average prey, especially invertebrates. Therefore, it is likely that the distribution of Phascogale populations is correlated to the richness and abundance of arthropods Recher *et al.* (1996) which are positively related to soil and foliar nutrient levels. A study by van de Ree *et al.* (2001) was able to provide support for this hypothesis by indicating that although home-ranges of Brush-tailed Phascogale within linear remnants were much smaller than average, viable populations were able to utilise linear remnants on high productivity soils, although success was also contributable to the high density of large (DBH>70 cm) remnant trees which provided greater foraging area and hollow abundance.

A detailed study of Brush-tailed Phascogale diet (Scarff *et al.* 1998) also found evidence of nectar feeding. The fact that four mature females utilised the same source indicated that flowers were a valuable food source given that females usually occur in intrasexually exclusive home ranges (Soderquist and Ealey, 1994; Rhind, 1998; van der Ree, 2001). Studies at three locations report extended bouts of nectar feeding by Brush-tailed Phascogale (Goldingay, 2000) suggesting that nectar feeding may provide an important carbohydrate resource. Soderquist (1995 cited in Scarff *et al.*, 1998) reports that much higher levels of nectar use are recorded in Eastern Australia although not all eucalypt flowers are used equally.

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Available Habitat in the Conservation Offset Area

Nesting / Roosting

There are a high number of hollows within the Tall Moist Forest suitable for the nesting and roosting behaviour of Brush-tailed Phascogale. There are many large trees that are likely to provide suitable nursery sites with large secure cavities with small openings. The Dry Forest contains low to moderate numbers of hollows which may be important for Brush-tailed Phascogale particularly when foraging in these areas of the offset.

Foraging

There is a diversity of tree and shrub species within the offset which provide nectar, which (as referenced above) may provide an important food resource for Brush-tailed Phascogale in the local area. Many invertebrates that also utilise these nectar and pollen resources are likely to be eaten by Brush-tailed Phascogale. The larger trees within the Tall Moist Forest provide a variety of microhabitats for invertebrates such as dead branches and rough bark providing foraging areas for Brush-tailed Phascogale. The higher nutrient levels of the volcanic soils of the Tall Moist Forest is likely to positively influence the abundance of larger invertebrates favoured by Brush-tailed Phascogale. The high abundance of fallen timber in areas is also likely to provide suitable foraging for invertebrates and possible nesting and roosting sites for Brush-tailed Phascogale. Areas of the Dry Forest are also likely to provide some foraging opportunities.

Conclusion

Core habitat elements for Brush-tailed Phascogale are present within the COA, considering the presence of large mature trees with high hollow numbers, a variety of suitable foraging resources and relatively high nutrient soils.

5.3.2 Koala

Preferred Habitat

Notwithstanding the definitive appearance of this species, observations of the free-ranging Koalas can be difficult. This is in part due to the cryptic nature of the species and the large and almost exclusive home ranges that individuals occupy; 100 Ha plus (White, 1999). The species is identified as a species in decline and there are many complex factors that limit free-ranging Koala populations, including food tree preferences, history of disturbance and Chlamydia infection, all of which make longer-term population trends of many populations difficult to predict (Phillips, 2000).

Evidence of tree use by Koalas and, therefore, the presence of Koalas is generally determined by faecal pellet counts and scratches on trees “possible Koala scratches”. Studies conducted by Phillips (2000) in the Port Stephens local government area showed that 10 Eucalyptus species and 9 species of non-eucalypt were utilised by Koalas in that area.

The following tree species which are used by Koalas are present in the COA:

- Grey Gum (*Eucalyptus punctata* or *E. propinqua*);
- Tallowood (*Eucalyptus microcorys*);
- Blackbutt (*Eucalyptus pilularis*);
- Spotted Gum (*Corymbia maculata*);
- Grey Ironbark (*Eucalyptus paniculata*);
- Broad-leaved White Mahogany (*Eucalyptus umbra*);
- Red Bloodwood (*Corymbia gummifera*);
- White Mahogany (*Eucalyptus acmenoides*);
- Red Mahogany (*Eucalyptus resinifera*); and
- Smooth Barked Apple (*Angophora costata*).

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Available Habitat in the Conservation Offset Area

Nesting / Roosting

Koalas have no specific nesting or roosting habitat requirements.

Foraging

The foraging habitat present for Koalas within the conservation offset includes a range of preferred and supplementary feed trees. Of the 19 species of trees identified by Phillips as being utilised by Koalas, 10 occur within the conservation offset. The higher nutrient soils present within the Tall Moist Forest and along the drainage lines of the Dry Forest of the conservation offset are likely to provide higher foliar nutrient levels favourable for Koalas (Phillips, 2000).

Conclusion

The COA is likely to provide habitat elements for Koala, considering the abundance of suitable feed trees and the presence of higher nutrient volcanic soils.

5.3.3 Powerful Owl

Preferred Habitat

Powerful Owl is the largest of Australia's owls. It feeds on large arboreal mammals, megabats, and other fauna captured in trees. It forages mostly in open forests and typically roosts in tall trees in dark moist gullies. It nests in a very large hollow, typically in large tree in a moist gully. Pairs maintain and hunt throughout a home range that may be up to 1000 Ha.

Available Habitat in the Conservation Offset Area

Nesting / Roosting

There are many large hollow bearing trees within the Tall Moist Forest that contain large vertical spout hollows which may provide suitable nesting habitat for Powerful Owls. The dense canopy within the major gully also provides suitable roosting habitat for Powerful Owls.

Foraging

There is likely to be a high abundance of prey for Powerful Owls. The major prey species of the Powerful Owl in the local area includes Brush-tailed possum, Grey-headed Flying Fox, Squirrel Glider, Sugar Glider and Brush-tailed Phascogale. These species are present in the local area, and the COA provides suitable habitat for these prey species.

Conclusion

Core habitat elements are present for Powerful Owl including large hollows and a dark moist gully suitable for nesting and roosting and the highly likely presence of abundant prey within the COA and surrounding areas of remnant vegetation.

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5.3.4 *Tetratheca juncea* (Black-eyed Susan)

Preferred Habitat

The majority of *Tetratheca juncea* populations occur on predominantly low nutrient soils with a dense understorey of grasses (NPWS, 2000). It is often found in association with Red Bloodwood (*Corymbia gummifera*) dominated vegetation communities, within which Smooth-barked Apple (*Angophora costata*) or Scribbly Gum (*Eucalyptus haemastoma*) are co-dominant, with a dense understorey of herbs, forbs, grass trees and grasses (Landenberger, 2003). *Tetratheca juncea* displays a preference for cooler southern aspects (161–240°) along ridges although it can be found on any aspect or slope and generally prefers sites with good drainage and low moisture levels (NPWS, 2000).

Available Habitat in the Conservation Offset Area

Tetratheca juncea was recorded in the COA within areas of the Dry Forest, as illustrated in **Figure 4**. The size of the two populations in the offset has not been accurately detailed, however, is likely to range from 20-100+ plants, the size of the population will be accurately detailed in monitoring studies. The Dry Forest area provides suitable habitat for *Tetratheca juncea*, where it was recorded on a south-southwest facing slope in grassy understorey with rocks and boulders present.

The COA contains suitable habitat for *Tetratheca juncea*. Areas where plant clumps were found in the COA have suitable areas of habitat surrounding in which the population could expand.

5.4 Site Management Measures

Feral Animal Control

Feral animals are monitored through opportunistic sightings of scats, targeting feral cats, goats, rabbits, dogs and foxes. Evidence of feral animals are recorded during ecological surveys.

If there is evidence of feral animals in the area, the most appropriate methods will be employed to control each species. Control methods may include trapping animals and getting them euthanized and/or poisonous baits.

HQPL strives to work with LLS and local community groups in an effort to combat the spread of pest species and the damaging impact they have on native biodiversity.

Weed Management

Weeds are not abundant in the COA and are mainly restricted to some minor *Lantana camara* infestations within areas of the Tall Moist Forest, which will be controlled and monitored overtime. These infestations will be controlled through methods detailed in **Section 4.7**.

Stock Management

There should be no stock within the COA.

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Any unplanned stock will be monitored through opportunistic sightings of scats, targeting cattle and goats. No evidence suggesting the presence of stock has been found in the offset and it is unlikely to be a significant problem in the future. If evidence is found to suggest the presence of stock in the offset, a number of management options can be implemented including liaison with local landholders who have stock which may be entering the offset area and/or the offset could be fenced to exclude any local stock.

Bushfire Management

Management of bushfire within the COA is needed to limit impacts of bushfires to mesic vegetation (habitat with a well-balanced supply of moisture) sensitive to fire present within areas of the Tall Moist Forest and to control fuel loads below residential dwellings on the eastern side of the offset. Bush fire management will be undertaken in consultation with NSW Rural Fire Service (RFS).

Hazard reduction burn would only be undertaken where there are heavy fuels that could support an uncontrolled fire. The NSW RFS will be consulted to determine the most appropriate method of assessing the fuel load and the level of fuel load that would warrant a hazard reduction burn.

Any hazard reduction burning will be undertaken in consultation with the relevant authorities and in accordance with the NSW RFS Standards for Low Intensity Bush Fire Hazard Reduction Burning.

Nest Boxes

In case of any nest boxes needing to be installed, 90% must be in working order at all times.

However, it should be noted that there are currently none installed within the COA and no further clearing at KHRQ is required at the site, which would trigger the installation of new nest boxes as a replacement to the loss of hollow bearing trees.

Fencing

Permanent protective fencing is to be in place and maintained in working order. This will be fauna friendly with no barbed strands (i.e. plain wire only), on the top or bottom strands.

This fauna-fencing will be installed sequentially at the “effective” interface with areas of non-native vegetation, such as Blue Rock Close and the operational areas of the adjoining KEQ site.

Sediment Controls

Most urban erosion is a short-term problem caused by the removal of site vegetation and the subsequent land reshaping that occurs during the construction of roads and buildings (Managing Urban Stormwater: Soils and Construction – Volume 2E, Mines and quarries [the Blue Book]). Fine sediment is a particular problem because it can “piggyback” nutrients that degrade the receiving waters by accelerating the growth of algae and weeds.

No clearing is planned to be undertaken within the COA, so sediment controls are unlikely to be necessary.

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However, if any works are necessary, the following principles are to be followed:

- Minimize disturbance footprint area and time of exposure through appropriate works planning;
- Focus on erosion control as a priority wherever applicable;
- Install sediment controls downslope before disturbing ground and for the duration off the disturbance;
- Monitor and maintain controls to ensure function, especially before and after rain;
- Progressive stabilization of disturbed areas should be undertaken during works; and
- Review and update the plan as required as site conditions change through the works.

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Mitigation Measures

The measures outlined in **Table 2** will be implemented to mitigate against potential indirect impacts of the Quarry Operations.

Table 2 *Mitigation Measures.*

Mitigation measure	Method/technique	Timing	Frequency	Responsibility	Likely efficacy
Vehicle strike on native fauna.	Impose low speed limits on site (20 km).	At all times.	At all times.	All vehicles.	Effective.
Edge effects: Physical.	- Clearly delineate the boundaries of the Development Site to ensure no accidental incursions within retained vegetation. - Ensure vehicle and equipment parking areas and stockpile areas are identified and sited to avoid areas containing ecological value wherever practicable. - Appropriate signage such as 'No Go Zone' or 'Environmental Protection Area' is to be installed. - Identify and communicate the location of any 'No Go Zones' in site inductions.	Construction and operation.	Once off	Quarry Manager and Environment & Development Manager (or suitable delegate).	Effective (low risk of failure).
Edge effects: Transfer of weeds and pathogens.	- Fungal pathogens, including <i>Phytophthora cinnamomi</i> and Myrtle Rust (<i>Puccinia psidii</i>), can impact on native plant communities and inhabiting fauna if not managed. Vehicles and equipment will be washed down prior to arrival on-site. - During pre-clearing surveys, areas of major weed infestation will be delineated with flagging tape to allow for separate stockpiling of this soil and vegetative material. This will reduce the spread and weed establishment of weed infestations in rehabilitated areas post construction. - Ensure soil and seed material is not transferred on machinery though appropriate wash down procedures.	At all times.	At all times.	All vehicles.	Effective.
Weeds.	Inspections of the development site and adjoining vegetation will be undertaken periodically to identify weeds and evidence of pest species, focusing on retained vegetation and the COA.	Spring-Summer	Annually during quarry operating life.	Environment & Development Manager (or suitable delegate).	Moderately effective- requires regular monitoring and management

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Mitigation measure	Method/technique	Timing	Frequency	Responsibility	Likely efficacy
	- 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. - Weed maintenance and rehabilitation will be conducted by a suitably qualified bush regenerator.				
Feral pests (cats, pigs, deer, feral dogs).	- Annual inspections/monitoring - Ground-based shooting - Trapping	As required.	Annually during quarry operating life.	Environment & Development Manager (or suitable delegate).	Moderately effective.
Light pollution.	Shielding and Directional Lighting: Utilizing shielded lighting to prevent light from escaping into the night sky and reducing upward light pollution. Proper design focuses light specifically on required work areas to minimize light spill and skyglow. - No nightwork proposed.	Construction and operation.	Once off.	Quarry Manager.	Effective (low risk of failure).
Surface water management controls to mitigate sediment run-off and/or contaminant runoff impacting surface water quality and quantity.	- Sediment and erosion controls (ESC) such as sediment fences, mulching and jute matting will be utilised where appropriate. - Diversion drains will be constructed to divert clean water away from the proposed disturbance area. - Diversion drains and earth bunds shall be constructed to ensure that runoff from disturbed catchments is directed to the site's sediment dams. - ESC is to be employed during construction activities. - Spill kits positioned at key locations across the site.	Construction and operation.	Once off.	Quarry Manager.	Effective (low risk of failure).
Erosion and sedimentation.	- Erosion and sediment controls are to be employed during construction activities. - Sediment and erosion control measures such as sediment fences, mulching and jute matting will be utilised where appropriate.	Construction and operation.	Once off.	Quarry Manager.	Effective (low risk of failure).

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6.0 Biodiversity Monitoring Regime

6.1 Baseline Data (2007-08)

6.1.1 Ecological Communities

Baseline datasets for each ecological community were re-established across the RVA and COA by RPS in the 2008 Annual Ecological Monitoring Report, as illustrated by **Figure 5** and **Figure 6**. Note, minor updates to the mapped ecological communities have been completed following various project surveys since this time. The methods for monitoring these vegetation communities comprise the use of permanent quadrats within each vegetation community surrounding the quarry.

6.1.2 *Tetratheca juncea* (Black-eyed Susan)

Baseline data has been collected on *Tetratheca juncea* which includes population size, vegetative floristic and structure and the location of the *Tetratheca juncea* subpopulations. Baseline data for the floristic and structure of each vegetation community within areas surrounding the quarry footprint was also collected prior to 2011 monitoring and will be subject to on-going monitoring.

The *Tetratheca juncea* subpopulations, detailed in the original EIS for the KHRQ (2003), have been substantially impacted from bushfire, although some plant clumps were recorded during the 2011 ecological monitoring round (RPS, 2011). The current extent and size of these populations will be detailed in monitoring activities.

Surveys of *Tetratheca juncea* are relatively difficult due to the counting of the species being subjective due to the clumping nature of the plant and therefore the methods must be standardised and a protocol developed that will remove subjective decisions when counting plants. A standardised distance measure between plant stems may be useful for determining population sizes.

A map of the known subpopulations and individuals of *Tetratheca juncea* on and adjacent to the development site and areas of likely occurrence is illustrated in **Figure 5**. Systematic searches throughout areas of suitable habitat have been conducted and all subpopulations/clumps have had baseline data recorded using the protocol developed for the surveys (RPS, 2008).

Permanent quadrats (5 x 5 m) have been established within the identified *Tetratheca juncea* subpopulations. Currently, 4 main patches of *Tetratheca juncea* have been identified at the site, known as Remnant Population 1 to 4, respectively; with an additional two additional populations identified in the COA, known as Conservation Population 1 and 2, respectively.

Remnant Population 1 to 3 are located to the west of and beyond the direct development site, and all subject to on-going monitoring. Remnant Population 4, located on a small ridgeline directly between the KHRQ weighbridge and the former Karuah Red Quarry, is no longer considered active with no individuals detected since the 2009/2010 monitoring event. Future monitoring of Remnant Population 4, quadrat Tj-Q01, is henceforth discontinued. Remnant Population 4 was observed to be an already isolated population subject to natural impacts of fragmentation, to which population decline is attributed.

Suitable methodology for monitoring these Remnant Populations included the establishment (at random using a nested hierarchical table) of permanent quadrats within these 4 sites. This method identifies suitable areas of *Tetratheca juncea* habitat, searches for subpopulations within these habitat areas and randomly located quadrats within subpopulations once they are defined. Information to be collected from the quadrats is precise data on the change in *Tetratheca juncea* numbers using the standardised survey protocol.

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Additional to the plant number data collected within these quadrats, information which was collected in baseline surveys (RPS, 2008) included:

- Exact locations of plants;
- A description of the surrounding vegetation;
- The foliage cover of clumps;
- Approximate shape and number of stems coming from clumps;
- Above ground biomass;
- Number of flowers, fruits and buds;
- Photos of clumps; and
- Any other relevant information.

Each new clump must be given an identification key and mapped.

6.1.3 Threatened Fauna Species

To allow for appropriate identification and assessment of trends over time, and for a holistic indication of target fauna species distribution, threatened fauna monitoring was undertaken within both the COA and the RVA prior to 2011 monitoring. Particular focus was given to three target fauna species, including Brush-tailed Phascogale, Koala, and Powerful Owl. During this 2007-08 baseline survey a series of fauna survey locations were established throughout the site, these locations have been utilised throughout subsequent annual monitoring events.

Diurnal Koala Habitat Searches

During the 2007-08 annual monitoring period, seven Koala Spot Assessment Technique (SAT) plot locations were selected. SAT plot locations were selected where a State Environmental Planning Policy No. 44 (SEPP 44) Schedule. Two food tree species were identified at a density greater than 15 percent. At each SAT plot a centre tree was selected that either:

- Had a Koala present;
- Had Koala scats at the base;
- Had scratches indicative of Koalas; or
- Was a Koala feed tree species as per SEPP 44.

Within each SAT plot, the closest 30 trees (greater than 20 cm diameter at breast height) to the centre tree were searched for Koala activity such as:

- Koala individuals;
- Koala scats; and
- Koala scratches.

Due to the presence of other arboreal mammals such as the Common Brushtail Possum, the identification of scratches on tree trunks as belonging to either koalas or other arboreal mammals is problematic. Where large scratches of similar size and shape to koala scratches were identified, they were noted as 'possible' Koala scratches.

Spotlighting

Spotlighting was undertaken over four nights (during the 2008-09 survey) within the site to target three key species (Brush-tailed Phascogale, Koala and Powerful Owl). Each spotlighting transect was traversed each night by two people resulting in a total of 16 person hours of spotlighting.

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Hair Tube Sampling

Hair tube sampling was undertaken across the site to target the Brush-tailed Phascogale. Each typical hair tube transect consisted of 10 hair funnels (Faunatech design) spaced 10-20 m apart. One atypical hair tube transect consisting of only 3 hair funnels was also set within a small area of vegetation (Transect 5). Each hair funnel was mounted on a tree trunk, approximately 2- 2.5 m above the ground. Hair tubes were baited with a mixture of rolled oats, peanut butter and honey and left active for a period of 10 nights, totalling 630 hair tube trap nights within the site (in 2011 period).

Note, hair tube sampling has since been replaced by Remote Camera Transects (RCT) from the 2020/2021 monitoring period.

Call Playback

Call playback of pre-recorded Powerful Owl calls was broadcast in an effort to elicit vocal responses from the species and/or to attract an owl to the playback site. The calls were broadcast through an amplification system (loud hailer) designed to project the sound for up to 1 km under still night conditions. The call was broadcast for at least five minutes, followed by five minutes of listening, and stationary spotlighting (RPS, 2008). Following the final broadcast and listening the surrounding area was spotlighted on foot.

During the 2008-09 survey and the 2009-10 survey, call playback for Masked Owl, Sooty Owl and Barking Owl was also undertaken. During the 2008-09 survey Masked Owl calls were played at all sites, with Sooty Owl calls played within appropriate wet habitats and Barking Owl calls within dry woodland habitat.

Incidental observations

Opportunistic sightings of secondary indications (such as scratches, scats, diggings and/or tracks) of targeted fauna were noted. Such indicators included:

- Distinctive scats left by mammals;
- Scratch marks made by various types of arboreal animals;
- Scats consistent with Koalas;
- Chewed Allocasuarina subsp. cones indicative of feeding by Glossy Black Cockatoos; and
- Whitewash, regurgitation pellets and prey remains from owls.

6.2 Monitoring (2008 – 2011)

Annual monitoring was conducted in Spring – Summer by RPS between 2008-2009 and 2010-2011. The methodology established for the Baseline Monitoring (2007-2008) was conducted during this monitoring period.

6.3 Monitoring (2011 – 2019)

No biodiversity monitoring was undertaken during the 2011 to 2019 period.

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6.4 Monitoring (2020-21, 2022-23 and 2024-25)

Two-yearly monitoring rounds recommended in the 2020-21 monitoring period by Kleinfelder and more recently by Wedgetail Project Consulting (WPC) for the 2022-23 and 2024-25 monitoring periods, with monitoring continuing for the life of the quarry operations.

This two-yearly monitoring frequency was approved by NSW Planning in the 2020 revision of this F&FMP (version 6) developed by SLR (dated September 2020).

Details of the flora and fauna monitoring regime for the RVA and the COA are outlined in the following sections. Survey locations are based on the RPS (2008) baseline ecological monitoring works, as illustrated by **Figure 5** and **Figure 6**, and detailed below in the remainder of **Section 6.6**.

6.4.1 Vegetation Monitoring

Vegetation monitoring consists of surveying eight (8x) permanently established ecological monitoring plots (20 x 20 m); with six (6x) within the RVA and two (2x) within the COA. Monitoring is scheduled for the flowering period (August – December) for optimum results.

The following data is collected:

- Flora species diversity;
- Total number of flora species;
- Number and percent of native flora species;
- Number and percent of introduced flora species;
- Flora species abundances recorded utilising a modified Braun-Blanquet (1982) cover abundance six ranking scale as shown in **Table 3**;
- Projected foliage cover for each vegetation layer; and
- Vegetation height of each vegetation layer in metres.

Table 3 *Flora Species Abundance Rankings.*

Cover Code	Projected Canopy Cover
1	<5% and uncommon
2	<5% and common
3	6-20%
4	21-50%
5	51-75%
6	76-100%

The following additional information is collected for each monitoring site:

- Topography;
- Altitude;
- Slope;
- Aspect;
- Geology;
- Soil type;
- Evidence of fire;
- Weed incursions; and
- Detail of any other disturbance.

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6.4.2 *Tetradthea juncea* (Black-eyed Susan)

On-going viability of *Tetradthea juncea* populations depends on identifying any decline in health during monitoring, allowing appropriate management to be implemented. Monitoring of *Tetradthea juncea* is to be conducted every two years (August – December) for the life of quarry operations.

Monitoring is conducted across ten (10x) permanently established 5 x 5 m quadrats, including:

- two (2x) within Remnant Area Population 1,
- four (4x) within Remnant Area Population 2,
- one (1x) within Remnant Area Population 3,
- one (1x) within Remnant Area Population 4,
- one (1x) within Conservation Population 1, and
- one (1x) within Conservation Population 2.

Within each quadrat, the number of *Tetradthea juncea* clumps is identified, adhering to the standardised method as set out by Payne et al. (2002) for counting *Tetradthea juncea* clumps, which involves the delineation of each plant clump by a distance of 30 cm.

The following data is collected:

- Number of stems on each *Tetradthea juncea* plant clump (estimate of biomass);
- Number of flowers on each *Tetradthea juncea* plant clump;
- Number of fruit on each *Tetradthea juncea* plant clump;
- Projected foliage cover of *Tetradthea juncea* plant clump;
- Other plant species flowering and or fruiting;
- Location of each *Tetradthea juncea* plant clump within the quadrat (to be shown on a Figure);
- Identification all other vascular plant species within the quadrat;
- Information on floristic structure and vegetation community, in which the quadrat occurs in;
- Disturbances; and
- Weed incursions.

These methods will be sufficient to establish whether a change in the cover and abundance of surrounding vegetation is affecting *Tetradthea juncea* subpopulations. If so, possible reasons for the change can be developed and management strategies implemented to ensure the persistence of the population.

6.4.3 *Grevillea parviflora* subsp. *Parviflora* (Small-flowered Grevillea)

On-going viability of *Grevillea parviflora* subsp. *parviflora* populations depends on identifying any decline in health during monitoring, allowing appropriate management to be implemented. Monitoring of *Grevillea parviflora* subsp. *parviflora* was conducted every two years (August – December) for the life of quarry operations.

Monitoring was conducted across three (3) permanently established 20 x 20 m plots across the RVA.

Data to be collected includes:

- Count of all individuals;
- Height of individuals;
- Presence/absence of flowers; and
- Evidence of recruitment.

However, as outlined in **Section 6.5**, monitoring for *Grevillea parviflora* subsp. *parviflora* ceased following the 2024-25 monitoring period.

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6.4.4 Fauna

Fauna monitoring is scheduled for the summer months (December – February) when most fauna species are active, and consists of the following surveys methodologies:

- Koala Scat Surveys using the Spot Assessment Technique:
 - Four (4x) locations within the RVA.
 - One (1x) location within the COA.
- Remote camera monitoring within baited cameras active for 10 nights:
 - 17 locations within the Remnant Vegetation Area across five transects (four transects with four cameras and one with two cameras).
 - 8 locations within the COA across two transects (four cameras along each transect).
- Owl call play-back locations, with pre-recorded owl calls will be broadcast for periods of 5 minutes with 5 minutes listening time. Owl calls will generally be broadcast prior to spotlighting:
 - Two (2x) locations within the RVA.
 - One (1x) at the edge of the COA.
- Spotlighting transects will be undertaken targeting Brush- tailed Phascogale, Koala and Powerful Owl. Spotlighting will be conducted for one person hour along each transect, with surveys replicated over two separate nights (i.e. one person hour each night):
 - Three (3x) transects within the RVA.
 - One (1x) transect within the COA.
- Anabat surveys will be conducted with devices activated for 1 hour each night for two nights.

6.5 Proposed Monitoring (2026-27 – onwards)

6.5.1 Remnant Vegetation Area Monitoring

In 2025, a review of the monitoring results from the past three monitoring rounds was completed by WPC and therefore, from the 2026-2027 monitoring rounds onwards, the ecological monitoring regime outlined by **Section 6.4** will continue within the RVA for the life quarry operations with the following amendments:

- Relocation of monitoring for Black-eyed Susan at Plot #TJ-Q01;
- Discontinuation of monitoring for Grevillea parviflora subsp. parviflora monitoring; and
- Revised monitoring frequencies as detailed by the BCT EMM (2021) through the application of the BCT EMM *Operational Manual* (2024).

Review of Black-eyed Susan (*Tetratheca juncea*) Monitoring

Review of the obtained data from the three most recent monitoring rounds by Kleinfelder and WPC has identified no active individuals within monitoring location Tj Q01 within Population 4. As such, this monitoring location will be adjusted to an adjacent location within the population to allow the continued monitoring of this remnant population.

All future monitoring surveys for *T. juncea* are to be undertaken in September-October to coincide with peak flowering to conform with the TBDC guidelines.

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Review of Small-Flower Grevillea (*Grevillea parviflora* subsp. *parviflora*) Identifications

A desktop review of recent advice from the NSW Herbarium concluded that previous samples of *Grevillea parviflora* subsp. *parviflora* are identified as a mix of either *Grevillea humilis* subsp. *humilis* or a *Grevillea humilis* subsp. *humilis* <-> *parviflora* subsp. *parviflora* integrade.

Intergrades are not considered to be the listed threatened species under the NSW Biodiversity Conservation Act 2016 (BC Act) and in accordance with Section 5.3.1 of Surveying threatened plants and their habitats – NSW survey guide for the Biodiversity Assessment Method (BAM) (DPIE, 2020). Therefore, monitoring of the ‘Small-flower Grevillea’ individuals at the site will be discontinued for the 2026-27 monitoring round and beyond.

Revised Monitoring Frequencies

It is proposed to complete monitoring at a regular 3-yearly frequency to ensure consistent management throughout operating life of the quarry. This approach results in a conservative monitoring period being applied for vegetation (plots) and Powerful Owl which would otherwise be subject to 5-yearly monitoring.

6.5.2 Conservation Offset Area Monitoring

Following the review of this FFMP in 2025 by the Conservation Programs, Heritage and Regulation Group (CPHR) within the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) the monitoring program for the COA has been updated to address the outcomes of the review.

Monitoring of the COA has been designed in accordance with the BCT EMM (2021) through the application of the BCT EMM *Operational Manual* (2024) and will be undertaken within the COA for the life of quarry operations.

The monitoring plan has been developed as per Section 2.2 of the EMM Operational Manual (BCT 2024):

- **Stratification:** COA contains two vegetation zones (Section 5.2), Mixed Tall Moist Forest (7.02 Ha) and Dry Forest (8.92 Ha).
- **Management Intensity:** moderate management intensity applied as all required management actions will be undertaken in accordance with this Plan.
- **Monitoring Category:** based on Table 3 in the EMM Operational Manual, each vegetation zone is categorised for the purposes of designating a plot monitoring prescription. For the purposes of applying Tale 3, both vegetation zones have been assumed to be in Moderate condition, and a monitoring category of B has been assigned.
- **Minimum number of plots:** minimum plot densities for each vegetation zone is determined by using Table 4 and Table 5 of the EMM Operational Manual (BCT 2024). Based on the monitoring category of B for each zone and their respective areas of 7.02 Ha and 8.92 Ha, each zone requires one monitoring plot to be conducted every 5-years.
- **Identify any threatened species monitoring requirements:** Monitoring for target species detailed in the consent conditions will be undertaken as part of the monitoring program. Targeted monitoring for the Brush-tailed Phascogale, Koala, Powerful Owl and Tetratheca juncea will be undertaken every 5-years within the COA.
- **Document ecological response objectives/targets:** Targets for monitoring have been aligned to those outlined in the EMM and are detailed below.

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Vegetation Monitoring

In accordance with the EMM Operational Manual (BCT 2024) a total of two plots will be conducted, with one plot in each vegetation zone, as illustrated by **Figure 5**. Both plots require plot/transects to collect site condition data for the composition, structure and function attributes in accordance with Section 4.3 of the BAM (DPIE 2020). This will include a full floristic plot (20 x 20 m) and a transect (20 x 50 m) to collect function attributes, at each location.

Vegetation plot monitoring is recommended to be undertaken every 5-years, as detailed in the EMM Operational Manual (BCT 2024). However, this plan adopts a consistent 3-year monitoring cycle across all monitoring types to ensure alignment with the guidelines and consistency in monitoring events.

Threatened Flora Monitoring

Within the EMM Operational Manual (BCT 2024) there are no specific monitoring guidelines for *Tetratheca juncea* outlined in Appendix 1: Threatened species population monitoring-recommended methods. As such, Table 11 was used as a guide to determine the monitoring methodology for *Tetratheca juncea* within the COA.

Recommended monitoring for shrubs includes, population census (small population); sample abundance plots; condition assessment; size class counts; and/or recruitment assessment (e.g. seedling survival, flowering). The monitoring is to be conducted every 3-5 years, with the primary indicator being abundance, area of occupancy and/or condition. To provide guidance on an appropriate methodology, other small shrub species within detailed methodologies within Appendix 1 of the EMM Operational Manual (BCT 2024) were reviewed.

The recommended monitoring methodology within the EMM Operational Manual (BCT 2024) is similar to that already being undertaken within the COA. As such, the existing monitoring methods will continue within the COA, with minor modifications (identified in **bold**):

- One 5 x 5 m quadrant within each of the two populations in the COA.
- Monitored in **September-October (in accordance with TBDC)**.
- Monitored at **3-yearly intervals**.
- Number of *T. juncea* clumps within each quadrat, adhering to the standardised method as set out by Payne et al. (2002) for counting *T. juncea* clumps involves the delineation of each plant clump by a distance of 30 cm.
- Number of stems on each *Tetratheca juncea* plant clump (estimate of biomass).
- Number of flowers on each *Tetratheca juncea* plant clump.
- Number of fruit on each *Tetratheca juncea* plant clump.
- Projected foliage cover of *Tetratheca juncea* plant clump.
- Other plant species flowering and or fruiting.
- Location of each *Tetratheca juncea* plant clump within the quadrat (to be shown on a Figure).
- Identification all other vascular plant species within the quadrat.
- Information on floristic structure and vegetation community, in which the quadrat occurs in.
- Disturbances.
- Weed incursions.

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Threatened Fauna Monitoring

Powerful Owl (*Ninox strenua*) monitoring

Within the EMM Operational Manual (BCT 2024) there are no specific monitoring guidelines for the Powerful Owl outlined in Appendix 1: Threatened species population monitoring-recommended methods. As such, Table 11 was used as a guide to determine the monitoring methodology for the Powerful Owl within the COA.

Recommended monitoring for Raptors (including Owls) includes, nest observations or aural-visual surveys (e.g. owls), with the primary indicator being presence/absence or breeding activity. As no nesting trees have been identified within the COA, presence/absence surveys will be undertaken.

Within the EMM Operational Manual (BCT 2024) the recommended survey frequency for threatened birds is 5-yearly. However, this plan adopts a consistent 3-year monitoring cycle across all monitoring types to ensure alignment with the guidelines and consistency in monitoring events.

Survey will be undertaken by acoustic monitoring, methods and effort will be undertaken in accordance with the *Hollow-dependent birds: Biodiversity Assessment Method survey guide* (NSW DCCEEW 2026). Acoustic recorders will be deployed within the COA for 42 nights (per recorder) and set to record from 30-minutes before dusk to 30-minutes after sunrise. Devices will be deployed at a spacing of approximately twice the detection range for the type of recorder used, and one replicate survey will be undertaken at each monitoring event (5-years).

Monitoring will occur between September and December. *Noting, surveys for the Powerful Owl can be conducted at any time of year, however, as Acoustic detectors will be used for both Powerful Owl and Koala surveys, survey timing to align with Koala survey requirements (outlined below).*

The total number of recording devices utilised during the monitoring will be dependent upon the type of devices used, for example a recorder with an estimated range of 200 m for the target species, recorders would be spaced approximately 400 m apart.

Koala (*Phascolarctos cinereus*) monitoring

As per the EMM Operational Manual (BCT 2024) Koala occupancy monitoring will be undertaken within the COA. Koala occupancy monitoring (with a primary objective of detection of presence) will be undertaken by acoustic monitoring. The recommended survey frequency for Koala monitoring detailed in the EMM Operational Manual (BCT 2024) is every 2 – 3 years. This plan adopts a consistent 3-year monitoring cycle across all monitoring types to ensure alignment with the guidelines and consistency in monitoring events.

Devices will be deployed between August and December for a minimum of 14-nights continuous recording from dusk to dawn. Assuming a 300 m detection range (e.g. SongMeter 4 device), then a minimum of one device will be deployed within the COA. Units should be placed within the target habitat, fixed to a tree (~1.5-1.8 m height) and enclosed in waterproof housing.

Brush-tailed Phascogale (*Phascogale tapoatafa*) monitoring

Within the EMM Operational Manual (BCT 2024), specifications for Squirrel Glider monitoring are outlined in Appendix 1: Threatened species population monitoring – recommended methods. These guidelines have been adapted for the Brush-tailed Phascogale.

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Remote motion-sensitive cameras will be deployed at a spacing of approximately 500 m across the COA (minimum of two cameras based on the size of the COA). Cameras will be installed at >2 m high in trees and focused on an attractant (e.g. bait within an adjacent tree) for a minimum of seven nights. Cameras will be deployed for between December and June to coincide with the survey period for the species and the primary indicator for monitoring is presence/absence.

Within the EMM Operational Manual (BCT 2024) the recommended survey frequency for threatened mammals is 5-yearly. However, this plan adopts a consistent 3-year monitoring cycle across all monitoring types to ensure alignment with the guidelines and consistency in monitoring events.

Anabat surveys

There are no target Microbat species that are required to be surveyed within the COA. As part of the previous monitoring regime, one device has been deployed within the COA, targeting the dam occurring in the south-east. Detections of threatened Microbat species, including the Southern Myotis which forages within suitable waterbodies. As such, the existing methodology will be adapted to align with the monitoring requirements for the Southern Myotis within the EMM Operational Manual (BCT 2024).

One acoustic recorder (Anabat or similar) will be deployed for a minimum of four nights between October and March. The device will target the dam occurring within the south-east of the COA and the primary indicator for monitoring is presence/absence (noting detections of microbat species will be recorded).

Within the EMM Operational Manual (BCT 2024) the recommended survey frequency for threatened bats is 5-yearly. However, this plan adopts a consistent 3-year monitoring cycle across all monitoring types to ensure alignment with the guidelines and consistency in monitoring events.

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6.6 Summary of Biodiversity Monitoring Locations

A summary of the monitoring locations are provided by **Tables 4 to 7** as illustrated by **Figure 5** and **Figure 6**.

Table 4 *Summary of Vegetation Monitoring Plots.*

Plot ID	Coordinates (GDA94, MGA56)		Plot Location	Established	Status
	Easting	Northing			
EMP-Q1	406485	6389170	Lot 21 (RVA)	2007-08	Current
EMP-Q2	406159	6389346	Lot 21 (RVA)	2007-08	Current
EMP-Q3	406114	6389455	Lot 21 (RVA)	2007-08	Current
EMP-Q4	406747	6389851	Lot 12 (KEQ)	2007-08	<i>Discontinued due to development of the KEQ extraction area.</i>
EMP-Q5	405816	6389403	Lot 201 (RVA)	2007-08	Current
EMP-Q6	405802	6389609	Lot 201 (RVA)	2007-08	Current
EMP-Q7	406087	6390232	Lot 201 (RVA)	2007-08	Current
EMP-Q8	406006	6389323	Lot 12 (COA)	2007-08	Current
EMP-Q9	406170	6389093	Lot 12 (COA)	2007-08	Current

Table 5 *Summary of Tetradlea juncea Monitoring Plots (5 x 5 m).*

Plot ID	Coordinates (GDA94, MGA56)		Plot Location	Established	Status
	Easting	Northing			
TJ-Q01	406095	6389113	Remnant Population 4	2007-08	<i>Discontinued (after 2024-25) as no individuals recorded.</i>
TJ-Q11	TBD	TBD	Remnant Population 4	To be established 2026-27	Plot location adjusted within population 4. First survey to be undertaken in 2026-27 monitoring.
TJ-Q02	405793	6389580	Remnant Population 2	2007-08	Current
TJ-Q03	405987	6389676	Remnant Population 2	2007-08	Current
TJ-Q04	406082	6389647	Remnant Population 2	2007-08	Current
TJ-Q05	405737	6389642	Remnant Population 2	2007-08	Current
TJ-Q06	406215	6390043	Remnant Population 1	2007-08	Current
TJ-Q07	406036	6390152	Remnant Population 1	2007-08	Current
TJ-Q08	407172	6389173	Conservation Population 1	2007-08	Current
TJ-Q09	407086	6389197	Conservation Population 2	2007-08	Current
TJ-Q10	405874	6389226	Remnant Population 3	2007-08	Current

Table 6 *Summary of Grevillea parviflora subsp parviflora Monitoring (20 x 20 m).*

Plot ID	Coordinates (GDA94, MGA56)		Plot Location	Monitored	Status
	Easting	Northing			
GP-Q1	406039	6390326	Lot 21 (RVA)	2020-21 to 2024-25	<i>Discontinued following NSW Herbarium advice confirming revised species identification.</i>
GP-Q2	406218	6389953	Lot 201 (RVA)	2020-21 to 2024-25	
GP-Q3	405720	6389626	Lot 201 (RVA)	2020-21 to 2024-25	

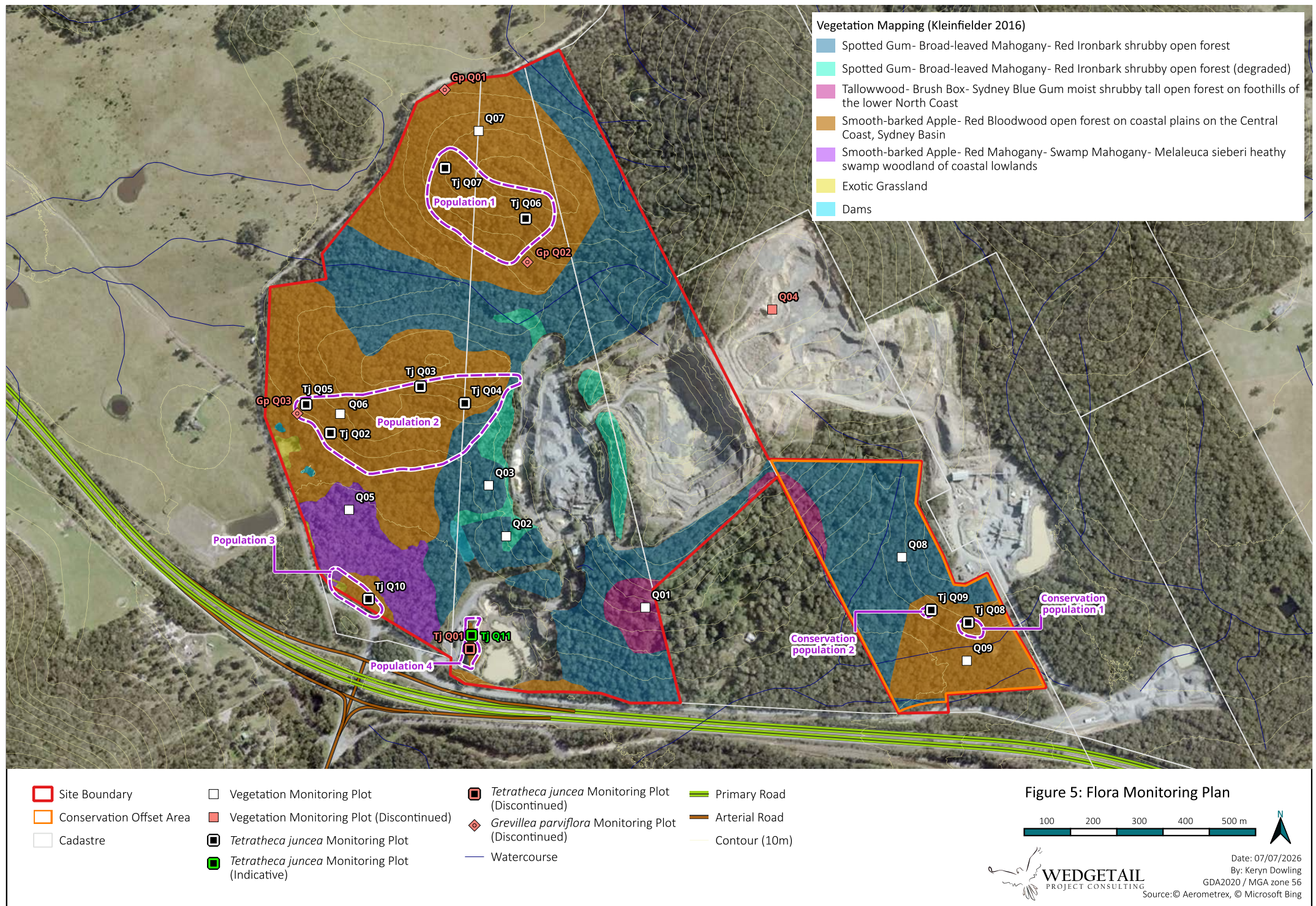
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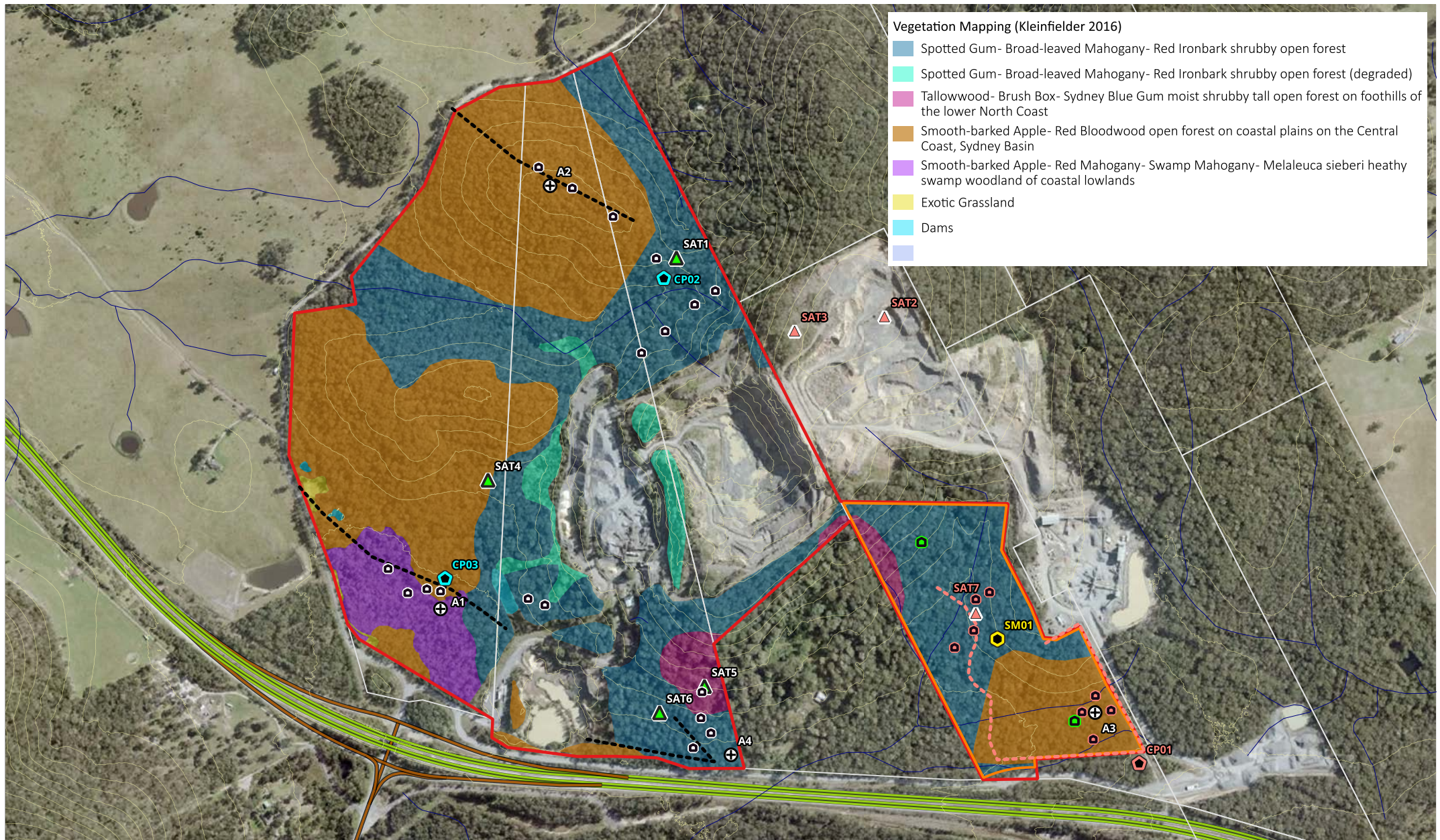
Table 7 Summary of Fauna Monitoring.

Survey ID	Coordinates (GDA94, MGA56)		Plot Location	Established	Status
	Easting	Northing			
Anabat Locations					
A1	405927	6389342	Lot 201 (RVA)	2007-08	Current
A2	406138	6390196	Lot 21 (RVA)	2007-08	Current
A3	407250	6389119	Lot 12 (COA)	2007-08	Current
A4	406528	6389016	Lot 21 (RVA)	2007-08	Current
Koala SAT Plots					
SAT1	406415	6390008	Lot 11 (RVA)	2007-08	Current
SAT2	406826	6389892	Lot 12 (KEQ)	2007-08	Discontinued due to development of the KEQ extraction area.
SAT3	406649	6389864	Lot 12 (KEQ)	2007-08	
SAT4	406043	6389569	Lot 201 (RVA)	2007-08	Current
SAT5	406470	6389162	Lot 21 (RVA)	2007-08	Current
SAT6	406382	6389110	Lot 21 (RVA)	2007-08	Current
SAT7	407006	6389323	Lot 12 (COA)	2007-08	Discontinued – Acoustic Monitoring undertaken
Owl Call Playback Location					
OCP1	406390	6389967	Lot 11 (RVA)	2007-08	Current
OCP2	405958	6389374	Lot 201 (RVA)	2007-08	Current
OCP3	407328	6389009	Lot 12 (COA)	2007-08	Discontinued – Acoustic Monitoring undertaken
Acoustic Monitoring Location					
AM1	TBD	TBD	Lot 12 (COA)	To be established 2026-27	Current
AM1	TBD	TBD	Lot 12 (COA)	To be established 2026-27	Current
Remote Camera Transect (Previous Hair Tube Transect)					
RC1	406505 (Start) 406346 (End)	6389948 (Start) 6389819 (End)	Lot 11 & 21 (RVA)	2007-08	Current
RC2	406485 (Start) 406482 (End)	6389223 (Start) 6389104 (End)	Lot 201 (RVA)	2007-08	Current
RC3	406181 (Start) 406117 (End)	6389339 (Start) 6389339 (End)	Lot 11 (RVA)	2007-08	Current
RC4	407035 (Start) 406963 (End)	6389359 (Start) 6389218 (End)	Lot 21 (RVA)	2007-08	Current
RC5	407196 (Start) 407226 (End)	6389061 (Start) 6389064 (End)	Lot 21 (RVA)	2007-08	Current
RC6	406505 (Start) 406346 (Start)	6389948 (Start) 6389819 (End)	Lot 12 (COA)	2007-08	Discontinued – Alternative camera locations within COA
RC7	406485 (Start) 406482 (End)	6389223 (Start) 6389104 (End)	Lot 12 (COA)	2007-08	Discontinued – Alternative camera locations within COA

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Survey ID	Coordinates (GDA94, MGA56)		Plot Location	Established	Status
	Easting	Northing			
Remote Camera Locations					
RC8	TBD	TBD	Lot 12 (COA)	To be established 2026-27	Current
RC9	TBD	TBD	Lot 12 (COA)	To be established 2026-27	Current
Spotlighting Transect					
T1	405973 (Start) 406332 (End)	6390303 (Start) 6390081 (End)	Lot 11, 21 & 201 (RVA)	2007-08	Current
T2	405672 (Start) 406079 (End)	6389556 (Start) 6389276 (End)	Lot 21 & 201 (RVA)	2007-08	Current
T3	406239 (Start) 406412 (End)	6389058 (Start) 6389100 (End)	Lot 21 (RVA)	2007-08	Current
T4	406929 (Start) 407144 (End)	6389358 (Start) 6389248 (End)	Lot 12 (COA)	2007-08	Discontinued – Alternative survey methods within COA





Vegetation Mapping (Kleinfielder 2016)

- Spotted Gum- Broad-leaved Mahogany- Red Ironbark shrubby open forest
- Spotted Gum- Broad-leaved Mahogany- Red Ironbark shrubby open forest (degraded)
- Tallowwood- Brush Box- Sydney Blue Gum moist shrubby tall open forest on foothills of the lower North Coast
- Smooth-barked Apple- Red Bloodwood open forest on coastal plains on the Central Coast, Sydney Basin
- Smooth-barked Apple- Red Mahogany- Swamp Mahogany- Melaleuca sieberi heathy swamp woodland of coastal lowlands
- Exotic Grassland
- Dams

Site Boundary

Conservation Offset Area

Cadastre

Spotlighting Transect

Spotlighting Transect (Discontinued)

Owl Call Playback

Owl Call Playback (Discontinued)

Koala SAT

Koala SAT (Discontinued)

Anabat

Acoustic Monitoring Location (Indicative)

Camera- Arboreal

Camera- Arboreal (Indicative)

Camera- Arboreal (Discontinued)

Watercourse

Primary Road

Arterial Road

Contour (10m)

Figure 6: Fauna Monitoring Plan



WEDGETAIL
PROJECT CONSULTING

Date: 07/07/2026
By: Keryn Dowling
GDA2020 / MGA zone 56
Source: © Aerometrex, © Microsoft Bing

7.0 Reporting

In accordance with Schedule 3, Condition 23 and Schedule 4, Condition 5 of the Development Consent, an assessment of biodiversity management at the quarry site will be included within the AEMR to be submitted to NSW Planning.

This F&FMP will be reviewed at a minimum of every five (5) years to assess its effectiveness. This F&FMP will be reviewed if there is a significant variation to the quarry plan.

In addition, a review of this F&FMP will be conducted following the first round of the revised monitoring regime within the COA. This update will detail final monitoring point locations (as installed), and summarise the baseline findings.

Where any changes are recommended as a result of review, the F&FMP will be revised to increase its effectiveness and resubmitted to NSW Planning for approval.

7.1 Rehabilitation Bond

Schedule 3, Condition 42 of the Development Consent required the preparation of a Rehabilitation Bond to be lodged with NSW Planning within 6 months of the date of consent, which was originally established via Bank Guarantee in 2006-07.

Schedule 3, Condition 43 of the Development requires the Rehabilitation Bond to be reviewed every five years with consideration given to the:

- Effects of inflation;
- Any changes to the area of disturbance; and
- The performance of any progressive rehabilitation which as been completed at the site to-date.

The Rehabilitation Bond was most recently reviewed in December 2023, approved by NSW Planning on 09 January 2024 and established via Bank Guarantee on 18 July 2024. The Rehabilitation Bond will subsequently next be reviewed in 2028.

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8.0 Roles and Responsibilities

It is the responsibility of Environment & Development Manager for the implementation of the F&FMP.

Table 8 outlines the responsible positions and accountable tasks.

Table 8 *Roles & Responsibilities.*

Position	Responsibility
Environment & Development Manager (or suitable delegate)	- Coordinate the flora and fauna monitoring requirements of this plan. - Evaluate and report monitoring results as required. - Coordinate Flora and Fauna related incident investigations and reporting as required by legislation and internal standards and guidelines. - Assist with the review of this plan.
All employees and contractors.	- Comply with all requirements of this F&FMP. - Report all potential environmental incidents immediately. - Seek approval from the Environment & Development Manager and Quarry Manager prior to commencing any vegetation clearing or making changes to infrastructure/processes which may result in increased biodiversity impacts.

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Appendix A: Correspondence with NSW Planning

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Scott Ellerton
Environment & Development Manager
Hunter Quarries Pty Ltd
PO Box 23
Karuah, NSW, 2324

07/09/2026

Subject: Flora and Fauna Management Plan

Dear Mr Ellerton

I refer to the Flora and Fauna Management Plan submitted in accordance with conditions 19 – 22 of Schedule 3 of the consent for the Karuah Hard Rock Quarry Project (DA265-10-2004). 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 of consent. Accordingly, as nominee of the Planning Secretary, I approve the Flora and Fauna Management Plan (version 7B, dated July 2026).

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@dphi.nsw.gov.au.

Yours sincerely

A handwritten signature in black ink, appearing to read "JMD", with a stylized flourish at the end.

James McDonough
Team Leader
Resource Assessments

As nominee of the Planning Secretary