

Preliminary Documentation Report

(Part A)

Blue Rock Quarry, Cedar Creek, Queensland, 4207
EPBC Act (2024/09844)



Prepared for Fulton Hogan Quarries Pty Ltd
11 March 2026

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Saunders Havill

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Attachments

Attachment A1 - EPBC Act Controlled Action Decision Notice
Attachment A2 - PD additional information request
Attachment A3 - Environmental Management Plan (EMP)
Attachment A4 - Impact MHQA Raw Data
Attachment A5 - Impact Raw SAT data
Attachment A6 - LRSA TEC raw data
Attachment A7 - Kipper Creek Offset Management Plan
Attachment A8 - Macadamia integrifolia Impact Management Plan

Acronyms and Abbreviations

Legislation, Policies and Guidelines

EOP	EPBC Act Environmental Offset Policy (Cth)
EPBC	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
NCA	*Nature Conservation Act 1992* (Qld)
VMA	*Vegetation Management Act 1999* (Qld)

Government Departments & Authorities

DAWE	Department of Agriculture, Water and the Environment (Cth – former)
DAF	Department of Agriculture and Fisheries (Qld)
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Cth – current)
DERM	Department of Environment and Resource Management (Qld)
DES	Department of Environment and Science (Qld – former)
DETSI	Department of Environment, Tourism, Science and Innovation
DNRME	Department of Natural Resources, Mines and Energy (Qld)
DOR	Department of Resources (Qld)
DTMR	Department of Transport and Main Road (Qld)
GCCC	Gold Coast City Council
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning (Qld)

General Terms

AKF	Australian Koala Foundation
ASRIS	Australian Soil Resource Information System
ESD	Ecologically Sustainable Development
FMP	Fauna Management Plan
FTE	full-time equivalent
ha	hectare(s)
km	kilometre(s)
KHAT	Koala Habitat Assessment Tool (as per the Koala Referral Guidelines)
MCU	Material Change of Use
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
m	metre(s)
NJKHT	non–juvenile koala habitat tree
PD	Preliminary Documentation
PMAV	Property Map of Assessable Vegetation
PMST	Protected Matters Search Tool
RE	regional ecosystem
RMP	Rehabilitation Management Plan
ROL	Reconfiguration of a Lot
SAT	Spot Assessment Technique
SHG	Saunders Havill Group
TEC	threatened ecological community
VCFMP	Vegetation Clearing and Fauna Management Plan

Reference Documents

Code of Practice

Wildlife and Threatened Species Operations Branch, Department of Environment and Science, Code of Practice – Care of Sick, Injured or Orphaned Protected Animals in Queensland, Nature Conservation Act 1992, August 2020.

Draft Code

Hanger, J & Nottidgem B., Queensland code of practice for the welfare of wild animals affected by land-clearing and other habitat impacts and wildlife spotter /catchers, Australia Wildlife Hospital, 2009.

EPBC Offsets Guide

Environment Protection and Biodiversity Conservation Act 1999 How to use the offsets assessment guide, (October 2012), Commonwealth of Australia, 2012.

FSRDM

Fauna Sensitive Road Design Manual Volume 2: Preferred Practices, State of Queensland (Department of Transport and Main Roads), 2010.

SI Guidelines

Matters of National Environmental Significance: Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999, Commonwealth of Australia, 2013.

1. Introduction

Saunders Havill Group (SHG) act on behalf of Fulton Hogan Quarries Pty Ltd (the Proponent) in the coordination and production of the response to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Controlled Action Determination for the expansion area of Blue Rock Quarry (the proposed action, EPBC Reference: 2024/09844) Cedar Creek, (Lot 89 on WD739), Queensland. Assessment is to be completed by Preliminary Documentation (PD) Report. The expansion area is a 5.9-hectare patch of vegetation immediately adjacent to the south of the existing operational quarry.

On 28 June 2024 a referral under the EPBC Act was made to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) referred to herein as 'the Department'. The proposed action was referred as 'not controlled' which included an assessment of the proposed action against the applicable EPBC Act guidelines and policies, including the *Significant Impact Guidelines 1.1* (SI Guidelines). The assessment found the proposed action as unlikely to have a significant residual impact on Matters of National Environmental Significance (MNES) as potential residual impacts can be appropriately managed on site (refer to **Part B** for a copy of the original referral material).

On 24 July 2024 the Department deemed the proposed action a Controlled Action requiring assessment via the PD process. The Controlled Action decision, provided at **Attachment A1**, was based on the determination of potential impacts on the following MNES and was made in accordance with section 75 of the EPBC Act:

- Listed threatened species and communities (sections 18 & 18A)

Further advice provided by the department identified the key threatened species of concern as the endangered Koala (*Phascolarctos cinereus* (combined populations of Queensland, New South Wales and the Australian Capital Territory)).

With the July 2024 controlled action determination, the Department issued a list of additional information required to be addressed within the PD reporting on 9 August 2024 which requested that in addition to the Koala, the potential for impacts be considered for the following species:

- Macadamia Nut (*Macadamia integrifolia*) – vulnerable;
- South-eastern Glossy-black-Cockatoo (*Calyptorhynchus lathami lathami*) – vulnerable;
- Greater Glider (*Petauroides volans*) – endangered; and
- Lowland Rainforest of Subtropical Australia Threatened Ecological Community (Threatened Ecological Community) – critically endangered

A copy of this PD additional information request is included as **Attachment A2** and each item correlates to a section or chapter of this PD. As part of this assessment process, the PD must be published for public comment upon receiving approval to do so from the Department.

1.1. Purpose

The purpose of this report is to provide additional information to the Department to facilitate the PD assessment process and ultimately obtain approval under the EPBC Act for the quarry expansion project.

1.2. Document Structure

The supporting information has been separated into two folders using the following structure:

- **Part A: Preliminary Documentation Report**
- **Part B: Referral Material and Technical Studies**

Part A: Preliminary Documentation refers to this document. Part A includes relevant figures, plans and supporting material required to support full assessment of the action by the Department. These have been referenced with the prefix A (*i.e.*, Figure A1, Plan A1, Attachment A1). Figures and Plans are provided in **Section 12** and Attachments in **Section 13** of this report for ease of reference.

Part B: Referral Material and Technical Documents refers to a copy of the full referral material submitted for the controlled action assessment as well as any supporting information and attachments. Relevant sections from each of these documents have been brought forward and incorporated into Part A of the PD for ease of reference and readability. It is noted that changes to the referral material are not possible, and Part A of the PD supersedes the information in the referral.

1.3. Reference Table

This section provides a reference table (refer **Table A1**) demonstrating where in the documentation the additional information requirements are addressed. The additional information request is included as **Attachment A2**. Each item has been extracted and provided within the corresponding section of this PD.

Table A1: Reference Table

RFI Item		Response Section
1	**n/a – General content, format and style**	**n/a**
2	**Description of the action**	
2.1	a) A description of all components of the proposed action (such as preconstruction, construction and operational), including the staging, sequencing, duration and timing.	2.1
	b) A description of the anticipated start and completion dates of all actions such as the extent, staging and timing of clearing undertaken over the construction period.	2.1 (b)
	c) The location, extent, and size (in hectares) of the total project footprint, disturbance/impact footprint, and of any adjoining areas (beyond the impact area) that may be subject to indirect or facilitated impacts, including edge effects, noise or light spill, vehicle access or other associated activities.	2.1
	d) A description, with supporting spatial information, detailing all site access roads and any other shared infrastructure with adjacent projects/areas to be constructed to facilitate the proposed action. *Please describe any changes to project or disturbance footprints that may have occurred since the original referral. Please note these changes may require a formal variation request.*	2.2 and 2.3
2.2	Provide a description of the intended land uses proposed as part of the completed development, including of any proposed open space and/or conservation areas and associated ongoing activities, and details of the intended party that would be responsible for future management activities.	2.4
2.3	Details of any local or State Government planning scheme, or plan or policy under any local or State Government planning system that applies or is likely to apply to the proposed action. Details should include (but are not limited to):	2.5
	a) what environmental assessment of the proposed action has been, or is being, carried out under the scheme, plan or policy?	2.5
	b) application/approval numbers for existing applications where relevant	2.5
	c) obtained approvals or additional approvals that are required.	2.5

RFI Item		Response Section
3	**Description of the environment and Matters of National Environmental Significance**	
3.1	A description of the environment more broadly including previous and current land use within and surrounding the proposed action area.	3.1
3.2	A description of any potential listed threatened species or ecological community (including but not limited to those listed in this request for information) that occur in the project area and adjacent areas. *Please ensure that a recent Protected Matters Search Tool report is generated and used during the assessment before finalising the draft preliminary documentation to identify any additional species (listed at the time of the controlled action area) that may be affected by the proposal.*	3.2
3.3	For listed threatened species and ecological communities that have the potential, or are likely, to be present at and in the vicinity of the project site, including but not limited to those listed in this request, please provide a likelihood of occurrence assessment including the following:	3.5
	a) Information on the abundance, distribution, ecology and habitat preference of the species or communities.	3.5
	b) Quantification of the extent of habitat (including maps identifying known or potential habitat) on site and, where feasible, in the broader landscape.	3.5
	c) Quality and importance of known or potential habitat for the species or communities.	3.5
	d) Information detailing known populations or records within at least five kilometres of the development footprint and (if known) the size of these populations.	3.5
	e) Conclusions on the likelihood of occurrence of listed threatened species and ecological communities within the project site, or within an area of impacts outside the project site.	3.5
	Likelihood or occurrence and habitat assessments must be informed by up-to-date desktop and field surveys and informed by relevant departmental documents (e.g., approved Conservation Advice, Recovery Plans, draft referral guidelines and Listing Advice, and SPRAT Database) and/or species experts.	
3.4	Up to date baseline and survey data at the impact site(s), and if relevant, the proposed offset site(s) site, including:	3.3

RFI Item		Response Section
	a) Information on the survey methodology or technique used (e.g., thermal detection, camera trapping, tree hollow search, SAT surveys etc)	3.3
	b) When surveys were conducted (e.g., dates, time of day, season, etc.) and survey effort (e.g., two hours for every one hectare within a 5-hectare area)	3.3
	c) Map/s of survey points or transects and how the survey points or transects were selected.	3.3
	d) An assessment of the adequacy of any surveys undertaken with reference to any relevant scientific literature and/or statutory documents. In particular, the extent to which these surveys were appropriate for the species and undertaken in accordance with relevant survey guidelines.	3.3
	e) Results of all surveys undertaken.	3.4
3.5	Based on survey data and with reference to relevant statutory documents, provide a clear description of the total extent and quality of habitat present within and surrounding the proposed action area for each species or ecological community potentially present or impacted by the action. For all species with residual significant impacts the method used to quantitatively assess the quality of habitat must be discussed and endorsed by the department before being applied. **Survey requirements** <u>Survey timing</u> Please note that some surveys can take more than a year to complete to ensure they are undertaken in the correct season. The department generally cannot accept survey data that's more than 5 years old because: • populations of species can change due to fires, drought, flooding and land management changes. • some species' ranges can shift due to climate change. If your data is older than 4 years when you start planning your project, the department recommends you undertake further up to date surveys. For information on survey methodologies approved by the Australian Government, please refer to https://www.dcceew.gov.au/environment/epbc/advice/surveys-and-data	3.3

RFI Item		Response Section
	Precautionary principle Failing to survey appropriately for threatened species that may be present at a site could result in the department applying the precautionary principle with regard to residual significant impact determinations. That is, if no supporting evidence (such as survey results) is presented to support the claim of species absence, then the department may assume that the species is in fact present. The department will not accept claimed species absence without effective validation such as through application of survey guidelines, other survey techniques (for example, a state guideline or an accepted industry guideline), or statements from relevant species experts. Where a claim of absence is made, proposals must provide a robust evaluation of species absence.	
4	**Impact Assessment**	
4.1	Include a clear description of the total extent and quality of the following: a) project footprint (including the total extent of habitat present for each relevant protected matter)	4.1
	b) direct and indirect impact areas (including the total extent of habitat for each relevant protected matter to be impacted)	4.1
	c) total areas proposed to be retained/avoided (including the total extent of habitat present for each relevant protected matter to be avoided).	4.1
4.3	To inform point 4.1, please provide an assessment of the direct, indirect, facilitated and cumulative impacts that may occur as a result of the proposed action at a local and regional scale. The assessment should include consideration of: a) the nature, likelihood, significance, and extent of impacts and whether any relevant impacts are likely to be unknown, unpredictable or irreversible.	4.3 – 4.7
	b) timing and whether the impact is temporary or permanent	4.3 – 4.7

RFI Item		Response Section
	c) species specific habitat requirements such as hollow bearing trees, nest trees, refuge habitat, foraging and breeding habitat, sheltering or other microhabitat features relevant to the species within and surrounding the development footprint (if applicable).	4.3 – 4.7
	d) whether connectivity and movement opportunities in the surrounding area may be retained, removed or functionally lost or compromised.	4.3 – 4.7
	e) adjacent areas of habitat that may or will be subject to intensification of ongoing impacts (for example, through increased human and vehicle presence)	4.3 – 4.7
	f) indirect or facilitated impacts that may result from the proposed action, including but not limited to the following: i. Edge effects – including the potential for the introduction of weed species and pathogens in the referral area and adjacent environment. ii. Vehicle movement – potential increase of vehicles to strike fauna in the pre-construction, construction, and operation phase of the project. iii. Increased presence of dogs – pre-construction, construction and operation phases have the potential to increase dog presence in the referral area and adjacent environment. iv. Earthworks – potential to generate dust emissions from the removal of vegetation and movement of soil in the pre-construction and construction phase of the project. v. Disturbance from increased noise, artificial light, sediment generation and other relevant stressors during construction and operation of the residential development.	4.3 – 4.7
	e) cumulative impacts, where potential project impacts on MNES are in addition to existing impacts of other activities (including current or future developments by the proponent and other proponents in the region and vicinity)	4.3 – 4.7
4.3	Include current maps and coordinates/shapefiles showing the total project footprint, total disturbance/direct and indirect impact areas, areas of habitat for MNES proposed to be retained.	4.3 – 4.7
4.4	Include details of any policy guidelines, relevant studies, surveys, or consultations with species experts/field specialists, which were not included in the referral or additional information provided in support of the referral.	4.3 – 4.7

RFI Item		Response Section
5	**Avoidance and Mitigation Measures**	
5.1	Demonstrate that you have applied the mitigation hierarchy and exhausted all options to avoid and mitigate harm to protected matters, before resorting to environmental offsets. In doing this, you must demonstrate that any avoidance or mitigation measures will provide ecological benefits to the species in the long-term. For example, on-site avoidance/conservation areas must be connected or provide connectivity opportunities for species in the broader landscape, and must include enduring mitigation of impacts from adjacent development.	5.2
5.2	Provide details (including a summary list or table) of avoidance and mitigation measures proposed to be undertaken to prevent or minimise impacts on protected matters (or their habitat) from the proposed action area, including: a) a description of avoidance measures that have been considered and applied. For example, project site selection to avoid valuable habitat, micro-siting of infrastructure to avoid impacts on habitat on site, or avoidance of any activity that may indirectly impact on essential lifecycle processes for species.	5.2
	b) a description of proposed safeguards and mitigation measures to minimise and manage relevant impacts of the action, with reference to relevant statutory or policy documents at the Commonwealth and State level (e.g., Guideline: State Development Assessment Provisions (State Code 25))	5.2
	c) pre-clearance and clearance procedures to ensure that species are detected and managed to minimise mortality, stress, injury, or introduction of disease.	5.2
	d) measures to address the risk of species, such as the koala, entering the residential area and becoming trapped/isolated without resources for shelter whilst in the residential area and safe movement opportunities to get out of the residential area, along with sufficient information on the location and design of these measures.	5.2
	e) ongoing management of direct and indirect impacts due to increased likelihood of human presence, attacks by domestic dogs, and injury caused by negotiating various fence types.	5.2
	f) details of how speed reduction is to be achieved (e.g., traffic calming devices) and plans showing the locations of each of these features and the manner in which they will be implemented).	5.2

RFI Item		Response Section
	g) information on safe road design and placement, including installation of crossing warning signs, wildlife threshold marking on road (include maps and imagery).	5.2
	h) the locations and size of any proposed fauna movement solutions, fire breaks, nogo or buffer zones (including buffers between the construction footprint or remaining habitat in the referral area and adjacent to the site), and potential fencing, including: i. the location of any movement solutions, fire breaks, buffer zones, or fencing. ii. the characteristics of the fauna movement solutions, fire breaks, buffer zones and fencing, (i.e., height, length, wildlife proof measures etc) iii. whether the proposed measures, such as fencing will provide a wildlife barrier to/from/within the proposed action area.	5.2
	i) a description of the environmental outcomes the measures are expected to achieve including details of any baseline data or proposed monitoring to demonstrate progress towards achieving these outcomes.	5.2
	j) information on the timing, frequency, and duration of the measures to be implemented.	5.3
	f) an actual or estimated cost of the mitigation measures.	5.3.3
5.3	Provide an assessment of the predicted effectiveness of each proposed avoidance or mitigation measure, noting that the effectiveness of a particular measure is a reflection of confidence in the anticipated outcome. The assessment of effectiveness should be evidence based and include examples of demonstrated success of a particular measure to achieve the desired avoidance/mitigation outcome.	5.4
5.4	For each measure proposed, indicate the: a) impacts that are being avoided and/or the significance of impacts being reduced through mitigation. b) Scientific basis for conclusions being drawn c) an evidence-based likelihood of success/risk assessment d) responsible party e) milestones / performance / completion criteria f) proposed monitoring and evaluation program.	5.4

RFI Item		Response Section
5.5	Describe any statutory or policy basis for the proposed measures, including reference to the SPRAT Database and relevant approved conservation advice, recovery plan or threat abatement plan, and a discussion on how the proposed measures are not inconsistent with relevant plans. For example, the National Recovery Plan for the Grey-Headed Flying Fox states an objective to: 'To improve the Grey-headed Flying-foxes national population trend by reducing the impact of the threats outlined in this plan on Grey-headed Flying-foxes through habitat identification, protection, restoration and monitoring'. Please provide a discussion on how the proposed action is not inconsistent with relevant species' objectives or alternatively, how the proposed avoidance, mitigation/management and offsetting actions will compensate for any residual significant impacts, thereby ensuring consistency with the objective for relevant EPBC Act species.	5.4
5.6	All proposed measures must consider the 'S.M.A.R.T' principle: S – Specific (protected matter-specific objectives, methods, outcomes, and repeatability) M – Measurable (baseline information, quantifiable, auditable) A – Achievable (timeframes, financial and human resources) R – Relevant (conservation advice, recovery plans, threat abatement plans) T – Time-bound (set implementation, performance and completion timeframes).	
6	**Proposed offset**	
6.1	Discuss how the proponent will provide offsets that meet the requirements of the EPBC Offsets Policy – offset proposal and Offset Management plan (OMP	6
7	Habitat Quality Assessment	6
	Details on the Modified Habitat Quality Assessment (MHQA) method utilised	6
8	**Economic and Social Matters**	
8.1	Provide details on the social and economic costs and/or benefits of undertaking the proposed action, including the basis for any estimations of costs and/or benefits. Where possible, please include the total economic capital investment and economic ongoing value of the project.	7.1
8.2	Identify if economic benefits and employment opportunities are in addition to what would have been expected if the action were not to take place.	7.2

RFI Item		Response Section
8.3	Provide details of any public stakeholder consultation activities, including the outcomes of those consultations.	7.3
8.4	Provide details of any consultation with Indigenous stakeholders.	7.4
9	**Ecologically Sustainable Development**	
9.1	Provide a description of how the proposed action meets the principles of ecologically sustainable development, as defined in section 3A of the EPBC Act, which are as follows: a) decision making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.	8.1
	b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.	8.1
	c) the principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	8.1
	d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making	8.1
10	**Environmental record of the person proposing to take the action**	
Include details of any past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:		**9.1**
10.1	The person proposing to take the action;	9.1
10.2	For an action for which a person has applied for a permit, the person making the application;	9.1
10.3	If the person is a body corporate—the history of its executive officers in relation to environmental matters; and	9.1
10.4	If the person is a body corporate that is a subsidiary of another body or company (the parent body)—the history in relation to environmental matters of the parent body and its executive officers.	9.1

1.4. Site Description and Details

The Proponent seeks an expansion to the existing, operational Blue Rock Quarry at Cedar Creek, legally described as part of Lot 89 on WD739 and Lot 1 on SP238024 ('referral area'). Blue Rock Quarry forms part of a cluster of key extractive industries in the region to cater for the increasing demands of development in South-East Queensland (SEQ) and has been operational since the 1970s. The referral area is shown in **Figure A1** and **Figure A2** and key property details are presented in **Table A2.** The referral area is provided at **Plan A1**.

The referral area is located within Gold Coast City Council (GCCC) local government area and zoned 'Extractive Industry' under the *Cold Coast City Plan 2017*. The initial extraction approval was obtained in 1972 with the quarry operational to the present day. A range of other State and Local approvals have been obtained over the years including Environmental Authorities (EAs) which outline management requirements for the extraction activities and operational works permits to allow vegetation clearing for approved extraction. The extent of the current extraction area was reached in approximately 2005 with vegetation within the quarry being cleared and regrowing in cycles to support the extraction activity. These areas are considered to form part of the existing quarry operations. The following State and local Council approvals have been obtained for the expansion/referral area (refer **Part B - Attachment 2** for copies of the EA and other State approvals):

- Environmental Authority P-EA-100268669 which includes extraction and screening activities for up to 1,600,000t per year on Lot 89 on WD739 and Lot 1 on SP238024.
- Clearing of remnant vegetation within the expansion area through DNRM permits RARP 2011/006373 and DPP 2005/101762
- MCU201400231 Material Change of Use Development Approval issued by Gold Coast City Council
- 306/3/248 (1977) Rezoning Approval for Extractive Industry issued by the then Albert Shire Council

The referral area is located within the suburb of Cedar Creek, approximately 12 kilometres (km) south of Beenleigh. Cedar Creek Road is present further south of the referral area and the current quarry footprint to the north. A mixture of remnant and regrowth vegetation and rural residential properties are present in the broader landscape. The referral area is accessed via the main quarry entrance at Tamaree Road with the referral area located in the south-east extent of the of the property area. The referral area is a 5.9 ha area located on an extremely steep vegetated slope, adjacent to cleared tracks and the existing extractive zones of the operating Blue Rock Quarry (**Figure A3**).



Table A2: Referral Area Details

Address	Blue Rock Quarry, Tamaree Road, Cedar Creek, Queensland, 4207
RPD	part of Lot 89 on WD739 and Lot 1 on SP238024
Proposed Action Area	5.9 ha
Regional Plan[1]	Regional Landscape and Rural Production Area
***Vegetation Management Act 1999* (VMA) (Qld) mapped features**	PMAV (2008/008614) Category X (non-remnant) Category B (Remnant) – Least Concern Regional Ecosystems (RE) 12.11.3 Essential Habitat - *Phascolarctos cinereus* (Koala) and *Calyptorhynchus lathami lathami* (South-eastern Glossy Black-cockatoo)
***Water Act 2000* (Qld) mapped features**	Unmapped Features
Matters of State Environmental Significance (MSES) mapped features	MSES wildlife habitat (special least concern animal) MSES wildlife habitat (endangered or vulnerable) MSES regulated vegetation (essential habitat) MSES wildlife habitat (SEQ koala habitat - core) MSES regulated vegetation (defined watercourse)
Koala Habitat mapped features (under the *Planning Regulation 2017 (Qld)*)	Koala Priority Area Koala Habitat Area (Core)
Local government area (LGA)	City of Gold Coast
Planning scheme / local plan	Gold Coast City Plan v11
Zone	Extractive Industry
Existing Land Use	Vacant bushland
Proposed Land Use	Extraction (expansion to existing quarry)



2. Description of the Action

2.1. Components of the Proposed Action

Item 2.1 (a) of the PD Request asks for, ***"A description of all components of the proposed action (such as preconstruction, construction and operational), Including the staging, sequencing, duration and timing."***

2.1.1 Project Context

The referral area covers 5.9 hectares (ha) and is located approximately 12 kilometres south of Beenleigh (refer **Figure A1**). The area is bound by rural and extractive land uses with Cedar Creek Road approximately 750m south-west and Beaudesert Beenleigh Road approximately 1.5km west. Notably, the existing quarry footprint is present immediately north of the referral area (refer **Figure A2).**

The referral area is a mix of remnant and non-remnant vegetation that is highly weed infested throughout with evidence of historical clearing observed. The broader landscape is a mosaic of vegetated and semi-cleared rural properties and extractive uses. Higher density residential uses are present to the west with steep vegetated area to the east (refer **Figure A2**).

The project is for a quarry expansion and will involve vegetation clearing of the entire referral area whereby extraction will occur in line with the quarry design (refer **Photo set 1**). The following provides details of standard quarry staging which has been utilised for the existing quarry footprint and will continue to be utilised for the proposed action.

Stage 1 – Mine Plan

A mine plan has been developed to coordinate the activity on site. The mine plan ensures quarrying follows an orderly process which maps out the quarry faces (vertical finished surfaces), quarry benches (horizontal finished surface) and haul routes to provide access to the extractive materials and ensure the finished quarry surface is safe, stable and suitable for rehabilitation.

Stage 2 – Vegetation Clearing and Remove Overburden

Vegetation is cleared under strictly controlled processes; the organic material is mulched for site stabilisation and the top layer of material (overburden) is removed to access the quarry material. Pre-clearance fauna surveys and clearing of vegetation only under the supervision of fauna spotter catchers that holds a permit issued by the Queensland Government former Department of Environment and Science (DES), now referred to as the Department of Environment, Tourism, Science and Innovation (DETSI).

Stage 3 – Drill and Controlled Blast

Holes are drilled into the rock (typically 10 – 15m deep) and explosives are placed into holes to blast the rock and other materials from the earth via electronic detonators within a strictly controlled safety exclusion zone.

Stage 4 – Load and Haul

Blasted or extracted material is loaded via excavators into quarry dump trucks and hauled to the processing plant.



Stage 5 – Processing

Material is processed on site in a crushing and screening plant to grade the material into different shapes, sizes and products depending upon resource type and customer requirements. The processed material is called quarry products and / or aggregates.

Stage 6 – Product Stockpiling and Transport

Processed materials are stored in piles on the sales floor and loaded into road trucks for transportation to customers and projects.

Stage 7 – Application

Quarry products are used in construction projects such as road base or may be used as raw materials to create other construction materials such as concrete or asphalt which are typically produced at offsite locations.

Stage 8 – Closure and Rehabilitation

The broader Blue Rock Quarry is a long-term operation however as resources are extracted and exhausted, the quarry is progressively rehabilitated to return it to the natural state (suitable native species) and to ensure the finished quarried surface is safe, stable and non-polluting in accordance with the approvals and authorisations for the activity. At the quarry closure and subject to permits and approvals, some other secondary land uses may be investigated to repurpose the quarry for other activities.



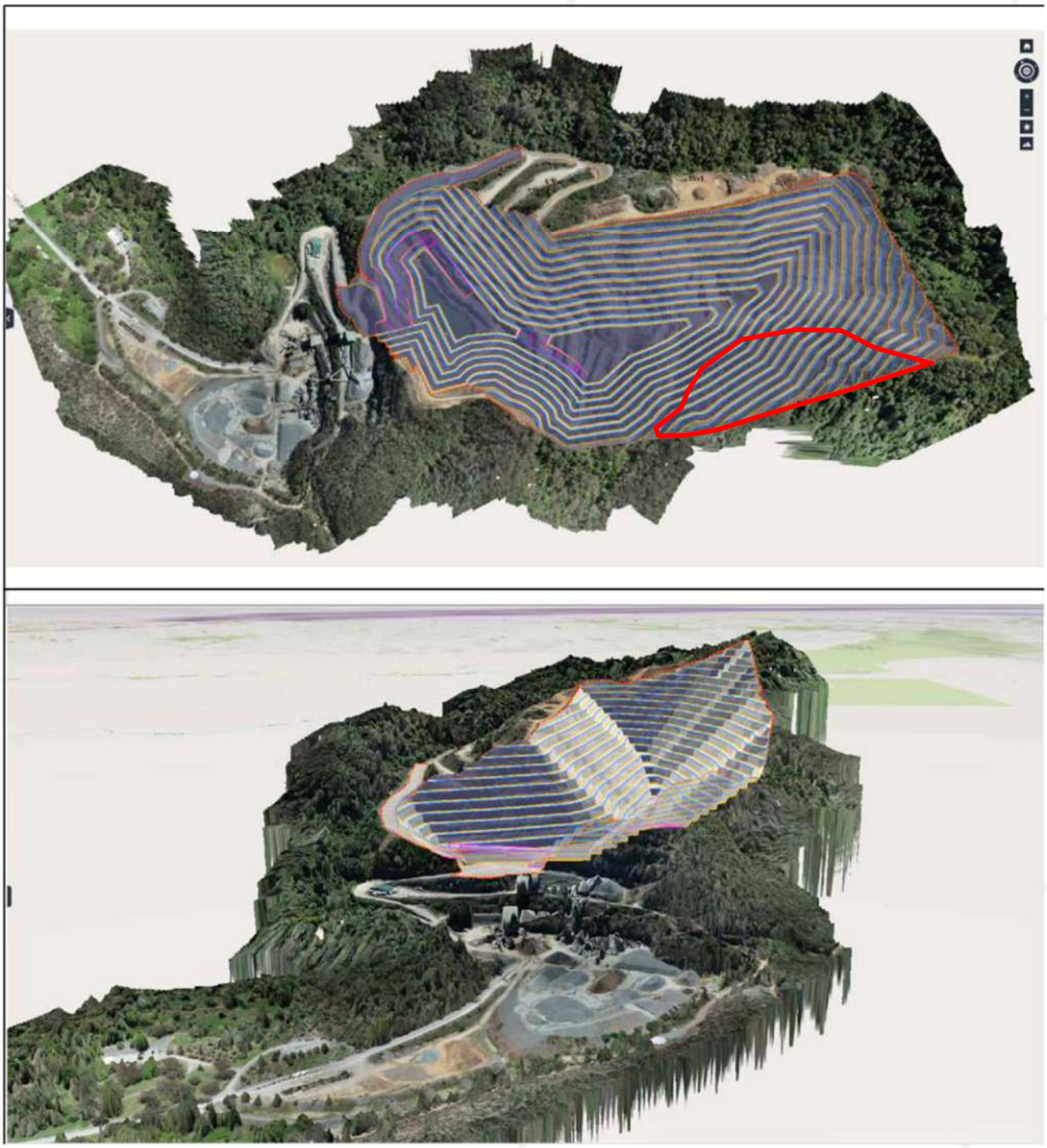


Photo set 1: Proposed quarry design – approximate referral area shown in red

Item 2.1 (b) asks for ***"A description of the anticipated start and completion dates of all actions such as the extent, staging and timing of clearing undertaken over the construction period."***

Quarry activities within the proposed expansion area will commence in mid-2026. The lifespan of resource from this area is subject to a range of variables including market demand but it is expected that extraction will be ongoing for 20 years. Other operations at the quarry including extraction, screening and processing will extend beyond this period.

Extraction activities will operate under the current approved hours of operation for Blue Rock Quarry, as follows:

- 06:00am to 06:00 pm Monday to Saturday.
- No activity to occur on Sundays or Public Holidays.

On completion of the extractive activity the referral area will be rehabilitated in accordance with the Environmental Authority conditions so that it is safe, stable and provide habitat for a range of terrestrial species.

2.2. Description of the Action

Item 2.1 (c) of the PD Request asks for, ***"The location, extent, and size (in hectares) of the total project footprint, disturbance/impact footprint, and of any adjoining areas (beyond the impact area) that may be subject to indirect or facilitated impacts, including edge effects, noise or light spill, vehicle access or other associated activities."***

The entire referral area (5.9 ha) will be directly impacted by the proposed action. **Table A3** provides details specific to the impact area.

Table A3: Details on impact area

Address	Tamaree Road, Cedar Creek, Queensland 4207
RPD	Part of Lot 89 on WD739 Part of Lot 1 on SP238024
Referral Area	5.9 ha
Impact Area	5.9 ha
MNES habitat (Koala)	5.9 ha
Proposed Land Uses	Extractive

Indirect impacts will be minimal and mitigated by site specific management plans currently in use for the existing operations. These management plans present effective and suitable measures to minimise indirect impacts including noise, light, dust and stormwater management plans which have been completed in accordance with the EA and detailed in the existing Environmental Management plan (EMP) (refer **Attachment A3**).

Further details on potential indirect impact are provided in **Section 4**.

2.3. Details of infrastructure

Item 2.1 (d) of the PD Request asks for, ***"A description, with supporting spatial information, detailing all site access roads and any other shared infrastructure with adjacent projects/areas to be constructed to facilitate the proposed action."***

The referral area sits immediately adjacent to the existing Blue Rock Quarry, which has been in operation for at least 50 years. The existing quarry contains screening and processing infrastructure that will be utilised for the materials extracted from the referral area. The expansion area will also utilise existing access roads and haulage routes. As such, no additional infrastructure is required to be constructed to facilitate the proposed action.

2.4. Intended land-uses

Item 2.2 of the PD Request asks for, ***"Provide a description of the intended land uses proposed as part of the completed development, including of any proposed open space and/or conservation areas and associated ongoing activities, and details of the intended party that would be responsible for future management activities."***

The proposed action is the expansion of an existing quarry with the entire referral area proposed to be utilised for extractive industries. Once quarry operations are complete, the referral area will be rehabilitated.

2.5. Associated Local or State Planning Scheme

Item 2.3 of the PD Request asks for, ***"Details of any local or State Government planning scheme, or plan or Policy under any local or State Government planning system that applies to the proposed action, or that the proponent reasonably believes are likely to apply, to the proposed action. Details should include:***

a) What environmental assessment of the proposed action has been, or is being, carried out under the scheme, plan or policy; and
b) Application/approval numbers for existing applications where relevant
c) Obtained approvals or additional approvals that are required."

The existing quarry has been operational since the 1970s with the initial extraction approval obtained in 1972. A range of other State and Local approvals have been obtained over the years including Environmental Authorities (EAs) which outline management requirements for the extraction activities and operational works permits to allow vegetation clearing for approved extraction. The extent of the current extraction area was reached in approximately 2005 with vegetation within the quarry being cleared and regrowing in cycles to support the extraction activity. These areas are considered to form part of the existing quarry operations.

The expansion area that is subject to this referral is a 5.9 ha patch of vegetation immediately south of the operational quarry. The following State and local Council approvals have also been obtained for the expansion/referral area including:

- Environmental Authority P-EA-100268669 which includes extraction and screening activities for up to 1,600,000t per year on Lot 89 on WD739 and Lot 1 on SP238024.



- Clearing of remnant vegetation within the expansion area through DNRM permits RARP 2011/006373 and DPP 2005/101762.
- MCU201400231 Material Change of Use Development Approval issued by Gold Coast City Council.
- 306/3/248 (1977) Rezoning Approval for Extractive Industry issued by the then Albert Shire Council.

Local and state approval documents are provided as part of the original referral material included in **Part B**. Existing approvals align with the zoning intent of the area. The existing operation quarry and proposed expansion area are both zoned as 'extractive industry' under GCCC City Plan 2016 (refer **Plan A2**)

In addition to the local government zoning the referral is also identified as Key Resource Area (KRA) 62. KRAs are identified by the State in the State Planning Policy with a total of 165 designations existing across Queensland. The intent of the designation is to protect land from development that could compromise the ability to access, extract and transport significant resources in the future.



3. Description of the Environment and Matters of National Environmental Significance

This section responds to Item 3 of the PD request which requires the proponent to provide a description of the environment within and surrounding the proposed action area, that may by directly or indirectly impacted by the proposed action.

3.1. Description of the Environment

Item 3.1 of the PD request asks for, ***"A description of the environment more broadly including previous and current land use within and surrounding the proposed action area."***

The referral area is located in a landscape that has seen widespread modification for housing, roads, rural uses and extractive industries resulting in a mixture of remnant and non-remnant vegetation communities (refer **Figure A4** and **Figure A5** for vegetation mapping within and surrounding the referral area and **Plan A3** for historical aerial imagery analysis). Even prior to the commencement of the quarry operation, the majority of the referral area and surrounds showed signs of historical clearing as far back as 1965, likely for agricultural uses. Vegetation clearing has since aligned with the continued expansion of the quarry footprint through the 1970s, 1980s and 1990s. The extent of vegetation clearing has remained largely unchanged since 2010 where patches of regrowth vegetation have been regularly managed to facilitate current quarry operations.

The existing quarry is located to the north-west, north and north-east of the referral area while the south-west, south and south-east contains predominantly vegetated areas. Despite the surrounding vegetated areas appearing relatively intact, a review of vegetation mapping, historical/high resolution aerial imagery and on-ground assessments identified much of this area as highly disturbed and dominated by weeds. It is likely the surrounding landscape has been subject to a range of rural pursuits, including cattle grazing and historical clearing, resulting in a dominance of exotic flora species. The majority of the surrounding vegetated areas to the east of the referral area are mapped as RE12.11.10 which is defined as 'notophyll vine forest vegetation.' While elements of this community were observed surrounding the project area, the majority of the area was heavily disturbed and lacked species indicative of this RE. To the south of the project area, vegetation is mapped as RE12.11.3 which is categorised as Eucalypt woodland, vegetation in this area reflected this community.

The referral area itself contains a steep south sloping gradient averaging 25° (47%) and as steep as 35° (70%) in parts based on detailed contour mapping and lidar imagery. Aerial imagery shows the area is predominantly vegetated however again shows high levels of disturbance indicated by weed incursion



and regrowth vegetation. Field surveys identified three (3) defined vegetation communities within the referral area. These were identified as:

1. AU1 – Indicative of remnant (RE12.3.11) – 3.5 ha
2. AU2 – Regrowth (RE12.11.10) – 1.1 ha
3. AU3 – Highly disturbed, dominated by weeds and acacia regrowth – 1.3 ha

Descriptions of each vegetation community are provided below.

AU1 – Indicative of remnant RE12.11.3

Remnant vegetation across the referral area is generally consistent with the RE mapping of 12.11.3 consisting of Eucalypt and Corymbia species including *Corymbia citriodora* (Spotted Gum*), Eucalyptus siderophloia* (Grey Ironbark), *Eucalyptus acmenoides* (White Mahogany), *Eucalyptus microcorys* (Tallowwood), *Eucalyptus tereticornis* (Forest Red Gum), and *Eucalyptus propinqua* (Small-fruited Grey Gum). The shrub and ground layer contains moderate to high disturbance with *Lantana camara* (Lantana) dominant (refer **Photo set 2**). The landform in this area is extremely steep and is estimated to be approximately 30°.



Photo set 2: AU1 - Indicative of remnant RE12.11.3

AU2 - Regrowth RE12.11.10 (1.1ha)

Vegetation in the eastern extent of the referral area was identified on-ground as containing species indicative of RE12.11.10 notophyll vine forest. Species included *Aphananthe philippensis* (Rough-leaved Elm), *Cordyline rubra* (Red-fruited Palm Lily), *Alphitonia excelsa* (Soap tree), *Flindersia australis* (Crows Ash), *Jagera pseudorhus* (Foambark) and *Maclura cochinchinensis* (Cockspur Thorn). This area contained high weed infestation dominated by *Lantana camara* (Lantana) and *Rivina humilis* (Coral Berry) (refer **Photo set 3**). Given the steep gradient across the referral area, this area showed signs of erosion. Notably, in Queensland RE12.11.10 is an indicator community for the *Lowland Rainforest Threatened Ecological Community* (LRTEC). As such, an assessment of the key diagnostic requirements was carried out within the referral area to determine if the community was present (refer **Section 3.5**). The steep slope and high density of weeds in this vegetation community made it difficult and unsafe to traverse.



Photo set 3: AU2 - Regrowth RE12.11.10

AU3 - Highly disturbed, dominated by weeds and acacia regrowth

The balance of the referral area displayed significant disturbance as a result of historical land clearing and ongoing erosion. A drainage line is present in the centre of the referral area which includes only weeds and acacia regrowth. The remaining areas of this polygon contained dense weeds including *Lantana camara* (Lantana), *Megathyrsus maximus* (Guinea Grass), *Melinis repens* (Red Natal Grass), *Solanum chrysotrichum* (Giant Devil's Fig), *Solanum mauritianum* (Wild Tobacco Tree), *Solanum*

seaforthianum (Brazillian Nightshade), and acacia regrowth (refer **Photo set 4**). The steep slope and high density of weeds in this vegetation community made it difficult and unsafe to traverse.



Photo set 4: AU3 - Highly disturbed, dominated by weeds and acacia regrowth

3.2. Matters of National Environmental Significance

Item 3.2 of the PD Request asks for, ***"A description of any potential Matters of National Environmental Significance (MNES) (including but not limited to those listed in this request for information) that occur in the project area and adjacent areas."***

The MNES listed under Item 4 of the PD Request considers that the proposed action was likely to have a significant impact on:

- Koala (*Phascolarctos cinereus* – combined populations of Qld, NSW and the ACT) – Endangered

The department considers that the proposed action may significantly impact on other listed threated species and communities including:

- Macadamia Nut (*Macadamia integrifolia*) – vulnerable
- South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*) – vulnerable
- Greater Glider (*Petauroides volans*) – endangered
- Lowland Rainforest of Subtropical Australia Threatened Ecological Community (TEC) – critically endangered

A recent PMST search was completed to obtain up to date information on potential MNES adjacent to the project. These results are summarised below:

- One (1) Wetland of International Significance;
- Six (6) listed Threatened Ecological Communities (TEC);
- Thirty-eight (38) listed threatened flora species; and
- Forty-two (42) listed threatened fauna species.

A likelihood of occurrence and risk of impact on the identified matters was undertaken as part of the initial desktop analysis of MNES potentially present at the site. Further assessments including detailed field studies (refer to section 3.3) have been carried out since the initial desktop analysis. The likelihood of occurrence assessment has been updated where appropriate to reflect the most recent and accurate information to the date of this report. The assessment includes the additional MNES the Department considers having the potential to occur on or adjacent to the referral area.

Marine species were not interrogated as part of this assessment given the lack of suitable aquatic and/or marine habitat available on-site and distance from areas under daily tidal influence (*i.e.,* submerged areas east of the mangrove ecosystem).

3.2.1 Threatened Ecological Communities

Desktop Review

At the time the controlled action decision was made, the PMST listed six (6) Threatened Ecological Communities, protected under the EPBC Act, with the potential to occur within 5 km of the referral area. The Likelihood of Occurrence Assessment determined through a review of historical aerial imagery and mapped values from local, state and Commonwealth databases, that one (1) ecological community had a 'moderate' likelihood of occurrence. This was confirmed by detailed site analysis with the TEC addressed in **Table A4**.

Table A4: Threatened Ecological Community Likelihood of Occurrence Analysis

TEC	EPBC Act Status	Community Description	Updated Likelihood of Occurrence
Lowland rainforest of subtropical Australia	Critically Endangered	This TEC occurs mainly on basalt and alluvial soils and is characteristic of a low abundance of *Eucalyptus, Melaleuca* and *Casuarina* species. Specimens with buttress roots and a diversity of vines are common throughout this TEC. This community is usually associated with REs 12.3.1 (more recently mapped as 12.3.16), 12.5.13, 12.8.3, 12.8.4, 12.8.13, 12.11.1, 12.11.10, 12.12.1, and 12.12.16.	**Moderate** The site is mapped as containing a pre-clear regional ecosystem (RE12.11.10) associated with this threatened ecological community in the east of the referral area. Field surveys found species indicative of this RE were present on site however it's in poor condition and highly disturbed by weeds. Further assessment is required, refer **Section 3.5**

3.2.2 Threatened Flora Species

At the time the controlled action decision was made, the PMST listed thirty-eight (38) flora species, protected under the EPBC Act, with the potential to occur within 5 km of the referral area. The Likelihood



of Occurrence Assessment determined through a review of historical aerial imagery and mapped values from local, state and Commonwealth databases, that ten (10) flora species had a 'moderate' likelihood of occurrence. Detailed site surveys found nine (9) of the listed flora species were not present on site (refer to **Table A5**).

Table A5: Threatened Flora Species Likelihood of Occurrence Analysis

Scientific Name	Status	Habitat Description	Updated Likelihood of Occurrence
Baloghia marmorata (Marbled Balogia)	Vulnerable	Marbled Balogia occurs in subtropical rainforest/notophyll vine forest and wet sclerophyll forest with a rainforest understorey. Associated species include *Eucalyptus microcorys, Archontopheonix cunninghamniana, Aphanthe philippinensis, Capparis arborea, Planchonella australis, Ficus spp, Olea paniculata, P. myrsinoides.*	**Unlikely** Pre-clear RE mapping indicates the potential for notophyll vine forest within the referral area. There are multiple records within 5km of the referral area and a high density of sightings in association with Tamborine National Park. While there is potential for suitable habitat within the referral area, the dominance of weeds and steep terrain indicates it is unlikely for this species to occur. Furthermore, the species has not been recorded within the referral area during multiple surveys.
Corchorus Cunninghamii (Native Jute)	Endangered	The Native Jute occurs in the ecotone of wet sclerophyll forest and dry-subtropical rainforest (e.g. araucarian microphyll vine forest), and in Hoop Pine (Araucaria cunninghamii) plantations. It often occurs on hill crests, exposed slopes, ridges or upper slopes of hilly terrain on south or south-east. It also occurs on sheltered slopes, gullies and on lower slopes, depending on the topographic position of the sclerophyll-rainforest margin.	**Unlikely** RE mapping indicates the potential sclerophyll forest within the referral area. There are several confirmed records within 5km of the site. While there is potential for suitable habitat within the referral area this is extremely limited by the dominance of weeds and steep terrain indicating it is unlikely for this species to occur. Furthermore, the species has not been recorded within the referral area during multiple surveys.
Corynocarpus rupestris subsp. Arborescens (Southern Corynocarpus)	Vulnerable	The Southern Corynocarpus occurs in dry rainforest on steep, rocky, basaltic slopes on the north-eastern face of Glenugie Peak. The subspecies persists in habitats where fire is excluded.	**Unlikely** Pre-clear RE mapping indicates the potential for dry rainforest/ notophyll vine forest vegetation to be present. Furthermore, there is a cluster of records 4.5km east of the referral area. While there is potential for suitable habitat within the referral area, the dominance of weeds indicates it is unlikely for this species to occur. Furthermore, the species has not been recorded within the referral area during multiple surveys.
Fontainea venos	Vulnerable	Occurs in notophyll vine forest and vine thicket with a mean annual rainfall of 1000-1100 mm on soils derived from and	**Unlikely** Pre-clear RE mapping indicates potential for notophyll vine forest vegetation. Furthermore, the steep terrain may include rocky outcrops.



Scientific Name	Status	Habitat Description	Updated Likelihood of Occurrence
		containing abundant andesitic rocks, often on rocky outcrops or along creeks.	There is a cluster of records of the species 2km north of the referral area. Notophyll vine forest vegetation within the referral area is limited to small 1. 1 ha polygon of regrowth in the east. This area was observed to heavily weed infested which reduces the suitability of the habitat for the species. Furthermore, the species has not been recorded within the referral area during multiple surveys and therefore is considered unlikely to occur.
Leichhardtia coronata (Slender Milkvine)	Vulnerable	Most commonly found in open eucalypt forest and woodland communities on hillslopes and ridge tops at altitudes of 40–780m above sea level. It has been found on rocky outcrops along cliff lines. Most commonly recorded with Eucalyptus fibrosa, E. carnea, Corymbia citriodora, C. henryi, E. acmenoides, and E. propinqua.	**Unlikely** Potential suitable habitat for this species occurs within the referral area, particularly within the remnant vegetation. Associated eucalypt species are likely to occur on site and according to Queensland WildNet, there are multiple records within 5km of site. Habitat broadly considered as suitable habitat is present within the referral area, however the area was observed to be densely weed infested throughout. Additionally, the species was not observed within the referral area despite several on-ground surveys indicating it is unlikely that the species would occur.
Macadamia integrifolia (Macadamia Nut)	Vulnerable	The Macadamia Nut grows in remnant rainforest. It prefers to grow in mild frost-free areas with reasonably high rainfall. Vegetation communities range from notophyll mixed forest, extremely tall closed forest, simple notophyll mixed very tall closed forest to simple microphyll-notophyll mixed mid-high closed forest with Araucaria and Argyrodendron emergents.	**Known** The majority of the referral area likely does not provide habitat known to support this species however, potential suitable habitat occurs within the mapped pre-clear notophyll vine forest. According to Queensland WildNet, there are multiple records of the species within 5km of the referral area. The species was observed within the less disturbed areas of notophyll vine forest vegetation in the east of the referral area
Macadamia tetraphylla (Rough-shelled Bush Nut)	Vulnerable	This species generally occurs in subtropical rainforest and complex notophyll vineforest, at the margins of the forests and mixed sclerophyll forest. It occurs in restricted habitat, growing on moderate to steep hillslopes on alluvial soils at well drained sites.	**Moderate** The majority of the referral area likely does not provide habitat known to support this species however, potential suitable habitat occurs within the mapped pre-clear notophyll vine forest. According to Queensland WildNet, there are multiple records of the species within 5 km of the referral area. Suitable habitat for this species overlaps with that of Macadamia integrifolia. This species was not observed within the referral area



Scientific Name	Status	Habitat Description	Updated Likelihood of Occurrence
			and therefore the likelihood of occurrence is considered as unlikely.
Planchonella eerwah (Shinyleaved Condoo)	Endangered	The species prefers subtropical rainforest, dry rainforest and Araucaria cunninghamii vine scrub.	**Unlikely** Pre-clear RE mapping indicates potential for notophyll vine forest vegetation. There are multiple records within 5km of the referral area. Subtropical rainforest habitat are limited to a 1.1 ha area in the east of the referral area. This area was observed to be heavily weed infested and indicative of regrowth vegetation. Furthermore, this species was not observed within the referral area despite several on-ground surveys indicating the species is unlikely to occur.
Randia moorei (Spiny Gardenia)	Endangered	Shrub or small bushy tree to about 8m in dry rainforest north of the Beenleigh area; endemic to Qld.	**Unlikely** Pre-clear RE mapping indicates potential for notophyll vine forest vegetation. There are multiple records within 5km of the referral area. Notophyll vine forest habitat is limited to a 1.1 ha area in the east of the referral area. This area was observed to be heavily weed infested and indicative of regrowth vegetation. Furthermore, this species was not observed within the referral area despite several on-ground surveys indicating the species is unlikely to occur.
Sophora fraseri	Vulnerable	This species normally grows in wet sclerophyll forest and a range of rainforest types. Associated species include: Corymbia citriodora, Eucalyptus carnea, E. microcorys, E. acmenoides, E. propinqua and Lophostemon confertus. The shrub appears to prefer growing along rainforest margins, in eucalypt forests in the vicinity of rainforests or in large canopy gaps in closed forest communities	**Unlikely** Potential suitable habitat for this species occurs within the referral area, particularly within the remnant vegetation. Associated eucalypt species are likely to occur on site and according to Queensland WildNet, there is one record within 5km of site. Broadly habitat suitability is present in the form of associated species, however the vast majority of the referral area is dominated by weeds and ther4fore reduces the suitability of the habitat. Additionally, the species was not observed within the referral area despite several targeted surveys indicating the species is unlikely to occur.

3.2.3 Threatened and Migratory Fauna Species

At the time the controlled action decision was made, the PMST listed forty-two (42) fauna species protected under the EPBC Act, with the potential to occur within 5 km of the project area (refer **Part B - MNES Ecological Technical Assessment, Appendix A**). Additional detailed assessment found only three (3) of these species have any potential to be present on site, Koala 'known,' South-eastern Glossy Black-Cockatoo 'low' and Grey-headed Flying-fox 'low.' All other threatened and/or migratory fauna species were assessed as 'unlikely' to occur (refer **Table A6** and **Table A7**).



Table A6: Threatened fauna species desktop assessment summary adapted from MNES Ecological Technical Assessment (Part B of this PD)

Scientific Name	Status	Habitat Description	Updated Likelihood of Occurrence
Birds			
Calyptorhynchus lathami lathami (Southern-eastern Glossy Black-cockatoo)	Vulnerable	This species prefers woodland areas dominated by she-oak *Allocasuarina*, or open sclerophyll forests and woodlands with a stratum of *Allocasuarina* beneath *Eucalyptus*, *Corymbia* or *Angophora*. Glossy black-cockatoos have also been observed in mixed *Allocasaurina, Casuarina*, cypress Callitris and brigalow *Acacia harpophylla* woodland assemblages. In SEQ west of the Great Dividing Range, they have been observed feeding in remnant belah *Casuarina cristata* and bulloak *Allocasuarina luehmannii* forests. This species is also known to utilise appropriate remnant woodlands, and individual or small pockets of *Allocasuarina* and *Casuarina* feed trees in urban areas.	**Low** The referral area contains wooded areas likely containing eucalypt woodland and Allocasuarina sub-canopy. According to Queensland WildNet and ALA, there are records of this species within 5 km radius of the site. A review of these records indicate that a higher number of sightings have been recorded further south towards Cedar Creek/Mount Tamborine National Park, and north-west towards Wickham National Park, areas which provides suitable roosting and/or foraging habitat due to containing mature intact bushland. The referral area was observed to contains minimal suitable habitat for the species and therefore identified as having a low likelihood of occurrence. Further assessment is provided in **Section 3.5** and **Section 4.5.**
Hirundapus caudacutus (White-throated Needletail)	Vulnerable	White-throated Needletails are known to occur over most habitat types, most often being above wooded areas, including open forest and rainforest. They are known to fly between trees or in clearing, below the canopy. They are less commonly recorded over treeless areas, such as grassland and swamps.	**Unlikely** The referral area contains wooded areas including open forests. A review of Queensland WildNet and ALA identified several records of the species within 5km of the site however the majority of these are 10+ years old. Despite the species being associated with broad habitat types being predominantly aerial, the likelihood of occurrence over the small referral area was considered as unlikely.
Mammals			
Phascolarctos cinereus (Koala)	Endangered	They are found in a range of habitats, from coastal islands and tall eucalypt forests to low woodlands inland.	**Known** The referral area is mapped as containing Category X (non-remnant), as a result of an approved PMAV (ref: 2008/008614) and Category B (remnant) vegetation under the Queensland Vegetation Management Act 1999. The area of Category B (remnant) vegetation is mapped as



Scientific Name	Status	Habitat Description	Updated Likelihood of Occurrence
			RE12.11.3 which is a Eucalypt dominated vegetation community containing known Koala habitat trees. According to Queensland WildNet Data, which dates back to the 1980s, 167 Koalas have been known to occur within a 5 km radius of the site. The nearest contemporary record was from 2014 approximately 500m south-west of the referral area. The species has been observed within the referral area during on-ground surveys. Further assessment of impacts is provided in **Section 3.5** and **Section 4**.
Pteropus poliocephalus (Grey-headed Flying-fox)	Vulnerable	Species generally roosts in camps in trees adjacent to larger permanent watercourses. The Grey-headed Flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. It also feeds on commercial fruit crops. The primary food source is blossom from Eucalyptus and related genera.	**Low** The referral area is mapped as containing Category X (non-remnant), as a result of an approved PMAV (ref: 2008/008614) and Category B (remnant) vegetation under the Queensland Vegetation Management Act 1999. The area of Category B (remnant) vegetation is mapped as RE12.11.3 which is a Eucalypt dominated vegetation community indicating potential foraging habitat may be present within the referral area. A review of the National Flying-fox monitoring viewer identified a GHFF roost approximately 8.7km north-east of the site (Pimapama, Mirambeena Drive (851). The vegetation on-site broadly meets the definition of foraging habitat for the species, however the small overall referral area which includes 2.4 ha of vegetation that likely does not provide suitable foraging habitat for the species, the likelihood of occurrence is low. Furthermore, the species has not been observed within the referral area despite targeted surveys.
Petauroides volans (Greater Glider)	Endangered	Greater Gliders are arboreal nocturnal marsupials that are mostly restricted to eucalypt forests and woodlands, although also occur in highest abundance in taller, montane, moist eucalypt forests with abundant (large)	**Low** The referral area is mapped as containing Category X (non-remnant), as a result of an approved PMAV (ref: 2008/008614) and Category B (remnant) vegetation under the



Scientific Name	Status	Habitat Description	Updated Likelihood of Occurrence
		hollow-bearing trees for shelter and a variety of eucalypt species for feeding. Diet consists of eucalypt leaves, and occasionally flowers. Small home ranges and low dispersability make this species sensitive to clearing and fragmentation, with low persistence in small forest fragments.	Queensland Vegetation Management Act 1999. The areas of the referral area dominated by eucalypt species, may provide potentially suitable habitat for the Greater Glider. There are recorded sightings 4-10km south of the site associated with Mount Tamborine National Park. While the vegetation within the referral area broadly meets the definition of habitat for the species, detail surveys observed significantly limited large hollow bearing trees which are necessary for the species to persist. There is considered to be a low likihood that the species would utilise vegetation within the referral area, further assessment is provided in **Section 3.5**

Table A7: Migratory fauna species desktop assessment summary adapted from MNES Ecological Technical Assessment (Part B of this PD)

Scientific Name	***Status***	***Habitat Description***	***Updated Likelihood of Occurrence***
Monarcha melanopsis (Black-faced Monarch)	*Migartory terrestreial species*	*The Black-faced Monarch mainly occurs in rainforest ecosystems, including semi-deciduous vine thickets, complex notophyll vine forests, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and occasionally cool temperate rainforest.*	*Unlikely* Pre-clear RE mapping indicates the potential for suitable habitat associated with notophyll vine forest over part of the referral area. Furthermore, a sighting of the species was recorded in close proximity to the referral area. Detailed on-ground surveys identified the area associated with notophyll vine forest to be a highly weed infested 1.1ha patch with limited suitable habitat. Furthermore, the species has not been observed within the referral area despite targeted survey and therefore considered unlikely to occur.
Myiagra cyanoleuca (Satin Flycatcher)	*Migartory terrestreial species*	*Satin Flycatchers inhabit heavily vegetated gullies in eucalypt dominated forests and taller woodlands, and on migration occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.*	*Unlikely* RE mapping indicates the potential for suitable habitat associated with eucalypt dominated woodland over part of the referral area. Furthermore, a sighting of the species was



			recorded in close proximity to the referral area. Detailed on-ground surveys identified the area associated with eucalypt dominated forest to be highly weed infested with limited suitable habitat, heavily vegetated gullies are absent. Furthermore, the species has not been observed within the referral area despite targeted survey and therefore considered unlikely to occur.
Rhipidura rufifrons (Rufous Fantail)	*Migartory terrestreial species*	*The Rufous fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by Eucalypts such as Eucalyptus microcorys, Eucalyptus pilularis, Eucalyptus resiniferia and a number of other Eucalyptus species.*	*Unlikely* RE mapping indicates the potential for suitable habitat associated with eucalypt dominated woodland over part of the referral area. Furthermore, a sighting of the species was recorded in close proximity to the referral area. Detailed on-ground surveys identified the area associated with eucalypt dominated forest to be highly weed infested with limited suitable habitat, heavily vegetated gullies are absent. Furthermore, the species has not been observed within the referral area despite targeted survey and therefore considered unlikely to occur.

3.3. Field Survey Effort

Item 3.4 of the PD information request asks for ***"up to date baseline and survey data at the impact site(s), and if relevant, the proposed offset site(s) site including:***

a. ***Information on the survey methodology or technique used (eg. Thermal detection, camera trapping, tree hollow search, SAT surveys etc***
b. ***When surveys were conducted (eg. Dates, time of day, season, etc.) and survey effort (e.g., two hours for every one hectare within a 5-hectare area)***
c. ***Map/s of survey points or transects and how the survey points or transects were selected***

Ecological field surveys were completed across the referral area in the attempt to confirm presence of potential MNES. Fauna surveys were conducted under the following permits held by SHG:

- Scientific Purposes Permit **P-SPP-100794835** granted under Research / Education Application issued under the provisions of the Nature Conservation (Animals) Regulation 2020
- Department of Agriculture and Fisheries (DAF) Ethics clearance **CA 2020/02/1355**
- Scientific User Registration **SUR000451**

All survey methods undertaken have been guided by best practice and where applicable, Commonwealth and State survey guidelines for threatened species. This includes the following methodologies:

- *Terrestrial Vertebrate Fauna Survey Guidelines.*
- *Survey guidelines for Australia's Threatened Bats.*
- *Survey Guidelines for Australia's Threatened Mammals.*
- *Survey Guidelines for Australia's Threatened Birds.*
- *Flora Survey Guidelines – Protected Plants (Nature Conservation Act 1992).*
- *Conservation Advice – Lowland Rainforest of Subtropical Australia*
- *Modified Habitat Quality Assessment (MHQA) methodology utilising the Guide to determining terrestrial habitat quality v 1.2 April 2017.*

Field surveys method implemented at the site are described in the following sub-sections with a summary of survey methods completed by date and target species provided in **Table A8** and **Table A9** respectively. Plans showing survey locations relevant to each target threatened species are included after the descriptions of the methods.

This section includes details of field surveys completed to support the original referral application and additional surveys completed in response to the PD information request. The referral area contains extremely steep terrain and dense weed infestations rendering parts of the area inaccessible and unsafe to traverse.



Table A8: Field survey dates and methods summary

Survey date	Temperature data	Rainfall data	Methods applied
5 December 2022	12.9°C min – 29.1°C max	0 mm	Preliminary site visit, incidental surveys, context analysis, Koala SAT surveys and vegetation and flora ground-truthing surveys
5 June 2023	13.9°C min – 20.5°C max	10.0mm	Ground-truth vegetation communities, MHQA assessments, context analysis, SAT survey, incidental surveys
10 October 2023	6.8°C min – 28.1°C max	0mm	Camera set up, incidental surveys
31 October 2023	11.0°C min – 35.9°C max	0mm	Dusk surveys and nocturnal searches
1 November 2023	14.7°C min – 24.8°C max	0mm	Camera collection, dusk surveys and nocturnal searches
22 October 2024	14.7°C min – 27.3°C max	0mm	MHQA assessments, Koala SAT surveys, incidental surveys, habitat tree identification and Allocasurina mapping
2 September 2025	7.1°C min – 23.1°C max	0mm	LRSA TEC assessments
20 January 2026	16.3°C min – 28.7°C max	0mm	Incidental surveys, habitat tree identification and Allocasurina mapping

NB: Temperature and rainfall data sourced from Bureau of Meteorology (BoM) – Station 40042 Canungra Finch Road for Rainfall and Station 140008 Canungra (Defence) for temperature



Table A9: Summary of targeted field survey techniques and survey effort

Scientific Name	Common Name	Survey guidelines	Techniques implemented and survey effort	Field personnel qualifications
Phascolarctos cinereus	Koala	*Survey guidelines for Australia's threatened mammals* Phillips and Callaghan (2011)	• Three (3) Spot Assessment Technique surveys • 12 person hours of spotlighting meanders over 2 days (October 2023 and November 2023) • Assessment of foraging and breeding values (habitat suitability) • Incidental surveys • 3 motion triggered camera trap deployed for 22 nights (October 2023)	**Principle Ecologist** • 12+ years of relevant experience • Bachelor of Applied Science (Natural Systems and Wildlife) • Suitably qualified ecologist as defined under the NCA Protected plants guidelines **Senior Ecologist** • 5 years of relevant experience • Bachelor of Environmental Management (Natural Systems and Wildlife) **Ecologist** • 4 years of relevant experience • Bachelor of Science (Ecology and Conservation Biology **Graduate Ecologist** • One year of relevant experience • Bachelor of Science (Ecology and Conservation Biology)
Pteropus poliocephalus	Grey-headed Flying-fox	*Survey guidelines for Australia's threatened bats*	• Daytime roost/camp searches (2022, 2023 and 2024) • 12 person hours of spotlighting meanders over 2 days (October 2023 and November 2023) • Assessment of foraging values and habitat suitability	
Petauroides volans	Greater Glider	*Survey guidelines for Australia's threatened mammals*	• 12 person hours of spotlighting meanders over 2 days (October 2023 and November 2023) • Assessment of breeding habitat (hollows) and foraging values • GPS location of hollow-bearing trees and recording of hollow sizing	
Calyptorhynchus lathami lathami	South-eastern Gloss Black-Cockatoo	*Survey guidelines for Australia's threatened birds*	• Over 32 hours of meander surveys (incidental searches) • Dusk 'point surveys'	

Scientific Name	Common Name	Survey guidelines	Techniques implemented and survey effort	Field personnel qualifications
			• Assessment of foraging values (Allocasuarina sp.)	
Macadamia integrifolia	Macadamia Nut		• Surveys lead by suitably qualified Ecologist (under QLD definition) for protected plants as per the *NCA 1992 Flora Survey Guidelines – Protected Plants*	
Lowland Rainforest of Subtropical Australia Threatened Ecological Community		*Lowland Rainforest of Subtropical Australia Conservation advice*	• Assessment of community utilising survey methodology as per Conservation Advice • Context assessment using on-ground observation and historical aerial imagery	

Incidental surveys (diurnal)

The referral area was walked to ensure all species (flora and fauna) were recorded and identified. Particular attention was paid to any threatened species that were listed as possibly occurring on or within the vicinity of the application area and specific micro-assemblages which may support these threatened species. This included observations for vertebrate fauna present on or that may utilise the study area, including faunal lists and significance status of species under the EPBC Act including the JAMBA, CAMBA, ROKAMBA and the Bonn Convention, and Queensland's NCA.

The incidental survey included identification of ecological features and values such as broad vegetation communities, fauna habitats and contextual assessment. Incideital surveys included observing a recording flora and fauna species through either direct observation or indirect evidence (calls, tracks, scats)

Motion Detection Camera

Surveys for native fauna species and non-native vertebrate pest species (primarily Wild Dog as key threatening process to Koala) were completed across the referral area. Infrared motion-triggered camera trapping was utilised which involves setting up a fixed digital camera to capture images or video of animals that pass in front of a camera with an infrared trigger. This survey technique identifies fauna activity beyond the scope of direct observational studies and with the absence of potential observer impacts. The method for determining camera locations utilised the standard grid-based system which is common practice where each camera is located equidistance from the other across the site.

In lieu of any published guidelines from DCCEEW for monitoring Wild Dogs, the number of cameras and distance between cameras was driven by several case studies and existing guidelines. These documents state a suggested distance of between 500 m and 1000 m between camera locations, given the vast home range and mobility of Wild Dogs. For the referral site, cameras were positioned approximately 100 m apart owing to the small overall area of the impact site and to provide suitable coverage. The ultimate location for camera deployment was influenced by accessibility of the area and presence of dense vegetation which can cause false triggering in winding conditions.

Once the camera locations were determined, cameras were directed to animal trails which are more likely to support fauna. Heavy, loose vegetation was avoided or removed to reduce the chance of false triggering, and the camera was aimed to avoid sun shining directly onto the lens. Cameras were attached 30-100 cm from the ground on a tree or post and directed towards landscape features.

Three (3) camera traps were installed across the referral area for a period of 22 nights from 10 October 2023 to 1 November 2023, baited with chicken necks to target Wild Dogs and other known potential threats to MNES in the broader area. Descriptions of the Camera deployment locations are provided in **Table A10**.



Table A10: Fauna camera summary (10 October to 1 November 2023)

ID	Latitude	Longitude	Photo	Description of location
1	-27.838889°	153.193782°		Camera 1 was deployed in the western extent of the referral area
2	-27.839467°	153.195513°		Camera 2 was deployed in the central portion of the referral area
3	-27.839413°	153.197211°		Camea 3 was deployed in the north-eastern portion of the referral area where adjacent access tracks are present.

Spot Assessment Technique

Surveys to understand Koala presence were undertaken across the referral area in accordance with the methodology developed by the Australian Koala Foundation (AKF) (Phillips & Callaghan 2011) and specified in the Koala Referral Guidelines.

The SAT method was implemented within vegetation located in the northern portion of the referral area. This methodology is an assessment of Koala activity involving a search for any Koalas and signs of Koala usage. The SAT method involves identifying a non-juvenile tree of any species within the referral area that is either observed to have a Koala or scats, or is known to be a Koala food tree or otherwise important for Koalas, and recording any evidence of Koala usage of that tree including physical presence, identifiable scratches or scats. The nearest non-juvenile tree is then identified and the same data recorded. The next closest non-juvenile tree to the first tree is then assessed and so on until 30 trees have been surveyed.

The number of trees showing evidence of Koala activity is expressed as a percentage of the total number of trees sampled to indicate the frequency of Koala usage. Assessment of each tree involves a systematic search for Koala scats beneath the tree within a 1 m radius of the trunk. After approximately two minutes of searching for scats, the base of the trunk is observed for scratches and the crown for Koala (Phillips & Callaghan 2011).

Nocturnal Spotlighting

This non-intrusive technique is the most effective method to obtain estimates of nocturnal arboreal mammal incidence and abundance in wooded habitats. Spotlighting also targets medium to large terrestrial nocturnal mammals and can detect other nocturnal taxon groups (e.g. frogs, geckoes, nocturnal snakes, nocturnal birds, spiders).

Spotlight searches were conducted over the course of two nights (31 October and 1 November 2023) from 1800hrs to 2100hrs by two Ecologists. High-powered spotlights (Fenix HP25R Rechargeable LED Headlamp – 1000 lumens) were used to detect cryptic and nocturnal fauna. Site access via foot was preferred (vehicle access was not possible).

Modified Habitat Quality Assessment

The Modified Habitat Quality Assessment (MHQA) methodology was utilised to assess the referral area condition, site context and species stocking rate. Refer to **Section 4.3** for more detail on methodology.

The referral area was broken into three (3) assessment units to reflect the differing states of the vegetation within the referral area. In order to determine the quantum and quality of the habitat suitable for koala within the referral area, vegetation/habitat quality was derived from the Modified Habitat Quality Assessment tool.

Hollow-bearing tree survey

All hollow-bearing trees were recorded across the referral area from the ground by experience Ecologists which is considered the standard methodology of hollow recording. Both dead and alive trees were recorded where necessary. Hollow sizes were recorded to provide specific suitability assessments (i.e Greater Glider and South-eastern Glossy Black-cockatoo require larger hollows). Every effort was made to walk the entire referral area, however steep terrain and dense weed infestations limited access in some areas. Given the referral area is small and on a steep south facing slope, visually observing the balance of the area from the hill side was possible particularly as large parts of the site contains regrowth



vegetation with no large trees. Areas where access was not possible are only approximately 30 m in width and therefore can be relatively easily observed. Furthermore, literature on hollow recording survey effort indicates that experienced Ecologists tend to overestimate the number of hollows within a study area (Harper et al. 2004, Rayner et al. 2011 and Penton et al. 2020).

Hollows were separated into the following size categories:

- Small (0-99 mm diameter),
- Medium (100-299 mm diameter) and
- Large (>300 mm diameter).

Allocasuarina mapping

The significance of Allocasuarina species is particularly relevant for the South-eastern Glossy Black-cockatoo as a key foraging resource. Any areas containing Allocasuarina species were mapped and where possible the number of individual specimens was included. Recording of Allocasuarina species was completed across the site over multiple days as part of vegetation and fauna assessments.

Dusk survey points

Point surveys were completed within and adjacent to the referral area in addition to diurnal incidental surveys. Point surveys are referenced in the *Survey guidelines for Australia's threatened birds* and considered a suitable method in this scenario where dense vegetation and steep terrain means a meandering transect is less effective. Additionally, the overall small total area of the referral area (5.9 ha) indicates point surveys are appropriate additional survey method to record birds that might be utilising the area. Two (2) point surveys were completed, one on 31/10/2023 and one on 1/11/2023 at dusk before spotlighting commenced where bird activity is typically high. Two (2) Ecologists remained at each location for 15 minutes and recorded direct observations of birds or calls.

Lowland Rainforest of Subtropical Australia (LRSA) Threatened Ecological Community

The identification and delineation of the LRSA TEC is principally determined by assessing mapped RE12.11.10 using the key diagnostic characteristics (KDCs) and the condition thresholds provided in LRSA TEC Conservation Advice (DCCEEW 2011). The first five KDCs relate to context with field surveys focusing on the final two KDCs relating to the structure and species richness of the vegetation. The specific criteria assessed by on ground surveys are:

- The structure of the ecological community is typically a tall (20 m–30m) closed forest, often with multiple canopy layers.
- Patches of the ecological community typically have high species richness (at least 30 woody species from Appendix A of the LRSA conservation advice).

Field surveys were targeted to identify whether the mapped regrowth and remnant RE12.11.10 polygons within and surrounding the referral area met the KDC for the LRSA TEC. Survey locations were restricted to Fulton Hogan's landholdings as private property to the south and east could not be surveyed as access was not provided by the landowners. The land in this area is also very steep with inclines greater than 30% therefore could not be safely assessed even if access was allowed.

Five (5) transects were completed in areas of regrowth RE12.11.10 in accordance with the methods recommended in the 'sampling protocol' of the LRSA TEC Conservation Advice. This involved marking out a 50 m x 20 m sample plot. A 50 m tape is used to record canopy cover which was measured along the tape with species richness recorded as all species within the 50 m x 20 m plot. Species recorded



focused on 'woody species' (i.e trees, shrubs, vines, ferns) as those are relevant to the LRSA TEC Conservation Advice.

Two of the transects (Transect 4 and 5) were located within and immediately adjacent to the referral area. An additional three (3) transects (Transect 1, 2 and 3) were completed within the broader Fulton Hogan's landholdings to the north where vegetation is also mapped as pre-clear RE12.11.10.

In addition to the transects seven (7) quaternary assessments were completed across the land holding which included areas mapped as remnant RE12.11.10 to the north of the quarry and where regrowth RE12.11.10 extends east and south from the referral area/property boundary. Quaternary vegetation assessments are point assessments with information recorded modified to suit the purpose of the assessment (species, disturbance, RE, etc). The Queensland herbarium recommends quaternaries as a suitable method for verifying vegetation communities and mapping (Neldner et al 2009). While these sites did not assess canopy cover, they were considered a suitable survey method to assess species richness on adjacent private land or inaccessible terrain where transects could not be completed. Quaternaries are also beneficial in drawing comparisons and observing changes in vegetation compared with other survey sites.

A meandering vegetation transect survey was also completed across the balance of the referral area mapped as RE12.11.10, where possible, to ensure all species were recorded.

The combined methods provide a detailed assessment of the structure and diversity of vegetation communities within and surrounding the referral area and can be used to assess whether the mapped regrowth and remnant RE12.11.10 meets the KDCs to be considered the LRSA TEC.

Koala

Field surveys directly related to Koala are shown in **Plan A4.1.** This includes:

- Diurnal incidental surveys (completed over 5 December 2022, 5 June 2023, 10 October 2023, 31 October 2023, 1 October 2023 and 22 October 2024)
- Two spotlighting nights (completed on 31 October 2023 and 1 November 2023)
- Three (3) motion detection cameras (deployed for 22 nights from 10 October to 1 November)
- Four (4) SAT assessments (completed in December 2022, June 2023 and October 2024)

Greater Glider

Field surveys directly related to Koala are shown in **Plan A4.2**. This includes:

- Two spotlighting nights (completed on 31 October 2023 and 1 November 2023)
- Mapping of specific habitat values namely hollow bearing trees (completed over the 5 December 2022, 5 June 202, 10 October 2023, 31 October 2023, 1 October 2023 and 22 October 2024)

South-eastern Glossy Black-cockatoo

Field surveys directly related to South-eastern Glossy Black-cockatoo are shown in **Plan A4.3**. This includes:

- Diurnal incidental surveys (completed on 5 December 2022, 5 June 2023, 10 October 2023, 31 October 2023, 1 October 2023 and 22 October 2024)



- Two (dusk) survey points (one on 31 October 2023 and one on 1 November 2023)
- Mapping of specific habitat values including hollow bearing trees and Allocasurina specimens (completed over the 5 December 2022, 5 June 202, 10 October 2023, 31 October 2023, 1 October 2023 and 22 October 2024)

Macadamia integrifolia

Field surveys directly related to South-eastern Glossy Black-cockatoo are shown in **Plan A4.4.** This includes:

- Ground-truthing vegetation communities (completed on 5 December 2022 and 5 June 2023)
- Recorded all flora species including locating Macadamia specimens (5 December 2022 and 5 June 2023)

Lowland Rainforest of Subtropical Australia Threatened Ecological Community

Field surveys directly related to South-eastern Glossy Black-cockatoo are shown in **Plan A4.5.** This includes:

- Ground-truthing vegetation communities (completed on 5 December 2022 and 5 June 2023)
- Detailed surveys of referral area containing potential LRSA TEC (completed on 5 June 2023)
- Further contextual surveys of LRSA TEC patch (completed on 2 September 2025)

3.4. Field Survey Results

Item 3.4(e) of the PD Request asks for "***Results of all surveys undertaken***". The results of the flora and fauna surveys provide an understanding of the ecological constraints and potential impacts to MNES associated with the proposed project area.

3.4.1 Flora Assessment Results

Vegetation Communities

Flora species were recorded throughout the referral area through a combination of incidental surveys and specific focused vegetation assessments. Following the delineation of the referral area into vegetation communities based on disturbance and vegetation composition, modified habitat quality transects were completed to quantify habitat values for specific threatened species.

The referral area showed high levels of disturbance throughout although significant changes in the vegetation where observed. Notably, eco-tonal areas were identified where contrasting vegetation communities were present. Generally, vegetation communities align with the RE mapping. The vegetation communities are grouped into the following Assessment Units (refer to section 3.1 and **Plan A5** for detailed descriptions of the vegetation communities):

- Assessment Unit 1: Indicative of remnant RE12.11.3 – *Eucalyptus siderophloia and Eucalyptus propinqua dominated open forest*
- Assessment Unit 2: Regrowth RE12.11.10 – *Notophyll vine forest*
- Assessment Unit 3: Highly disturbed, dominated by weeds and acacia regrowth (pre-clear RE12.11.3)

A total of 98 species of flora were recorded within the referral area including 65 native species and 33 introduced species. Native species were present throughout the canopy including *Eucalyptus propinqua* (Small-fruited Grey Gum), *Eucalyptus siderophlioa* (Grey Ironbark) and *Eucalyptus tereticornis* (Forest Red Gum) while exotic weed species dominated the understory and ground cover including *Passiflora suberosa* (Corky Passion Vine), *Lantana camara* (Lantana), *Lantana montevidensis* (Creeping Lantana) and *Megathyrsus maximus* (Guinea Grass). Species indicative of notophyll vine thicket (RE12.11.10) vegetation were observed in the east of the referral area including *Maclura cochinchinensis* (Cockspur Thorn), *Grevillea robusta* (Silky Oak) and *Ficus watkinsiana* (Strangler Fig).

Hollow-bearing trees

Hollow -bearing trees were observed to be lacking across the referral area as where large mature trees. Only two (2) hollow bearing trees were recorded within the referral area. One of these trees was a *Eucalyptus crebra* (Narrow-leaved Ironbark) and the other was a dead/stag tree.

Small (<100mm diameter) = 3
Medium (100-300mm diameter) = 2
Large (>300mm diameter) = 2

Allocasuarina specimens

A total of 8 individual specimens of Allocasurina were recorded at two distinct locations. Allocasurina was observed as sporadic and not forming a dense subcanopy



Threatened Flora

Macadamia integrifolia (Macadamia Nut), which is listed as vulnerable under the EPBC Act and state NC Act, was recorded within and immediately adjacent to the referral area (refer **Plan A6.4**). No other threatened flora species were observed within or adjacent to the referral area and are considered unlikely to occur primarily a s result of specific habitat requirements (rainforest) and high disturbance and the ground level.

Threatened Ecological Communities

Vegetation within the referral area that aligns with pre-clear mapped RE12.11.10 was found to not meet the KDC for the LRSA TEC as a result of a lack of species richness, canopy cover and maturity. Remnant and regrowth communities on adjacent private land could not be accessed for detailed surveys, however visual observation points were completed along the boundary of Fulton Hogan's property and representative surveys sites were completed across mapped RE12.11.10 within Fulton Hogan's landholdings. All surveys completed found regrowth did not meet the KDC for the LRSA TEC. Surveys that could be completed in remnant areas also indicated they do not meet the KDCs however access in these areas was difficult therefore the precautionary principle has been applied in identifying them as potentially meeting the LRSA TEC KDC. Detailed results are discussed in **Section 3.5.5** and shown on **Plan A6.5**.

3.4.2 Fauna Assessment Results

A detailed fauna assessment has been conducted across the project area to identify and describe on-ground habitat features (e.g. habitat trees, fallen logs, termite mounds, roosting sites etc.), signs of fauna activity (e.g. scats, tracks, scratch marks on trees, nests etc.) and observations of species present within the area. Consideration was also given to the ecological significance of the site in the context of the local area and the broader region.

Koala SAT Surveys

The project area contains remnant eucalypt woodland that provides potential foraging habitat for the koala. Field surveys targeting koala have been completed within the project area utilising multiple survey methods including the SAT method, spotlighting and general meander surveys.

A total of four (4) SAT surveys were completed across the referral area between December 2022 and October 2024. SAT survey results are interpreted using the broad population categories provided in the Australian Koala Foundation Koala activity level classification table. These categories being 'East Coast (low)', 'East Coast (med-high)' and 'Western (med-high)' are shown in
Table A11 and are used to estimate koala activity within a given area. Depending on the population category applied, koala activity is described as 'low', 'moderate', or 'high'. Population categories are assigned as follows:

- Sites considered to have high suitability for koalas are assigned the 'East Coast (med-high)' category;
- Sites considered to have low suitability are assigned the 'East Coast (low)' category; and
- The 'Western (med-high)' category does not apply to South East Queensland local government areas.

Table A11: Koala Activity Level Classification (Phillips and Callaghan 2011)

Activity	East Coast (low)	East Coast (med-high)	Western (med-high)
Low	<3.33%	<22.5%	<35.8
Moderate	3.33-12.6%	22.5-32.8%	35.8-46.7
High	>12.6%	>32.8	>46.7

The site is most accurately described by the East Coast (med-high) population category due to the location of the site within Gold Coast LGA and the presence of habitat types and conditions that are considered favorable to koalas (Rhodes *et al.*, 2015, Phillips and Callaghan, 2011).

In accordance with the above, the SAT results achieved koala activity scores of 'low' (**Table A12**). A Koala was directly recorded within the referral area (**Plan 6.1**). Refer to **Attachment A4** for full SAT survey results.

Table A12: SAT survey results based on East Coast (med-high) population activity threshold

SAT Number	Trees with scats	Percentage usage	Koala activity
1	0	0	Low
2	0	0	Low
3	2	6.66	Low
4	0	0	Low

Observed Fauna

A total of 20 fauna species were recorded throughout the survey period including 13 birds, 5 mammals and two (2) reptiles. Species were identified through direct observations, calls or via detection on motion sensor cameras. Refer **Table A13** for the full species list and method of detection. One (1) species, *Phascolarctos cinereus* (Koala), listed as threatened under the EPBC Act and NCA was recorded utilising the referral area (refer **Photo set 5**). No evidence of any other threatened species was recorded. Evidence of *Canis lupus familiaris* (wild dog) was also observed in the form of footprints and camera detection.



Photo set 5: Direct sighting of Koala within the referral area (right) and sighting of wild dog recorded on camera trap (left).

Table A13: Fauna species observed on-site

Scientific Name	Common Name	Incidental Survey (diurnal)	Spotlighting		Motion camera traps			Native/Exotic
			Night 1 (31.10.2023	Night 2 (01.11.2023)	Camera 1	Camera 2	Camera 3	
BIRDS								
Alectura lathami	Brush-turkey	✓						Native
Centropus phasianinus	Pheasant Cuckoo	✓						Native
Corvus orru	Torresian Crow	✓						Native
Coturnix ypsilophora	Brown Quail	✓						Native
Dacelo novaeguineae	Laughing Kookaburra	✓						Native
Geopelia humeralis	Bar shouldered dove	✓						Native
Gymnorhina tibicen	Australian Magpie	✓					✓	Native
Malurus cyaneus	Superb Fairy-wren	✓						Native
Malurus melanocephalus	Red-backed Fairy Wren	✓						Native
Philemon corniculatus	Noisy Friarbird	✓						Native
Psophodes olivaceus	Eastern Whipbird	✓						Native

Scientific Name	Common Name	Incidental Survey (diurnal)	Spotlighting		Motion camera traps			Native/Exotic
			Night 1 (31.10.2023	Night 2 (01.11.2023)	Camera 1	Camera 2	Camera 3	
Rhipidura leucophrys	Willie Wagtail	✓						Native
Sericornis fontalis	White-throated Scrub Wren	✓			✓			Native
MAMMALS								
Canis lupus familiaris	Wild Dog	✓					✓	Exotic
Macropus giganteus	Eastern Grey Kangaroo	✓	✓	✓			✓	Native
Phascolarctos cinereus	Koala	✓	✓				✓	Native
Trichosurus vulpeca	Brushtail Possum		✓	✓	✓			Native
Wallabia bicolor	Swamp Wallaby	✓	✓			✓		Native
REPTILES								
Morelia spilota	Carpet Python		✓					Native
Varanus varius	Lace Monitor	✓				✓		Native

3.5. Technical detail on MNES present at, or in the vicinity to, the project site

Item 3.3 of the PD Request asks for, ***"For listed threatened species and ecological communities that have the potential, or are likely, to be present at and in the vicinity of the project site, including but not limited to those listed in this request for further information, this section must provide a likelihood of occurrence assessment based on the following:***

- ***a) Information on the abundance, distribution, ecology and habitat preference of the species or communities.***
- ***b) Quantification of the extent of habitat (including maps identifying known or potential habitat).***
- ***c) Quality and importance of known or potential habitat for the species or communities within the proposed action site and surrounding areas.***
- ***d) Information detailing known populations or records within at least five kilometres of the development footprint and (if known) the size of these populations.***
- ***e) Conclusion on the likelihood of occurrence of listed threatened species and ecological communities within the project site, or within an area of impacts outside of the project site.***

3.5.1 Koala (*Phascolarctos cinereus*)

a) Information on the abundance, distribution, ecology and habitat preference of the species or communities.

Distribution

The Koala is found from north-east Queensland to the south-east corner of South Australia. Due to translocations, Koala are found outside their historic range, for example, Kangaroo Island. The distribution of Koala is influenced by altitude, temperature and leaf moisture, avoiding arid climates due to physiological stress. Thus, the density of the Koala population in coastal regions is generally greater than inland areas.

Habitat and Ecology

In South-east Queensland, a recent study completed by Rhodes *et al.* (2015) indicates that the average koala density across the region is estimated to be 0.04 koalas/ha. The majority of the region is predicted to have low population densities, suggesting that koalas in SEQ may be relatively widely distributed, but of low density in most areas (Cork & Sanson 1990). Rhodes *et al*. (2015) found a negative relationship between temperature and koala densities, which is associated with low koala densities in Ipswich and west Logan, where temperatures are relatively high. Data presented by Rhodes *et al*. (2015) indicates that the average koala density in the City of Gold Coast from 1996 to 2015 is approximately 0.04 koalas/ha.

Koala population estimates are carried out annually by the Commonwealth Scientific and Industrial Organisation (CSIRO) through the National Koala Monitoring Program (NKMP). As at March 2024:

- The latest data-driven estimate of population size for the EPBC Act listed koala population (combined populations of Queensland, New South Wales and the Australian Capital Territory) is between 95,000 and 238,000.
- This broadly aligns with the Threatened Species Scientific Committee (TSSC) estimate of 92,184 koalas in the combined Queensland, New South Wales and Australian Capital Territory population, based on best available information and expert elicitation in 2021.



- The latest population estimate for the koala populations not listed under the EPBC Act is between 129,000 and 286,000.

A recent study published by Law et. al. (2024) carried out over seven years also indicated a large population of koalas are present in NSW public forests. Occupancy levels have remained stable over a long period of time including during high-severity fires in 2019.

b) Quantification of the extent of habitat (including maps identifying known or potential habitat).

The majority of the referral area is vegetated and identified on-ground as three (3) defined vegetation communities (refer **Section 3.1**). AU1 contains koala habitat trees associated with mapped RE12.11.3 however is also highly disturbed with a dense, weed dominated understorey and steep slopes that would make it difficult for koalas to traverse. Koala habitat trees present include *Corymbia citriodora* (Spotted Gum), *Eucalyptus siderophloia* (Grey Ironbark), *Eucalyptus acmenoides* (White Mahogany), *Eucalyptus microcorys* (Tallowwood), *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus propinqua* (Grey Gum). While the referral area is highly disturbed and difficult to traverse the presence of habitat trees means it would meet the definition of habitat critical to the survival of the Koala under the EPBC Act.

In the east of the referral area is a small polygon of regrowth notophyll vine forest vegetation which consists of predominantly rainforest trees, shrubs and vines (AU2) with some scattered *Lophostemon confertus* (Swamp Box) within the eco-tonal area of RE12.11.3. This vegetation broadly aligns with vegetation community RE12.11.10 (notophyll vine forest) which is not considered a recognised Koala habitat community under the Queensland Herbarium vegetation mapping.

While AU2 does not contain koala habitat trees DCCEEW recognises habitat critical to the survival of the Koala if the species is able to use the area for dispersal. This AU extends for several hundred meters to the south and east of the referral area and contains a dense understorey of vines and shrubs which would present a challenging environment for the species to traverse. High weed infestations and extremely steep terrain further add to the difficulty of this landscape, therefore the vegetation is considered unlikely to provide a dispersal role for the Koala. Nevertheless, given the low threshold for critical habitat under the EPBC Act, AU2 has been considered to provide dispersal habitat for the Koala.

The balance of the referral area consists of polygons that have been more recently cleared and contain dense weed infestations and acacia regrowth (AU3). Part of this area is associated with a drainage channel in the centre of the referral area. This AU contains some juvenile regrowth Koala habitat trees and is weed infested, and therefore does have potential to provide dispersal habitat for Koalas given proximity to areas containing Koala habitat trees and therefore is defined as critical habitat under the EPBC Act for similar reasons as AU2.

The area of critical Koala habitat is considered as the entire 5.9 ha referral area (refer to **Plan A7**).

c) Assessment of quality and importance of known or potential habitat for the species or communities within the proposed action site and surrounding areas.

The referral area is predominantly vegetated and contains Koala habitat values in the form of Eucalypt woodland including *Corymbia citriodora* (Spotted Gum), *Eucalyptus siderophloia* (Grey Ironbark), *Eucalyptus acmenoides* (White Mahogany), *Eucalyptus microcorys* (Tallowwood), *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus propinqua* (Grey Gum). This vegetation is associated with RE12.11.3 (AU1).

The referral area contains highly modified vine thicket vegetation (AU2) and weed infested/cleared vegetation (AU3). While these vegetation communities theoretically provide dispersal habitat for the Koala, the dense vegetation structure and lack of Koala habitat trees combined with the context of large areas of potential vine thicket vegetation indicates dispersal by Koala is extremely unlikely. However, the broader locality does contain areas of RE12.11.3 and therefore the entire referral area is considered to be habitat critical to the survival of the Koala. Potential Koala habitat surrounding the referral area is shown in **Plan A8** as well as local records. This plan has highlighted all vegetated areas as potential habitat irrespective of vegetation status or community which therefore shows large areas of potential habitat surrounding the referral area.

d) Information detailing known populations or recorded within at least five kilometres of the development footprint and (if known) the size of these populations.

During field surveys, a Koala was observed within Eucalypt vegetation defined as AU1 with further indirect evidence (scats) also observed (refer **Plan A6.1**).

Review of Queensland (wildlife Online) and National (Atlas of Living Australia) databases identified a number of Koala observations within a 5 km radius of the project area since the year 2000 (refer **Plan A8**).

e) Conclusions on the likelihood of occurrence of listed threatened species and ecological communities within the project site, or within an area of impacts outside the project area

Field surveys directly observed a Koala within the referral area as well as indirect evidence of usage. The referral area contains 5.9 ha of Koala habitat in the form of foraging and dispersal habitat. Notably, AU1 (RE12.11.3) contains Koala habitat trees while AU2 and AU3 provide potential dispersal habitat. Furthermore, there are numerous records of Koala within the locality of the referral area.

The presence of multiple Koala records within 5 km of the site and observations of Koalas directly within the referral area suggests the area supports a local Koala population. Details on significant impacts and quantification of habitat quality are provided in **Section 4.3**.



3.5.2 Greater Glider (*Petauroides volans*)

a) Information on the abundance, distribution, ecology and habitat preference of the species or communities.

Distribution

The Greater Glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest), with an elevational range from sea level to 1200 m above sea level.

Habitat and Ecology

The Greater Glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forest and woodlands. It is primarily folivorous with a diet mostly comprising of eucalypt leaves and occasionally flowers. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The species favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.

During the day it shelters in tree hollows, with a preference for large hollows in large, old growth trees (Smith *et al.* 2007). The Greater Glider requires an abundance of hollows, in SEQ this is a density of 2-4 hollows per 2 ha. The species is particularly sensitive to forest clearance and intensive logging practices (Kavanagh & Wheeler 2004). Subsequently, Greater Gliders have relatively low persistence in small forest fragments and disperse poorly across vegetation that is not native forest. Modelling suggest that they require native forest patches of at least 160 km^2 to maintain viable populations (Eyre 2002).

b) Quantification of the extent of habitat (including maps identifying known or potential habitat).

The referral area contains vegetation that broadly meets the definition as habitat for the Greater Glider in the form of Eucalypt woodland (remnant RE12.11.3). However, detailed on-ground surveys identified that despite the vegetation being mapped as remnant, characteristics of regrowth were observed with limited hollow-bearing trees or mature trees when compared with the benchmark values. Historical aerial imagery as shown on **Plan A3** illustrates that parts of the referral area have been historically cleared where other parts have been retained. The lack of mature trees is therefore two-fold, firstly being the result of historical clearing and secondly being poor quality soils associated with steep rocky terrain. Trees within the referral area are likely mature aged but not mature size, indicating they may never form substantial suitable hollows required by the species.

The eastern extent of the referral area (AU2) includes a small polygon of regrowth RE12.11.10 (notophyll vine thicket). A study by Eyre (2006) assessing 43.7 million ha of potential Greater Glider habitat is South-east Queensland stated that notophyll vine thicket forests were not considered as a Greater Glider habitat even where emergent eucalypts (ironbarks, bloodwoods, stringybarks) are present. Given part of the referral area and surrounds include Notophyll vine forest which does not include emergent eucalypts as part of the technical description, it can be concluded that this vegetation community is not considered Greater Glider habitat.

The balance of the referral area (AU3) consists of highly degraded and cleared vegetation consisting of only dense weeds and some regrowth native species. Individual native species within this area may provide some limited dispersal opportunity however is considered highly unlikely given the Greater Gliders' natural avoidance behaviour to disturbed areas and the lack of suitable habitat within the referral area.

Given the Greater Gliders susceptibility to areas of clearing and has limited dispersal ability to move through disturbed/cleared areas, this vegetation is not considered to provide dispersal, foraging or breeding habitat to the species.

c) Assessment of quality and importance of known or potential habitat for the species or communities within the proposed action site and surrounding areas.

While the referral area contains potential Greater Glider habitat in the form of Eucalypt woodland, only two (2) trees was recorded as containing hollows with only four (4) hollows recorded of a suitable size (i.e >100 mm diameter). Notably, one of these hollow bearing trees was recorded as a dead/stag tree which is not the preferred habitat for the species given the thermal regulatory properties of living hollows which the species requires. Location of hollows are shown on **Plan A6.2**. Across the referral area hollows are present a density of 0.67 hollows per ha, well below the required 2-4 hollows per 2 ha as stated in the *Conservation Advice for Petauroides volans (2022)*.

Eyre et at 2021 (as referenced in the Conservation Advice for the species) states that trees >300mm DBH are preferentially selected for foraging and occasionally denning but not in proportion to their availability within their home range. Trees >500mm DBH is preferential for denning as trees > 500mm DBH are more likely to contain suitable hollows for sheltering by Greater Glider. Further assessments of the vegetation condition compared with the benchmark values showed that the referral area contains significantly fewer mature trees compared with the benchmark value. Remnant RE12.11.3 has a value of 67 large trees (≥450 mm DBH) per ha. Results of the MHQA assessment identified a large tree density of approximately 10 per ha, or less than 15% of the benchmark. Given the key habitat requirement for the Greater Glider is the abundance of hollow bearing trees associated with large mature eucalypts, the referral area does not contain suitable habitat for the species. Furthermore, parts of the referral area and surrounds include regrowth notophyll vine thicket vegetation which is not habitat for the species.

A key habitat description for the Greater Glider is defined as *'large contiguous areas of eucalypt forest, which contain mature hollow-bearing trees and a diverse range of the species preferred food species in a particular region.'* The referral area contains a single potentially suitable vegetation community (RE12.11.3) however was identified on-ground as not containing the necessary habitat attributes (large hollow bearing trees) to support the species. Furthermore, the vegetation within the referral area is not considered to form a large contiguous area of eucalypt forest given the presence of notophyll vine thick to the east (RE12.11.10) which is not considered a suitable Greater Glider habitat and does not provide dispersal habitat. **Plan A9** demonstrates potentially suitable habitat surrounding the referral area based on a desktop assessment utilising recognised habitat communities for the species, this plan also shows the presence of Greater Glider records within 5 km and 10 km of the referral area.

The species was not observed during target surveys which given the small overall area of potential habitat and ease at which the species is detected provides high confidence that the species was not present during surveys.

d) Information detailing known populations or recorded within at least five kilometres of the development footprint and (if known) the size of these populations.

The Greater Glider is relatively elusive given its habitat requirements are predominantly located outside of areas utilised by humans. A review of Queensland Wildnet search does not return any records of the species within 5 km of the referral area. A review of ALA returns recorded sightings within 5 km of the referral area, however since the uplifting of the species to endangered status, recent records have been

assigned a spatial uncertainty of 29.68 km to protect the threatened taxon. Records with confirmed locations area present >8km south of the referral near North Tamborine which vary from more recent sightings (2017) and older sightings (1976) **Plan A9**. Records assigned spatial uncertainty are shown within the 5km of the referral area and have been included on **Plan A9** for completeness. While this level of uncertainty makes it difficult to draw accurate conclusions. Based on the habitat and ecology of the species, it is likely that records of the species are present win large areas of contiguous habitat to the south of the referral area. These areas are not well connected to the referral area as a result of roads, cleared rural land and extractive industry.

Notably, all confirmed records are located in a landscape with large areas of contiguous remnant vegetation. Vegetation mapping indicates that vast majority of this area as tall open forest communities (i.e RE12.8.8, RE12.9-10.17, RE12.11.24, RE12.12.14 and RE12.12.15) which are known to provide suitable habitat for the species. On the contrary, a significant amount vegetation surrounding the referral area is non-remnant vegetation mapped as notophyll vine forest (RE12.11.10) which is not suitable habitat for the species. Where RE12.11.3 extends to the south of the site, this community terminates where roads and cleared lands are present approximately 800m to the south. Therefore, the landscape is significantly fragmented between the referral area and known records by cleared areas and non-habitat (refer **Plan A10**).

The VMA vegetation mapping shows remnant vegetation at a relatively broad scale, further detailed assessments completed by Griffith University (2023) mapped forest maturity at a higher resolution providing more detail on potential old growth forest (refer **Plan A11**). This plan clearly shows that the nearest confirmed sighting of Greater Glider is within/adjacent to a large area of 'mature' vegetation associated with Tamborine National Park. This area retains limited connectivity to the referral area by large cleared rural properties. Given the sensitivity of the species to disturbance and will often exhibit avoidance behaviour to the edge of bushland, narrow strips of vegetation are highly unlikely to provide connectivity to the referral area as large contiguous areas of suitable habitat.

e) Conclusions on the likelihood of occurrence of listed threatened species and ecological communities within the project site, or within an area of impacts outside the project area

The likelihood of occurrence assessment for the Greater Glider is driven by several key attributes. While there are records of the species within 10 km of the referral area, these are all within contiguous mature habitat including several eucalypt vegetation communities. The referral area is not well connected to this area as cleared/disturbed rural properties, roads and non-habitat vegetation are present. The habitat within the referral area contains some characteristics suitable for the species in the form of remnant RE12.11.3 (AU1) with the balance of the referral area containing extrmerly limited peotnial dispersal habitat (AU3) or not suitable habitat for the Greater Glider (AU2). Further detailed field surveys assessed the presence of specific habitat requirements being large mature and hollow bearing trees. Both large mature trees and hollow bearing trees were significantly limited across the referral area being only two (2) living tree hollows observed and large tree numbers less than 15% of the benchmark value. Targeted surveys included nocturnal surveys failed to detect the species within the referral area. Through a combination of these results the species is considered unlikely to be present within or adjacent to the referral area.

As part of the original referral material, assessment against relevant criteria in the MNES Significant Impact Guidelines 1.1 was completed for Greater Glider. This assessment has been brought forward and updated as provided in **Section 4.4**.



3.5.3 South-eastern Glossy Black-cockatoo (*Calyptorhynchus lathami lathami*)

a) Information on the abundance, distribution, ecology and habitat preference of the species or communities.

Distribution

South-eastern Glossy Black-cockatoos are known to occur from Mitchell, Queensland, through eastern New South Wales to East Gippsland, Victoria.

Habitat and Ecology

South-eastern Glossy Black-cockatoos feed almost exclusively on she-oak seeds (*Allocasuarina* spp. and *Casuarina* spp.) Birds often only feed on one or two species in one region (Higgins 1999). In south-east Queensland and north-east New South Wales, they show preference for Black She-oak (*A. littoralis*) and Forest She-oak (*A. torulosa*). They also show strong preference to individual feed trees and will not feed on many other proximate trees of the same tree species. Feeding reward is the main driver of this preference, with that being composed of the size of cones, the number and weight of seeds contained therein, and their nutritional content.

South-eastern Glossy Black-cockatoos are hollow nesters, utilising large hollows in living and dead eucalypt trees. The species usually occurs in pairs or in groups of three (made up of a breeding pair and their offspring), in woodlands. The movement patterns and ranging behaviour of the South-eastern Glossy Black-cockatoo are poorly understood. It has been suggested that they are seasonal migrants in south-east Queensland, likely as a response to changing of resource availability or breeding requirements, observed a correlation between group size and environmental conditions, such that larger foraging groups were observed when food resources were limited.

In NSW the majority of the nesting hollows are in narrow-leaved ironbark (*Eucalyptus crebra*). Trees may be living or dead. As a guide, potential nest hollows for the subspecies have the following traits, >8 m above ground, located in branches >30 cm in diameter, branch or stem no more than 45° from vertical; and minimum entrance diameter of >15 cm. Further research is needed to expand our knowledge on the nesting habits and habitat of the subspecies (i.e., nest tree species used in other regions of the subspecies' range). Areas that are not currently occupied by the subspecies because they have been recently burnt but are capable of supporting cockatoo populations in the future, should also be considered as habitat critical for the survival of the South-eastern Glossy Black-cockatoo.

b) Quantification of the extent of habitat (including maps identifying known or unknown potential habitat) on site and, where feasible, in the broader landscape.

The species requires two key habitat types, dense *Allocasuarina* species for foraging and large hollows for nesting. While the referral area does contain vegetation reflective of Eucalypt woodland, a dense stand of *Allocasurina* was not observed on-ground. Only small patches of individual *Allocasuarina torulosa* (Mountain She-oak) were identified including 8 individual trees at 2 locations which demonstrates significantly limited foraging resources. Furthermore, only 2 trees were recorded as containing potentially suitable hollows for the species (1 of which was a dead/stag tree). Allocasuarina identified on site are shown on **Plan A6.3**.

Additionally, a significant portion of the surrounding vegetation is mapped as remnant and regrowth RE12.11.10 (notophyll vine forest) which does not include Casuarina or Allocasuarina as part of the technical description. This community also does not include emergent eucalypts which would be where hollows would form overtime. A distribution of potentially suitable habitat surrounding the referral area



is provided as **Plan A12** which also shows records of the species within 5km and 10km of the referral area.

c) Quality and importance of known or potential habitat for the species or communities.

Detailed on-ground surveys identified limited foraging resources for the species with limited *Allocasuarina* specimens observed. Given the species is highly selective of individual foraging specimens, a dense stand of *Allocasuarina* is required to provide the necessary foraging resources. Furthermore, hollow-bearing trees were limited to only two (2) across the referral area which limits the suitability of the referral area to provide breeding habitat.

d) Information detailing known populations or records within at least five kilometres of the development footprint and (if known) the size of these populations.

Occurrence records of the South-eastern Glossy Black-cockatoo (*Calyptorhynchus lathami lathami)* are clustered approximately 5 km north-east of the referral area. Notably, a search for *Calyptorhynchus lathami* returns additional records within 5 km of the referral area. The referral area and surrounds contain scattered polygons of potentially suitable habitat mixed with large areas of non-habitat vegetation communities (refer **Plan A12**).

e) Conclusions on the likelihood of occurrence of listed threatened species and ecological communities within the project site, or within an area of impacts outside the project site.

The likelihood of occurrence for the South-eastern Glossy Black-cockatoo has been determined based on several factors. While there are records of the species within 5 km of the referral area, on-ground field surveys observed significantly limited foraging or breeding habitat for the species. A small number of the preferred food tree, *Allocasuarina torulosa*, were observed with eight trees counted over two (2) small patches which is not considered suitable to meet the foraging requirements of the species. Additionally, hollow-bearing trees were limited across the referral area with only two (2) trees recorded containing potentially suitable hollows. These factors make it is highly unlikely that the species would utilise the referral area. Regardless a significant impact assessment has been completed for the South-eastern Glossy Black-cockatoo and provided in **Section 4.**

3.5.4 Macadamia Nut (*Macadamia integrifolia*)

a) Information on the abundance, distribution, ecology and habitat preference of the species or communities.

Distribution

Macadamia integrifolia (Macadamia Nut) occurs from Mt Bauple, near Gympie, to Currumbin Valley in the Gold Coast hinterland, south-east Queensland. It occurs as a scattered rare to occasional tree, and population sizes are difficult to estimate. Populations in the south-east Queensland Regional Forest Agreement region (area of 10,000 km²) are estimated at 2 500 mature individuals in 20 populations. These populations were formerly declining but are presently stable (Queensland CRA/RFA Steering Committee, 1997).

Ecology

Macadamia integrifolia (Macadamia Nut) is a member of the Proteaceae family and are genetically closely related and often hybridised with *Macadamia tetraphylla* (Rough-Shelled Nut).

Macadamia integrifolia (Macadamia nut) is a long-lived perennial mid-storey evergreen subtropical rainforest tree to 20m tall, with greyish branchlets dotted with raised lenticels. Individuals are often multi stemmed with small crowns. The simple obovate to narrowly oblong leaves are arranged in whorls of three or opposite, and 5.5cm to 14cm long by 2.5cm to 6cm wide. Blade tips are rounded and finish in a short sharp point; the base tapers to petioles 5 to 10mm long. Axillary creamy-white flowers are arranged in brush-like hanging racemes 10 to 30 cm long.

Habitat

Macadamia integrifolia (Macadamia Nut) are endemic to rainforest and wet sclerophyll forest communities including notophyll vine forest found within the northeast New South Wales-southeast Queensland coastal region. This species grows in remnant rainforest, including complex mixed notophyll forest, and prefers partially open areas such as rainforest edges. *Macadamia integrifolia* (Macadamia Nut) is identified in the Queensland Herbarium Regional Ecosystem Description Database as occurring in Regional Ecosystem 12.3.1, 12.8.3, 12.11.10 and 12.12.16.

b) Quantification of the extent of habitat (including maps identifying known or unknown potential habitat) on site and, where feasible, in the broader landscape.

The referral area contains a small polygon of non-remnant vegetation which is mapped under pre-clear RE mapping as RE12.11.10 (notophyll vine forest). This vegetation community is recognised as potential habitat for *Macadamia integrifolia* (Macadamia Nut). While elements of this community were observed on-ground, species diversity and maturity were lacking compared with benchmark values. Furthermore, the area was highly disturbed and dominated by weeds (*Lantana camara* and *Ardisia crenata*).

The mapping of RE12.11.10 extends south and east of the referral area with large patches of both remnant and regrowth RE12.11.10 in the broader landscape. Large in this area have been historically cleared for rural uses resulting in non-remnant and regrowth status and dense weed infestations. Remaining remnant vegetation patches are isolated and located within very steep rock faces and gully lines with minimal access.

Field surveys recorded a total of 15 specimens of *Macadamia integrifolia* within this polygon in the less disturbed areas and were predominantly juvenile specimens (refer **Plan A6.4**). Two specimens of



Macadamia integrifolia have been recorded adjacent to the referral area during site surveys. Notably, one of these specimens was recorded as *Macadamia tetraphylla* as part of the original referral material but has since been corrected to *Macadamia integrifolia* after further site inspection by SHs Principal Flora Ecologist and analysis of the leaf structure. *Macadamia integrifolia* and *Macadamia tetraphylla* are genetically very similar and are known to hybridise in this locality.

c) Quality and importance of known or potential habitat for the species or communities.

As discussed, potential habitat for *Macadamia integrifolia* (Macadamia Nut) is associated with RE12.11.10 which was observed within the referral area. The majority of the referral area does not contain suitable habitat (e.g notophyll vine forest) for the species. Further assessments the site and immediate surrounds found a high level of disturbance including dense weed infestation. Furthermore, field surveys confirmed that vegetation within the referral area did not reflect remnant RE12.11.10.

d) Information detailing known populations or records within at least five kilometres of the development footprint and (if known) the size of these populations.

The National Recovery Plan for Macadamia Species details priority populations based on criteria as shown in **Insert A1**. Priority populations are categorised as Medium, High or Very High depending on factors such as distance between populations, the presence of multiple macadamia species, distance to remnant vegetation and number of specimens within the population.

There are multiple records of *Macadamia integrifolia* within 5 km of the referral area, with the majority of records to the east (refer **Plan A13**). *Macadamia tetraphylla* has also been recorded within 5 km of the referral area although fewer records then that of *Macadamia integrifolia*. The *Macadamia integrifolia* recorded within and adjacent to the referral area are considered a 'high priority' population under table 4 of the National Recovery Plan for Macadamia Species as there are at least two neighbours within 3 km AND it is within 50 m of remnant vegetation AND is a Population Class of 11-26.

A total of 15 macadamia specimens were recorded within the referral area with an additional two (2) specimens located approximately 50m to the southeast (**Plan A6.4**). A cluster of *macadamia integrifolia* records are present approximately 1.9 km south-east of the referral area and remnant vegetation is located within 50 m (mapped as RE12.11.3), although this remnant vegetation is not recognised as *macadamia integrifolia* habitat. Remnant RE12.11.10 (recognised as Macadamia habitat) is present approximately 170 m east.



Priority	Criteria
VERY HIGH	Populations with at least two neighbouring populations within 3km AND within 50m of remnant vegetation AND Population Class 26–49 or greater OR Populations where two Macadamia species are recorded as present
HIGH	Populations with at least two neighbours within 3km AND within 50m of remnant vegetation AND Population Class 11–26 or greater OR Populations with at least two neighbours within 3km AND Population Class 26–49 or greater OR Populations within 50m of remnant vegetation AND Population Class 26–49 or greater
MEDIUM	All other populations

Insert A1: Table 4 from The National Recovery Plan for Macadamia Species detailed criteria for priority populations.

e) Conclusions on the likelihood of occurrence of listed threatened species and ecological communities within the project site, or within an area of impacts outside the project site.

Macadamia integrifolia (Macadamia Nut) were confirmed within the referral area during site surveys where vegetation indicative of RE12.11.10 was present. Review of this population against the National Recovery Plan for Macadamia Species indicates the population is defined as 'high' priority. Refer to Section 4.6.1 for response to significant impact guidelines for the species. It is of note that any population of macadamia species identified in the wild is considered medium priority as a minimum.

3.5.5 Lowland Rainforest Threatened Ecological Community

a) Information on the abundance, distribution, ecology and habitat preference of the species or communities.

The Lowland Rainforest of Subtropical Australia Threatened Ecological Community (LRSA TEC) primarily occurs from Maryborough in Queensland to the Clarence River (near Grafton) in New South Wales (NSW). It includes isolated areas between the Clarence River and Hunter River, such as Bellinger Valley. Lowland Rainforest mostly occurs in areas < 300 m above sea level, and typically occurs in areas with high annual rainfall (> 1300 mm).

Patches of LRSA TEC are generally small in size (<10 ha) and scattered / isolated. The LRSA TEC mostly occupies areas on highly fertile basaltic and alluvial soils, including sand and old or elevated alluvial soils as well as floodplain alluvia. These areas have been heavily cleared as they are the most suitable for agricultural use.

The ecological community is generally a moderately tall (≥ 20 m) to tall (≥ 30 m) closed forest (canopy cover ≥ 70 %). Tree species with compound leaves are common and leaves are relatively large (notophyll to mesophyll). Typically, there is a relatively low abundance of species from the genera Eucalyptus, Melaleuca and Casuarina. Buttresses are common as is an abundance and diversity of vines.

In Queensland, the LRSA TEC is associated with Regional Ecosystems (RE) 12.3.1, 12.5.13, 12.8.3, 12.8.4, 12.11.1, 12.11.10, 12.12.1 and 12.12.16.

b) Quantification of the extent of habitat (including maps identifying known or potential habitat).

Desktop review

Approximately 3.5 ha of the referral area is mapped as 'Eucalypt woodland' associated with Category B (remnant) RE12.11.3. The balance of the referral area (2.4 ha) is mapped as Category X (non-remnant) vegetation. The eastern extent of the referral area (1.1 ha) is identified as RE12.11.10 by pre-clear mapping therefore there is potential for regrowth in this area to be considered the LRSA TEC. Review of regional ecosystems mapping indicates the LRSA TEC also has potential to be present in areas immediately south and east of the referral area where vegetation is as regrowth RE12.11.10. Polygons of remnant RE12.11.10 are also mapped approximately 175 m east and 445 m south of the referral area. Remnant, regrowth and preclear regional ecosystem mapping within and adjacent to the referral areas is shown on **Plan A4.5**.

No regrowth RE12.11.10 is mapped within Fulton Hogan's landholdings, however this is likely due to a PMAV lodged over the property which 'locks in' vegetation mapping at the time the application is made. Regrowth polygons intersecting the property, and preclear RE mapping, indicate vegetation to the north of the existing extraction pit would be mapped as regrowth RE12.11.10 if not for the PMAV (refer **Plan A4.5**).

LRSA TEC field results/findings

Field survey found vegetation within the referral area and surrounds contained some rainforest species indicative of RE12.11.10 however these areas were dominated by acacia regrowth and dense weed infestations as a result of historical clearing. Further assessment was required against the key diagnostics criteria for the LRSA TEC to identify if the TEC is present.



Key Diagnostic Criteria

Five (5) sample plots assessing vegetation mapped as pre clear RE12.11.10 against the Key Diagnostic Criteria (KDC) for the LRSA TEC were completed within Fulton Hogan's landholdings. One of the plots was within the referral area and another nearby to the northeast (refer to **Plan A4.5**).

None of the vegetation present on site fulfilled all of the KDC to be considered the LRSA TEC. Key outcomes of the assessment against the KDC included:

- The vegetation does not consist of a tall (20 m–30 m) closed forest with multiple canopy layers and instead is reflective of regrowth vegetation with an absent T1 layer and canopy recorded at predominantly < 10 m in height (10 m being the minimum height for canopy to be recorded as per LRSA Conservation Advice).
- A total of 25 species from Appendix A of the LRSA TEC Conservation Advice were recorded across the entire site. This is below the required 30 species, refer **Table A14**, **Table A15** and **Table A16**. It should also be noted this is the sum of species recorded across the entire site. The maximum recorded at one sample plot was 11, less than half of the KDC requirements.

In addition to the sample plots, seven (7) quaternary assessments were completed in vegetation surrounding the quarry (refer to **Figure A4.5**). These locations contained few rainforest species and no species from Appendix A of the conservation advice were recorded in addition to those found in the sample plots.

Quaternaries 1 and 2 were located within vegetation polygons mapped as remnant RE12.11.10 however they did not reflect the LRSA TEC and were instead dominated by Eucalypt species. Quaternaries 3-7 were completed along the property boundary where regrowth RE12.11.10 mapping extends east and south of the referral area. These areas contained high weed infestations (Lantana) and a largely absent canopy dominated by acacia species. Vegetation did not meet the KDC for the TEC.

While the adjacent property could not be accessed, the topography of the neighbouring land allowed for visual observations to be made of the vegetation for at least 50 m beyond the site boundary. These observations found vegetation to be consistent with the associated quaternary site (i.e. no canopy that would indicate a tall, closed forest and weed infested understorey with no indication of rainforest species (**Photo set 6**).

Raw data for all sample plots and quaternaries is included as **Attachment A6**.

Table A14: Key diagnostic criteria for the LRSA TEC

Key Diagnostic Criteria	Sample Plot 1	Sample Plot 2	Sample Plot 3	Sample Plot 4	Sample Plot 5
• Distribution of the ecological community is primarily in the NSW North Coast and South Eastern Queensland bioregions, according to Interim Biogeographic Regionalisation for Australia (IBRA) version 6.1 (2004).	✓	✓	✓	✓	✓
• The ecological community occurs on: soils derived from basalt or alluvium; or enriched rhyolitic soils; or basaltically enriched metasediments.	✓	✓	✓	✓	✓
• The ecological community generally occurs at an altitude less than 300 m above sea level.	✓	✓	✓	✓	✓
• The ecological community typically occurs in areas with high annual rainfall (>1300mm).	✓	✓	✓	✓	✓
• The ecological community is typically more than 2 km inland from the coast.	✓	✓	✓	✓	✓
• The structure of the ecological community is typically a tall (20 m–30m) closed forest, often with multiple canopy layers.	✗	✗	✗	✗	✗
• Patches of the ecological community typically have high species richness (at least 30 woody species from Appendix A).	✗	✗	✗	✗	✗



Q3 facing south



Q4 facing south



Q5 facing east



Q6 facing East

Photo set 6: Photos from Quaternary Points 3, 4, 5 and 6 into the adjacent property.

Table A15: Summary of raw data from sample plots

Transect and Quaternary ID	Canopy Cover % (all species ≥ 10 m)	Species recorded from Appendix A of LRSA TEC
1	17.6	8
2	62	8
3	28.8	3
4	57	1
5	11	11
Q1	Not recorded	1
Q2	Not recorded	2
Q3	Not recorded	3
Q4	Not recorded	3
Q5	Not recorded	3
Q6	Not recorded	1
Q7	Not recorded	3
		Total of 25 species recorded from Appendix across all sites (refer **Table A16**)

Table A16: Woody species that align with Appendix A recorded within/adjacent to the referral area

Scientific Name	Common Name	Species recorded from Appendix A
Alphitonia excelsa	Soap Tree	X
Aphananthe philippensis	Rough-leaved Elm	X
Araucaria cunninghamii	Hoop Pine	X
Asplenium australasicum	Bird's Nest Fern	X
Cordyline rubra	Red-fruited Palm Lily	X
Diploglottis australis	Native Tamarind	X
Eustrephus latifolius	Wombat Berry	X
Ficus watkinsiana	Strangler Fig	X
Flindersia australis	Crows Ash	X
Grevillea robusta	Silky Oak	X
Jagera pseudorhus	Foambark	X
Lophostemon confertus	Brush Box	X
Macadamia integrifolia	Macadamia	X
Maclura cochinchinensis	Cockspur Thorn	X



Scientific Name	Common Name	Species recorded from Appendix A
Mallotus philippensis	Red Kamala	X
Melia azedarach	White Cedar	X
Pandorea pandorana	Wonga-wonga Vine	X
Pittosporum sp.	-	X
Platycerium bifurcatum	Elk Horn Fern	X
Platycerium superbum	Stag Horn	X
Polyscias elegans	Celery Wood	X
Smilax australis	Barbed-wire Vine	X
Stephania joponica	Tape Vine	X
Syzygium floribundum	Weeping Lilly Pilly	X
Toona ciliata	Red Cedar	X
Total woody species (Appendix A)		**25**

Assessment of a 'Patch'

Under the LRSA TEC Conservation Advice *'A patch is defined as a discrete and continuous area of the ecological community. However, a patch may include small-scale 'disturbances'.*

Five Sample plots and seven quaternary vegetation sites were completed across Fulton Hogan's landholdings where RE12.11.10 is mapped inclusive of small polygons of remnant RE12.11.10 where possible. These surveys identified much of the area to be highly disturbed and dominated by acacia regrowth and weeds. Large portions of regrowth RE12.11.10 contained no rainforest species indicative of RE12.11.10, instead reflecting wet sclerophyll forest with Eucalypts dominant. Pockets of vegetation that more closely align with RE12.11.10 were observed but these areas were small in scale and associated with narrow gully lines and equally disturbed with weed infestations and no discernible canopy. No surveys identified vegetation that meets the KDC to be considered LRSA TEC

While indicator species of RE12.11.10 were recorded in some locations, the species richness and canopy coverage was well below the KDC to be classified as the TEC at all sample sites. Notably, the historical clearing of these areas has resulted in most trees/shrubs recorded < 10 m in height (refer **Table A15**). Furthermore, the consistent widespread dominance of weeds (primarily *Lantana camara*) has suppressed native regrowth reducing species richness with the number of woody species recorded from Appendix A of the LRSA TEC Conservation Advice from all sample sites below the minimum of 30.

Two of the quaternary assessments were completed within small polygons of remnant RE12.11.10 mapped on Fulton Hogan's landholdings. Full sample plots could not be completed in these polygons as they were either too small or inaccessible. Despite vegetation in these areas not reflecting vine thicket due to dominance of Eucalypts and lack of species richness, using an abundance of caution, polygons of RE12.11.10 have been considered potential LRSA TEC. It has also been assumed polygons of remnant vegetation that couldn't be accessed on adjacent land are also LRSA TEC. The closest polygons to the referral area are 445 m south and 176 m east (refer **Plan A6.5**).

Vegetation within and surrounding Fulton Hogan's landholdings do not meet the Conservation Advice definition of a 'patch' which is described as a discrete and continuous area of the ecological community

that may include small-scale 'disturbances'. Vegetation on and surrounding the referral area would be better described as a highly disturbed area of vegetation with some small, isolated patches of remnant vegetation that may be considered the ecological community.

c) Quality and importance of known or potential habitat for the species or communities.

Condition Classification

In the first instance, mapped RE12.11.10 within and adjacent to the referral area does not meet the KDC even when including additional sample plots in the broader area. For increased robustness of the conclusions, the vegetation was assessed against the condition classifications detailed in the Conservation Advice. Notably, the condition classes reference 'and' for each attribute meaning that all specified attributes need to be achieved to be considered the LRSA TEC. The results of the sample plots failed to meet **4 out of 5** of these attributes as detailed below.

Patch Type

The referral area and surrounds were recognised as having some residual trees from Appendix A of the LRSA TEC, however regeneration is significantly supressed by dense *Lantana camara* infestations. Evidence of natural regeneration is referenced in the condition classes as a *'range of native species that did not originate through planting.'* It is not clear what quantifies as 'a range of species' however the Conservation Advice further states that *'Regeneration (natural or through supplementary planting) must be of stature and quality that reflects the "Description" of the ecological community (i.e. tall, closed forest with representative species composition and species diversity, as well as a relatively low weed component in all layers).'* This level of natural regeneration diversity was not observed within the referral area nor adjacent areas as dense weed infestations have supressed recruitment with acacia regrowth and weeds now dominant.

Patch size

The 'patch' of mapped RE12.11.10 inclusive of the referral area and surrounds is ≥1 ha.

Canopy Cover

Emergent/canopy/subcanopy cover was recorded well below the reference 70% minimum as a result of historical clearing (average of 35.28% across all sample sites with no individual site ≥70%). Notably, canopy is recorded as all species ≥10 m in height. The referral area and surrounds lack a tall canopy with a dominance of *Mallotus philippensis* (Red Kamala), *Acacia* species and other pioneer species not reflective of the LRSA TEC < 10m in height.

Species Richness

In order for a 'patch' to be considered the LRSA TEC, it must have a species richness and diversity reflective of the community. As detailed in the LRSA TEC Conservation Advice the patch must contain >30 woody species (or > 40 depending on condition class) from Appendix A of the LRSA TEC Conservation Advice. Results from all sample plots as well as the additional meandering surveys identified 25 species from Appendix A.

Percent of total vegetation cover that is native

Finally, the patch needs to be ≥50% native (or ≥70% depending on condition class). All survey sites recorded considerable weed infestations with a dominance of predominantly *Lantana camara* and other weeds at over 50%



Condition thresholds:

The listed **Lowland Rainforest of Subtropical Australia** ecological community comprises those patches that meet the key diagnostic characteristics (above) and the **condition thresholds** (below).

Patch Type (evidence of remnant vegetation & regeneration status)	**A** Natural remnant evident by the persistence of mature residual trees from Appendix B. **AND**	**B** Some residual trees from Appendix B are present plus evidence of either; natural regeneration*1 **AND/OR** regeneration with active management*2 **AND**	**C** A non-remnant patch that has recovered through a) natural regeneration*1 **AND/OR** b) supplementary planting that has stature and quality that is reflective of the 'Description' *3 **AND**
Patch Size (excludes buffer zone)	≥ 0.1 ha **AND**	≥ 1 ha **AND**	≥ 2 ha **AND**
Canopy Cover (over entire patch)*4	Emergent/canopy/subcanopy*4 cover is ≥ 70% **AND**		
Species Richness (over entire patch)	contains ≥ 40 native woody species *5 from Appendix A **AND**	contains ≥ 30 native woody species*5 from Appendix A **AND**	
Percent of total vegetation cover that is native *6 (use sample plot)	≥70% of vegetation *6 is native	≥50% of vegetation *6 is native	

Notes:

*1 Evidence of natural regeneration is shown by the presence of seedlings of a range of native species that did not originate through deliberate plantings.

*2 A patch that is **actively managed** has regular (e.g. every 1–2 years) on the ground human regenerative activity such as weed control or supplementary plantings.

*3 Closed canopy, 20–30 m tall, of representative species (e.g. white booyong, hoop pine, figs, brush box, yellow carabeen, red cedar, rosewood, white beech)

*4 Canopy cover (projective foliage cover) is estimated over the entire patch. When assessing the ecological community, the canopy includes the emergents and subcanopy (everything above 10 m tall). Canopy/sub-canopy includes all trees and vines (native and non-native).

*5 Woody species are trees, shrubs or vines that contain wood or wood fibres that consist mainly of hard lignified tissues. Excluded from woody species are graminoids, other herbs and non-woody vines.

*6 Total vegetation cover includes emergents/canopy/subcanopy and understorey and ground layers.

Insert A2: Condition thresholds from LRSA TEC conservation advice

d) Conclusions on the likelihood of occurrence of listed threatened species and ecological communities within the project site, or within an area of impacts outside the project site.

Results from detailed vegetation surveys completed across Fulton Hogan's landholdings found that the LRSA TEC is not present within the referral area or adjacent areas where surveys were possible. Given the disturbance observed across all sample locations, which included five (5) plots and seven (7) quaternary assessments, vegetation within and surrounding Fulton Hogan's landholdings do not meet the Conservation Advice definition of a 'patch' of LRSA TEC. Vegetation on the site would be better described as a highly disturbed area of vegetation with some small, isolated patches of remnant vegetation that may be considered the ecological community.

While it is ultimately not possible to conclusively determine where and if the LRSA TEC is present off-site in private land, field surveys demonstrate the LRSA TEC is not present within or immediately adjacent to the referral area. Utilising the precautionary principle, consideration has to be given to the potential for the vegetation within the referral area (confirmed as not being the LRSA TEC) as a connected to a broader patch that containing some polygons of LRSA TEC. For this reason, there is potential for the project to impact the LRSA TEC. Refer **Section 4.7** for further discussion on risk of significant impact.

4. Quantification of Impacts

Item 4 of the PD Request requires an assessment of impacts (both direct and indirect) is provided: ***"The preliminary documentation must include an up-to-date assessment of potential impacts that may occur as a result of the proposed action."***

"Consideration of impacts must not be confined to the immediate area of the proposed action but must also consider the potential of the proposed action to impact on adjacent areas that are likely to contain populations and/or habitat for MNES."

4.1. General Assessment of Impacts

Item 4.1 of the PD request asks to, ***"Include a clear description of the total extent and quality of the following:***
a) project footprint (including the total extent of habitat present for each relevant protected matter)
b) direct and indirect impact areas (including the total extent of habitat for each relevant protected matter to be impacted)
a) total areas proposed to be retained/avoided (including the total extent of habitat present for each relevant protected matter to be avoided)."

The referral area is a 5.9 ha patch of highly disturbed remnant and non-remnant vegetation with historic clearing resulting in dense weed infestations and regrowth dominated vegetation. MNES with the potential to be impacted are limited to the threatened species addressed in **Section 3.5** with many of the species, including Greater Glider and South-eastern Glossy Black-cockatoo considered highly unlikely to be found in the referral area due to a lack of habitat features and existing disturbance and fragmentation within and surrounding the referral area.

Two species protected under the EPBC Act were observed within the referral area, Macadamia Nut (*Macadamia integrifolia)* and Koala (*Phascolarctos cinereus*). Fifteen *Macadamia integrifolia* will be removed as a result of the proposed action, although offsets will be required under State requirements resulting in a net gain of individuals. The project will result in the removal of 5.9 ha of vegetation considered critical habitat for the Koala. This is mostly a result of the wide definition of critical habitat as defined by the EPBC Act as much of the referral area is considered dispersal habitat despite a lack of koala habitat trees and dense weed infestation limiting movement.

The project is not expected to result in any further indirect impacts given the high level of existing disturbance in the region and the significant benching associated with the quarry design and implementation of standard mitigation measures already in effect. Access roads and other infrastructure are already in place as part of the existing quarry footprint.

4.2. Direct and Indirect impacts

Item 4.2 of the PD request asks to, ***"provide an assessment of the direct, indirect, facilitated and cumulative impacts that may occur as a result of the proposed action at a local and regional scale. The assessment should include consideration of:***

a) ***the nature, likelihood, significance, and extent of impacts and whether any relevant impacts are likely to be unknown, unpredictable or irreversible.***
b) ***timing and whether the impact is temporary or permanent***
c) ***species specific habitat requirements such as hollow bearing trees, nest trees, refuge habitat, foraging and breeding habitat, sheltering or other microhabitat features relevant to the species within and surrounding the development footprint (if applicable).***
d) ***whether connectivity and movement opportunities in the surrounding area may be retained, removed or functionally lost or compromised.***
e) ***adjacent areas of habitat that may or will be subject to intensification of ongoing impacts (for example, through increased human and vehicle presence)***
f) ***f) indirect or facilitated impacts that may result from the proposed action, including but not limited to the following:***
    i. ***Edge effects – including the potential for the introduction of weed species and pathogens in the referral area and adjacent environment.***
    ii. ***Vehicle movement – potential increase of vehicles to strike fauna in the pre-construction, construction, and operation phase of the project.***
    iii. ***Increased presence of dogs – pre-construction, construction and operation phases have the potential to increase dog presence in the referral area and adjacent environment.***
    iv. ***Earthworks – potential to generate dust emissions from the removal of vegetation and movement of soil in the pre-construction and construction phase of the project.***
    v. ***Disturbance from increased noise, artificial light, sediment generation and other relevant stressors during construction and operation of the residential development.***

a) ***cumulative impacts, where potential project impacts on MNES are in addition to existing impacts of other activities (including current or future developments by the proponent and other proponents in the region and vicinity)***

4.2.1 Direct impacts

Vegetation Clearing

The proposed action will involve the direct impact of vegetation clearing of the entire 5.9 ha referral area. Rock will then be extracted in a manner that is consistent to achieve the detailed quarry design. The action will not directly impact any additional areas outside of the referral area.

Clearing will result in a permanent impact to the entire 5.9 ha referral area; however, the majority of this vegetation is highly disturbed with dense weed incursion throughout. Remnant vegetation is present within the referral area where native canopy exists however specific habitat attributes such as large trees and hollow bearing trees were significantly limited across the referral area. The balance of the referral area has been observed as highly disturbed regrowth vegetation dominated by weeds with minimal native species maturity or richness.

Fragmentation

The referral area does contain local level connectivity in a southern direction however over 50% of the referral area boundary is with the existing quarry footprint. Vegetation connectivity in the local area is associated with very steep rocky terrain with the lower elevation areas having been largely cleared for rural and residential uses. The broader locality includes several major roads including Beaudesert Beenleigh Road and Cedar Creek Road as well as other operational quarries. While the referral area does retain connectivity to the south, the shape of the referral area which protrudes into the existing quarry footprint indicates that it is unlikely the proposed action will increase fragmentation in the locality.



Vegetation to the east and south-east contains notophyll vine thicket which does not provide suitable habitat for fauna species associated with eucalypt vegetation. Furthermore, the referral area consists of only 5.9 ha of highly disturbed vegetation that offers limited habitat value.

Direct Mortality or Injury

Direct mortality or injuries to fauna is considered unlikely to occur throughout the operational phase of the proposed action as the clearing will be undertaken in accordance with mitigation measures outlined in **Section 5.2**.

Direct impacts are managed thought the implementation of the EMP (refer **Attachment A3**) which includes details on roles and responsibilities, planning and risk management, environmental protection process, monitoring and reporting. Further details provided in **Section 5.**

4.2.2 Indirect and Facilitated Impacts

Weeds

Increased vehicle movement during the operation phase of the project has the potential to increase the spread of weeds in the area, particularly during the vegetation clearing phase. In particular *Lantana camara* (Lantana) which was identified across the referral area. With implementation of standard mitigation measures, the project is likely to result in a negligible impact to ecological values due to the potential introduction/spread of weeds. Details of how weed management will occur is presented in the EMP (refer **Attachment A3**) which includes requirements such as '*All reasonable and practicable measures must be taken to control and eradicate noxious weeds and declared plants on site and to prevent the spread of weeds beyond the boundary of the site*.'

Vehicle Movement

During operation, the number of vehicles within the referral area is anticipated to increase marginally as the quarry is already in operation. Direct impacts from vehicle movements on threatened species and vegetation communities include:

- damage or destruction of vegetation or fauna habitat by vehicles traversing these areas; and
- fauna strike.

Indirect impacts include:

- interference of fauna through visual and noise impacts. This in turn can affect feeding, roosting, breeding or nesting behaviour;
- introducing and/or spreading weeds or feral animals carried on or in vehicles, resulting in deterioration or loss of vegetation and important fauna habitat; and
- damage or destruction of vegetation and fauna habitat through smothering by dust generated by vehicles traversing the project area.

With implementation of standard mitigation measures the project is likely to result in a temporary and minor impact to ecological values due to vehicular movements. Quarries by nature are benched down into the ground to create a physical barrier to surrounding areas, limiting indirect impacts.



Extraction

Quarry activities have the potential to generate dust emissions. The main sources of dust will be generated via:

- wheel-generated dust from vehicles;
- dust lift-off from exposed surfaces
- Moving/dumping material
- vegetation and soil clearing of the land.

Excessive deposition of dust on leaves of plants can suppress their growth and photosynthesis, resulting in reduced habitat quality for fauna. High levels of airborne dust can irritate the respiratory systems of fauna and potentially result in ingestion of dust-coated seeds and other foods. Dust can impact on other sensitive receptors such as residences and waterbodies, however none exist in the vicinity of the project area. With implementation of standard mitigation measures as detailed in the EMP (refer **Attachment A3**), the project is likely to result in a temporary and minor impact to ecological values due to the generation of dust. The EMP specifies performance criterial and management measures to ensure dust monitoring results are within the EA dust depositional parameters.

Blasting

Blasting is the process of controlled explosions to break down large rock masses to manageable pieces for extraction. Blasting involves the controlled use of explosives, typically in a planned and sequential manner, to maximize rock breakage while minimizing noise, vibration, and dust. Blasting has the potential to cause indirect impacts in the form of dust, noise and vibration. The management of blasting activities is clearly detailed and conditioned in the EA which includes hours of operation and monitoring of indirect impacts.

Light Emissions During operation

The quarry operation activities will not occur during night periods, therefore no impacts associated with artificial lighting is expected.

Quarry Design and Acoustics

Quarries by nature are benched down into the ground to create a physical barrier to surrounding areas, meaning indirect impacts on adjacent retained vegetation is expected to be negligible. The referral area slopes steeply to the south with vegetation retained beyond the southern boundary. The southern boundary of the referral areas is approximately 200-250m AHD, the quarry design demonstrates the significant drop in elevation to as low as 100m AHD in the north of the referral area. Given the referral area is only 150m wide, this demonstrates the significant benching associated with the quarry design which helps direct impacts such as noise and dust internally. Details of noise management requirements are specified in the EMP (refer **Attachment A3**)

Fulton Hogan engaged MWA Environmental to carry out extensive sound modelling as part of a study to increase the Blue Rock Quarry's annual extraction limit. The MWA Environmental report addresses the potential impact of noise emissions from the proposed increase in operation limit at surrounding sensitive land uses as per condition N2 of Environmental Authority P-EA-100268669 (EA). Details of noise modelling are outlined below, refer **Part B MNES Report, Appendix G** for full noise report):

The relevant EA noise limits for the anticipated operating hours are:

- Day 7am to 6pm: 45 dB(A) LAeq at a sensitive place
    - 45dB generally considered 'soft' consistent with a suburban area at night
- Early morning 6am to 7am: 35 dB(A) LAeq at a sensitive place
    - 35db considered 'soft' consistent with a natural area with no wind

Thirty-two (32) sensitive receptors surrounding the quarry were represented in the MWA Environmental model used to predict the noise of increasing the extraction limit of the quarry. Results of the noise modelling highlighted that if quarry operations are to increase the annual extraction limit, the noise levels at all receptors would comply with the above limits. Notably, the noise model was used to predict the levels at the nearest boundary of Tamborine National Park, approximately 800m (south-west). Results indicate that the quarry noise levels will be below the expected ambient background noise levels at the nearest boundary of the Tamborine National Park. On this basis, the acoustic amenity of the Tamborine National Park will be preserved in accordance with the objective of the Queensland Environmental Protection (Noise) Policy 2019 for protected areas. Furthermore, noise levels for the full operational scenarios (Short - Term and Long-Term Extraction) within retained vegetation immediately south of the referral area is predicted to be below LAeq, 45 dB(A) at the very edge of the quarry, reducing to below LAeq, 39 dB(A). For the product loading and dispatch only (early morning) scenario the predicted noise levels are below LAeq, 23 dB(A) within retained vegetation to the south. These results indicate that vegetation south of the referral area will not be significantly impacted by effects of noise associated with the quarry expansion, as such the suitability of this vegetation for flora and fauna species will not be compromised.

Noise and Vibration

Noise levels greater than existing ambient noise levels are expected during the establishment of the proposed pit expansion within the project area. Sources of noise are likely to consist of short, intense pulses from mobile plant equipment, and more prolonged noise, with consistent vibration, pitch and volume from generators, excavators and pumps, in addition from noise from vehicles. Objectives, performance criteria and monitoring/reporting of noise and vibration is detailed in the EMP (refer **Attachment A3**).

Increased Human Presence

Increased human activity during quarry operation has the potential to disturb fauna within adjacent habitat areas. Resulting impacts to fauna include heightened vigilance and predator avoidance, which can disrupt foraging and roosting efficiency or deter wildlife from using particular areas. Impacts essentially represent a reduction in habitat availability due to edge effects. Human presence is limited to one or two people on a temporary basis until extraction reaches terminal benching. Therefore, the project is likely to result in a temporary and minor impact to ecological values due to increased human presence on site during the operational period

Increased presence of dogs

The proposed action, which is quarry operation, will not result in an increase in wild dog occurrence. No comanion dogs or pets are permitted within Blue Rock Quarry.

Traffic

The proposed action is unlikely to increase traffic in the area as Blue Rock Quarry is currently operational and therefore exiting traffic levels are unlikely to increase.



Hazardous and Dangerous Goods

Spills and leaks from transfers (e.g. fuel and/or chemicals) and inadequate storage of dangerous goods and hazardous wastes could result in point-source contamination of surrounding land. Direct adverse impacts could include toxic impacts on vegetation (resulting in degradation or loss of vegetation and habitats), direct toxic impacts on fauna (from contact, inhalation or ingestion) or indirect impacts on threatened and migratory species from habitat loss. Direct adverse impacts on surface and groundwater quality are also possible.

With the application of standard mitigation and management measures, impacts from liquid and solid waste disposal will be avoided or localised and small in scale. Further to this, the likelihood of significant spillages is considered extremely low. Therefore, the project is likely to result in a negligible impact to ecological values due to potential spills and leaks. Details of Waste handaline are covered in the EMP (refer **Attachment A3**).

4.3. Quantum Impact Assessment – Koala

This section of PD provides an assessment of the quantum impact of Koala habitat. The original referral material provided as Part B included an assessment of the proposed action against the significant impact guidelines for the Koala with the result being that a significant impact was unlikely given the small area of Koala habitat within the referral area and minimal likelihood that the removal of vegetation would impact Koala populations or disrupt movement opportunities. As part of the controlled action determination the department considered it likely that the proposed action will have a significant impact on the Koala. The department also considers the entire referral area as Koala habitat as with potential for dispersal in areas that do not contains Koala habitat trees. Considering the entire referral area as 'habitat critical to the survival of the Koala' increases the area of impacted habitat and subsequently increasing the likelihood for a significant impact on the species. For the purposes of this assessment, the entire referral area has been considered as habitat critical to the survival of the Koala.

4.3.1 Direct and indirect impacts

The habitat critical to the survival of the koala present within the referral and proposed to be impacted is presented in **Plan A15**. The referral area was assessed using a modified version of the Queensland State Governments "Guide to determining terrestrial habitat quality: A toolkit for assessing land-based offsets under the Queensland Environmental Offsets Policy" Version 1.2 April 2017 (the terrestrial habitat guideline). The purpose of the Guideline is to provide a methodology for proponents to measure the habitat quality of a land-based offset under the Queensland Environmental Offset Policy (QEOP).

4.3.2 Assessment Methodology

The referral area reflects varying vegetation values and was delineated into three (3) AUs. All AUs have been considered to provide Koala habitat in either a foraging/breeding or dispersal capacity. Therefore, the project will result in the clearing and functional loss of 5.9 ha of habitat critical to the survival of the Koala (refer **Plan A15**).

In order to determine the quantum and quality of the habitat suitable for Koala on-site, the vegetation has been assessed using a modified version of the Queensland State Governments 'Guide to determining terrestrial habitat quality: A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy' Version 1.2 April 2017. This assessment approach utilises the Queensland BioCondition Assessment method combined with site context and species stocking rate assessments to determine the habitat quality of the impact area.

The purpose of this guideline is to provide a methodology for proponents to determine the habitat quality of a site under the Queensland Environmental Offsets framework. The guideline is a step-by-step methodology explaining how to measure habitat quality for land-based offsets. This methodology has been adopted and tailored/modified to assess the impacts and offsets relating to Matters of National Environmental Significance (MNES). BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland V2.2 February 2015 provides the base methodology for the Guide to determining terrestrial habitat quality and in some cases the scoring and methods from BioCondition have been used within our Modified Habitat Quality Assessment Tool. These instances are identified within the methodology.

Assessment Units

The variance in quality of habitat on an impact or offset site is accounted for by delineating sites into Assessment Units (AUs). AUs are mapped to determine where the sample sites will be and how many



are required to adequately assess the site's condition. AUs were defined using a combination of desktop information and vegetation ground-truthing. In general, they should be relatively homogenous, defined by a distinct regional ecosystem or habitat type and distinct from other patches of vegetation on a site. The AUs identified are used in the assessment of habitat values for Koala.

The vegetation within the referral area varies considerably however, largely reflects RE12.11.3 or RE12.11.10 as per the pre-clear and current regional ecosystem mapping across the referral area. The habitat areas of the referral area have been delineated into three (3) AUs (refer **Plan A5**).

The proposed action will result in impacts to **5.9 ha** of vegetation identified as providing critical habitat for the Koala as defined by the EPBC Act. Notably, RE12.11.3 is a recognised Koala habitat community owing to the presence of Koala habitat trees where RE12.11.10 (notophyll vine thicket) is not considered Koala habitat. The department considers the entire referral area as habitat critical to the survival of the Koala taking into account potential dispersal habitat albeit limited. For the purposes of this assessment, the entire referral area is considered Koala habitat.

To determine the quantum impact and quality of the habitat suitable for Koala within the referral area, vegetation / habitat quality was derived from the MHQA tool. This assessment approach utilises the Queensland *Guide to determining terrestrial habitat quality: A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy* (version 1.2) and Queensland *BioCondition Assessment* method combined with site context and species stocking rate assessments to determine the habitat quality of the project area.

Modified Habitat Quality Assessment

The following section details the methodology utilised to assess the site condition, site context and species stocking rate under the MHQA.

Site Condition (30%)

Assessing site condition is an integral step in determining specific quantification of impacts, while also determining whether an offset site is suitable to establish a desired capacity to support the prescribed environmental matters being offset. The on-site condition is a key element of habitat quality and has a direct influence on the biodiversity it supports. Site condition is assessed using a suite of attributes to describe the structure and function of the vegetation community and is benchmarked against the expected range for a relatively undisturbed community.

The site condition assessment under the MHQA is assessed using 15 condition characteristics. Each condition characteristic and the relevant scoring and benchmark percentage is provided in **Table A17**.

Table A17: Koala site condition scoring attributes (BioCondition Manual)

Site condition attribute	*Scoring and benchmark percentage*			
*(1) Recruitment of woody perennial species in ecologically dominant layer in EDL**	Score	0	3	5
	Benchmark	<20%	≥20-75%	≥75%
(2) Native plant species richness – trees	Score	0	2.5	5
	Benchmark	<25%	≥25-90%	≥90%
	Score	0	2.5	5



Site condition attribute	*Scoring and benchmark percentage*				
(3) Native plant species richness – shrubs	Benchmark	<25%	≥25-90%		≥90%
(4) Native plant species richness – grasses	Score	0	2.5		5
	Benchmark	<25%	≥25-90%		≥90%
(5) Native plant species richness – forbs	Score	0	2.5		5
	Benchmark	<25%	≥25-90%		≥90%
(6) Tree canopy height	Score	0	3		5
	Benchmark	<25%	≥25-70%		≥70%
(7) Tree canopy cover	Score	0	2	3	5
	Benchmark	<10%	≥10%-<50%	≥200%	≥50-200%
(8) Shrub canopy cover	Score	0	3		5
	Benchmark	<10%	≥10%-<50% or ≥200%		≥50-<200%
(9) Native perennial grass cover	Score	0	1	3	5
	Benchmark	<10%	≥10-50%	≥50-90%	≥90%
(10) Organic litter	Score	0	3		5
	Benchmark	<10%	≥10%-50% or ≥200%		≥50-<200%
(11) Large trees	Score	0	5	10	15
	Benchmark	0%	0-50%	≥50-100%	≥100%
(12) Coarse woody debris	Score	0	2		5
	Benchmark	<10%	<50% or ≥200%		≥50% or <200%
(13) Non-native plant cover	Score	0	3	5	10
	Benchmark	>50%	≥25-50%	≥5-25%	<5%

Assessment methodology of the above condition characteristics mostly do not differ from the traditional terrestrial habitat quality assessment. In developing the MHQA to better incorporate MNES, two (2) species habitat index characteristics, being (1) 'quality and availability of food and foraging habitat', and (2) 'quality and availability of shelter', have been added to the site condition indicator.

Quality and Availability of Food and Foraging Habitat

Food-tree availability is consistently identified as one of the most important determinants of koala population dynamics, owing to their highly specialised folivorous diet and dependence on a narrow subset of Eucalyptus species (Kavanagh et al., 2007).

To reflect the importance of food trees to koala habitat, the quality and availability of foraging habitat has been assessed using two parameters:

- Abundance of koala food trees
- Tree canopy cover



These two parameters provide an indication of the number of trees available for koalas to forage in and the amount of resource available from those trees. Weighting of the parameters in the assessment is 80% for food tree abundance and 20% for canopy cover as koalas are known to graze on trees of any size and established smaller trees will grow to provide a larger canopy area over time.

All koala food trees (eucalypt, corymbia and angophora species) with a DBH >100mm were counted within a 100m x 20m plot at each habitat transect to estimate abundance. The count is multiplied by 5 to produce a stem density per hectare which is averaged across the assessment unit. The count is then compared to the average stem density per hectare identified in the regional ecosystem technical descriptions combining T1 and T2 layers (Ryan 2019) with a score out of 8 calculated (**Table A18**).

Table A18: Stem density percentage and relevant score – quality and availability of foraging habitat

Stem density as percentage compared with benchmark	Score
<1%	0/8
1% - 24.99%	2/8
25% - 49.99%	4/8
50% - 74.99%	6/8
75% - 100%+	8/8

Canopy in Southeast Queensland Eucalypt woodland is dominated by koala food tree species, therefore, the tree canopy cover collected a part of the site condition assessment provides an accurate estimate of food source availability, and if anything would overestimate food availability giving a conservative baseline score. Canopy cover (T1 layer) has been averaged and compared to the benchmark for the regional ecosystem. A score out of 2 has been calculated (refer **Table A19**):

Table A19: Canopy overage percentage and relevant score - quality and availability of foraging habitat

Canopy cover as percentage compared with benchmark	Score
<1%	0/2
1% - 24.99%	0.5/2
25% - 49.99%	1/2
50% - 74.99%	1.5/2
75% - 100%+	2/2

The scores for food tree abundance and canopy cover are then added together to provide an overall score out of 10 for quality and availability of food sources. For the purposes of the MHQA condition assessment, scores have been categorised (refer **Table A20**).



Table A20: Combined stem density and canopy coverage score – quality and availability of foraging habitat

Combined score for stem density and canopy cover	Final Score
0 – 2.99/10	1
3 – 6.99/10	5
7 – 10/10	10

Quality and Availability of Shelter Habitat

Koalas choose shelter in trees that provide thermal protection, safety from predators, and access to preferred food trees (Briscoe et al 2014; Ellis et al 2012; Law et al 2022). Studies have found shelter trees are not necessarily food species such as eucalypts with a range of ancillary species used as long as they are near a food source. Trees selected are often larger with a DBH 0f 30cm – 60cm.

Two parameters have been used to assess shelter habitat values at the impact and offset sites:

- Abundance of koala food trees and ancillary trees (hereby referred to as shelter trees)
- Abundance of large shelter trees (food and ancillary species)

These two parameters provide an indication of the number of koala shelter trees available on the impact and offset sites as well as existing larger trees that can be preferred while resting through the day. Weighting of the parameters in the assessment is 60% for shelter tree abundance and 40% for large trees.

All shelter trees with a DBH >100mm were counted within a 100m x 20m plot at each MHQA transect completed at the impact and offset sites to estimate abundance. The count is multiplied by 5 to produce a stem density per hectare which is averaged across the assessment unit. The count is then compared to the average stem density per hectare identified in the regional ecosystem technical descriptions combining T1 and T2 layers (Ryan 2019) with a score out of 6 calculated (refer **Table A21**).

Table A21: Stem density percentage and relevant score – quality and availability of shelter habitat

Stem density as percentage compared with benchmark	Score
<1%	0/6
1% - 24.99%	1.5/6
25% - 49.99%	3/6
50% - 74.99%	4.5/6
75% - 100%+	6/6

Large shelter trees are counted over a 100m x 50m plot at each MHQA transect completed at the impact and offset sites to estimate abundance of large trees. The count is multiplied by 2 to produce a density per hectare which is averaged across the assessment unit and compared to the benchmark for the regional ecosystem. A score out of 4 is calculated (refer **Table A22**):



Table A22: Large tree percentage and relevant score – quality and availability of shelter habitat

Large Trees as percentage compared with benchmark	Score
<1%	0/4
1% - 24.99%	1/4
25% - 49.99%	2/4
50% - 74.99%	3/4
75% - 100%+	4/4

The scores for shelter tree abundance and large trees are then added together to provide an overall score out of 10 for quality and availability of shelter. For the purposes of the MHQA condition assessment, scores will be categorised (refer **Table A23**):

Table A23: Combined stem density and large tree score – quality and availability of shelter habitat

Combined score for stem density and large trees	Final Score
0 – 2.99/10	1
3 – 6.99/10	5
7 – 10/10	10

Site Context (30%

The site context assessment considers the landscape characteristics adjoining the site. Site context is measured using a suite of attributes to describe the location of the habitat within the surrounding landscape and the influence of its associated threats. This assessment also considers the influence of adjacent vegetated areas and ecological corridors. Under the MHQA, site context is measured using seven characteristics. In developing the MHQA, three species habitat index characteristics were nominated to form part of the site context characteristics: role of site location to overall species population in the state, threats to the species, and species mobility capacity. The seven characteristics are listed below with details of how each are measured in accordance with the *Guide to determining terrestrial habitat quality: A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy* (version 1.2).

- Size of patch – Measured as the area of vegetation in which the assessment unit(s) is contained, and add on all other directly connecting areas of koala habitat. The calculation of the area of the patch size uses the method outlined in the BioCondition assessment manual v2.2 that considers the patch to be areas connected by corridors greater than 200 m wide within a 1 km radius of the site. This methodology includes use of a "segmentation" process that removes areas connected to the assessment area by narrow corridors)
- Connectedness – Relates to the capacity that the species have to disperse through the landscape. This attribute is calculated using GIS by measuring the length koala habitat along the boundary of the site, calculated as a percentage



- Context – The context score is calculated by GIS to quantify the amount of vegetation immediately surrounding the assessment site. It is measured as the percentage of koala habitat within a 1 km radius of the site
- Ecological corridors – This attribute is as per the methods of the Guide to determining terrestrial habitat quality V1.2 and is used to determine if a site is located within or shares a boundary with an ecological corridor that facilitates long term ecosystem function by connecting large patches of remnant vegetation with sufficient tract size (corridor width in relation to the fragmentation of the landscape) (EHP 2014). These corridors support the habitat of MNES by providing opportunity for long term dispersal of habitat species following landscape level changes in climate. Although the ecological corridors allow for the dispersal of MNES themselves, for example, Koala, this is not their primary function when assessing the attribute. An 'ecological corridor' is represented as any 'Riparian' or 'Terrestrial' feature within the 'CORR_TYPE' attribute table of the 'Queensland biodiversity and vegetation offsets special features' map. The mapping can also be viewed on Queensland Globe in the 'Statewide Biodiversity Corridors' layer
- Role of site location to species overall population in the state – This attribute is based on the observed role of the site in relation to the overall population of the species. The scoring table considers the species' use of the site – such as whether it is used for feeding and/or nesting and the effect that damage to or removal of the site would have to the likelihood of the species' overall population survival.
- Threats to the species – This attribute identifies the presence and severity of threatening processes observed at or adjacent to the site which may include clearing associated with development, creation of a barrier to movement, introduction or spread of disease or pathogens, risk of high-intensity fires, degradation of habitat from hydrological change and introducing or increasing mortality attributed to vehicle strike or dog attacks as references in the *Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory*. The highest threat level is given to a site if it isolated from other Koala habitat, or if major roads without exclusion measures, or residential encroachment is within 1500 m of the site boundary. A risk matrix relative to the conservation advice for the Koala was applied to determine threats to species:
    - Habitat loss is considered 'Very High Risk' under the Koala conservation advice. Clearing and degradation of habitat is scored Low, Moderate and High and weighted according to risk factor relative to the expected threat score for each (summed vertically as 15 for Low, 7 for Moderate or 1 for High).
    - High intensity bushfire is considered 'Very High Risk' under the Koala conservation advice. Inappropriate fire regimes is scored Low, Moderate and High relative to the implementation of an endorsed bushfire management plan and fuel load weighted according to risk factor relative to the expected threat score for each (15, 7 or 1).
    - Vehicle strike is considered 'Moderate Risk' under the Koala conservation advice. Vehicle strike is scored Low, Moderate and High relative to the presence and severity of road use within 1 km of the site and weighted according to risk factor relative to the expected threat score for each (15, 7 or 1).
    - Dog attack is considered 'Moderate Risk' under the Koala conservation advice. Dog attack is scored Low, Moderate and High relative to the presence of dogs and level of cover available and weighted according to risk factor relative to the expected threat score for each (15, 7 or 1).



- Species mobility capacity – The Guide to Determining Terrestrial Habitat Quality version 1.2 states that this attribute is scored based on the presence and severity of factors that would contribute to a reduction in the mobility of the species. The scoring is based on a percentage reduction of mobility ranging from minor restriction (0-25% reduction) to severely restricted (76-100%). A score of 1, 4, 7 or 10 may be attributed depending on the level of restriction (refer **Table A24**) for scoring as provided in the guideline.

  The Guideline references the presence and severity of factors that would contribute to a reduction in the mobility of the species. This can include barrier that would result in a long-term reduction in genetic fitness or access to important resources. DCCEEW defines a barrier for Koala as an impediment to the genetic dispersal of Koalas over multiple generations such as escarpments or inhospitable landscapes. However, it is noted that the presence or absence of barriers alone do not exclusively determine the percentage reduction in mobility. Other factors such as roads, cleared areas and dense weed infestations (i.e Lantana) will contribute to a reduced mobility capacity and are still relevant when scoring this attribute as 'presence and severity.' Under the Habitat Quality Guideline, species mobility capacity is measured in terms of a percentage reduction. A method for calculating percentage reduction is detailed below:

  Factors that may limit or impede mobility for the koala used to inform this assessment include:
  - The presence of large stretches of cleared land where uses are incompatible with koala movement. This may include intensive agriculture (e.g. cropping) or commercial uses (e.g. hardstand or carparks).
  - The presence of thick lantana infestations in woodland or gullies.
  - Waterways larger than 40 m wide.
  - Roads such as 4-lane arterial roads or smaller connectors that are highly trafficked and safe koala movement features such as underpasses are not present.
  - The presence of a non-climbable fences and other small-scale infrastructure.
  - The presence of a rail corridor or other linear infrastructure with regular anthropogenic uses.

While the guideline identifies features that restrict mobility, they are not attributed a category of restriction. A literature review has been completed to identify which features would be considered to have the potential to be a severe, high or moderate restrictions to dispersal. The outcomes are summarised in **Table A24**.

Potential severity assumes a 'worst case' scenario and site-specific condition need to be considered for the assessment. For example, a rural property surrounded by barbed wire with timber fencing and small infrastructure littered throughout the property may only be considered to provide a moderate impediment to koala movement whereas urban areas with timber fencing present in several areas around the site would be considered a high or severe impediment.



Table A24: Severity of Mobility Restrictions

Potential Severity	Impediment	Primary Effect on Mobility	References
Severe	Habitat Loss & Fragmentation	Isolates habitat patches; reduces canopy connectivity; forces ground travel. The site must be isolated from any other vegetation cleared land with uses incompatible to koala movement.	Rhodes et al. 2006 McAlpine et al. 2006 Youngentob 2021
Severe	Roads & Vehicle Traffic	Roads act as hard physical barriers; vehicle strikes kill dispersing koalas. Dual lane or high trafficked roads with no or limited koala movement features such as underpasses are considered a high barrier to dispersal.	Rhodes et al. 2006 Lunney et al. 2002
High	Fencing & Small-Scale Infrastructure	Fences can prevent koalas from reaching adjacent habitat patches, particularly when too high or lacking climbable surfaces.	NSW Department of Planning and Environment (2022) McAlpine et al. 2006
High	Human Disturbance & Noise	Koalas and other small mammals tend to avoid habitats close to major roads, construction sites, and other loud human activities. If major anthropogenic noise sources are located adjacent the site it is considered a high barrier to dispersal.	McAlpine et al. 2006 Blickley and Patricelli 2010
Moderate	Dense weed infestation	Weed invasion alters vegetation structure, reduces habitat quality, and can significantly influence how koalas move through the landscape.	NSW Department of Planning and Environment (2022)
Moderate	Waterways	Waterways can impede koala movement primarily by creating physical gaps in canopy connectivity, forcing koalas to travel on the ground where they are more vulnerable to predation and vehicle strikes. Large waterways (>40 m wide) are considered a significant barrier because they isolate habitat patches and reduce safe dispersal routes.	Rhodes et al. 2006 McAlpine et al. 2006

Species mobility capacity will be calculated using the following method:

- The site will be spit into four quadrants (north, south, east and west).
- Each quadrant will be reviewed using a combination of desktop and field assessment (where possible) to identify if any restriction to mobility is present.
- Restriction will be allotted a percentage score based on severity as follows:
    - No or any minor restriction not listed in **Table A24** – 0%
    - Moderate restriction – 40%
    - High restriction – 65%
    - Severe restriction – 90%



- Percentages will be added together and divided by 4 to obtain an overall percent reduction in mobility for the site. A score will then be allotted according to the mobility restriction severity scoring in .**Table A25**

Table A25: Koala site context scoring attributes

Site context attribute	*Scoring and benchmark percentage*				
Size of patch	0	2	5	7	10
	<5 ha	5-25 ha	26-100 ha	101-200 ha	>200 ha
Connectedness	0	2	4		5
	0-10%	>10-<50%	50-75%		>75% or >500 ha
Context	0	2	4		5
	<10% habitat	>10-30% habitat	>30-75% habitat		>75% habitat
Ecological corridors	0	4	6		
	Not within	Sharing a common boundary	Within (whole or part)		
Role of the site location to species overall population in the state	1	4	5		
	Not or unlikely to be critical to survival of the koala	Likely to be critical to survival of the koala	Critical to the survival of the koala		
Threats to the species	1	7	15		
	High threat level	Moderate threat level	Low threat level		
Species mobility capacity	1	4	7	10	
	Severely restricted (76-100% reduction)	High restricted (51-75% reduction)	Moderately restricted (26-50% reduction)	Minor restriction (0-25% reduction)	

Species Stocking Rate (40%)

The MHQA incorporates species stocking rate as an attribute not discussed under the traditional terrestrial habitat assessment methodology. Species stocking rates are estimates of the koala carrying capacity of the site at the time of undertaking the survey. Given the discreet nature of the koala and limited to no published literature on habitat carrying capacity of the species, the species stocking rate scoring methodology has been derived through the collation of site-specific surveys and surrounding contextual habitat analysis. Species stocking rate is calculated using the following parameters:

- Species presence on or adjacent to the site – whether or not evidence of koala has been recorded within or adjoining the site. Evidence may be direct in the form of observation of koalas, or indirect via the presence of scats.



- Species usage of the site (habitat type and evidenced usage) – the type of habitat includes vegetation structure such as whether it contains remnant, regrowth or non-remnant vegetation values, and evidenced usage is the confirmed presence or use of the species within the habitat. Both factors are used to inform the species usage of the site. Depending on the level of variability in vegetation and usage patterns across the site, this characteristic may be scored differently for assessment units.
- Approximate density of the species on the site – measured through the use of Spot Assessment Technique (SAT) (Phillips *et al.* 2011) and targeted searches with a high probability of detection. The combination of methods produces a higher reliability of data when extrapolating koala density. The SAT method is an industry recognised technique for identifying presence/absence of koala and measuring activity. SAT survey results are interpreted using the broad population categories provided in the Australian Koala Foundation Koala activity level classification table to infer an activity level or approximate density. These categories being 'East Coast (low)', 'East Coast (med-high)' and 'Western (med-high).' Depending on the population category applied, koala activity is described as 0%, 'low', 'moderate', or 'high'.
- Role/importance of species population on site – the extent to which the site is considered a key source population for breeding, dispersal, is necessary for maintaining genetic diversity or near the limit of the species' range.

For subjective criteria where it is unclear whether a particular attribute score is achieved, the precautionary approach is applied to favour the higher score. **Table A26** outlines the attributes utilised to assess species stocking rate.

Table A26: Koala Species Stocking Rate Scoring

Attribute	*Scoring and criteria*				
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	Score (/10)	0	5	10	
		No	Yes – adjacent to site	Yes – on-site	
Species usage of the site (habitat type and evidenced usage)	Score (/15)	0	5	10	15
		Not habitat	Dispersal habitat	Foraging habitat	Breeding habitat
Approximate density (per ha)	Score (/30)	0	10	20	30
		0%	Low	Medium	High
*Role/importance of species population on site**	Score (/15)	0	5	10	15
		0	5-15	20-35	40-45
Total SSR	/70				
SSR Score	/4				

**Species Stocking Rate supplementary table – Total supplementary score 0 = 0, 5-15 = 5, 20-35 = 10, 40-45 = 15*			
Key source population for breeding	Score (/10)	0	10
		No	Yes/Possibly

Key source population for dispersal	Score (/5)	0	5
		No	Yes/Possibly
Necessary for maintaining genetic diversity	Score (/15)	0	15
		No	Yes/Possibly
Near the limit of the species range	Score (/15)	0	15
		No	Yes

Scoring Weight Justification

Site Condition and Site Context were given a weighted score out of three (3), while Species Stocking Rate was given a weighted score out of four (4).

Species Stocking Rate was assigned the highest weighting as it is considered the greatest determinant of site suitability for the Koala. Species Stocking Rate is an important component when assessing the overall habitat quality of a site as it indicates species usage.

Site Condition and Site Context were assigned the equal weighting (scored out of 3). The Koala is known to occupy a variety of habitats, ranging from non-remnant regrowth eucalypt forest/woodland through to old growth remnant forest/woodland, however, the site condition of the habitat is considered to directly influence the long-term Koala carrying capacity. Site Context is considered an important component when assessing the Koala as it directly relates to the long-term survival rate of the species. The proximity of the site to other areas of suitable habitat, the movement pattern through the landscape of the Koala (and/or barriers inhibiting movement) and threats to the species are important attributes to assess when considering the overall functionality of the site.

It is considered that the provision of this weighted scoring most accurately quantifies the ecological requirements of the Koala, which will then assist in determining whether an offset site is suitable to establish a desired capacity to support the prescribed environmental matters being offset.

4.3.3 Discussion

The habitat quality scores for each AU were determined using a combination of Site Condition, Site Context and Species Stocking Rate technical data and scoring. The site was given an overall weighted habitat quality score of **5.73** out of the total of 10 which is considered a moderate habitat quality score. This score is calculated based on the combined weighted habitat quality scores for each assessment unit.

Refer to **Table A27** for a summary of the results. The detailed results are presented in **Table A36** to **Table A41**. The complete raw data for site condition is provided at **Attachment A5**.

Table A27: MHQA Final Weighted Scores Summary

MHQA Final Weighting	AU1	AU2	AU3
Site Condition (/3)	1.82	1.04	0.72
Site Context (/3)	2.25	2.25	2.25
Species Stocking Rate (/4)	2.29	1.71	1.71
Assessment Unit Area (Impact) (ha)	3.50	1.10	1.30
Total Impact Area (ha)	5.90	5.90	5.90
AU Weighted Score	0.593	0.186	0.220
Total Weighted Score	**5.73 (rounded to 6)**		

Quality and availability of food and foraging resources

Table A28: Koala Food Tree Abundance – Impact

Impact Assessment Unit	RE	Benchmark (trees/ha)	Site Count (trees/ha)	Benchmark Percentile	Score
AU1	12.11.3	544	395	73%	6/8
AU2	12.11.10	No benchmark, RE does not have Koala food trees as part of technical description	No Koala food trees	Not applicable	0/8
AU3	12.11.3	544	110	20%	2/8

Table A29: Canopy Cover – Impact

Impact Assessment Unit	RE	Benchmark (% cover)	Site (% cover)	Benchmark Percentile	Score
AU1	12.11.3	72	75.8	105%	2/2
AU2	12.11.10	47	No T1 canopy layer	0%	0/2
AU3	12.11.3	17	No T1 canopy layer	0%	0/2

Table A30: Final score for Quality and availability of food and foraging resources

Assessment unit	Total score	MHQA score
AU1	8/10	10
AU2	0/10	1
AU3	2/10	1

Quality and availability of shelter

Table A31: Shelter Tree Abundance – Impact

Impact Assessment Unit	RE	Benchmark (trees/ha)	Site Count (trees/ha)	Benchmark Percentile	Score
AU1	12.11.3	544	395	73%	4.5/6
AU2	12.11.10	No benchmark, RE does not have Koala food trees as part of technical description	No Koala food trees	Not applicable	0/6
AU3	12.11.3	544	110	20%	1.5/6



Table A32: Large Trees abundance – Impact

Impact Assessment Unit	RE	Benchmark (trees/ha)	Site (trees/ha)	Benchmark Percentile	Score
AU1	12.11.3	67	10	15%	1/4
AU2	12.11.10	88	4	5%	1/4
AU3	12.11.3	67	0	0%	0/4

Table A33: Final score for Quality and availability of shelter

Assessment unit	Total score	MHQA score
AU1	5.5/10	5/10
AU2	1/10	1/10
AU3	1.5/10	1/10

Site Context (30%)

→Size of patch

This attribute is a measure of the size of the patch of vegetation in which the assessment unit is located. The scoring reflects the importance of large patches in the landscape and is based on the size of the patch of critical Koala habitat connected to the site in this instance. This attribute is scored such that is reflects the fact that larger patches are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller patches. The size of patch attribute was calculated using GIS and determined the referral area to be part of a patch size of larger than 500 ha. This achieved a score of **10 out of 10** (>200 ha Koala Habitat as per the *Queensland BioCondition Assessment* methodology) (refer **Plan A16**).

→Connectedness

As a landscape level attribute, connectedness aims to assess the degree to which the assessment unit is connected to adjacent native vegetation. Connectedness relates to the capacity of the species to disperse through the landscape between sustainable patches of habitat, and therefore has important implications for species persistence. Connectedness was calculated using GIS, with the percentage of referral area boundary length supporting a Koala critical habitat connection off and on-site was calculated at 48 %, and consequently this attribute scored a **2 out of 5** as per the *Queensland BioCondition Assessment* methodology (refer **Plan A16**).

→Context

The context attribute refers to the amount of critical koala habitat that is retained within a 1 km buffer of the site being assessed and is calculated using GIS. Each assessment unit achieved the same scores for Site context. Existing critical koala habitat within a 1 km buffer of the site was calculated at 79%, and therefore the context attribute achieved a score of **5 out of 5** as per the *Queensland BioCondition Assessment* methodology (refer **Plan A16**).

→Ecological Corridors

GIS was utilised to identify the role of the site in any ecological corridors on or adjacent to the site. A score of **6 out of 6** was given to the Ecological Corridors component of Site Context as the site is within state and regional corridors (refer **Plan A17**).



→Role of site location to species overall population in the State

This attribute aims to quantify the importance of the site for state Koala populations through a combined approach that considers the activity and usage across the site and the importance of habitat for fulfilling the Koala's life cycle (*i.e.,* foraging and breeding) and thus the effect that removal of habitat would have on a local population and the species as a whole. This attribute achieved a score of 5 out of 5 as it was determined that the referral area contains habitat critical to the survival of the species. While habitat within the referral area is highly disturbed and site-specific surveys found low koala activity, any habitat that meets the definition of critical koala habitat under the EPBC Act is also considered potential breeding habitat.

→Threats to the species

The 'threats to the species' attribute aims to quantify potential risks to the survival of Koala existing within and adjacent to the referral area. Key known threats to the survival of the Koala include proximity to main roads increasing the risk of motor vehicle strike, as well as predation by wild or domestic dogs. Records from the Queensland Koala hospital showing deceased and injured koala records within 5 km of the referral area are shown on **Plan A18**.

Table A34 provides a risk matrix relative to the conservation advice for the Koala to determine threats to the species. Essentially, each of the threats identified within the conservation advice is weighted relative to the identified level of risk, with the weighted scores summed to provide the threat score, noting the MHQA allows for only scores of 1 (high), 7 (moderate) or 15 (low) for threats.

- Clearing and degradation of habitat – the referral area is zoned as 'extractive industry' under the GCCC city plan. Additionally, the referral area holds current approvals under state and local legislation. A high-level mapping exercise indicates approximately 30-50% of the surrounding area is disturbed land, predominantly for the rural and extractive uses (refer **Insert A3**). The high-level threat for the referral area is attributed to existing environmental approvals and zoning as part of an existing quarry footprint. Therefore, a weighted score of **0.4** or 'high risk' is appropriate
- Inappropriate fire regimes – The GCCC city plan identifies the majority of the referral area as 'very high potential bushfire hazard' and 'high potential bushfire hazard.' A non-Koala specific Bushfire Management Plan is not in place for the referral area which Is considered to have high fuel load as a result of dense lantana infestation throughout. Therefore, a weighted score of **0.4** or 'high risk' is appropriate.
- Vehicle strike – There is a mix of main roads and internal industry roads located proximal to the referral area. The referral area is located 550 m east of Cedar Creek Road which is signposted as an 70 km p/hr vehicle speed and 1.3 km east of Beaudesert Beenleigh Road which is signposted as an 80 km p/hr vehicle speed. The Queensland Koala hospital has recorded 14 vehicle strikes within 5 km of the referral area. The risk of vehicle strike is considered low-moderate and therefore, a weighted score of **1.5** or 'low risk' is appropriate.
- Dog attack – Wild Dog was recorded within the referral area. Refuge for Koala is present across the majority of the site as intact canopy therefore, a weighted score of **0.7** or 'moderate' is appropriate.

The site is considered to have a 'high-risk' threat level for Koalas. Consideration is given to the precautionary principle in favour of a higher habitat value score. Therefore, a score of **7 out of 15** or 'moderate risk' is considered appropriate for the site.



Table A34: Koala Threat Scoring Matrix (green shading indicates applicable scores for the site)

Metric	Low	Moderate	High
Threat Thresholds			
Clearing and Degradation of Habitat	Apply one of the following options in order of priority: 1. Apply a current legal protective mechanism. 2. The site is zoned for conservation purposes or clearing is not permitted. 3. If ≤30% of the area within a 5 km buffer of the site is cleared or disturbed land.	In the absence of justification for scoring as high or low and if: >30% and <70% of the area within a 5km buffer of the site is cleared or disturbed land.	Apply one of the following options in order of priority: 1. The site is zoned for development. 2. If ≥ 70% of the area within a 5 km buffer of the site is cleared or disturbed land.
Score Weighting	**6**	**2.8**	**0.4**
Inappropriate Fire Regimes Very High Risk	Current Government endorsed Bushfire Management Plan (BMP) to protect the Koala is in effect.	Non-Koala specific BMP in effect. or; Low fuel load and low fire risk.	Site has a high fuel load and/or high fire risk.
Score Weighting	**6**	**2.8**	**0.4**
Vehicle Strike Moderate Risk	Low volume of cars, unsealed, no Koala accessibility, fencing, and mitigation measures in place, negligible Koala mortality.	Site-specific and evidence-based qualitative assessment of these considerations	High volume of cars, sealed, accessibility for Koala, no fencing, and no mitigation measures in place, high Koala mortality
Score Weighting	**1.5**	**0.7**	**0.1**
Dog Attack Moderate Risk	No Dogs recorded on site.	Dogs recorded on site and adequate refuge for Koalas (>70% canopy cover).	Dogs recorded on site and limited refuge for Koalas (<70% canopy cover)
Score Weighting	**1.5**	**0.7**	**0.1**
Threats to Species			
Threshold Analysis	≥13.5	>5 and <13.5	≤5
Score	**15**	**7**	**1**



Insert A3: High level assessment of degraded land within 5 km of the referral area (between 30 and 50%)

→Species mobility capacity

Species mobility capacity is used to quantify the ability of the species to move from the site and through the surrounding landscape to meet survival needs. Species mobility capacity is considered particularly important in response to rapid changes to the surrounding environment, such as the commencement of land clearing. Assessment has been carried out in accordance with method provided in Section 4.3.2 with outcomes provided in **Table A35**. The site is considered moderately restricted giving it a score of 7/10.

Table A35: Impact site species mobility capacity assessment

Direction	Description of restriction	Restriction score
North	The existing quarry operations are present to the north presenting an extensive barrier tom species mobility.	Severe – 90%
South	Land to the south contains existing native vegetation	No restriction
East	Land to the east is partially restricted by existing quarry operations but predominantly contains existing vegetation. A significant portion of this area is densely infested with	Moderate – 40%

	Lantana which does contribute to reduced species mobility for the Koala	
West	Land to the west is partially restricted by existing quarry operations but predominantly contains existing vegetation	No restriction
Total restriction score		130 / 4 = 32.5% (moderately restricted or **7 out of 10**)

Species Stocking Rate (40%)

The final component of the MHQA technique is species stocking rate. Species stocking rates are estimates of the Koala carrying capacity of the site at the time of undertaking the survey. Species stocking rate is ordinarily considered for the site as whole. However, this project includes considerably variations in vegetation values and communities that have significantly different habitat for Koala.

- *Species presence on or adjacent to the site* – A Koala was directed observed within the referral area, therefore this attribute scored **10 out of 10**.
- Species usage of the site (habitat type and evidenced usage) – The referral area contains three (3) distinct vegetation communities. AU1 reflects eucalypt woodland with evidence of usage, therefore this assessment unit aligns with potential breeding habitat and scores **15 out of 15** for species usage. AU2 contains notophyll vine forest vegetation which is not recognised as Koala habitat owing to the omission of Koala habitat trees. Therefore, AU2 only provides a dispersal role for the species and therefore scores a **5 out of 15**. AU3 is highly degraded and recently cleared non-remnant vegetation consisting of only weeds and some regrowth acacia species, this AU also only provides a dispersal role for the species and also scores a **5 out of 15**.
- Approximate density of the species on the site – measured through the use of Spot Assessment Technique (SAT) (Phillips *et al.* 2011) and targeted searches with a high probability of detection. The SAT method is an industry recognised technique for identifying presence/absence of Koala and measuring activity. A total of four (4) SATs were completed across the referral area between 2022 and 2024. SAT results indicated 'low' usage based on utilising the East coast (med-high) criteria (Phillips and Callaghan, 2011).
- Role/importance of species population on site – the extent to which the site is considered a key source population for breeding, dispersal, is necessary for maintaining genetic diversity or near the limit of the species' range. The site is not considered to be a key source population for breeding or genetic diversity based on low usage recorded and is not near the limit of the species range. There is potential that the site is a key source population for dispersal and therefore scores a 5.

A species stocking rate score of **40 out of 70** was attributed to AU1 and **30 out of 70** for AU2 and AU3.

Total Quantum Impact – Koala

The proposed action will result in the clearing and functional loss of **5.9 ha** of vegetation identified as critical habitat for the Koala. With a weighted habitat quality score of 5.73 rounded to **6.00**, the proposed development will result in an overall Quantum Impact of **3.54 ha**.



Table A36: Assessment Unit 1 – MHQA results (Koala)

Assessment Unit - Regional Ecosystem	AU 1 - Remnant (RE12.11.3)					
	RE12.11.3 Benchmark	Transect 1	Transect 2	Average of Transect(s)	% Benchmark	Score
SITE CONDITION						
Recruitment of woody perennial species in EDL	**100**	100	100	**100.00**	100.00	**5**
Native plant species richness - trees	**6**	12	11	**11.50**	191.67	**5**
Native plant species richness - shrubs	**12**	6	4	**5.00**	41.67	**2.5**
Native plant species richness - grasses	**4**	3	2	**2.50**	62.50	**2.5**
Native plant species richness - forbs	**21**	13	9	**11.00**	52.38	**2.5**
Tree canopy height (Canopy)*	**25**	19	22	**20.50**	82.00	5
Tree canopy height (Sub-canopy)*	**10**	8	11	**9.50**	95.00	5
***Average tree canopy height**						**5**
Tree canopy cover (Canopy)**	**72**	77.5	74.1	**75.8**	105.28	5
Tree canopy cover (Sub-canopy)**	**17**	35.6	26.8	**31.2**	183.53	5
****Average tree canopy cover**						**5**
Shrub canopy cover	**21**	11.6	4.9	**8.25**	39.29	**3**
Native grass cover*	**16**	13	23	**18.00**	112.50	**5**
Organic litter*	**76**	57	65	**61.00**	80.26	**5**
Large trees (euc plus non-euc) (per ha)	**67**	14	6	**10.00**	14.93	**5**
Coarse woody debris (per ha)	**370**	11.4	22.4	**16.90**	4.57	**0**
Non-native plant cover	**0**	70	60	**65.00**	65.00	**0**
Quality and availability of food and foraging habitat	**NA**	10	10	**10.00**	-	**10**
Quality and availability of shelter	**NA**	10	10	**10.00**	-	**5**
Site Condition Score (/100)						**60.5**
Overall Site Condition Score - out of 3						**1.82**
SITE CONTEXT						
Size of patch	**10**	-	-	-		**10**
Connectedness	**5**	-	-	-		**2**
Context	**5**	-	-	-		**5**
Ecological Corridors	**6**	-	-	-		**6**
Role of site location to species overall population in the state	**5**	-	-	-		**5**
Threats to the species	**15**	-	-	-		**7**
Species mobility capacity	**10**	-	-	-		**7**
Site Context Score (/56)						**42**
Overall Site Context Score - out of 3						**2.25**
SPECIES STOCKING RATE						
Koala Stocking Rate (utilising SSR & SSR Supplementary Table(s)	**70**	-	-	-		**40**
Species Stocking Rate Score (/70)						**40.00**
Overall Species Stocking Rate Score - out of 4						**2.29**
Overall Assessment Unit Score						**6.35**

Table A37: Assessment Unit 1 – Koala Species Stocking Rate Results (AU1)

Species Stocking Rate attributes	
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	10/10
Species usage of the site (habitat type and evidenced usage)	15/15
Approximate density (per ha)	10/30
Role/importance of the species population on site*	5/30
Total Species Stocking Rate Score	**40/70**
Species Stocking Rate Score – out of 4	**2.29**

*Species Stocking Rate supplementary table attributes	
Key source population for breeding	0/10
Key source population for dispersal	5/5
Necessary for maintaining genetic diversity	0/15
Near the limit of the species range	0/15

Table A38: Assessment Unit 2 – MHQA results (Koala)

Assessment Unit - Regional Ecosystem	AU 2 - Regrowth (RE12.11.10)				
	RE12.11.10 Benchmark	Transect 3	Average of Transect(s)	% Benchmark	Score
SITE CONDITION					
Recruitment of woody perennial species in EDL	**100**	100	**100.00**	100.00	**5**
Native plant species richness - trees	**25**	6	**6.00**	24.00	**0**
Native plant species richness - shrubs	**23**	8	**8.00**	34.78	**2.5**
Native plant species richness - grasses	**1**	1	**1.00**	100.00	**5**
Native plant species richness - forbs	**35**	7	**7.00**	20.00	**0**
Tree canopy height (Canopy)*	**22**	0	**0.00**	0.00	0
Tree canopy height (Sub-canopy)*	**8**	9	**9.00**	112.50	5
***Average tree canopy height**					**2.5**
Tree canopy cover (Canopy)**	**64**	0	**0**	0.00	0
Tree canopy cover (Sub-canopy)**	**47**	70	**70**	148.94	5
****Average tree canopy cover**					**2.5**
Shrub canopy cover	**29**	2.4	**2.40**	8.28	**0**
Native grass cover*	**15**	0	**0.00**	0.00	**0**
Organic litter*	**54**	34	**34.00**	62.96	**5**
Large trees (euc plus non-euc) (per ha)	**88**	4	**4.00**	4.55	**5**
Coarse woody debris (per ha)	**705**	820	**820.00**	116.31	**5**
Non-native plant cover	**0**	70	**70.00**	70.00	**0**
Quality and availability of food and foraging habitat	**NA**	1	**5.00**	-	**1**
Quality and availability of shelter	**NA**	5	**5.00**	-	**1**
Site Condition Score (/100)					**34.5**
Overall Site Condition Score - out of 3					**1.04**
SITE CONTEXT					
Size of patch	**10**	-	-		**10**
Connectedness	**5**	-	-		**2**
Context	**5**	-	-		**5**
Ecological Corridors	**6**	-	-		**6**
Role of site location to species overall population in the state	**5**	-	-		**5**
Threats to the species	**15**	-	-		**7**
Species mobility capacity	**10**	-	-		**7**
Site Context Score (/56)					**42**
Overall Site Context Score - out of 3					**2.25**
SPECIES STOCKING RATE					
Koala Stocking Rate (utilising SSR & SSR Supplementary Table(s)	**70**	-	-		**30**
Species Stocking Rate Score (/70)					**30.00**
Overall Species Stocking Rate Score - out of 4					**1.71**
Overall Assessment Unit Score					**5.24**

Table A39: Assessment Unit 2 – Koala Species Stocking Rate Results (AU2)

Species Stocking Rate attributes	
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	10/10
Species usage of the site (habitat type and evidenced usage)	5/15
Approximate density (per ha)	10/30
Role/importance of the species population on site*	5/30
Total Species Stocking Rate Score	**30/70**
Species Stocking Rate Score – out of 4	**1.71**

*Species Stocking Rate supplementary table attributes	
Key source population for breeding	0/10
Key source population for dispersal	5/5
Necessary for maintaining genetic diversity	0/15
Near the limit of the species range	0/15

Table A40: Assessment Unit 3 – MHQA results (Koala)

Assessment Unit - Regional Ecosystem	AU 3 – Highly disturbed and dominated by weeds and acacia regrowth (RE12.11.3)				
	RE12.11.3 Benchmark	Transect 4	Average of Transect(s)	% Benchmark	Score
SITE CONDITION					
Recruitment of woody perennial species in EDL	**100**	100	**100.00**	100.00	**5**
Native plant species richness - trees	**6**	6	**6.00**	100.00	**5**
Native plant species richness - shrubs	**12**	3	**3.00**	25.00	**2.5**
Native plant species richness - grasses	**4**	1	**1.00**	25.00	**2.5**
Native plant species richness - forbs	**21**	4	**4.00**	19.05	**0**
Tree canopy height (Canopy)*	**25**	0	**0.00**	0.00	0
Tree canopy height (Sub-canopy)*	**10**	7	**7.00**	70.00	3
***Average tree canopy height**					**1.5**
Tree canopy cover (Canopy)**	**72**	0	**0**	0.00	0
Tree canopy cover (Sub-canopy)**	**17**	18.2	**18.2**	107.06	5
****Average tree canopy cover**					**2.5**
Shrub canopy cover	**21**	5.4	**5.40**	25.71	**3**
Native grass cover*	**16**	1	**1.00**	6.25	**0**
Organic litter*	**76**	0	**0.00**	0.00	**0**
Large trees (euc plus non-euc) (per ha)	**67**	0	**0.00**	0.00	**0**
Coarse woody debris (per ha)	**370**	0	**0.00**	0.00	**0**
Non-native plant cover	**0**	90	**90.00**	90.00	**0**
Quality and availability of food and foraging habitat	**NA**	1	**1.00**	-	**1**
Quality and availability of shelter	**NA**	1	**1.00**	-	**1**
Site Condition Score (/100)					**24**
Overall Site Condition Score - out of 3					**0.72**
SITE CONTEXT					
Size of patch	**10**	-	-		**10**
Connectedness	**5**	-	-		**2**
Context	**5**	-	-		**5**
Ecological Corridors	**6**	-	-		**6**
Role of site location to species overall population in the state	**5**	-	-		**5**
Threats to the species	**15**	-	-		**7**
Species mobility capacity	**10**	-	-		**7**
Site Context Score (/56)					**42**
Overall Site Context Score - out of 3					**2.25**
SPECIES STOCKING RATE					
Koala Stocking Rate (utilising SSR & SSR Supplementary Table(s)	**70**	-	-		**30**
Species Stocking Rate Score (/70)					**30.00**
Overall Species Stocking Rate Score - out of 4					**1.71**
Overall Assessment Unit Score					**4.92**

Table A41: Assessment Unit 3 – Koala Species Stocking Rate Results (AU3)

Species Stocking Rate attributes	
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	10/10
Species usage of the site (habitat type and evidenced usage)	5/15
Approximate density (per ha)	10/30
Role/importance of the species population on site*	5/30
Total Species Stocking Rate Score	**30/70**
Species Stocking Rate Score – out of 4	**1.71**

*Species Stocking Rate supplementary table attributes	
Key source population for breeding	0/10
Key source population for dispersal	5/5
Necessary for maintaining genetic diversity	0/15
Near the limit of the species range	0/15

4.4. Impact Assessment – Greater Glider

As part of the original referral material (provided as **Part B**), the Greater Glider was assessed as unlikely to occur within the referral area owing to the limited suitable habitat in both a foraging and breeding capacity. This significant impact assessment has been brought forward and updated where necessary. The significant impact assessment determined that the project was unlikely to have a significant impact on the species owing to the lack of suitable habitat and low likelihood of occurrence (refer **Table A42**).

Table A42: Significant Impact Assessment – Greater Glider (endangered)

Significant Impact Criteria	Assessment	Impact
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of a population	The referral area of 5.9 ha is mapped as containing 2.4 ha of Category X (non-remnant) and 3.5 ha of Category B (remnant) vegetation under the Queensland *Vegetation Management Act 1999* as a result of an approved PMAV (ref: 2008/008614). Native canopy species within the mapped remnant polygon (AU1) include *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus siderophloia* (Grey Ironbark), *Corymbia intermedia* (Pink Bloodwood), *Corymbia citriodora* (Spotted Gum), *Eucalyptus propinqua* (Grey Gum), *Eucalyptus acmenoides* (White Mahogany), *Eucalyptus grandis* (Flooded Gum) and *Eucalyptus microcorys* (Tallowwood). The eastern extent of the referral area (AU2) includes a small polygon of regrowth RE12.11.10 (notophyll vine thicket). A study by Eyre (2006) assessing 43.7 million ha of potential Greater Glider habitat is South-east Queensland stated that notophyll vine thicket forests were not considered Greater Glider habitat even where emergent eucalypts (ironbarks, bloodwoods, stringybarks) are present. Given part of the referral area and surrounds include Notophyll vine forest which does not include emergent eucalypts as part of the technical description, it can be concluded that this vegetation community is not considered Greater Glider habitat. The balance of the referral area (AU3) consists of highly degraded and cleared vegetation consisting of only dense weeds and some regrowth native species. Given the Greater Gliders susceptibility to areas of clearing and has limited dispersal ability to move through cleared areas, this vegetation is not considered to provide dispersal, foraging or breeding habitat to the species. While the referral area contains potential Greater Glider habitat in the form of Eucalypt woodland, only 2 trees were recorded as containing 4 hollows of a suitable size for Greater Gliders (i.e >100 mm diameter). Notably, one of these hollow bearing trees is a dead/stag tree which is not the preferred habitat for the species given the thermal regulatory properties of living hollows which the species requires. Across the referral area hollows are present at a density of 0.67 hollows per ha, well below the required 2-4 hollows per ha as stated in the *Conservation Advice for Petauroides volans (2022)*. Further assessments of the vegetation condition compared with the benchmark values showed that the referral area contains significantly fewer mature trees compared with the benchmark value. Remnant RE12.11.3 has a value of 67 large trees (≥450 mm DBH) per ha. Results of the MHQA assessment identified a large tree density of approximately 10 per ha, or less than 15% of the benchmark. Given the key habitat requirement for the Greater Glider is the abundance of mature hollow eucalypts, the referral area does not contain suitable habitat for the	**Significant impact not likely**

Significant Impact Criteria	Assessment	Impact
	species. Furthermore, parts of the referral area and surrounds include regrowth notophyll vine thicket vegetation which is not habitat for the species. Eyre et at 2021 states that trees >300mm DBH are preferentially selected for foraging and occasionally denning but not in proportion to their availability within their home range. Trees > 500mm DBH is preferential for denning as trees > 500mm DBH are more likely to contain suitable hollows for sheltering by Greater Glider. Therefore, utilising the large tree threshold of 450mm DBH is considered suitable for assessing the potential for hollows. A review of online databases (ALA) identified multiple records within 5 km of the referral area. However, all these records have a spatial uncertainty of 29.68 km to protect the elevated threatened status of the species. These records could theoretically be closer of further from the referral area, but it is more likely that they are located within large areas of contiguous remnant vegetation to the south where confirmed records are present. The nearest records with confirmed locations are approximately 7.5 km and 8 km south of the referral area associated with large intact areas of contiguous bushland including Tamborine National Park. These areas are not connected to the referral as a result of roads and cleared rural land with only thin linear strips of vegetation remaining (refer **Plan A10**). The impact of removing a small area of poor-quality vegetation for the Greater Glider that is not connected to existing habitat is highly unlikely to have a significant impact on a population. Furthermore, the species was not observed within the referral area with no records of the species within connected vegetation.	
Reduce the area of occupancy of a population of the species	Targeted surveys did not detect any evidence of Greater Glider within the referral area, suggesting it is not present. There are no records of the species within connected vegetation to the referral area with the nearest recorded sightings approximately 3 km south and 2.5 km north-west however these have a spatial uncertainty of 29.68 km. Of the 5.9 ha referral area, only 3.5 ha contained vegetation with the potential to be considered Greater Glider habitat (AU1). Only 4 hollows of a suitable size for Greater Gliders were recorded (i.e >100 mm diameter). One of these hollow bearing trees is a dead/stag tree which is not the preferred habitat for the species given the thermal regulatory properties of living hollows which the species requires. Across the referral area hollows are present a density of 0.67 hollows per ha, well below the required 2-4 hollows per ha as stated in the *Conservation Advice for Petauroides volans (2022)*. Further assessments of the vegetation condition compared with the benchmark values showed that the referral area contains significantly fewer mature trees compared with the benchmark value. Remnant RE12.11.3 has a value of 67 large trees (≥450 mm DBH) per ha. Results of the MHQA assessment identified a large tree density of approximately 10 per ha, or less than 15% of	**Significant impact not likely**

Significant Impact Criteria	Assessment	Impact
	the benchmark. Given the key habitat requirement for the Greater Glider is the abundance of hollow bearing trees associated with large mature eucalypts, the referral area does not contain suitable habitat for the species. The referral area contains limited habitat for the species which is poorly connected to broader suitable habitat associated with large contiguous areas of old growth vegetation. There is no evidence to suggest the referral area is utilised by the species. It is highly unlikely the species would disperse into an area of poor habitat from areas of suitable habitat through highly modified and disturbed land. The species is highly sensitive to disturbance and disperses poorly though degraded land. It is therefore highly unlikely that the impacts associated within the referral will reduce the area of occupancy of a population of the species.	
Fragment an existing population into two or more populations	There is no evidence that an existing population is present within the referral area based on detailed contemporary field surveys and historical records. The small area of vegetation on-site is considered poor quality habitat for the species as a result of high levels of disturbance and few large, hollow bearing trees. As a result, the removal of a small area of vegetation as an extension to an existing quarry footprint is not likely to fragment an existing population, particularly as large areas of intact vegetation is present further south at Mount Tamborine National Park where multiple records of the species exist.	**Significant impact not likely**
Adversely affect habitat critical to the survival of a species	Detailed targeted surveys did not detect any evidence of Greater Glider within the referral area, suggesting the vegetation on-site is not utilised by Greater Glider. Queensland Wildnet and ALA record no sightings of Greater Glider within a 5 km radius of the referral area. Sightings have been recorded within 5 km by iNaturalist, although these records have a spatial uncertainty of 29.68 km therefore may be located much further or closer from the referral area than indicated. Given the referral area is not well connected to large areas of continuous remnant habitat it is unlikely that records of the species are within vegetation connected to the site. The referral area contains 3.5 ha of 'eucalypt woodland' (AU1) considered low quality for the species due to the lack of hollow bearing trees. The eastern extent of the referral area (AU2) includes a small polygon of regrowth RE12.11.10 (notophyll vine thicket). A study by Eyre (2006) assessing 43.7 million ha of potential Greater Glider habitat is South-east Queensland stated that notophyll vine thicket forests were not considered Greater Glider habitat even where emergent eucalypts (ironbarks, bloodwoods, stringybarks) are present. Given part of the referral area and surrounds include Notophyll vine forest which does not include emergent eucalypts as part of the technical description, it can be concluded that this vegetation community is not considered Greater Glider habitat. The balance of the referral area (AU3) consists of highly degraded and cleared vegetation consisting of only dense weeds and some regrowth native species. Given the Greater Gliders susceptibility to areas of clearing	**Significant impact not likely**

Significant Impact Criteria	Assessment	Impact
	and limited ability to move through cleared areas, this vegetation is not considered to provide dispersal, foraging or breeding habitat to the species. The *Petauroides volans* (greater glider (southern and central) Conservation Advice (DCCEEW, 2022) defines habitat critical to the survival of the Greater Glider as: • large contiguous areas of eucalypt forest, which contain mature hollow-bearing trees and a diverse range of the species' preferred food species in a particular region; and • smaller or fragmented habitat patches connected to larger patches of habitat, that can facilitate dispersal of the species and/or that enable recolonization; and • cool microclimate forest/woodland areas (e.g. protected gullies, sheltered high elevation areas, coastal lowland areas, southern slopes); and • areas identified as refuges under future climate changes scenarios; and short-term or long-term post-fire refuges (i.e. unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonize burnt areas. The referral area does not meet the definition of habitat critical to the survival of the Greater Glider in the conservation advice.	
Disrupt the breeding cycle of a population	The action will not disrupt the breeding cycle of a population of Greater Glider as: • Detailed targeted surveys did not detect any evidence of Greater Glider within the referral area. • The referral area contains 3.5 ha of 'eucalypt woodland' (AU1) considered low quality for the species due to the lack of hollow bearing trees. • Queensland Wildnet and ALA record no sightings of Greater Glider within a 5 km radius of the referral area. Sightings have been recorded within 5 km by iNaturalist, although these records have a spatial uncertainty of 29.68 km. • Locations where the species have been observed are not connected to the referral as a result of roads and cleared rural land with only thin linear strips of vegetation remaining (refer **Plan A9**). Surveys indicate no Greater Gliders are present on or adjacent to the site, let alone a breeding population.	**Significant impact not likely**
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that	The impact area is 5.9 ha of vegetation that contains 1.1 ha of regrowth notophyll vine forest vegetation (AU2), which are not considered Greater Glider habitat. The remaining vegetation consists of 3.5 ha of remnant eucalypt vegetation (AU1) lacking the specific habitat requirements (abundance of hollows) necessary for the species to persist. An area of 1.3 ha (AU3) was observed to be highly disturbed and dominated by weeds and	**Significant impact not likely**

Significant Impact Criteria	Assessment	Impact
the species is likely to decline	some regrowth native species. Furthermore, the referral area is not well connected to large areas of contiguous eucalypt forest as mapped notophyll vine forest is present to the east and south-east, the existing quarry footprint is present to the north and cleared/highly degraded rural land is present further south and west (including roads and dwellings). A review of online database (ALA) identifies multiple records within 5 km of the referral area. However, all these records have a spatial uncertainty of 29.68 km to protect the elevated threatened status of the species. The nearest record with confirmed location is approximately 7.5 km and 8 km south of the referral area associated with large intact areas of contiguous bushland including Tamborine National Park. These areas are not connected to the referral as a result of roads and cleared rural land with only thin linear strips of vegetation remaining (refer **Plan A10**). The lack of suitable habitat for the species within the referral area and minimal connectivity to large areas of known suitable habitat (i.e Mount Tamborine National Park) outside of the referral area indicates that it is highly unlikely that the proposed action will modify Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat	The proposed action will not result in the introduction or increase of invasive species that are harmful to the Greater Glider or Greater Glider habitat that are not already present.	**Significant impact not likely**
Introduce disease that may cause the species to decline	Disease is not listed as a threat to Greater Glider in the conservation advice. The project is highly unlikely to introduce disease that may cause the species to decline, and therefore no significant impact is considered to result from the proposed action.	**Significant impact not likely**
Interfere substantially with the recovery of the species	Detailed targeted surveys did not detect any evidence of Greater Glider within the referral area, suggesting the vegetation on-site is not utilised by Greater Glider. Queensland WildNet returned no sightings of Greater Glider within a 5 km radius of the referral area. A review of online database (ALA) identifies multiple records within 5 km of the referral area. However, all these records have a spatial uncertainty of 29.68 km to protect the elevated threatened status of the species. The nearest record with confirmed location are approximately 7.5 km and 8 km south of the referral area associated with large intact areas of contiguous bushland including Tamborine National Park. These areas are not connected to the referral as a result of roads and cleared rural land with only thin linear strips of vegetation remaining (refer **Plan A10**).	**Significant impact not likely**

Significant Impact Criteria	Assessment	Impact
	The recovery actions for the Greater Glider focus on preventing impacts from fires and the removal and fragmentation of habitat. The proposed action is not considered to interfere with the recovery of the species because the habitat on-site is already heavily disturbed due to historical clearing. In addition, the referral area contains 3.5 ha of eucalypt woodland that lacks the species habitat requirements for the species. This is considered an insignificant area of impact within the region, particularly as the species has been recorded multiple times within Mount Tamborine National Park, >8 km to the south, where large contiguous areas of habitat exist.	

4.5. Impact Assessment – South-eastern Glossy Black-cockatoo

As part of the original referral material (provided as **Part B**), the South-eastern Glossy Black Cockatoo was assessed as unlikely to occur within the referral area owing to the lack of suitable habitat in both a foraging and breeding capacity. Therefore, a response to the significant impact guidelines 1.1 was not considered required. This PD RFI identified the potential for the project to have a significant impact on the species and therefore a response has been provided in **.** The significant impact assessment determined that the project was unlikely to have a significant impact on the species owing to the lack of suitable habitat and low likelihood of occurrence.

Table A43: Significant Impact Assessment – South-eastern Glossy Black-cockatoo (Vulnerable)

Significant Impact Criteria	Assessment	Impact
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of an important population	Foraging habitat for the South-eastern Glossy Black-Cockatoo is characterised by dense stands of *Casuarina* or *Allocasuarina* species. Field surveys found the referral area lacked *Allocasuirna* or *Casurina* species with only eight (8) individual trees identified across two locations (refer **Plan A6.3**). The small referral area and lack of foraging specimens indicates extremely limited foraging habitat for the species. Two (2) hollow bearing trees were recorded across the referral area which contained hollows broadly considered suitable for the species (i.e ≥150mm diameter) (refer **Plan A6.3**). However, the context of the site has to be considered when assessing the suitability of habitat. The conservation advice states that hollows utilsed by the species are mostly within 1km of suitable feed trees and within 200m of permanent water. The referral habitat has only limited vegetation able to be utilized for foraging and paired with the lack of water present on site, the referral area is highly unsuitable as foraging habitat for the species. There is an identified area of foraging habitat located directly south of the referral area, but it does not overlap. (refer **Plan A12**) No evidence of a population exists within the referral area, nor were any individuals observed during field surveys. The closest evidence of a potential population surrounding the referral comes from species records located ~4.5km northwest in Plunkett Conservation Park. Due to the limited foraging and breeding habitat within the referral area and lack of population evidence, it is not anticipated that the area supports the species. Thus, it is considered highly unlikely that the proposed development will lead to long-term decrease in the size of an important population.	**Significant impact not likely**
Reduce the area of occupancy of an important population of the species	Despite some of the referral area being mapped as remnant vegetation, no vegetation within the referral area is considered to be potential foraging habitat (review **Plan A12**). Historical disturbance has seen large parts of the area be reflective of regrowth vegetation which has presented itself by having a distinct lack of hollow bearing trees being found across the site (one alive and one dead tree). Hollow bearing trees provide suitable breeding habitat key for the species. While there were hollows recorded on-site that have potential to be utillised by the species, the lack of foraging resources and water indicates it is highly unlikely the species would utilise the very few hollows on-site. Furthermore, the species was not observed on-site and a review of publicly available databases returned a high density of records approximately 4.5 km northwest of the site adjacent Plunkett Conservation Park. Over thirty (30) records are located within this same area suggesting that there is suitable and preferred habitat is present (refer **Plan A12**). While further records are present within 5 km of the referral area, these are within recognised areas of suitable habitat.	**Significant impact not likely**

Significant Impact Criteria	Assessment	Impact
	The removal of vegetation providing minimal foraging habitat and limited roosting habitat is not considered to have a significant impact on the species and will not reduce the area of occupancy of an important population of the species.	
Fragment an existing important population into two or more populations	No individuals, let alone a population, of this species were observed on site which also has minimal foraging resources and no water sources as preferred by the species. Even if the referral is occasionally utilized by the species it is highly unlikely that the action will result in fragmentation of an existing important population as the referral area is an expansion to an already existing quarry. As this expansion will only be clearing vegetation next to existing cleared areas, no patches of vegetation will be cut off from the intact vegetation in the surrounding area. Vegetation within the referral area does not provide the necessary foraging or breeding resources required by the species. No dense stands of suitable food tree's exist within the referral area and only two suitable hollows were observed. Therefore, it is highly unlikely the proposed development will result in the fragmentation of an existing important population into two or more populations.	**Significant impact not likely**
Adversely affect habitat critical to the survival of a species	The *Conservation Advice for Calyptorhynchus lathami lathami (South-eastern Glossy Black-cockatoo)* (DCCEEW 2022b) defines habitat critical to the survival of the species as areas: • For activities such as foraging, breeding, roosting or dispersal; • For long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators); • To maintain genetic diversity and long term evolutionary development; • For the reintroduction of populations or recovery of the species or ecological community. As mentioned previously, the referral area lacks suitable foraging and breeding habitat to support the species on account of the lack of foraging specimens and lack of large hollow bearing trees. Foraging habitat for the South-eastern Glossy Black-cockatoo is characterised by dense stands of *Allocasuarina* species. Field surveys identified the referral area to contain very limited *Allocasuarina* or *Casuarina* stands with only eight (8) individual specimens of *Allocasuarina torulosa*. Potentially suitable hollows were observed within two (2) trees (one alive and one dead) on-site. The referral area does not offer suitable foraging or breeding habitat which could support an important population of South-eastern Glossy Black-cockatoo. The lack of suitable habitat within and adjoining the referral area is	**Significant impact not likely**



Significant Impact Criteria	Assessment	Impact
	reflected in the lack of records within proximity of the site with the nearest being a high density of records approximately 4.5km northwest of the referral area adjoining Plunkett Conservation Park. These areas are far more likely to offer habitat that would contribute to the long-term maintenance of the species than the site where the high density of records within 5km of the site suggest the habitat values on site are undesirable. Given the referral area does not offer suitable foraging or breeding habitat for the species coupled with a general lack of records on the site and surrounding habitat, the project is highly unlikely to adversely affect habitat critical to the survival of a species.	
Disrupt the breeding cycle of an important population	The site does not contain suitable foraging or breeding habitat for the species. Detailed field surveys did not detect any evidence of a population of South-eastern Glossy Black-cockatoo within or adjacent to the referral area. Given the lack of suitable habitat to support the species and general limited presence within the local area it is considered highly unlikely that the project will disrupt the breeding cycle of an important population.	**Significant impact not likely**
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The referral area adjoins an already highly disturbed existing quarry. Field surveys did not identify suitable foraging habitats for the species due to a lack of dense stands of *Allocasuarina* and *Casuarina* specimens preferred by the species. Two (2) hollow bearing trees, one alive and one dead, were recorded which contained hollows that are broadly suitable for the species (≥150mm diameter). However, the suitability of these hollows as breeding habitat is limited by the context of the site and lack of foraging habitat in the vicinity. As the referral area does not contain significant breeding or foraging habitat to support this species, the proposed action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	**Significant impact not likely**
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Invasive flora and fauna species are not listed as a major impact to South-eastern Glossy Black-cockatoo under their conservation advice. However, large areas of *Lantana camara* intrusion were observed across the site during field surveys limiting any potential enhancement of suitable habitat on the referral area. While this species is not listed as a potential impact on the species, the invasion of invasive species is likely to limit the potential for suitable habitat to grow on site. Thus, as there is already an established presence of invasive species, any potential impact will not occur due to the proposed action and it will not have an impact to the species.	**Significant impact not likely**
Introduce disease that may cause the species to decline	Psittacine Beak and Feather Disease (PBFD) is known to affect the South-eastern Glossy Black-cockatoo. There is no mechanism for the proposed action (expansion of quarry operations) to introduce or spread PBFD. This is particularly so as the referral area currently lacks any suitable habitat and therefore is unlikely to attract any South-eastern Glossy Black-cockatoos to the area where disease could spread.	**Significant impact not likely**

Significant Impact Criteria	Assessment	Impact
Interfere substantially with the recovery of the species	Several conservation and management priorities have been identified in the *Calyptorhynchus lathami lathami* Conservation Advice. Some of these management priorities include protecting, restoring and enhancing the quality of known suitable habitat and increasing its extent, establishing buffer zones around native forests or woodlands, protecting large old trees and maintaining connectivity between regions. As discussed in the above points, detailed field surveys did not identify suitable foraging or breeding habitat for the species nor was any evidence of the species utilising the referral area observed. The proposed action is located adjacent to an existing quarry operation and contains vegetation with limited potential to provide habitat for this species. It is therefore considered highly unlikely that the project will interfere substantially with the recovery of the species as it is considered unlikely the referral area in its current state could support the species in any capacity.	**Significant impact not likely**

4.6. Impact Assessment – *Macadamia integrifolia*

As discussed in detail in Section 3.5.4 of this PD, 15 mostly juvenile (<100mm DBH) *Macadamia integrifolia* will be impacted by the action. Based on the criteria provided in the National Recovery Plan for Macadamia Species, the species on-site would be considered a 'high' priority population. A significant impact assessment is provided as which concludes that there is potential for the project to have a significant impact on the species though direct impacts to specimens on-site. An offset is proposed for those specimens that are unavoidably impacted. Refer **Section 6** for offset details.

Table A44: Significant Impact Assessment – Macadamia integrifolia (Vulnerable)

Significant Impact Criteria	Assessment	Impact
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
Lead to a long-term decrease in the size of an important population	Field surveys identified 15 individual specimens of *Macadamia integrifolia* within the referral that will be impacted as part of the proposed action. This population is considered a 'high priority' population under the National Recovery Plan for Macadamia Species (refer to section 3.5.4) based on the presence of records and number of individuals. The removal of 15 specimens of Macadamia integrifolia will decrease the size of an important population in the short-term through direct impact. Therefore, there is potential that the proposed action will lead to a decrease in the size of an important population.	**Potential for significant impact**
Reduce the area of occupancy of an important population of the species	Under the DCCEEW species profile for *Macadamia integrifolia*, their habitat is largely associated with remnant vegetation containing subtropical rainforest and complex notophyll vine-forest. Within the referral area there is 1.1 ha of non-remnant vegetation which contains regrowth characteristics reflective of RE 12.11.10. This area was observed to contain vegetation characteristic of notophyll vine forest and therefore reflects habitat for *Macadamia integrifolia*. It is however noted that on-ground the area of vine-forest was reflective of regrowth values in structure and composition, therefore lacking species diversity and densities. Areas were also observed to contain disturbance from invasive species, in particular, *Lantana camara* (Lantana) and *Ardisia crenata* (Coral Berry). Field assessments throughout and adjacent to the referral area identified 15 specimens of *Macadamia integrifolia* within and adjacent to the referral area which can be considered a 'high priority' population under the National Recovery Plan for Macadamia species.	**Potential for significant impact**
Fragment an existing important population into two or more populations	A review of online databases (ALA) identified several records of *Macadamia integrifolia* within 5 km of the referral area. Records are generally associated with presence of mapped RE12.11.10 in the broader locality. This vegetation is primarily located to the south-east, east and north-east of the referral area. Vegetation to the west of the referral area is predominantly mapped as RE12.11.3 which is not habitat for *Macadamia integrifolia*. The proposed action will impact 15 juvenile individuals located in 1.1 ha of poor-quality habitat on the periphery of a larger area of mapped RE12.11.10 which extends east and south. All but 1 record within 5 km of the referral area are located to the east or north of the site where large areas of mapped RE12.11.10 are present. It is therefore highly unlikely that the proposed action will fragment and existing important population into two or more populations.	**Significant impact not likely**

Significant Impact Criteria	Assessment	Impact
Adversely affect habitat critical to the survival of a species	The referral area contains 1.1 ha of regrowth RE12.11.10 which is highly disturbed and dominated by weeds. *Macadamia integrifolia* were recorded in areas of comparatively lower levels of disturbance. Records of the species in the broader locality are predominantly associated with large continuous areas of mapped RE12.11.10 which include remnant communities. Direct impact to 1.1 ha of poor-quality, regrowth habitat on the periphery of a much larger area of mapped RE12.11.10 is highly unlikely to adversely affect habitat critical to the survival of the species.	**Significant impact not likely**
Disrupt the breeding cycle of an important population	*Macadamia integrifolia* reproduce through cross-pollination by insects. The removal of 15 *Macadamia integrifolia* specimens is highly unlikely to disrupt the breeding cycle of an important population given the vast number of surrounding records that are located to the east and north where continuous areas of suitable habitat associated with RE12.11.10 is mapped. This allows for ample opportunity for cross-pollination and reduced reliance on juvenile specimens to be impacted as part of the proposed action.	**Significant impact not likely**
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	While *Macadamia integrifolia* specimens were located within the referral area where regrowth RE12.11.10 is present, the value of habitat is low as a result of dense weed coverage, *Lantana camara* (Lantana) and *Ardisia crenata* (Coral Berry), across the majority of the area. Mapped RE12.11.10 extends south and east of the referral area which formas part of a much larger, continuous area of mapped RE12.11.10. Notably, a significant portion of mapped RE12.11.10 adjacent to the referral area is equally highly modified. The direct impact to 1.1 ha of poor value regrowth RE12.11.10 on the periphery of a larger area of mapped RE12.11.10 is highly unlikely to decrease the availability or quality of habitat to the extent that the species is likely to decline. A review of online databases identified several surrounding records with all but 1 located within mapped RE12.11.10 to the east and north (refer **Plan A13**).	**Significant impact not likely**
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The referral area contains a significant number of invasive species at present, with the area currently containing the *Macadamia integrifolia* specimens observed to contain a dominance of *Lantana camara* (Lantana) and *Ardisia crenata* (Coral Berry). Exotic vines such as Cat's claw creeper (D. unguis-cati) and Madeira vine (A. cordifolia) can smother and kill mature macadamia trees, neither of which were observed within the referral area and therefore are unlikely to be spread by the proposed action. The benching design of quarries means that indirect impacts are considered minimal. Furthermore, surveys identified a significant portion of the surrounding landscape to be dominated by weeds. It is highly unlikely that the proposed	**Significant impact not likely**

Significant Impact Criteria	Assessment	Impact
	action will result in the introduction of new invasive species that are harmful to *Macadamia integrifolia* or Macadamia habitat that are not already present.	
Introduce disease that may cause the species to decline	Phytophthora root rot is a major problem for the Australian Macadamia industry and is a serious threat to wild populations. Of the Phytophthora species impacting Macadamia, *Phytophthora cinnamomi* is most widespread, has frequent impact and is the most devastating; *P. cinnamomi* causes stem canker, root rot, tree decline, dieback and tree death. The extent and severity of P. cinnamomi infestation is unknown. However, the probability of loss of populations through disease is considered as 'occasional.' P. cinnamomic is likely spread through movement of infested soil, water or plant material. The nature of quarry benching design and implementation of existing stormwater management plans and vegetation clearing management plans will reduce the risk of indirect impacts. It is highly unlikely that the proposed actions will introduce disease that will cause the species to decline.	**Significant impact not likely**
Interfere substantially with the recovery of the species	Under the DCCEEW species profile for these Macadamia species, their habitat is largely associated with remnant vegetation containing subtropical rainforest and complex notophyll vine-forest. Within the referral area there is 1.1 ha of non-remnant vegetation mapped which contains regrowth characteristics reflective of RE 12.11.10. This area was observed to contain vegetation characteristic of notophyll vine forest and therefore reflects potential habitat for *Macadamia integrifolia*. It is however noted that on-ground the area of vine-forest was reflective of regrowth values in structure and composition, therefore lacking species diversity and densities. Areas were also observed to contain disturbance from invasive species, in particular, *Lantana camara* (Lantana) and *Ardisia crenata* (Coral Berry). Field assessment identified 15 specimens of *Macadamia integrifolia* within the referral that will be directly impacted. The removal of low-value habitat for *Macadamia integrifolia* on the periphery of large areas of potentially suitable habitat with known records is unlikely to interfere substantially with the recovery of the species. Furthermore, directly impacted *Macadamia integrifolia* are proposed to be offset within suitable vegetation in the north of the property at a ratio of 4:1 resulting in a net gain. This proposed offset area forms part of a large area of mapped RE12.11.10 where records are present.	**Significant impact not likely**

4.7. Impact Assessment - Lowland Rainforest of Subtropical Australia – Threatened Ecological Community

Review of regional ecosystems remnant and regrowth vegetation mapping indicates the LRSA TEC has potential to be present in areas immediately south and east of the referral area. Field surveys demonstrated LRSA TEC is not present within or immediately adjacent to the referral area and representative surveys completed in other parts of Fulton hogan's landholdings also found areas mapped as regrowth RE12.11.10 did not meet the Key Diagnostic Criteria for the TEC (refer to **section 3.5.5**). However, given access was not possible on adjacent properties the potential presence of patches of LRSA TEC in the broader landscape cannot not be completely ruled out.

A significant impact assessment has been provided as **Table A45** which concludes that impacts to 1.1 ha of highly disturbed vegetation that is confirmed as not the LRSA TEC will not have a significant impact on the patch as a whole. Buffer distances of at least 35m will be present between the impact area and the neighbouring property avoiding any direct impacts. In addition to this buffer, visual observations indicate the TEC is note present for at least 50m south and east of the property boundary. Management measures to be implemented for extraction operations will also ensure indirect impacts are avoided.

Table A45: Significant Impact Assessment – Lowland Rainforest of Subtropical Australia TEC (Critically Endangered)

Significant Impact Criteria	Assessment	Impact
An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:		
Reduce the extent of an ecological community	Results from detailed vegetation surveys completed across Fulton Hogan's landholdings found that the LRSA TEC is not present within the referral area or adjacent areas where surveys were possible. Given the disturbance observed across all sample locations, which included five (5) plots and seven (7) quaternary assessments, vegetation within and surrounding Fulton Hogan's landholdings do not meet the Conservation Advice definition of a 'patch' of LRSA TEC. Vegetation on the site would be better described as a highly disturbed area of vegetation with some small, isolated patches of remnant vegetation that may be considered the ecological community. While it is ultimately not possible to conclusively determine where and if the LRSA TEC is present off-site in private land, field surveys demonstrate the LRSA TEC is not present within or immediately adjacent to the referral area. The minimum buffer from clearing associated with the action to the property boundary is 35m. Visual surveys did not observe vegetation that would meet the Key Diagnostic Criteria to be considered the LRSA TEC for a minimum of 50m beyond Fulton Hogan's property boundary. This buffer distance in combination with the benching quarry design and management actions outlined in chapter 5 avoids risk of an indirect impact on vegetation that may meet the LRSA TEC.	**Significant impact not likely**
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The referral area and adjacent land do not contain the LRSA TEC. Based on site observations and regional ecosystems mapping the closest patch of vegetation that may be considered the TEC are polygons of mapped remnant RE12.11.10 with the closest being approximately 175m from the referral area (refer to **Plan A6.5**). Vegetation within and surrounding Fulton Hogan's landholdings do not meet the Conservation Advice definition of a 'patch' which is described as a discrete and continuous area of the ecological community that may include small-scale 'disturbances'. Vegetation on and surrounding the referral area would be better described as a highly disturbed area of vegetation with some small, isolated patches of remnant vegetation that may be considered the ecological community. The referral area is an extension of the existing extraction activity and therefore is located on the edge of a larger area disturbed by ongoing extraction activities. The extension will not increase fragmentation in this area. Given extraction is ongoing, no additional roads will be required which may	**Significant impact not likely**

Significant Impact Criteria	Assessment	Impact
	fragment vegetation. The vast majority of mapped RE12.11.10 (pre-clear, regrowth and remnant) in the broader locality is present to the east of the referral area and extends north and south. The proposed action will not fragment this area with the referral located in the far west of the mapped extent.	
Adversely affect habitat critical to the survival of an ecological community	The area to be impacted does not meet the Key Diagnostic Criteria for the LRSA TEC. While it could not be confirmed on ground, there is potential that the LRSA TEC is present to the east of the referral area where remnant RE12.11.10 polygons are mapped. This vegetation polygon is located approximately 175m from the referral area. Site surveys indicate all vegetation between the referral area and the remnant polygon is not TEC. Impacts to highly degraded vegetation that does not meet the key diagnostic criteria for the LRSA TEC will not adversely affect habitat critical to the survival of the ecological community.	**Significant impact not likely**
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	The referral area is a steep south facing slope adjacent to an existing quarry footprint. The proposed quarry design (refer **Section 2.1.1**) provides benching which limits potential indirect impacts outside of the referral area. Furthermore, existing management plans (such as a stormwater management plan) are in use for the current quarry footprint. These management plans further reduce potential indirect impacts off-site. While the LRSA TEC was confirmed to not be within or adjacent to the referral area the precautionary principle dictates that it may be present within the neighboring property however the exact location is unknown with field surveys indicating occurrence is likely to occur where remnant RE12.11.10 is present. The referral area retains at least 35m buffer to the edge of the Fulton Hogan property which is the nearest point that the LRSA TEC could be present utilising the precautionary principle. Field surveys indicate the LRSA TEC is highly unlikely to be present within 50m of the property boundary due to high levels of disturbance. The inclusion of a buffer area, management plans and quarry pit design indicates it is highly unlikely that the proposed action will modify or destroy abiotic factors necessary for the ecological community's survival.	**Significant impact not likely**
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally	The 1.1 ha of regrowth RE12.11.10 with the referral area was observed to not contain the species diversity to be considered the LRSA TEC owing largely to historical clearing resulting in dense weed infestations suppressing natural regeneration and resulting in low species diversity.	**Significant impact not likely**

Significant Impact Criteria	Assessment	Impact
important species, for example through regular burning or flora or fauna harvesting	Direct impacts to vegetation confirmed to not be the LRSA TEC will not cause substantial change to the species composition of an occurrence of the ecological community.	
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: **- assisting invasive species, that are harmful to the listed ecological community, to become established, or** **- causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or**	Extensive surveys have been completed within and adjacent to the referral area where regrowth RE12.11.10 is present. All survey points (including 5 transects and 7 quaternary points) identified high levels of disturbance resulting in dense weed infestations as a result of historical and contemporary rural land-uses. The referral area will only impact vegetation confirmed to not meet the criteria of the LRSA TEC and therefore the proposed action will not cause a substantial reduction in the quality or an occurrence of the LRSA TEC. The proposed action will not assist invasive species as these species are already present in abundance. Furthermore, the proposed use of the referral area is for extraction and does not include the use of fertilisers, herbicides or other chemicals which may impact the LRSA TEC.	**Significant impact not likely**
Interfere with the recovery of an ecological community	The area proposed to be impacted is highly degraded and dominated by invasive species throughout which have suppressed native regrowth. The LRSA TEC lists the following criteria when considering recovery • *Large size and/or a large area to boundary ratio – larger area/boundary ratios are less exposed and more resilient to edge effect disturbances such as weed invasion and other human impacts* The area of mapped RE12.11.10 within the referral area is located on the western edge of a much larger continuous area of RE12.11.10 which includes both regrowth and remnant communities. Surveys have found vegetation within and immediately adjacent to Fulton Hogan's landholdings are not the TEC however vegetation extends further east, north and south. The area proposed to be impacted is highly unlikely to impact the larger area given it is adjacent to an existing quarry and does not contain a TEC.	**Significant impact not likely**

Significant Impact Criteria	Assessment	Impact

- *Evidence of recruitment of key native plant species or the presence of a range of age cohorts (including through successful assisted regeneration);*

Evidence of recruitment is significantly limited within the referral area with invasive species suppressing regeneration. Species richness was poor and does not meet the LRSA TEC criteria.

- *Good faunal habitat as indicated by patches containing mature (persistent residual) trees, logs, watercourses, diversity of landscape, contribution to movement corridors;*

Vegetation mapped as RE12.11.10 within the referral area lacked mature vegetation with the majority of canopy species recorded <8m. Furthermore, a diversity of habitats such as waterways were not present. Vegetation to the west of the referral area is mapped as RE12.11.3 and therefore the referral area is not well located to provide movement opportunities for fauna utilising RE12.11.10.

- *High species richness, as shown by the variety of native species;*

Species richness is key to defining the LRSA TEC with vegetation within the referral area observed to lack the species richness typical for this community (refer Section 3.5.5). Dense weed infestations and historical disturbance have resulted in limited regeneration of native species and thus low species richness across all strata.

- *Presence of listed threatened species;*

Threatened species *Macadamia integrifolia* was recorded within and adjacent the referral area. The species has been recorded at multiple locations within the broader landscape where RE12.11.10 is mapped (refer **Plan A13**).

- *Areas of minimal weeds and feral animals, or where these can be managed;*

As discussed throughout this document, the referral area and adjacent areas are highly disturbed and dominated by invasive species. The referral area is located on a steep south facing slope (up to 30%) indicating that active management of invasive species would be highly challenging. Furthermore, the referral area is zoned as extraction with existing state and local approvals.

- *Connectivity to other native vegetation remnants or restoration works. In particular, a patch in an important position between (or linking) other patches in the landscape; and/or,*

Regrowth RE12.11.10 associated with the referral area is located on the periphery of a larger area of continuous mapped RE12.11.10 further east which extends north and south. Vegetation within the referral area is not strategically positioned to link other patches in the landscape as vegetation to the

Significant Impact Criteria	Assessment	Impact
	west is broadly defined as eucalypt woodland with cleared rural land and roads present along with the active quarry. • *Patches that occur in areas where the ecological community has been most heavily cleared and degraded, or that are at the natural edge of its range* The referral area has been heavily degraded through historical rural land-uses as has a significant portion of the surrounding landscape. However, the referral area is not located at the natural edge of its range and is instead located adjacent to a large area of continuous RE12.11.10.	

5. Avoidance and Mitigation

This section responds to Item 5 of the PD request which requests the provision of a consolidated description of all proposed measures to avoid and mitigate impacts, including any additional to those described in the referral. The following subsections provide a response to Item 5.

5.1. Description of avoidance measures

Item 5.1 of the PD Request asks to ***"demonstrate that you have applied the mitigation hierarchy and exhausted all options to avoid and mitigate harm to protected matters, before resorting to environmental offsets. In doing this, you must demonstrate that any avoidance or mitigation measures will provide ecological benefits to the species in the long-term. For example, on-site avoidance/conservation areas must be connected or provide connectivity opportunities for species in the broader landscape, and must include enduring mitigation of impacts from adjacent development."***

5.1.1 Site identification for impact avoidance

The location/suitability of the expansion area is driven by the following key criteria:

- Strategic Alignment with Regional Planning: The site is mapped within a Key Resource Area which prioritises the area for the intended extractive resource land use. Blue Rock Quarry forms a part of a cluster of extractive industries within the wider Cedar Creek locality where the proximity to these, help cater the growing needs of development within SEQ.
- The existing quarry footprint and future expansion area (referral area) hold existing Environmental Authorities and local approvals that have been longstanding and reflect the planning intent of the region.
- The referral area sits immediately south of the existing Blue Rock Quarry footprint which has been operational for the at least 50 years, supplying SEQ with material to allow the expansion of urban areas including Priority Development Areas and significant infrastructure upgrades necessary to cope with rising population growth of the region.
- Expansion of an existing quarry with existing access roads avoids the need to open a new greenfield quarry which involves new access roads, infrastructure and other impacts. The referral area is a logical expansion to the existing footprint where 'least concern' vegetation communities are present
- With SEQ growth, and despite current quarry capacities and hardrock reserves, forecast quarry demand for Queensland is estimated to deplete by 33% by 2039-40. Significant depletion of hardrock material reserves in certain regions such as Greater Brisbane (depleting -70%) and the Gold Coast (depleting -29%), will lead to long term supply issues. It is therefore important to utilise existing quarries and expansion areas to ensure supply is able to cater for increased demand
- The expansion area is able to utilise and build on existing, operational management plans.

The site's location within an established extractive area and its integration with existing infrastructure and planning frameworks demonstrate its suitability for the proposed project. By utilising a highly



disturbed site and aligning with strategic planning goals, the Proponent has minimised ecological and community impacts associated with the development.

5.2. Description of Avoidance Measures

Item 5.2 of the PD Request asks to ***"Provide details (including a summary list or table) of avoidance and mitigation measures proposed to be undertaken to prevent or minimise impacts on protected matters (or their habitat) from the proposed action area."***

Item 5.2 (a) of the PD Request asks to provide "***a) description of avoidance measures that have been considered and applied. For example, project site selection to avoid valuable habitat, micro-siting of infrastructure to avoid impacts on habitat on site, or avoidance of any activity that may indirectly impact on essential lifecycle processes for species."***

As previously discussed within this PD info request response, the project is for extractive industry and will serve as an expansion to current resource extraction activities. The wider area has seen high levels of historical disturbance, and the referral area shows this same characteristic with high levels of weed incursion as well as immature "regrowth" vegetation. Due to the proximity to the existing quarry, the expansion is not expected to cause any further fragmentation within the area and the current levels of connectivity to surrounding vegetation will be upheld. Paired with the choice to locate the expansion within previously disturbed and extremely steep terrain, areas of higher quality habitat were avoided therefore the impact to valuable habitat is minimised and avoided as is reasonably practical.

5.2.1 Safeguards and mitigation measures

Item 5.2 (b) of the PD Request asks to provide ***"b) A description of proposed safeguards and mitigation measures to minimise and manage relevant impacts of the action, with reference to relevant statutory or policy documents at the Commonwealth and State level (e.g., Guideline: State Development Assessment Provisions (State Code 25))."***

The referral area holds current Environmental Authorities which pre-dates the listing of the Koala and therefore a response to the State Code 25 will not be required. However, a Vegetation Clearing and Fauna Management Plan (VCFMP) will form part of the broader management document for the proposed action.

5.3. Description of pre-clearance and clearance procedures

Item 5.2(c) of the PD Request asks for details of ***"pre-clearance and clearance procedures to ensure that species are detected and managed to minimise mortality, stress, injury, or introduction of disease."***

A range of mitigation measures are proposed to reduce identified potential direct and indirect impacts on habitat suitable for the identified MNES. The mitigation measures will include:

- Preparation of Vegetation Clearing and Fauna Management Plans (VCFMP);
- Preparation of Environmental Pre-clearance Prestart Packages;
- On-site prestart meeting;
- Engagement of a DETSI registered fauna spotter catcher;
- Ongoing annual compliance reporting.



These measures are detailed within the following sub-sections.

5.3.1 Environmental Management Plan (EMP)

Blue Rock Quarry is managed by an existing Environmental Management Plan (EMP) (refer **Attachment A3**). A number of management measures are included to ensure impacts are avoided and or minimised through the clearing and operational phases which include:

- Resources, roles and responsibilities
- Environmental and sustainability commitments
- Site specific processes
    - Noise and vibration
    - Air Quality
    - Stormwater Management
    - Waste Resources
- Awareness training and communication
- Monitoring and auditing
    - Water quality monitoring
    - Air quality monitoring
    - Noise monitoring

5.3.2 MNES Management Plan (MMP)

In addition to the above mitigation measures covered in the existing Environmental Management Plan, a specific MNES Management Plan (MMP) will be prepared and signed off by the Environmental Coordinator prior to construction. The MMP will either be a standalone document or be integrated into the existing EMP. Measures will be designed to avoid and mitigate the direct and indirect impact from the proposed action on all MNES with a focus on the Koala and Macadamia.

Key outcomes within the MMP include:

- MNES are protected on-site, where they are present.
- The abilities for MNES to move into, within and out of the site is maintained.
- Potential risks to species (e.g. vehicle strike, entanglement, fragmentation of habitat / becoming stranded, noise / light pollution, etc.) are identified and appropriately managed.
- All persons involved in construction and operation of the development are aware of the site values, their potential to impact on MNES and their habitats, and their responsibilities in regard to procedures and strategies with the MMP.

The MMP outlines construction measures to manage and mitigate impacts on native flora, and fauna, specifically the listed MNES and will include details on:

- Project description, site design and identification of conservation areas.
- Ecological values of the project area, including:
    - existing flora and fauna values on the subject site and in surrounding areas; and



    - key results from survey data, and the availability and quality of habitat.
- Environmental management, including:
    - EMP objectives and targets.
    - Roles and responsibilities.
    - Environmental protection processes
    - Environmental awareness and compliance training for all contractors and sub-contractors.
    - Monitoring and reporting
    - Statutory requirements.
- Pre-clearance requirements – fauna management, including:
    - Vegetation management (clearing and protection), including:
        - Objectives.
        - Management strategy.
        - Performance indicators.
        - Environmental outcomes.
        - Monitoring and adaptive management.
    - Protection of focal MNES and native wildlife, including:
        - Objectives.
        - Management strategy.
        - Performance indicators.
        - Environmental outcomes.
        - Monitoring and adaptive management.
        - Requirements of the DES approved Fauna Spotter / Catcher and adoption of the *Code of Practice for the Welfare of Animals Affected by Land Clearing and Other Habitat Impacts* in pre-clearance surveys, reporting and monitoring.
        - Sequential clearing plan and clearing restrictions.
        - Specifications and requirements for fauna exclusion fencing.
- Maintenance of safe wildlife movement opportunities (during construction) including:
        - Objectives.
        - Management strategy.
        - Performance indicators.
        - Environmental outcomes.
        - Details of temporary fencing.
        - Hours of operation.
        - Details of fauna awareness signage.

- Details of vehicle movement controls.

5.3.3 Vegetation Clearing and Fauna Management Plan

The Vegetation Clearing and Fauna Management Plan (VCFMP) is a document that provides an overview of core retention and removal areas within the application site as well as potential impacts of the construction phase on fauna from the loss of vegetated areas, isolated trees and likely barriers and impediments to local dispersal.

The purpose of the VCFMP is to manage the vegetation removal process and protection of fauna species within the clearing area. It is likely that an overarching VCFMP will be produced for the project area, followed by stage specific VCFMPs so that clearing mechanisms and management procedures are precise. Vegetation clearing information will include:

- Clearly show all vegetation communities to be removed and retained.
- Identify locations of threatened flora species both within the clearing area and adjacent locations to avoid impacts where possible.
- Include details of all civil works likely to impact on existing vegetation.
- Roles and responsibilities for site contractors, developer and the consultant group.
- Stockpiling and site access locations.
- A clearing sequencing plan showing the commencement of clearing and direction of removal (this should be in conjunction with the fauna management protocols to allow for the appropriate flushing of fauna towards surrounding safe haven areas.
- The stock piling and reuse of cleared vegetation.
- Specific details on the removal of previously identified potential fauna habitat trees.

Under Queensland's *Nature Conservation Act 1992*, all native fauna are protected and as such the following activities are required to ensure that vegetation removal and construction does not adversely affect native fauna species:

- Immediately prior to the commencement of clearing of native vegetation, a daily visual inspection of the area must be carried out;
- In the event of an animal being located, an area of 5 metres radius should be established around the tree, excluding machinery from this area until the animal has relocated (usually overnight); or
- If an animal requires relocating, this must be undertaken by a suitable qualified fauna expert (e.g. fauna spotter-catcher) recognised by the Queensland Parks and Wildlife Service.
- Any native fauna orphaned or injured by the development process must be reported to the Queensland Parks and Wildlife Service.
- The site supervisor is responsible for the safe management of site fauna and implementation of these specific fauna requirements.

Fauna management information included in the VCFMP will include:



- Species surveyed as using the site with a focus on those most likely impacted by development works.
- A list of relevant State and Commonwealth legislation constraints and controls for the above listed fauna.
- A plan showing existing habitat opportunities and locations.
- Details of the threats to existing fauna species.
- Clearing sequence plan from the VCFMP.
- Management and mitigation measures *i.e.,* temporary use of fauna exclusion fencing.
- Fauna spotter role, contacts and certification.
- Specific fauna management procedures for potential or known habitat trees.

5.3.4 Environmental pre-clearance process

Each clearing phase will be subject to an Environmental Pre-Clearance Checklist and Environmental Pre-Clearance process to ensure all approval requirements are met prior to vegetation clearing. Environmental Pre-Clearance Checklists are designed to easily show compliance for approval requirements, including EPBC approval requirements, in a format where they can be 'ticked off' prior to vegetation clearing.

The purpose of the checklist is to ensure:

- All required approvals are in place prior to clearing and all relevant documentation including approvals, approved plans and management documents are compiled and distributed to all relevant personnel.
- Threatened flora and fauna pre-clearance checks are undertaken of the clearing extent and appropriately documented so that:
    - Any threatened flora in the cleared area is identified and appropriate measures are in place.
    - Any threatened fauna and / or fauna habitat is identified and appropriately managed.
- Appropriate induction procedures are in place and environmental requirements are understood and complied with by all contractors and sub-contractors.

The Environmental Pre-Clearance Checklist is to be read in conjunction with the EMP. Together the Environmental Pre-Clearance Checklist and subsequent attachments, and the EMP will form the Environmental Pre-Clearance Package for that scope of works. Environmental Pre-clearance Packages require all approval documentation, including EPBC approval requirements, relevant to that clearing stage to be prepared, compiled and distributed to all relevant parties prior to the commencement of clearing. The Environmental Coordinator will be responsible for preparation of and the Environmental Pre-clearance Package.

All relevant parties (e.g. civil contractor, clearing contractor, fauna spotter catcher, environmental coordinator, superintendent and client) must sign the checklist prior to clearing, acknowledging that they have reviewed all, and will undertake the works in accordance with, approved procedures and reporting.



As way of acknowledgement, the Environmental Pre-Clearance Checklist will be run through at a project pre-start meeting with all personnel and relevant parties required to sign the checklist. No clearing can commence for a specific phase of works until the checklist has been completed and signed off by the Environmental Coordinator.

5.3.5 Fauna Spotter Catcher roles and reporting

A registered and suitability qualified fauna spotter catcher/ecologist will be employed for the construction phase of the proposed action to implement a protocol of best management practises as required under State legislation.

This role is mandated for any clearing of native vegetation in Queensland. The role of the Fauna Spotter Catcher is to complete an assessment of the works area no more than 2 weeks prior to clearing and present a short report to the proponent on the findings and how the proposed clearing is to be managed. The Fauna Spotter Catcher is required at the pre-start meeting and be on-site during all times of construction. Under the *Nature Conservation Act 1992* registered Fauna Spotter Catchers must complete a return of operations report to the Queensland State Government stating all fauna encountered and the specific management measures used to ensure the safety of native animals.

It is the role of the Fauna Spotter Catcher to take all reasonable steps to protect wildlife that may be impacted by vegetation clearing. These steps include:

- Undertaking wildlife load reduction measures through the pre-clearing trapping and relocation of wildlife within 1-2 weeks prior to the approved clearing being conducted. Sequential clearing cannot be used as a primary fauna management measure;
- Clearly mark (flag) vegetation found to contain fauna or fauna habitat (such as tree hollows, arboreal termite mounds, stick nests or possum drays with flagging tape) and visually and verbally communicate this information to the tree feller to ensure flagged trees are not felled until authorised by the fauna manager;
- Manage any Koalas identified on site in accordance with the *Nature Conservation (Koala) Conservation Plan 2006* and Management Program 2006-2016;
- Manage fauna habitat identified during the site inspection using the protocols discussed within the EMP, pre-clearance surveys and VCFMP;
- Work in conjunction with a professional tree feller in the removal of any vegetation;
- Schedule vegetation clearing to ensure that the impacts on wildlife are minimised and the likelihood of detection and capture of wildlife is maximised and wildlife load reduction measures are productive;
- Ensuring vegetation and rubbish piles are not left to serve as refuge for displaced or roaming wildlife through the implementation of the following measures:
    - Immediately (within 12 hours) remove or destroy such material
    - Erect wildlife proof barriers. Fencing surrounding stockpiles to prevent wildlife use
    - Ensure old (>12 hours) piles of felled vegetation are treated as potential wildlife habitat and inspected by a wildlife spotter/catcher prior to removal or destruction
- Limiting the felling of habitat and hollow bearing trees to the following methods:



- Segmental removal of tree, with hollow bearing limbs being checked by the Fauna Spotter Catcher and cleared of fauna using a cherry picker or suitable means determined by the Fauna Spotter Catcher
- Segmental removal of the tree, with hollow bearing limbs plugged and lowered to the ground for inspection by wildlife spotter
- Use of an excavator with vertical grab to lower the main trunk (only after the removal of lateral limbs)
- A combination of the above methods

5.3.6 Adoption of the RSPCA / ESU of WW Draft Code for Fauna Spotting

The project will adopt the DRAFT Code of Practice for the welfare of animals affected by land-clearing and other habitat impacts (Draft Code) prepared by the Australia Zoo Wildlife Warriors and Voiceless. This Draft Code is not mandatory, however, is advocated by various environmental organisations as the leading practice method for minimising impacts of native wildlife during construction processes.

The Draft Code will be adopted to ensure that fair, reasonable and appropriate measures are undertaken to minimise the adverse impacts on wildlife as a result of vegetation clearing. The code provides standards and guidelines for the humane treatment of wild animals affected by land clearing by detailing the general responsibilities of people involved in land clearing and the specific roles of wildlife spotter/catchers. As emphasised within the Draft Code, it will be the responsibility of all relevant parties to:

- Take all reasonable steps necessary to prevent cruelty or suffering to animals;
- Minimise the loss of wildlife caused directly or indirectly by development or land clearing; and
- Conserve, as much as possible, the ecological values of the development site and their surrounding natural environment (Draft Code, p.5)

The following components of the code are to be adopted as the following actions for any clearing works:

Action 1 – Developer to Engage Fauna Spotter Catcher

This action requires that the developer engage a Fauna Spotter Catcher with full registrations and licences provided in accordance with **DETSI**.

Action 2 – Fauna Spotter to Prepare a Wildlife Protection and Management Plan (WPMP)

The WPMP should include the following information:

- Description of the project with reference to impacts on wildlife or wildlife habitat;
- Pre-development plan of the site showing habitat areas, features, corridors, riparian habitats and adjacent areas;
- Results of any fauna surveys including pre-clearance surveys; and
- A wildlife and habitat impact assessment based on the proposed development works.

Action 3 – Prepare a Wildlife and Habitat Impact Mitigation Plan (WHIMP)

Following completion and of the WPMP the Fauna Spotter Catcher should prepare a more specific Wildlife and Habitat Impact Mitigation Plan (WHIMP), which will include details on:



- Measures required to be completed to minimise wildlife and habitat impacts during operational works;
- Wildlife capture and removal plan;
- Contingency plan for wildlife requiring euthanasia, other veterinary procedures or captive care;
- Wildlife storage and housing plan;
- Wildlife release and disposal plan; and
- Post works measures to minimise impacts on wildlife.

Action 4 – Fauna Spotter Catcher Role at Pre-Start Meeting

Prior to the commencement of any construction works, a pre-start meeting is to be held between the project manager, site foreperson, plant operators and Local Government representatives. At the pre-start meeting, the Fauna Spotter Catcher is to outline the clearing process and the requirements listed in the EMP.

Action 5 – During Clearing

The Fauna Spotter Catcher is to be on-site during all phases of clearing.

Action 6 – Post Works Reporting (Wildlife Management Report)

During the course of all site works, including the pre-clearance surveys, the Fauna Spotter Catcher is to keep an accurate record of all animals encountered, captured, incidents and disposals for each stage of the project. The records should form part of the Wildlife Management Report to be issued under licence requirements to the State Government. The Wildlife Management Report should consist of the following 3 sections:

a) Wildlife Habitat Management Plan – Aspects of the planning, design, construction and ongoing operation of the project in which risks to wildlife have been identified. This plan should also include recommendations and outline the type, frequency and timeframes for monitoring.

b) Wildlife Capture and Disposal Plan – Should contain the following details for each captured animals:

   i. Species
   ii. Identification name or number
   iii. Sex (M, F or unknown)
   iv. Approximate Age or Age Class (neonate, juvenile, sub-adult, adult)
   v. Time and date of capture
   vi. Method of capture
   vii. Exact point of capture (GPS coordinates)
   viii. State of health
   ix. Incidents associated with capture likely to affect health
   x. Veterinary intervention or treatments
   xi. Time held in captivity
   xii. Disposal method (euthanasia, translocation, re-release)

xiii. Date and time of disposal

xiv. Detailed of disposal (GPS points of release)

xv. For released animals, location relative to point of capture

c) Animal Injury and Euthanasia Report – similar details for the Wildlife Capture and Disposal Plan should be included in this report.

5.4. Operational phase

State Environmental Authority

The quarry extraction activities will be carried out in accordance with the relevant permits and approvals from State and Local government. In particular, extraction activities require an EA. An EA imposes conditions to reduce or avoid potential environmental impacts.

The Proponent holds a current EA (100268669) for existing operations which includes the expansion area (refer **Part B – Attachment 2a for full approval**). Key management actions conditioned for the expansion area include the following:

- All waste generated in carrying out the activity must be reused, recycled or removed to a facility that can lawfully accept the waste.
- Odours or airborne contaminants must not cause environmental nuisance to any sensitive place or commercial place and must not exceed defined concentrations as set out in the EA
- Contaminants must not be released to land and potential erosion is minimised
- Rehabilitation of disturbed areas must take place progressively as works are staged and new extraction areas are commenced.
- Noise generated by the activity must not cause environmental nuisance to any sensitive place or commercial place. Noise levels must not exceed identified *noise limits* as specified in the EA
- Generation of substantial low frequency noise is not permitted.
- Blasting activities must not exceed the limits for peak particle velocity and air blast overpressure in at any sensitive place or commercial place in accordance with the associated monitoring requirements set out in the EA.
- Blasting is only permitted during the hours of 9 am to 3 pm Monday to Friday, and from 9 am to 1 pm on Saturdays.
- Contaminants must not be released to any waters. The only contaminants to be released to surface waters are settled treated stormwater runoff from areas of the site not likely to be contaminated with waste materials in accordance with Surface water release limits and the associated monitoring requirements.
- An appropriately qualified person(s) must monitor, record and interpret all parameters that are required to be monitored by this environmental authority and in the manner specified by this environmental authority.
- When required by the administering authority, monitoring must be undertaken in the manner prescribed by the administering authority, to investigate a complaint of environmental nuisance

arising from the activity. The monitoring results must be provided within 10 business days to the administering authority upon its request.

- Any breach of a condition of this environmental authority must be reported to the administering authority as soon as practicable within 24 hours of becoming aware of the breach. Records must be kept including full details of the breach and any subsequent actions taken.

The existing EMP details management measures to ensure compliance with EA as detailed in **Section 5.2.4** during quarry operation. These include

- Water quality management and monitoring
- Air quality (dust) management and monitoring
- Noise and vibration management and monitoring
- Waste management
- Weeds management

Refer to **Attachment A3** for Existing Environmental Management Plan

5.5. Species Risk

Item 5.2 (d) of the PD Request asks to provide ***"measures to address the risk of species, such as the koala, entering the residential area and becoming trapped / isolated without resources for shelter whilst in the residential area and safe movement opportunities to get out of the residential area, along with sufficient information on the location and design of these measures."***

Item 5.2(e) of the PD Request asks for ***"ongoing management of direct and indirect impacts due to increased likelihood of human presence, attacks by domestic dogs, and injury caused by negotiating various fence types."***

Item 5.2(f) of the PD request asks for ***"details of how speed reduction is to be achieved (e.g., traffic calming devices) and plans showing the locations of each of these features and the manner in which they will be implemented)."***

Item 5.2(g) asks for ***"Information on safe road design and placement, including installation of crossing warning signs, wildlife threshold marking on road (include maps and imagery)."***

Item 5 (h) ask for ***"the locations and size of any proposed fauna movement solutions fire breaks, no-go or buffer zones (including buffers between the construction foodprint or remaining habitat in the referral area and adjacent to the site), and potential fencing, including***:

i. the location of any movement solutions, fire breaks, buffer zones or fencing,

ii. the characteristics of the fauna movement solutions, fire breaks buffer zones and fencing (i.e., height, length, wildlife proof measures etc)

iii. whether the proposed measures, such as fencing will provide a wildlife barrier to/from/within the proposed action area."

Exclusion fencing is not proposed for the project as the steep rocky terrain would be extremely challenging to erect fencing while also posing a significant risk to personnel. Furthermore, the topography and quarry interface (benching) create a natural barrier to fauna movement indicating it would be unlikely that Koalas would enter the quarry area.

No fauna friendly fencing is considered necessary as no retained areas are proposed.

5.5.1 Environmental Outcomes

Item 5.2(i) asks for ***"a description of the environmental outcomes the measures are expected to achieve including details of any baseline data or proposed monitoring to demonstrate progress towards achieving these outcomes."***

The environmental measures implemented for this project are designed to achieve several key outcomes, including the protection and preservation of biodiversity, minimization of ecological disturbance, and mitigation of impacts on fauna and habitats in the area. Specific outcomes include:

- The reduction in habitat fragmentation through logical expansion of the existing quarry footprint utilising existing infrastructure and access. This will help to maintain ecological corridors and minimise disturbances to local fauna in the area.



- The engagement of a Fauna spotter catcher and their preparation of a Wildlife Protection and Management Plan (WPMP) and Wildlife and Habitat Impact Mitigation Plan (WHIMP) in addition to post works reporting will allow for monitoring of the mitigation measures and their effectiveness throughout the clearing and operational process.

Further details on the proposed mitigation measures, monitoring and effectiveness is discussed in the following sections.

5.5.2 Timing, frequency and duration

Item 5.2(j) asks for ***"information on the timing, frequency, and duration of the measures to be implemented."***

The mitigation measures will be implemented throughout the clearing and operation phases. Initial measures, such as the pre-clearance surveys and fauna spotter-catcher appointments, will be conducted before any land clearing begins.

As no vegetation is proposed to be retained within the referral area, no design-specific mitigations measures are proposed to be implemented during the operation of the development.

Prior to commencement of the Action

- Fauna spotter engagement - Pre-clearance surveys and design of Wildlife protection Management Plan (WIMP) and a Wildlife and Habitat Impact Mitigation Plan (WHIMP)
- Pre-clearance process and checklist managed by an environmental coordinator
- Approval of Macadamia Impact Management Plan under the *NCA 1992*

During clearing

- Fauna spotter present
- Implementation of Environmental Management Plan (EMP)
- Implementation of Vegetation Clearing and Fauna Management Plan (VCFMP)

During operation

- Post Works Reporting (Wildlife Management Report)
- Implement EMP and EA conditions
- Establish on-going control measures and reporting/monitoring requirements

5.5.3 Cost

Item 5.2(k) asks for ***"an actual or estimated cost of the mitigation measures."***

No design-specific mitigation measures are proposed as part of the project. Clearing and operation mitigation measures such as the engagement of a fauna spotter catcher will be factored in as part of clearing and operation costs with an approximate cost of $15,000.

5.6. Mitigation Measure Assessment of Effectiveness

Item 5.3 of the PD Request asks to ***"Provide an assessment of the predicted effectiveness of each proposed avoidance or mitigation measure, noting that the effectiveness of a particular measure is a reflection of confidence in the anticipated outcome. The assessment of effectiveness should be evidence based and include examples of demonstrated success of a particular measure to achieve the desired avoidance/mitigation outcome."***

Item 5.4 of the PD Request asks "for each measure proposed, indicate the:

- ***a) impacts that are being avoided and/or the significance of impacts being reduced through mitigation.***
- ***b) Scientific basis for conclusions being draw***
- ***c) an evidence-based likelihood of success/risk assessment***
- ***d) responsible party***
- ***e) milestones / performance / completion criteria***
- ***f) proposed monitoring and evaluation program.***

Refer to **Table A46** for an assessment of mitigation measures effectiveness during the clearing and operation phases of the project.

Item 5.5 of the PD Request asks to ***"Describe any statutory or policy basis for the proposed measures, including reference to the SPRAT Database and relevant approved conservation advice, recovery plan or threat abatement plan, and a discussion on how the proposed measures are not inconsistent with relevant plans.***

For example, the National Recovery Plan for the Grey-Headed Flying Fox states an objective to:

> ***'To improve the Grey-headed Flying-foxes national population trend by reducing the impact of the threats outlined in this plan on Grey-headed Flying-foxes through habitat identification, protection, restoration and monitoring'.***

Please provide a discussion on how the proposed action is not inconsistent with relevant species' objectives or alternatively, how the proposed avoidance, mitigation/management and offsetting actions will compensate for any residual significant impacts, thereby ensuring consistency with the objective for relevant EPBC Act species."

Item 5.6 of the PD Request states that ***"All proposed measures must consider the 'S.M.A.R.T' principle:***

S – Specific (species-specific objectives, methods, outcomes, and repeatability)
M – Measurable (baseline information, quantifiable, auditable)
A – Achievable (timeframes, financial and human resources)
R – Relevant (conservation advice, recovery plans, threat abatement plans)
T – Time-bound (set implementation, performance and completion timeframes)."

A number of mitigation measures are proposed to reduce identified impacts on koala and their habitat and include the following:

- Implementation of the site-specific Vegetation Management Plan and Fauna Management Plan



- Preparation of Environmental Pre-clearance Prestart Packages;
- On-site prestart meeting prior to clearing; and
- Engagement of a DETSI registered fauna spotter catcher.

These measures are detailed in **Table A32**.

Table A46: Clearing and Operational impacts

Impact	Avoidance and Mitigation Measures	Evaluation of the Effectiveness of Measures	Mitigation	Timeline	Risk Assessment	Milestone	Residual Impact
Loss of 5.9ha of critical habitat for the Koala.	Habitat to be cleared on site is regrowth and remnant vegetation that has been subjected to historical modification. No more than 5.9 hectares of vegetation identified as habitat critical to the survival of the koala will be removed to facilitate the project and is considered unavoidable.	Ecological surveys and habitat assessment conducted across the referral area led to the precise spatial analysis of vegetation and habitat qualities. The project will result in the unavoidable loss of not more than 5.9 ha of critical habitat for the koala.	Location of project immediate adjacent to the existing quarry footprint earmarked for extractive industry.	Works complete	The field survey applied has accurately mapped the features that are to be impacted.	The project area is cleared and extraction commences	**Loss of 5.9 ha critical habitat for the koala**
Risk of injury or mortality to koalas from vegetation clearing and operation	All clearing will be undertaken in accordance with the stage specific Environmental Management Plan (EMP). This will include: • Provisions for the proponent to engage a qualified Fauna Spotter Catcher to participate in all stages of vegetation clearing. The Fauna Spotter Catcher will be required to adopt elements of the Draft Code of Practice endorsed by the Australia	The use of a Fauna Spotter Catcher throughout clearing is an effective tool to: 1. Identify they types of species on site prior to clearing; and 2. Identify and flag habitat features that require thorough examination before clearing. Fauna Spotter Catchers have a primary role to ensure no fauna are in vegetation before it is cleared. Given the size of koalas and their	Fauna Spotter Sequential Clearing	Present at all times during clearing works At all times during clearing	Fauna Spotter not present and Koala injured or killed Sequential clearing not undertaken and fragmentation induced	No injury or death to Koalas during clearing Clearing completed as per sequential clearing	The use of a Fauna Spotter is mandated **No residual impact** Sequential clearing is mandated and guided by VCFMP and pre-clearance checklists and pre-starts

Impact	Avoidance and Mitigation Measures	Evaluation of the Effectiveness of Measures	Mitigation	Timeline	Risk Assessment	Milestone	Residual Impact
	Zoo Wildlife Warriors and Voiceless (The Draft Code). The role of the Fauna Spotter Catcher is to ensure that no injury or deaths occur to Koalas or other fauna species. • Vegetation will be cleared sequentially. Clearing will be conducted so that fauna are flushed into safe, vegetated areas and it will avoid pushing fauna into fragmented areas. • Restricted operating hours (i.e. daylight 6am - 6pm) • Prohibition of companion /security animals (e.g. dogs). • Restricted vehicle speeds (e.g. max 40 km) within project area. In addition to this, all personnel shall attend environmental training as part of the site induction process prior to entering the work site. As part of this training all	utilisation of tree branches, they can quite easily be observed from the ground. As such, it is extremely unlikely that a koala will be killed or injured during vegetation clearing, particularly given the onerous and thorough procedures set out The Draft Code. The sequential clearing of vegetation will allow for the gradual loss of vegetation, giving fauna time to naturally disperse away from the disturbance. Each of these measures will ensure that the risk of injury or death to Koalas as a result of operation are avoided and mitigated. The aim of these procedures is to support **zero injuries or death to identified MNES threatened species** as a result of clearing	Restricted clearing hours Dog prohibitions Low vehicle speeds	At all times during clearing At all times during clearing and operation At all times during clearing and operation	Works outside of hours No companion and security dogs on-site Speeds are exceeded resulting in fauna strike	Works area completed within mandated hours Clearing an operation of quarry without dogs on-site Clearing and operation completed without vehicle strike	**No residual impact** Works hours are mandated and guided by the MMP. **No residual impact** Dog controls are mandated and guided by the MMP. **No residual impact** Speed limits are mandated and guided by the MMP. **No residual impact**

Impact	Avoidance and Mitigation Measures	Evaluation of the Effectiveness of Measures	Mitigation	Timeline	Risk Assessment	Milestone	Residual Impact
	personnel will be instructed on their obligations in regard to vehicle movement and operational speed limits.		Site inductions	At all times during clearing and operation	Induction avoided	Clearing and operation completed without inductions being breached	Inductions are mandated and guided by the MMP. **No residual impact**
Disturbance to Koala during clearing and operation	The EMP includes controls to avoid, minimise and mitigate risk of disturbance to MNES habitat during clearing and operation, specifically: <u>Light and noise disturbance</u> Operation of the project will result in increased noise and light disturbance. These impacts may disturb fauna and disrupt foraging, reproduction or movement behaviours. Restricted operation hours (e.g. 6am-6pm) will limit disruption from light and noise impacts, as well as allow a 12 hour period for fauna to disperse and forage. <u>Contamination, weeds and pathogens</u>	Clearing and operation management implemented by the EMP are considered to be able to effectively avoid, minimise and mitigate risk of disturbance to Koala and allow for adaptive management where required. With appropriate monitoring, pre, during and post construction by the Fauna Spotter Catcher, no residual impacts area expected to occur.	Minimise light and noise disturbance The risk of contamination and exacerbating weeds and pathogens is minimised	At all times during clearing and operation At all times during clearing and operation	Light and noise impacts on fauna Contamination, weed and pathogen incursion	Light and noise disturbance is limited to daylight hours Contamination and weed and pathogen incursions do not occur	Light and noise restrictions mandate works between 6 am and 6 pm in the MMP. **No residual impact** The MMP and VCFMP will mitigate the risk of contamination and weed and pathogen incursion **No residual impact**



Impact	Avoidance and Mitigation Measures	Evaluation of the Effectiveness of Measures	Mitigation	Timeline	Risk Assessment	Milestone	Residual Impact
	Operation activities increase the risk of weeds, pathogens and contamination into the site. To manage these impacts, a Weed and Pathogen Management Plan will be prepared to identify potential weed species, and include appropriate controls for weed and pathogen management, disposal and monitoring. Weeds will be actively managed within the project footprint and disposed of appropriately. No companion animals (e.g. dogs) will be allowed within construction areas. <u>Vehicle disturbance</u> Reduced vehicle speeds in proximity to existing bushland areas during operation. <u>Barriers to dispersal</u> Vegetation will be cleared sequentially. Clearing will be conducted so that fauna are		Barriers to dispersal are not created	At all times during clearing and operation	Vegetation clearing and stockpiling creates a barrier to fauna	Vegetation clearing and stockpiling is undertaken as guided by the VCFMP	As above **No residual impact**
			Inductions and training	At all times during clearing and operation	Inductions avoided	All inductions are completed and records maintained	Site induction mandatory **No residual impact**
			Adaptive management	At all times during operation	Adaptive management not applied	Adaptive management utilised if required	The MMP includes adaptive management strategies to avoid recurrence of adverse incidents should they occur **No residual impact**

Impact	Avoidance and Mitigation Measures	Evaluation of the Effectiveness of Measures	Mitigation	Timeline	Risk Assessment	Milestone	Residual Impact
	flushed into safe, vegetated areas and it will avoid pushing fauna into fragmented areas. <u>Contractor management</u> All personnel shall attend environmental training as part of the site induction process prior to entering the work site. As part of this training, all personnel will be instructed on their obligations in regard to vegetation clearing protocols and to protect native fauna. Additional controls for Koala will be presented in a toolbox talk.						
Hydrological changes	• Stormwater/erosion management measures will continue to be implemented as per existing management plans for Blue Rock Quarry • All work will be undertaken in accordance with appropriate management plans to	The implementation of a project wide Stormwater Management Plan as designed by certified engineers ensures that hydrological change area appropriately accounted for. Theses management measures will reduce impacts from higher levels of surface water flow caused by hardstand areas and ensures natural drainage lines	Hydraulic and Stormwater Management Plan	Existing operational management plan	Unforeseen hydrological changes	No worsening of hydrological impacts as a result of the expansion	The Hydraulic and Stormwater Management Plan has been prepared for the referral area **No residual impact**

Impact	Avoidance and Mitigation Measures	Evaluation of the Effectiveness of Measures	Mitigation	Timeline	Risk Assessment	Milestone	Residual Impact
	ensure the hydrological changes across the site do not impact on surrounding vegetation.	continue to function as they naturally would have. Stormwater detention basins prevent localised flooding of drainage lines and waterways caused by increased runoff over hardstand areas and also contribute to maintaining water quality levels.					

6. Proposed Offsets

Item 6 of the PD Request asks for ***"Where residual significant impacts remain to the MNES identified in part 3 after exhaustion of all reasonable avoidance and mitigation measures, a compensatory environmental offset in accordance with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy (EPBC Offsets Policy) may be required. Offsets must be specific to the species or ecological community being impacted, be like for like, and must improve or maintain the viability of the species. Offsets are not intended to make proposed actions with unacceptable impacts, acceptable."***

A significant impact is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment that is to be impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts.

It is considered that the proposed action is likely to have a significant residual impact on Koala and *Macadamia integrifolia*. Several avoidance and mitigation measures relating to the clearing and operation of the quarry are proposed which seek to reduce the potential for immediate and long-term impacts or indirect impacts on MNES.

6.1. Significant Residual Impact Summary

An impact of 5.9 ha of critical Koala habitat will occur from the direct clearing associated with the proposed action. The management measures described throughout this PD submission sufficiently mitigate the risk of increased injury or mortality to MNES.

Koala:	**Removal of 5.9 hectares of critical habitat at a MHQA score of 5.73 (rounded to 6) with a quantum impact of 3.54 ha.**
Macadamia integrifolia:	**Removal of 15 individual specimens (juvenile and semi-mature)**

6.2. Offset Proposal (Koala)

Significant residual impacts on the identified MNES being Koala habitat, are proposed to be wholly acquitted over a third-party offset area.

The offset area is located on the Little Kipper Creek Offset Property at Little Kipper Creek Road, Biarra, within the Somerset Regional Council Local Government Area (LGA), approximately 11 km west of the Queensland town of Esk. It is located within a broader offset property owned by third-party offset provider Koala Farmland Fund (KFF1 Pty Ltd). The offset area is located on a common network of State and Regional corridors. Presently, the offset area is utilised for cattle grazing and is managed through regenerative farming practices (refer **Attachment A7** for Offset Management Plan). Key site details are provided in **Table A47** . The offset site is shown on **Plan A19** with completed field surveys shown on **Plan A20**.

Table A47: Little Kipper Creek offset area summary

Address	Little Kipper Creek Road, Biarra, Queensland, 4313
Lot / Plan	Part of Lot 112 on CA311003
Area	40 ha
Tenure	Freehold
Local Government Area	Somerset Regional Council

6.3. Offset Area Suitability (Koala)

One (1) offset area has been selected to be secured to wholly acquit the impacts to MNES proposed under the EPBC application (EPBC 2024/09844) and provide benefit additional to the required compensation for residual impacts. The suitability of the proposed offset area is discussed within this section and considers the bioregional context of the site, ecological values, water resources and topography, and existing habitat values for Koala.

6.3.1 Bioregional Context

Queensland is divided into 13 biogeographical areas to identify biodiversity features at a regional scale. The proposed offset area is located in the South East Queensland (SEQ) Bioregion. The SEQ Bioregion shares its western boundary with the Brigalow Belt Bioregion and extends from the Border Ranges on the New South Wales border, north to the dry coastal corridor between Gladstone and Rockhampton (DEHP 2016). The McPherson Range borders the southern boundary of the bioregion while the Great Dividing Range is to the west. Ranges extend north-south through the central region creating an altitudinal gradient from the coast. Small volcanic plugs remain in the landscape offering distinctive conditions for taxa and ecosystems (DEHP 2016). Large sand islands off the coast offer unique environments and create sheltered bays and passages within which marine and coastal plants and animals thrive (DEHP 2016). The impact area and proposed offset area are both in the same sub-bioregion, being the Moreton Basin.

6.3.2 Offset Area Values

Regional and landscape context

The proposed offset area sits adjacent to the Biodiversity Planning Assessment regional corridor and Southeast Queensland Regional Plan (‘*ShapingSEQ 2023*’) regional biodiversity corridor which spans from the Noosa headland in the north, down to Mount Barney and Lamington National Park on the Queensland border. The offset site is shown in the context of surrounding koala habitat on **Plan A21** and regional corridors on **Plan A22**. The corridor aims to encompass large tracts of vegetation, terrestrial connectivity, aquatic connectivity, species richness, diversity and refugia, ecosystem representation and uniqueness and climate resilience areas (Queensland Government 2017).

The regional biodiversity corridor forms part of the Great Eastern Ranges terrestrial corridor which extends from the mountains of Victoria to the Atherton Tablelands in far north Queensland (Mackay *et al.* 2010). The Great Eastern Ranges corridor provides habitat and movement for a range of species that have Federal, State and Local significance, supports significant cultural heritage values and offers scenic amenity and outdoor recreation opportunities (Mackay *et al*. 2010).



The proposed offset area will conserve freehold land surrounding the regional biodiversity corridor, extending the habitat within the adjoining legally bound environmental offset areas and that is generally available around the remnant vegetation within the regional biodiversity corridor. The proposed offset site is well positioned to provide high conservation values once rehabilitated through the management actions proposed in this OMP and contribute to the provision of protected, well-connected, and high-quality Koala habitat in the region. By assisting the natural revegetation, replanting, and removing pests, weeds, and threats, the property will provide biodiversity offsets that ensure an ecological gain on the residual impacts resulting from the impact area which aligns with offset principle 1 of the EPBC Act Environmental Offset Policy (EOP).

Topography

The proposed offset area has varied topography characterised by open paddock and gently sloping hills. The topography of the proposed offset area ranges from 295m Above Sea Level within the higher points to 205m above sea levels in the gully line areas.

Water resources

The proposed offset area contains a central watercourse which flows downstream west-east. Additional gully lines are present across the proposed offset area which are not mapped as waterways. Vegetation is consistent across the proposed offset area.

Koala habitat

The proposed offset area comprises low quality Category X (non-remnant) vegetation which is mapped as a single pre-clear vegetation community RE12.9-10.2. The site contains scattered Koala habitat trees and regrowth vegetation but is dominated by cleared open paddock with pasture grasses throughout. Existing vegetation within the offset area consists of scattered *Corymbia citriodora* (Spotted Gum) with *Eucalyptus crebra* (Narrow-leaved Ironbark), *Corymbia intermedia* (Pink Bloodwood) and *Angophora subvelutina* (Broad-leaved Apple). Species present are indicative of the pre-clear vegetation community of RE12.9-10.2 described in **Table A48** below and **Photo set 7**.

Table A48: Regional ecosystem descriptions

Regional Ecosystem	Description (Queensland Herbarium)
12.9-10.2	*Corymbia citriodora subsp. variegata* open forest or woodland usually with *Eucalyptus crebra*. Other species such as *Eucalyptus tereticornis*, *E. moluccana*, *E. acmenoides* and *E. siderophloia* may be present in scattered patches or in low densities. Understorey can be grassy or shrubby. Shrubby understorey of *Lophostemon confertus* (whipstick form) often present in northern parts of bioregion. Occurs on Cainozoic and Mesozoic sediments. Not a Wetland. (BVG1M: 10b).

The dominance of vegetation communities containing foraging habitat values for the Koala suggests the proposed offset area can provide value for this species with targeted restoration techniques.

Current management arrangement

Presently, the proposed offset area is utilised for cattle grazing and is managed through various farming practices. This includes the use of the following management activities:

- Controlled grazing to ensure ground cover levels are maintained, subsoil moisture is retained, and pasture growth is encouraged
- Invasive and noxious weed control in grazing areas targeting WONS where practicable, and;
- Establishing and maintaining adequate firebreaks across the property.

Current threats

The wider Little Kipper Creek Road Offset Property is and has been utilised in various ways for agriculture, which attracts threats to both livestock and native wildlife. The major and obvious threat within the proposed offset area and broader offset property is wild dogs. The Somerset Regional Council (SRC) lists wild dogs as abundant and widespread throughout the Somerset region and has also listed wild dogs (*Canis familiaris dingo*, *Canis familiaris dingo* X *Canis familiaris*, *Canis familiaris*) as declared pest animals. The SRC website documents that wild dog numbers are at an all-time high across the region. Further, residents are increasingly engaged in raising livestock and poultry, resulting in a readily available food sources for wild dogs.

The Queensland WildNet database identifies 2 confirmed records of *Canis* sp. and/or *Canis familiaris* and 3 records of European foxes within 20 km of the proposed offset area, located within connected vegetation. Wild dogs are known to travel up to 20 km seeking prey with home ranges of individuals likely to overlap with the offset area. Further, as discussed in detail in **Attachment A7**, both motion-sensor camera traps that were placed on site for the baseline surveys recorded wild dogs.

Under the Queensland *Biosecurity Act 2014*, there is a 'general biodiversity obligation' for landholders to manage biosecurity risks that are under their control and take reasonable and practical steps in doing so. To determine the extent of management and whether it is necessary to take reasonable steps in managing the biosecurity risk, the landholder is required to assess the risk and its potential harm (*i.e.,* extensive productivity loss). Currently, the landholder does not undertake feral animal control as it is assessed under the 'general biosecurity obligation' of the *Biosecurity Act 2014*, that feral animal threat to productivity does not have a positive cost benefit to the current land use (*i.e.,* the expenditure to undertake feral animal control would not result in enough economic gain in productivity to warrant implementation).

Other threats include:

- clearing and harvesting of timber for pastoral uses
- uncontrolled wildfire, and;
- barbed wire.





Photo set 7: Offset Area AU1 – Non-remnant RE12.9-10.2

6.3.3 Offset Management Plan

An Offset Management Plan (OMP) has been developed for the proposed offset area and is provided as **Attachment A7.** It provides details on offset suitability, environmental outcomes, baseline survey methods and results and management framework. The objective of the OMP is to summarise existing habitat quality for the Koala (*Phascolarctos cinereus*) within the offset area and to provide management actions designed to achieve the identified environmental outcomes.

The OMP identifies outcomes focused management actions pursuant the EPBC Act, for the provision of the Koala (*Phascolarctos cinereus*) habitat offset. The management objectives for the offset area, in alignment with the EOP will:

- Deliver an overall conservation outcome that improves the viability of habitat for the Koala
- Provide a direct offset that is in proportion to the level of statutory protection that applies to habitat for the Koala
- Be of a size and scale proportionate to the residual impacts on habitat for the Koala
- Effectively account for and manage the risks of the offset not being successful within the required management timeframe.
- Provide a conservation gain additional to what is already required by a duty of care or to any environmental planning laws at any level of Government.
- Be efficient, effective, timely, transparent, scientifically robust and reasonable with appropriate transparent governance arrangements in place for measuring, monitoring, auditing and enforcing the management of the offset area.

The achievement of environmental outcomes within the offset area will be measured using methodologies, monitoring and maintenance detailed in **Attachment A7 – Offset Management Plan.** The approval holder must apply management actions to achieve the prescribed outcomes at the offset area.

6.3.4 Impact Compensation

The proposed offset area will acquit **151.32%** of the quantum impacts for Koala (refer **Table A49**)

Table A49: Offset Area Koala MHQA offset improvement scores

Assessment Unit	Area (ha)	Habitat Quality Score		Offset Acquittal
		Baseline (rounded score)	Future (rounded score)	
AU1	40.00	5.98 (6)	7.61 (8)	151.32%

6.4. Offset Proposal (*Macadamia integrifolia*)

Significant residual impacts on the identified MNES being 15 *Macadamia integrifolia* specimens, are proposed to be directly offset utilising the 'feature' component of the EPBC Offset Assessment Guide. The proposed offset area where *Macadamia integrifolia* will be offset is located in the northern extent of Fulton Hogan's landholdings (**Plan A23**). The Planting Offset Area (POA) is a 1.77 ha area mapped as containing a mixture of remnant, regrowth and pre-clear RE12.11.10.

Direct offset of *Macadamia integrifolia* is also a state requirement under the *Nature Conservation Act 1992*. As part of this requirement, Macadamia integrifolia specimens are required to be offset at a ratio of 4:1 and detailed in a *Macadamia integrifolia* Impact Management Plan which will require approval from the Queensland Government.

6.4.1 Impact Management Plan

An Impact Management Plan (IMP) has been prepared in accordance with **Section 3.2** of the *Nature Conservation (Plants) Regulation 2020 Protected Plants Assessment Guidelines* and also responds to the requirements of the EPBC Act Environmental Offsets Policy.

The following sections are detailed in the IMP:

- Nature of Impact
- Management of Impact
    - Risk of Impact
    - Prior to vegetation clearing
    - During operation works
- Proposed Planting Area assessment
- Propagation measures
- Planting, Maintenance and Monitoring
- Adaptive Management/risk of failure
- Conclusion

6.4.2 General Suitability EPBC Offset Policy Criteria

A response the EPBC offset Policy criteria for the proposed *Macadamia integrifolia* offset has been provided as **Table A50**.

Table A50: Response to Offset suitability criteria – Macadamia integrifolia

No.	Offset Suitability Criteria	***Macadamia integrifolia* – Planting Offset Area**
1	*Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action*	The Planting Offset Area (POA) delivers a conservation gain for *Macadamia integrifolia* through: a) Direct compensation for impacts on 15 *Macadamia integrifolia* as part of the proposed action. b) Results in a net gain of individual *Macadamia integrifolia* in the broader landscape by planting 60 specimens within a nearby area with similar vegetation values. c) Replace and increase the number of individuals of the local population which is known to be present adjacent to the POA d) Provide an opportunity for *Macadamia integrifolia* to disperse into areas that contain suitable vegetation to the north of the site.
2	*be built around direct offsets but may include other compensatory measures*	The POA includes a direct offset solution which equites 300% utilising the features portion of the Offset Assessment Guide.
3	*be in proportion to the level of statutory protection that applies to the protected matter*	At the time of the referral, *Macadamia integrifolia* was listed under the EPBC Act as 'Vulnerable.' Under the International Union for Conservation of Nature data the probability of annual extinction is 0.2. This factor applies through the meta data of the Offset Guide assessment calculation sheets for which each species has been assessed as achieving greater than 100% offset through the proposed POA
4	*be of a size and scale proportionate to the residual impacts on the protected matter*	Direct and indirect impacts for the protected matters have been calculated at the impact site using the count method: • *Macadamia integrifolia* – 15 individuals To achieve an offset, direct features are provided at a ratio of 4:1 at the POA. This will result in the planting of 60 individuals.
5	*effectively account for and manage the risks of the offset not succeeding*	The proposed POA is located in the northern extent of Fulton Hogan's landholdings away from areas utilised for extraction. This area contains mapped vegetation communities known to be habitat for *Macadamia integrifolia* (RE12.11.10). Existing wild *Macadamia integrifolia* were observed adjacent to this area off-site indicating the suitability of vegetation for the species. The proposed offset will be at a ratio of 4:1 to ensure a net gain in individual *Macadamia integrifolia* in the region. A *Macadamia integrifolia* Impact Management Plan has been included as **Attachment A8** which detail the methods, management and monitoring of planted Macadamia integrifolia and reducing risk of the offset not succeeding. Additionally, this IMP will be required to be approved and implemented under the state Nature Conservation Act 1992 which will include several approval conditions.
6	*be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs*	The proposed offset of the impacted *Macadamia integrifolia* is proposed at 4:1 which is far additional to what is required under the EPBC Offset Assessment guide equating to **300%** of the impact. This results in a net gain of *Macadamia integrifolia* in the areas which would not have occurred without the controlled action decision.
7	*be efficient, effective, timely, transparent, scientifically*	An Impact Management Plan has been developed in accordance with the appropriate state guidelines detailing the timing management of the proposed offset planting area.



No.	Offset Suitability Criteria	*Macadamia integrifolia* – Planting Offset Area
8	*have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced*	The POA will be legally secured by Voluntary Declaration (VDec) followed by a covenant under either the *Land Act 1994* or *Land Titles Act 1994* or suitable protective mechanism as determined by the department. Management of the POA will continue to be owned and funded by the proponent (Fulton Hogan) in accordance with approval conditions under state and federal legislation.

7. Social and Economic Matters

This section responds to Item 8 of the PD request which requests further details on economic and social matters, including:

a. ***Provide details on the social and economic costs and / or benefits of undertaking the proposed action, including the basis for any estimations of costs and / or benefits.***
b. ***Identify if economic benefits and employment opportunities are in addition to what would have been expected if the action were not to take place.***
c. ***Provide details of any public stakeholder consultation activities, including the outcomes of those consultations.***
d. ***Provide details of any consultation with Indigenous stakeholders.***

7.1. Economic costs and / or benefits

A report completed for the Queensland Department of Resources (Oxford Economics Australia 2023) details the existing and project demand for quarry material in Queensland.

- Quarry Hardrock demands in Queensland are predominately driven by civil engineering construction.
- In 2021 South East Queensland accounted for 48% of all quarry materials in the state. South East Queensland construction activity is forecast to rise from $23.4 billion in 2022-23 to a peak of $34.6 billion in 2030-31 (+48%).
- Demand is driven by the dwelling stock deficiency and strong population in dense areas within South-eat Queensland.
- Construction work done in the Greater Brisbane region is set to increase from $14.9 billion to a peak of $23.4 billion (+57%) by 2030-31
- Civil engineering construction is forecast to rise steadily over the next decade, peaking at $7 billion in 2031-32 (from $4.1 billion in 2022-23)
- Quarry material demand in South East Queensland is estimated to shift up 13% in 2023-24, before growing to a peak of 42 Mt in 2031-32.
- Quarry material demand will soften mid-decade, before being pulled back up to record levels as residential investment cycles up – in volume terms reaching 7.9 Mt (2026-27).

The above forecasts are driving demand for hardrock associated with the project. Furthermore, Blue Rock quarry is centrally positioned to provide resources for the rapidly developing south-east Queensland. This activity will have a ripple effect, creating secondary economic benefits for local businesses. The proximity of the referral area to existing road networks, ensures efficient transport and logistics operations



7.2. Social costs and / or benefits

The project will bring multiple social benefits to the community. Primary benefits would include direct employment opportunities at Blue Rock Quarry for the extraction and processing of material. Secondary benefits would be the supply of major projects in the area (residential developments/infrastructure upgrades) which intern leads to increased employment opportunities and benefits to the local community and broader SEQ locality.

7.3. Stakeholder engagement and consultation activities

The Development Application lodged in 2014 which included vegetation clearing for the project area involved a Public Notification process. This involved public notices on all of the site road frontages, letter drops to all the neighbours and an advertisement in the local newspaper which described the project and invited submissions. The public notice period for submissions was 15 business days and a total of four (4) submissions were received.

Submissions were made by local landowners and private citizens. Five overarching concerns were raised in the four submissions which can be summarised as follows:

1. Quarry expansion impacts relating to noise, traffic, blasting and dust (environmental & health).
2. Impacts of vegetation clearing (habitat, wildlife and fragmentation of landscape)
3. Koala habitat protection
4. Consistency with land use / Council town planning
5. Impacts on Stormwater and health of Cedar Creek

Fulton Hogan responded to all of the submitters concerns to the satisfaction of Council and the State assessment agencies which resulted in issue of Planning Approval for the works.

7.4. Cultural Heritage Considerations

Fulton Hogan engaged external consultants (Everick Heritage) regarding aboriginal cultural heritage on the referral area. Duty of care assessment has been provided as part of the original referral material detailing cultural heritage management strategies to be implemented in compliance with the Aboriginal Cultural Heritage Act 2003 (QLD). The Cultural Heritage Duty of Care Assessment was included as part of the original referral lodgement (**Part B** - **Attachment 6**). No further cultural heritage consultation has occurred.

8. ESD and Environmental Record

8.1. Ecologically Sustainable Development

Item 9.1 of the PD Requests asks to, ***"Provide a description of how the proposed action meets the principles of ecologically sustainable development, as defined in section 3A of the EPBC Act."***

The EPBC Act has a key objective to '*promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resource,'* (EPBC Act section 3). Ecologically Sustainable Development (ESD) is defined within the Commonwealth Government's National Strategy for Ecologically Sustainable Development as *'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'.*

The goal of the National Strategy for Ecologically Sustainable Development is:

> *Development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.*

The core objectives include:

1. To enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;
2. To provide for equity within and between generations; and
3. To protect biological diversity and maintain essential ecological processes and life-support systems

These objectives are accompanied by seven guiding principles of ESD (refer **Table A51**).

Table A51: ESD Principles

ESD Core Objectives
1. Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.
The design of the project has taken both long-term and short-term economic, environmental, social and equitable considerations into account. Local planning has identified the area as suitable for extractive industries and long-standing approvals are in effect. **The project will benefit individuals and the community by providing key material to enable the development of housing and infrastructure in the local area and broader state. The Oxford Economics Australia 2023) details the existing and projected demand for quarry material in Queensland highlight the rapid increase in demand for quarry material to keep up with the expected investment and delivery of a wide range of developments in SEQ.**

2. **If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.**

The implementation of precautionary measures in decision making is used where there is a threat of serious or irreversible harm and where there is scientific uncertainty as to the extent of possible environmental damage. There are a number of factors which help determine whether or not an action might cause serious or irreversible environmental damage, including:

i. **The spatial scale;**
ii. **The magnitude of possible impacts;**
iii. **The perceived value of the threatened environment;**
iv. **The complexity and connectivity of possible impacts;**
v. **The manageability of possible impacts;**
vi. **The level of public concern and the rationality or scientific basis for the concern; and**
vii. **Reversibility of possible impacts.**

Impacts to the Koala and associated habitat have been identified as the primary environmental concern on a level of National Environmental Significance. The site's utilisation by Koalas and its ability to provide critical habitat for the Koala has been discussed in detail throughout this report. The site has been recognised to support low level of Koala activity and an area of 5.9 hectares has been identified as containing habitat critical to the survival of the Koala.

A number of possible impacts have been identified as a result of the project; however these are all considered to be localised impacts. The magnitude of impacts is restricted to the referral area. Impacts can be summarised as those arising from the loss of habitat. A number of management measures will be imposed to avoid and mitigate these impacts.

The proposed action is not considered to pose a threat of serious or irreversible damage to the local Koala population or the broader environment. Potential impacts have been considered and management plans will be in place to ensure that any impacts are minimised and offset.

3. **The principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations**

The referral area was identified due to its location proximal to existing quarry footprint. The project will ensure extractive needs of the region are met inline with the zoning intent and long-standing environmental approvals without compromising areas within the broader locality with more significant ecological value and greater connectivity.

4. **The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.**

The location of the ecological values within the referral area are considered to provide highly disturbed ecological values. Although Eucalypt woodland is present, surveys identified a lack of

specific habitat features such a foraging resources, mature trees and hollows. The referral area is a logical expansion to an existing quarry footprint that will not require any additional access or infrastructure to complete. While vegetation is present further south of the referral area, the quarry expansion area shares the majority of its boundary with the existing quarry footprint. Furthermore, management plans and approvals are already in place for the referral area providing greater confidence in the effectiveness of mitigation measures.

9. Environmental Record

Fulton Hogan have an exemplary record for environmental management and sustainability at State and National levels. Fulton hogan have worked closely with community as well as local and state authorities to ensure site responsive outcomes on several projects.

9.1. Proceedings under a Commonwealth. State or Territory Law

Item 10 of the PD Request asks for, ***"The information provided must include details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:***

- ***a) The person proposing to take the action;***
- ***b) For an action for which a person has applied for a permit, the person making the application;***
- ***c) If the person is a body corporate – the history of its executive officers in relation to environmental matters; and***
- ***d) if the person is a body corporate that is a subsidiary of another body or company (the parent body)—the history in relation to environmental matters of the parent body and its executive officers."***

There have been no legal proceedings brought under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against the Fulton Hogan since at least 2005 (being the date to which the Fulton Hogan current record system extend).

10. Conclusion

Saunders Havill Group (SHG) act on behalf of Fulton Hogan Quarries Pty Ltd in the coordination and production of the response to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Controlled Action Determination. Assessment is to be completed by a Preliminary Documentation (PD) for the expansion area of Blue Rock Quarry (the proposed action, EPBC Reference: 2024/09844).

- Listed threatened species and communities (sections 18 & 18A)

The entire 5.9 ha referral area will be cleared to facilitate extractive processes. Within the referral area, vegetation was observed to vary from remnant Eucalypt woodland to regrowth notophyll vine forest and weed dominated areas. High levels of disturbance were observed across the referral area.

MNES were observed within the referral area being Koala (*Phascolarctos cinereus*) and Macadamia Nut *(Macadamia integrifolia)*. Other MNES flora and fauna species were determined to have low/unlikely likelihood of occurrence due to habitat limitations such a foraging resources and mature/hollow bearing trees.

A land-based offset is proposed to offset significant residual impacts for the Koala including direct impacts to breeding and dispersal habitat within the referral area. The proposed offset accounts for **151.32%** of the impact which more than compensates for the impacts associated with the project. Furthermore, the proposed offset area includes greater contextual value to Koala amongst existing and future offset sites that will be protected in perpetuity.

A direct offset solution is proposed for impacts to 15 *Macadamia integrifolia* to be impacted which utilises the 'features' component of the Offset Assessment Guide. The proposal is to directly offset impacted specimens at 4:1 located in the northern portion of Fulton Hogan's landholdings. The proposed offset accounts for **300%** of the impact.

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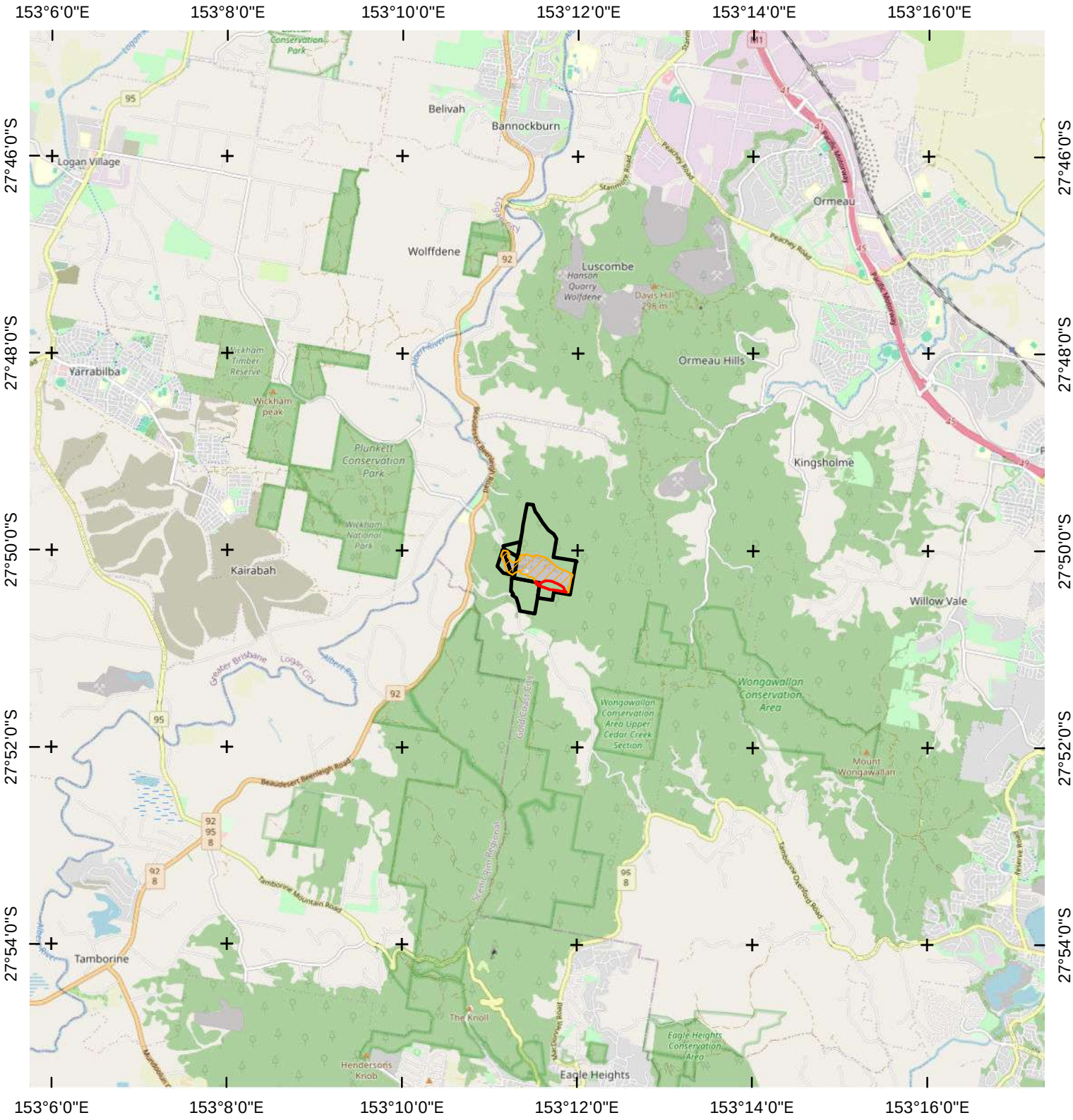
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12. Figures & Plans



LEGEND

- Site Boundary
- Referral Area [5.9 ha]
  Quarry Expansion Area
- Existing Quarry Area

FIGURE A1

SITE CONTEXT

CLIENT

Fulton Hogan

PROJECT
CEDAR CREEK, QLD

COORDINATE SYSTEM
GDA 2020 MGA Z56

SCALE (A4)
1:100,000

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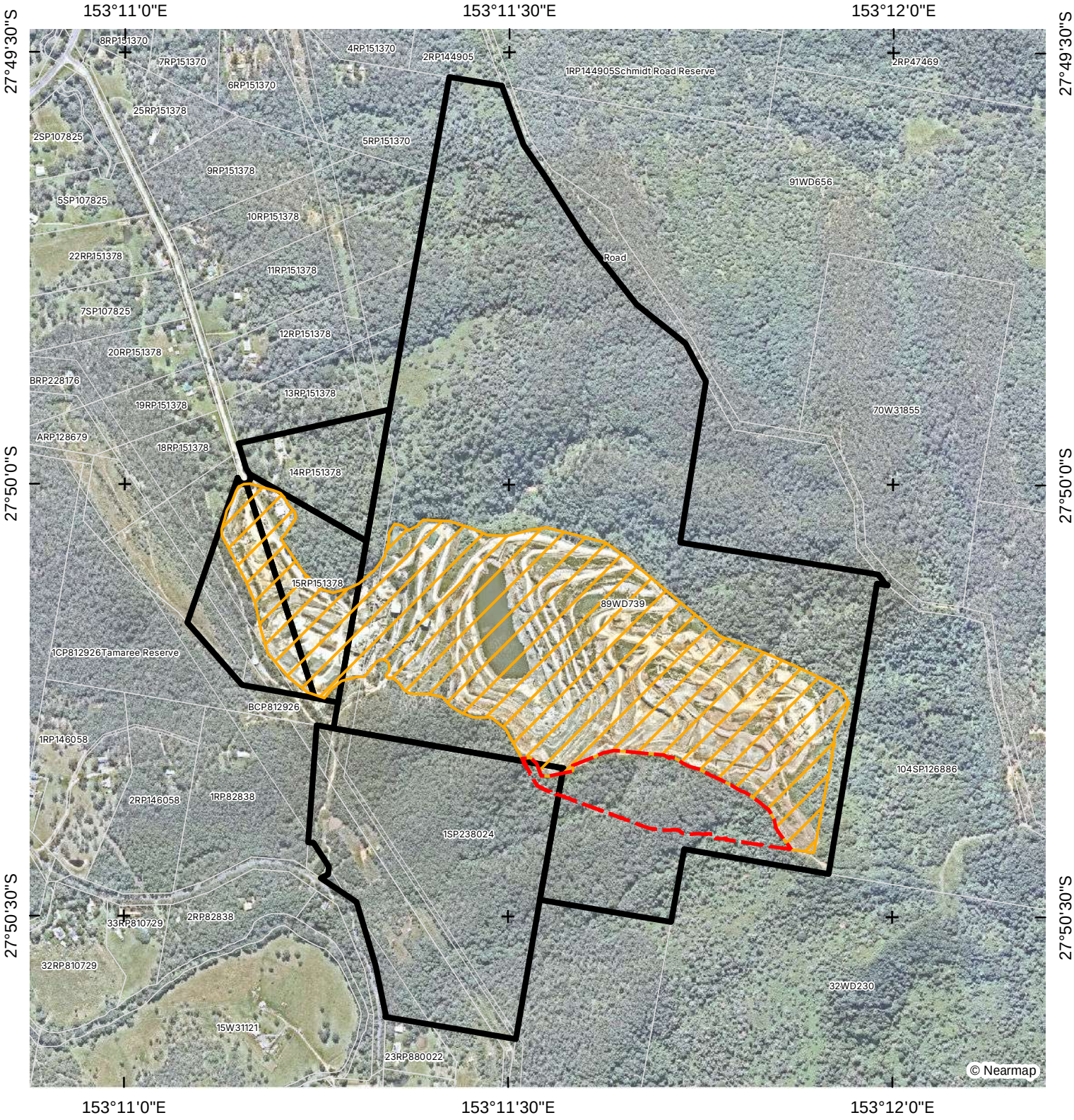
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FILE REFERENCE
11390 E PD Figure 1 Site Context A

DATE 7/10/2025



LEGEND

- Qld DCDB
- Site Boundary
- Referral Area [5.9 ha]
  Quarry Expansion Area
- Existing Quarry Area

FIGURE A2

SITE AERIAL

PROJECT
CEDAR CREEK, QLD

COORDINATE SYSTEM
GDA 2020 MGA Z56

SCALE (A4)
1:11,419

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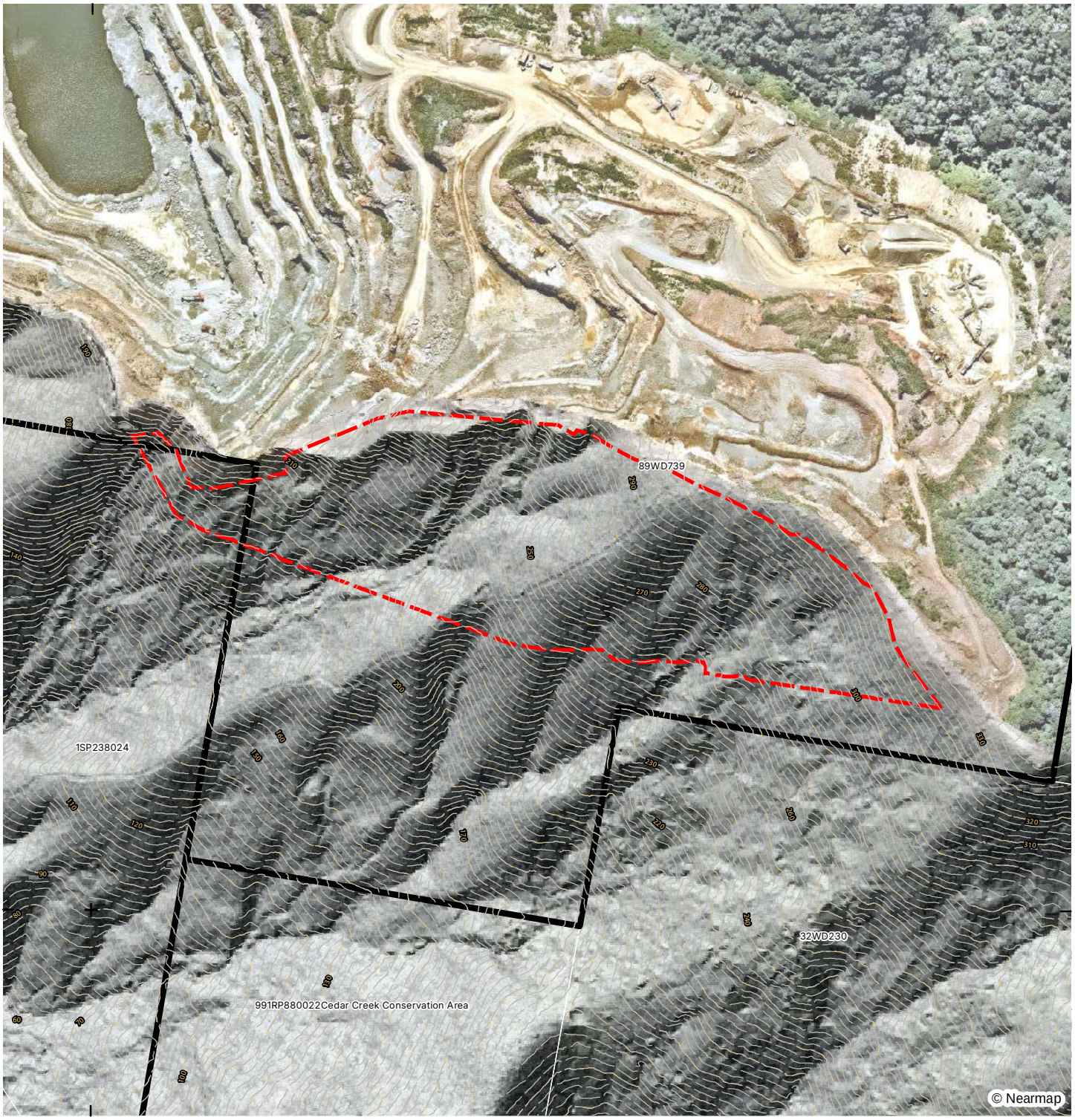
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FILE REFERENCE
11390 E PD Figure 2 Site Aerial A

DATE 7/10/2025

153°11'30"E



27°50'30"S

27°50'30"S

153°11'30"E

LEGEND

- Qld DCDB
- Site Boundary
- Referral Area [5.9 ha]
  Quarry Expansion Area
- Contours (2.5m intervals)
- Contours (10m intervals)

FIGURE A3

TOPOGRAPHY

PROJECT
CEDAR CREEK, QLD

COORDINATE SYSTEM
GDA 2020 MGA Z56

SCALE (A4)
1:4,000

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N

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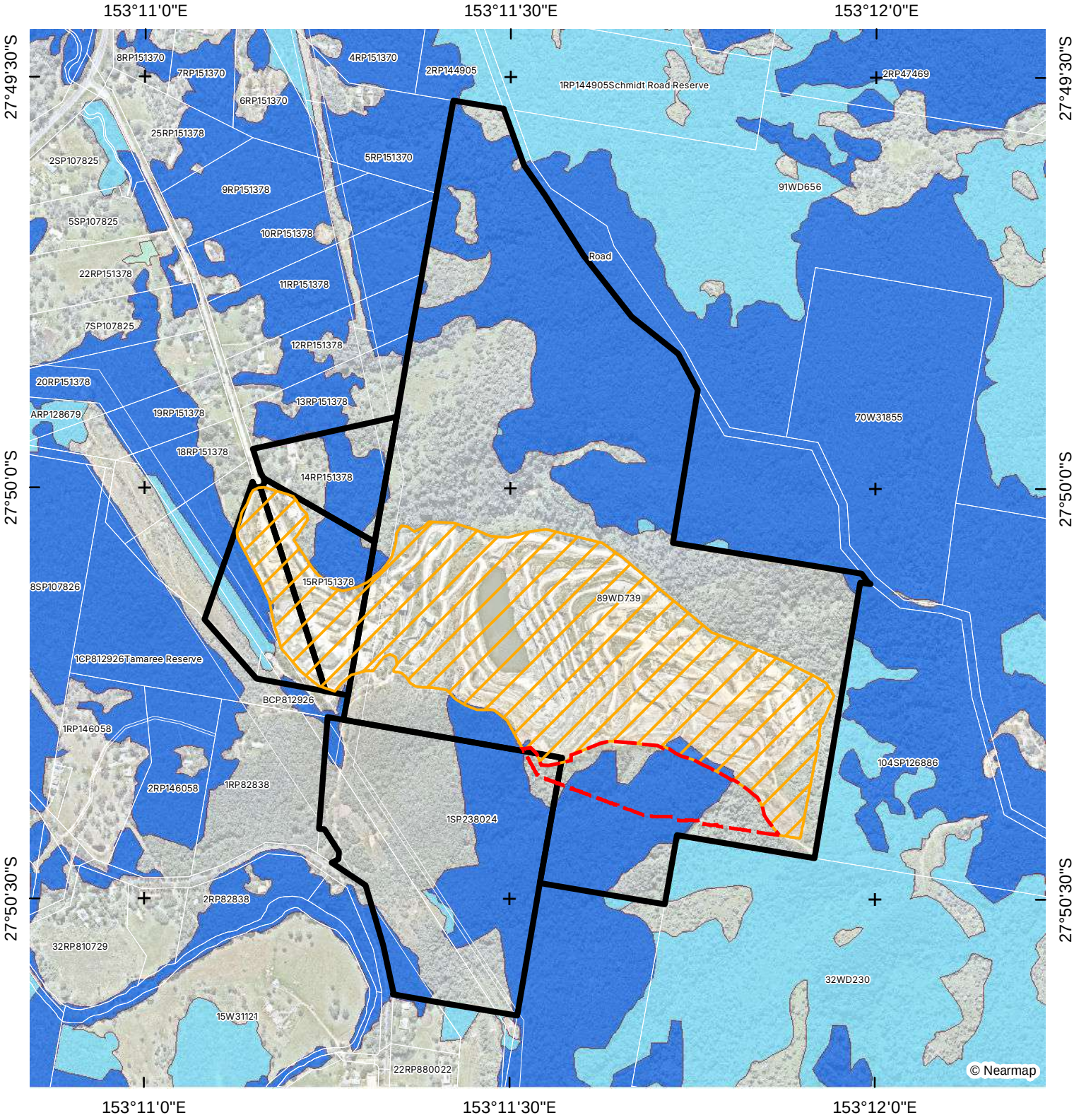
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FILE REFERENCE
11390 E PD Figure 3 Topography A

DATE 7/10/2025



LEGEND

- Qld DCDB
- Site Boundary
- Referral Area [5.9 ha] *Quarry Expansion Area*
- Existing Quarry Area

Regulated Vegetation

- Category B area - *Remnant vegetation*
- Category C area - *High value regrowth vegetation*
- Category X area - *Vegetation not regulated under the VMA*
- Water

FIGURE A4

REGULATED VEGETATION MAP

PROJECT
CEDAR CREEK, QLD

COORDINATE SYSTEM
GDA 2020 MGA Z56

SCALE (A4)
1:12,000

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CLIENT

Fulton Hogan

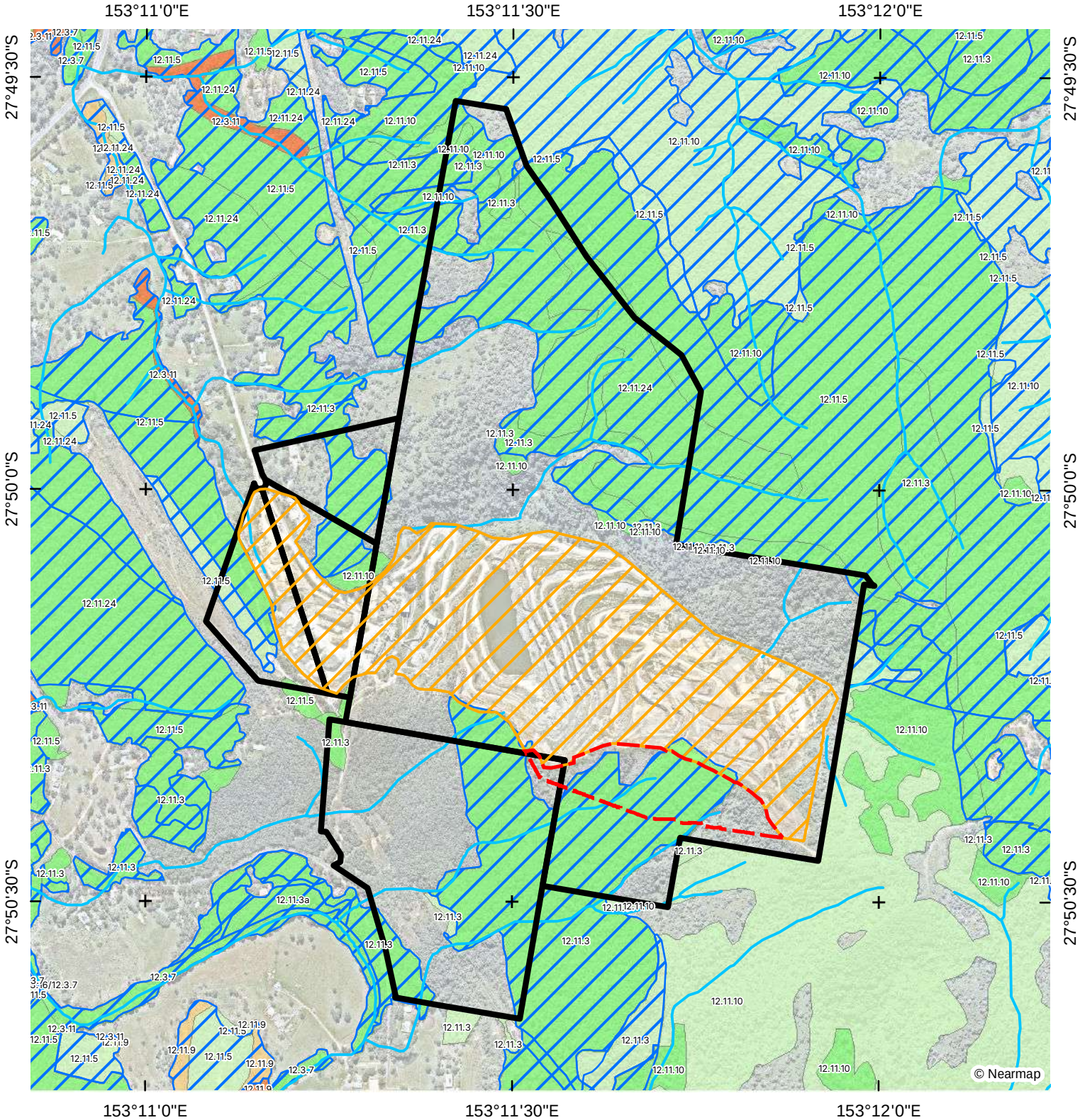
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FILE REFERENCE
11390 E PD Figure 4 RVM A

DATE 7/10/2025



LEGEND

- Site Boundary
- Referral Area [5.9 ha]
  Quarry Expansion Area
- Existing Quarry Area
- VM Watercourses
- VM Essential Habitat

VMRE Mapping

- Category A or B area containingof concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C area containingof concern regional ecosystems
- Category C area that is a least concern regional ecosystem

FIGURE A5

SUPPORTING VEGETATION MAP

CLIENT

Fulton Hogan

PROJECT
CEDAR CREEK, QLD

COORDINATE SYSTEM
GDA 2020 MGA Z56

SCALE (A4)
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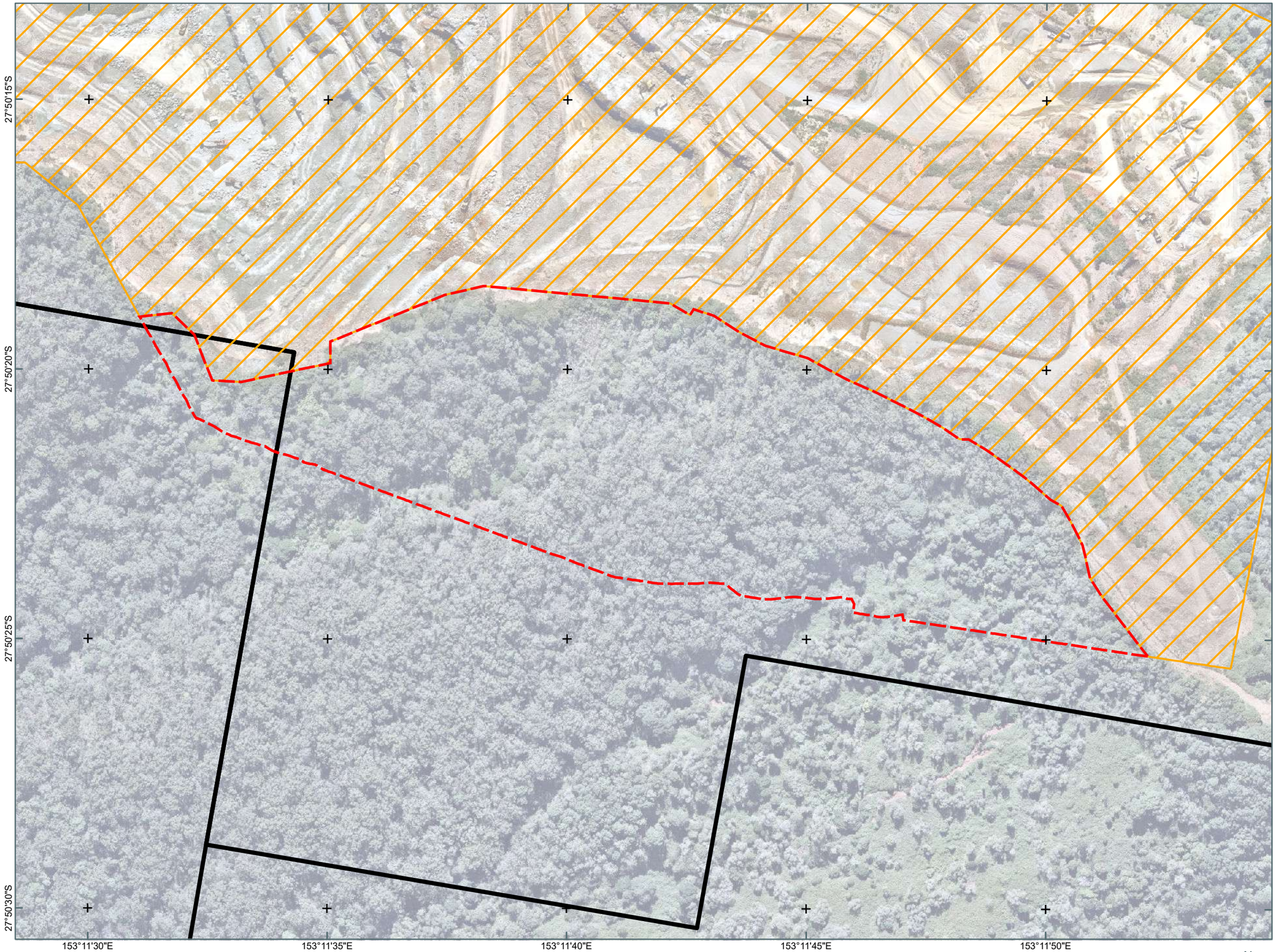
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DATE 7/10/2025

PLAN A1. PROPOSED IMPACT AREA



Notes:
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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]



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Fulton Hogan

BLUE ROCK QUARRY, CEDAR CREEK

0 20 40 60 m

N

Transverse Mercator
GDA 2020 | Zone 56

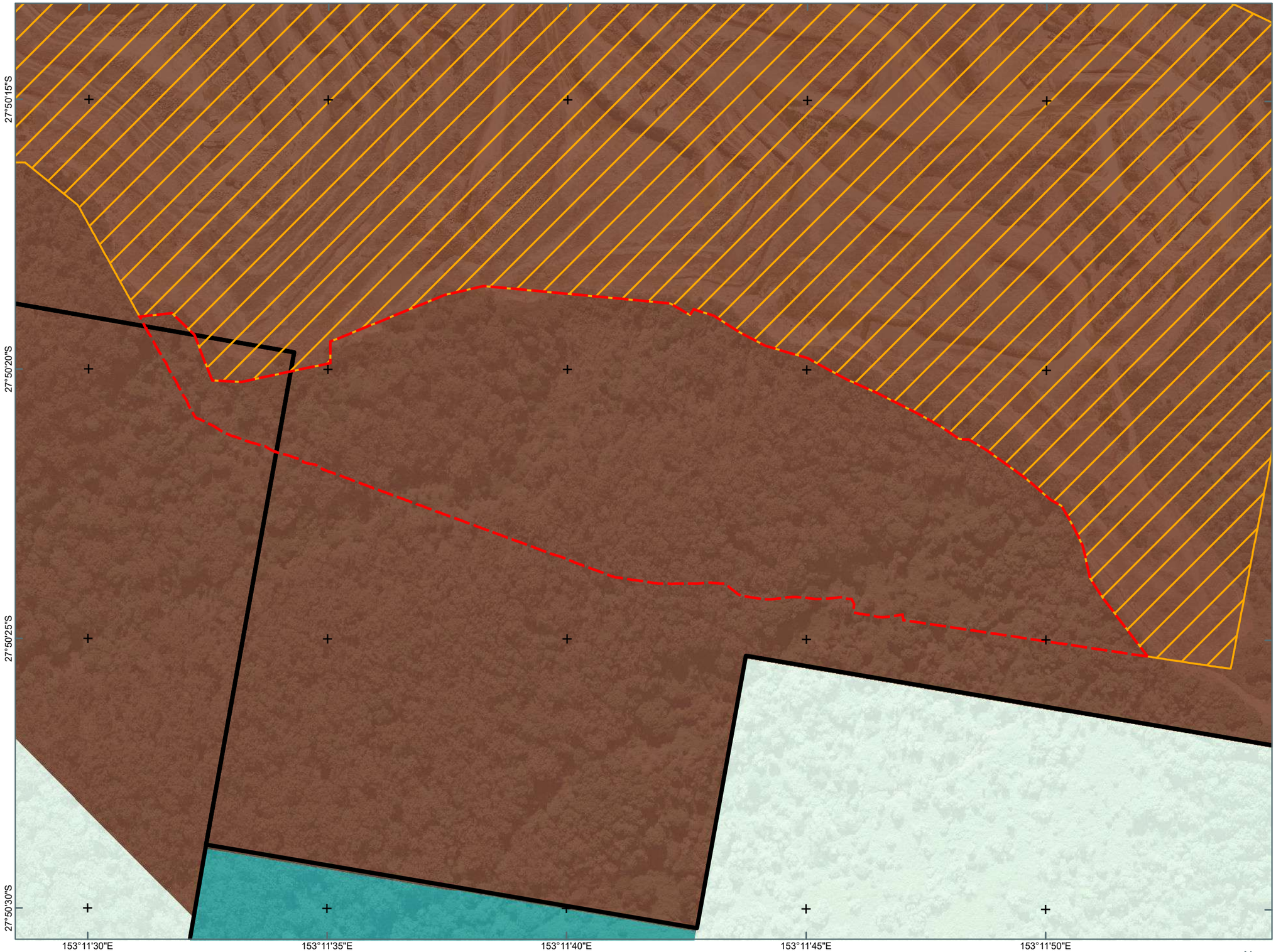
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@ A3

Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024
Lots 14-16 on RP151378

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11390 E PD 01 Impact Area A

PLAN A2. ZONING PLAN



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]

GCCC Zoning

- Conservation
- Extractive industry
- Rural
- Unzoned



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0 20 40 60 m

N

Transverse Mercator
GDA 2020 | Zone 56

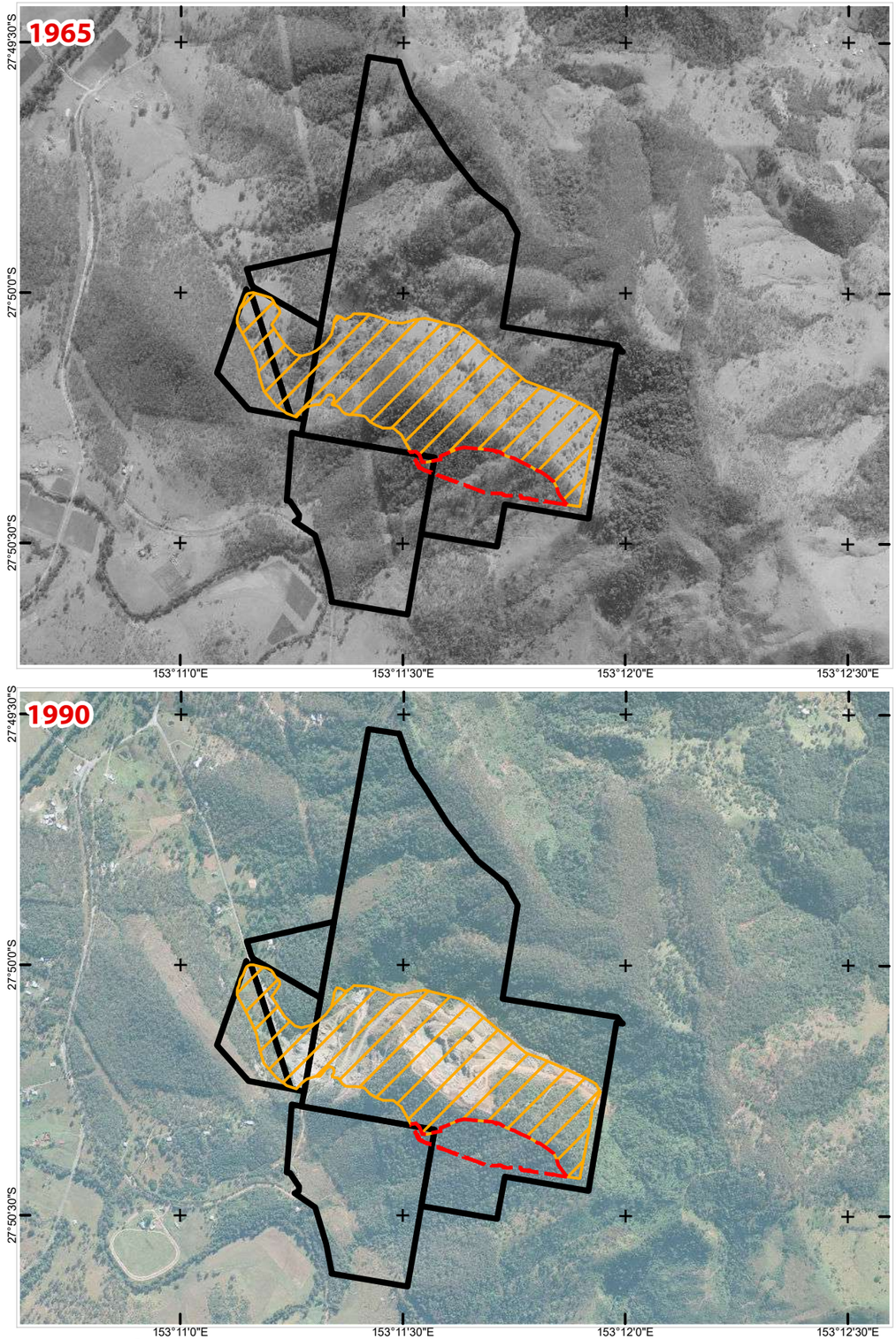
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11390 E PD 02 Zoning Plan A

PLAN A3. HISTORICAL AERIAL IMAGERY



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]



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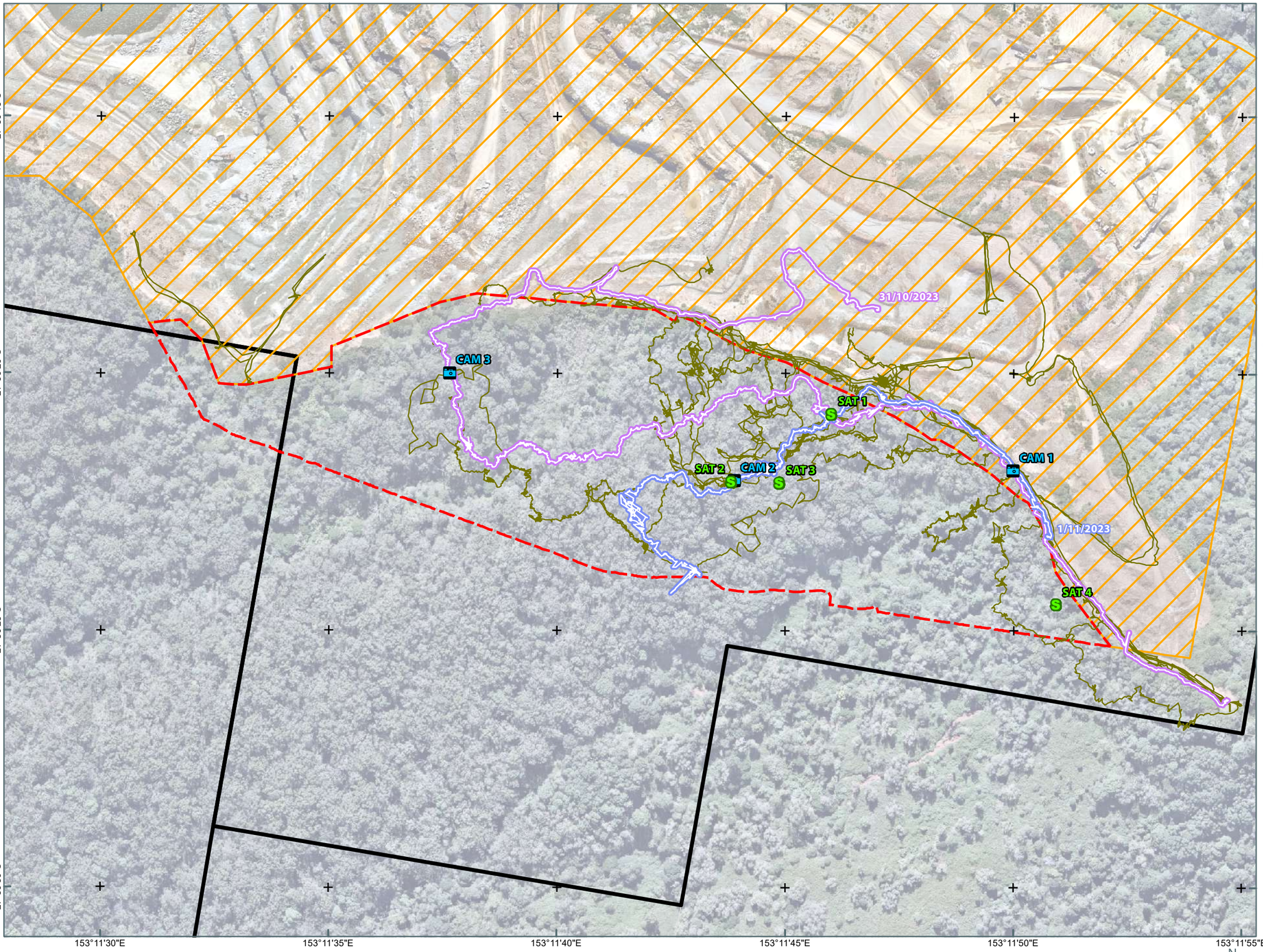
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Transverse Mercator
GDA 2020 | Zone 56
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@ A3

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11390 E PD 03 Aerial History A

PLAN A4.1. FIELD SURVEY EFFORT – KOALA



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- Spotlighting Survey (1/11/2023)
- Spotlighting Survey (31/10/2023)
- Incidental Surveys
- Camera Locations [3]
- SAT Survey Locations [4]
  2022-2024



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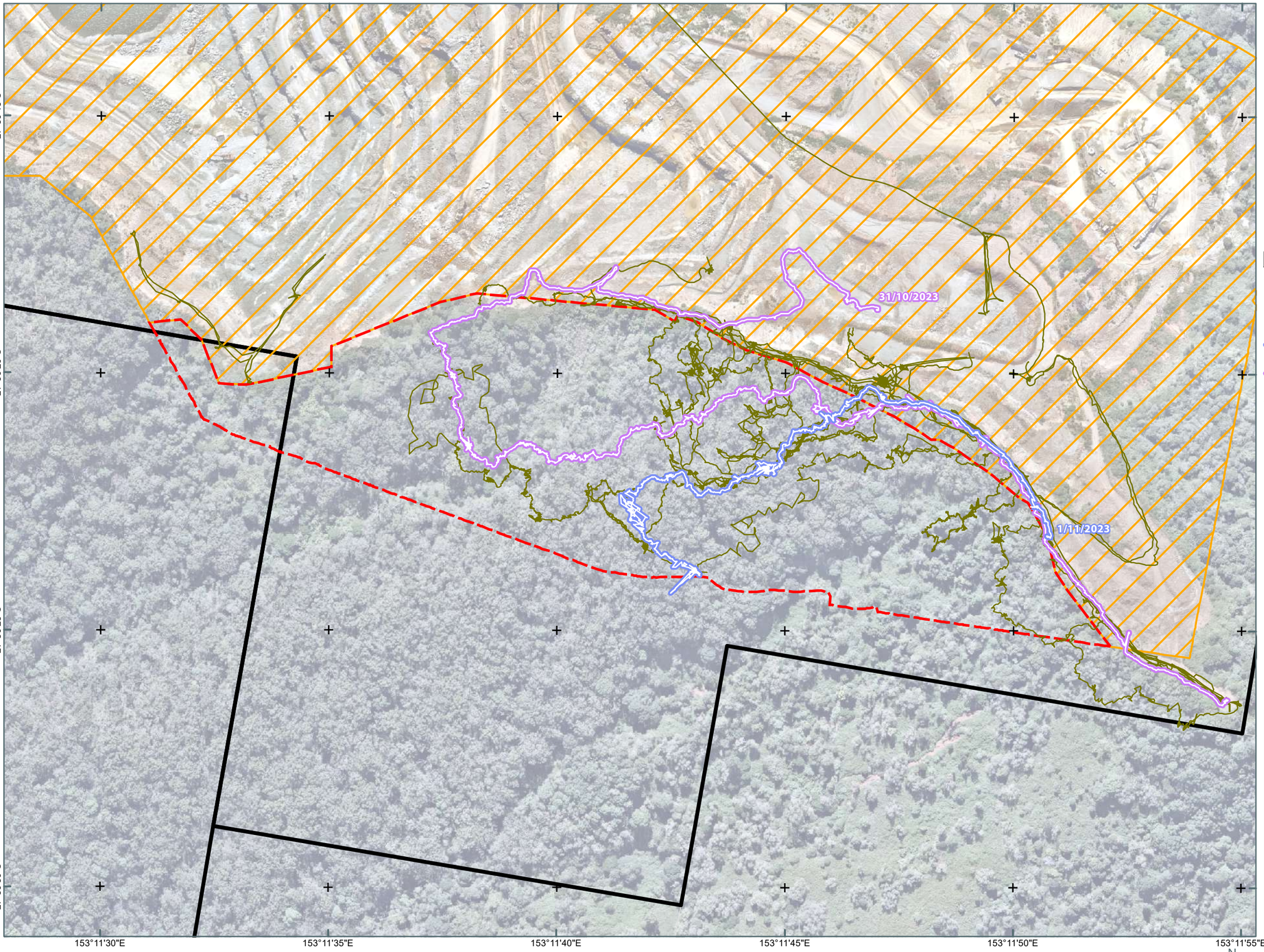
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Transverse Mercator
GDA 2020 | Zone 56
1:2,300
@ A3

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2/02/2026

11390 E PD 04_1 Field Survey K A

PLAN A4.2. FIELD SURVEY EFFORT – GREATER GLIDER



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- Spotlighting Survey (1/11/2023)
- Spotlighting Survey (31/10/2023)
- Hollow Bearing Trees Identification



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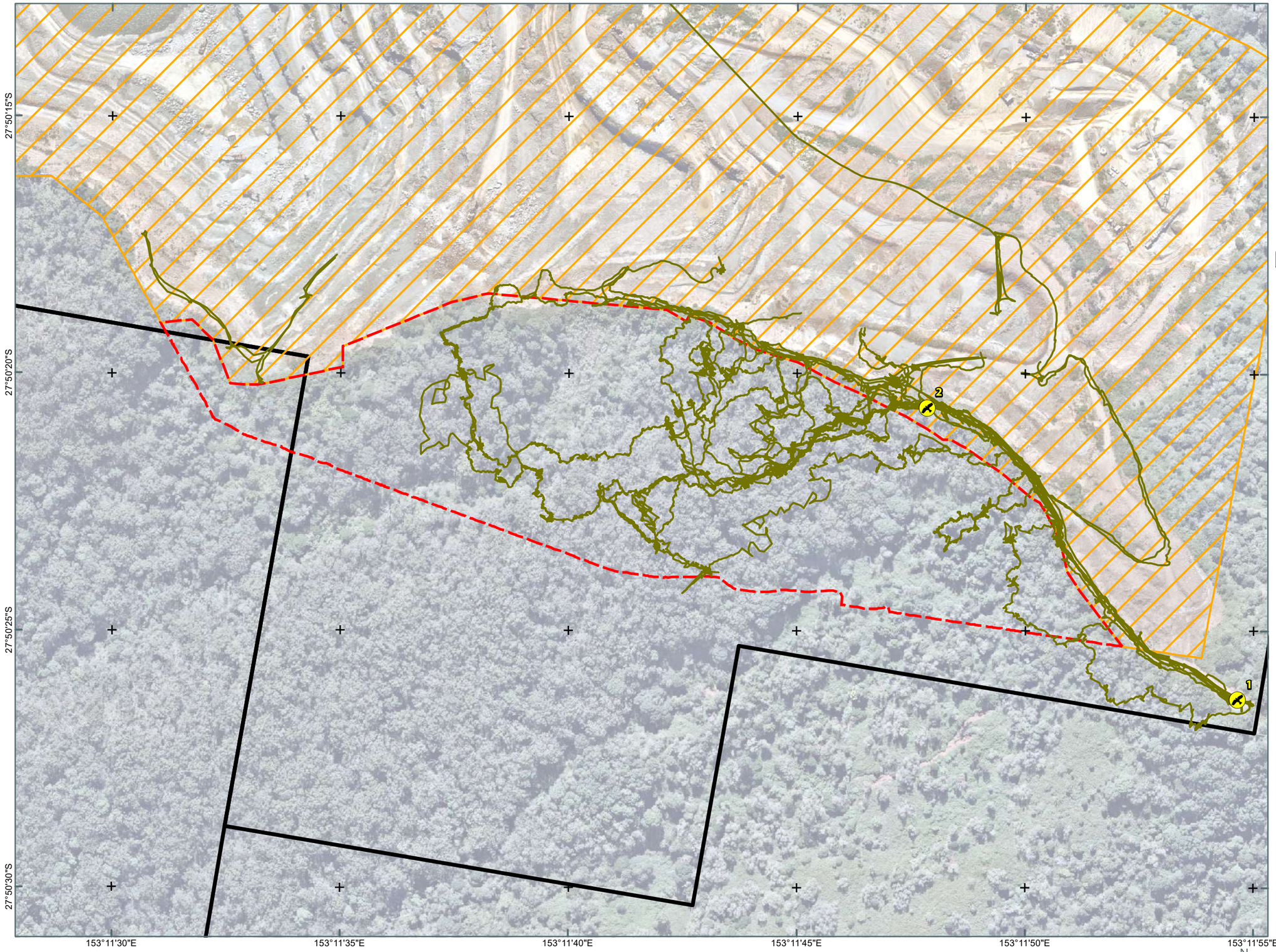
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Transverse Mercator
GDA 2020 | Zone 56
1:2,300
@ A3

Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024
Lots 14-16 on RP151378

2/02/2026

11390 E PD 04_2 Field Survey GG A

PLAN A4.3. FIELD SURVEY EFFORT – SOUTH-EASTERN GLOSSY BLACK-COCKATOO



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- Hollow Bearing Trees Identification, Allocasuarina Mapping, Diurnal Surveys and Incidental Surveys
- Dusk Bird Survey Points [2]



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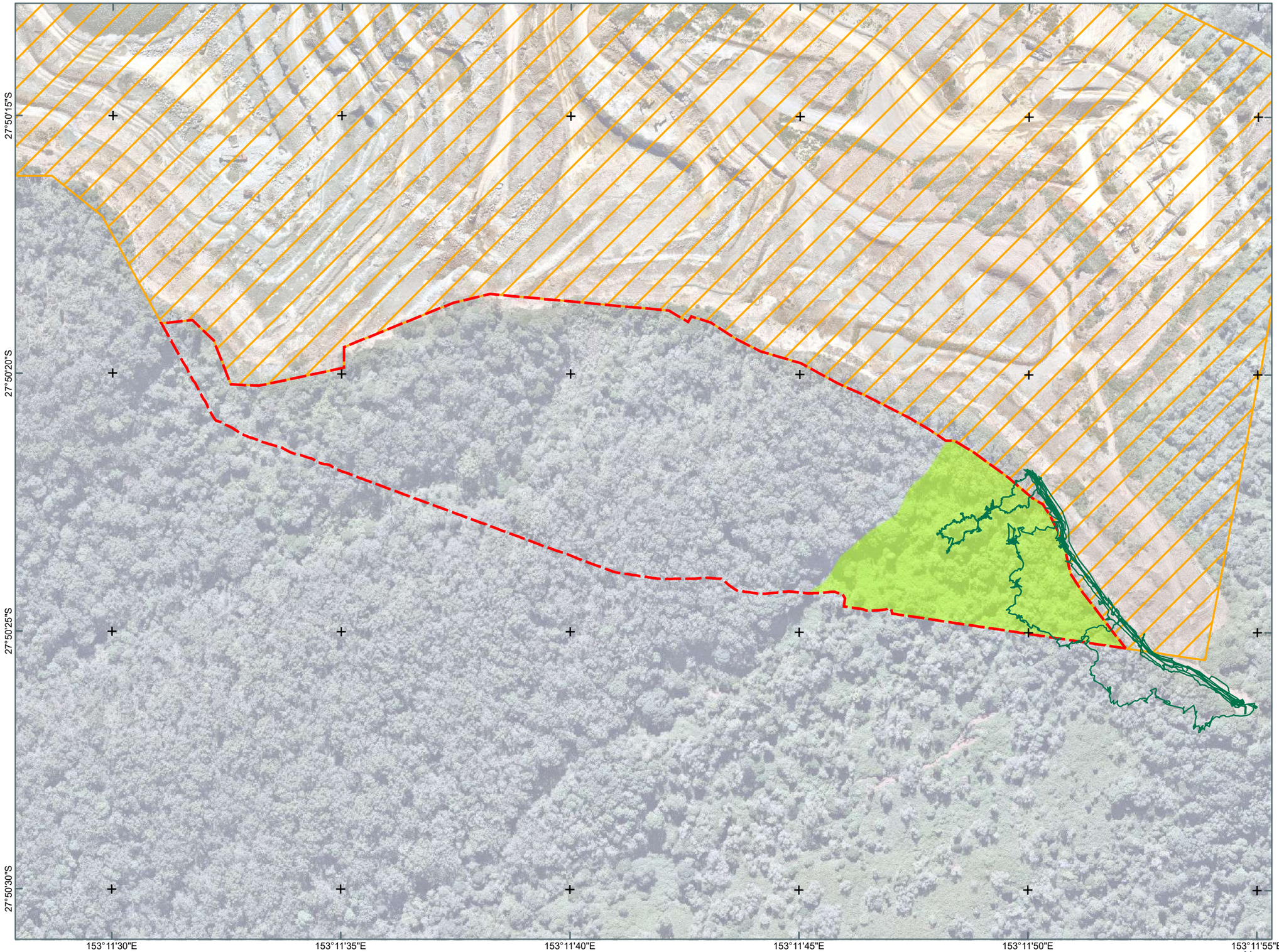
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Transverse Mercator
GDA 2020 | Zone 56
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@ A3

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2/02/2026

11390 E PD 04_3 Field Survey GBC A

PLAN A4.4. FIELD SURVEY EFFORT – MACADAMIA



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- Ground Truth RE 12.11.10
- Macadamia Surveys



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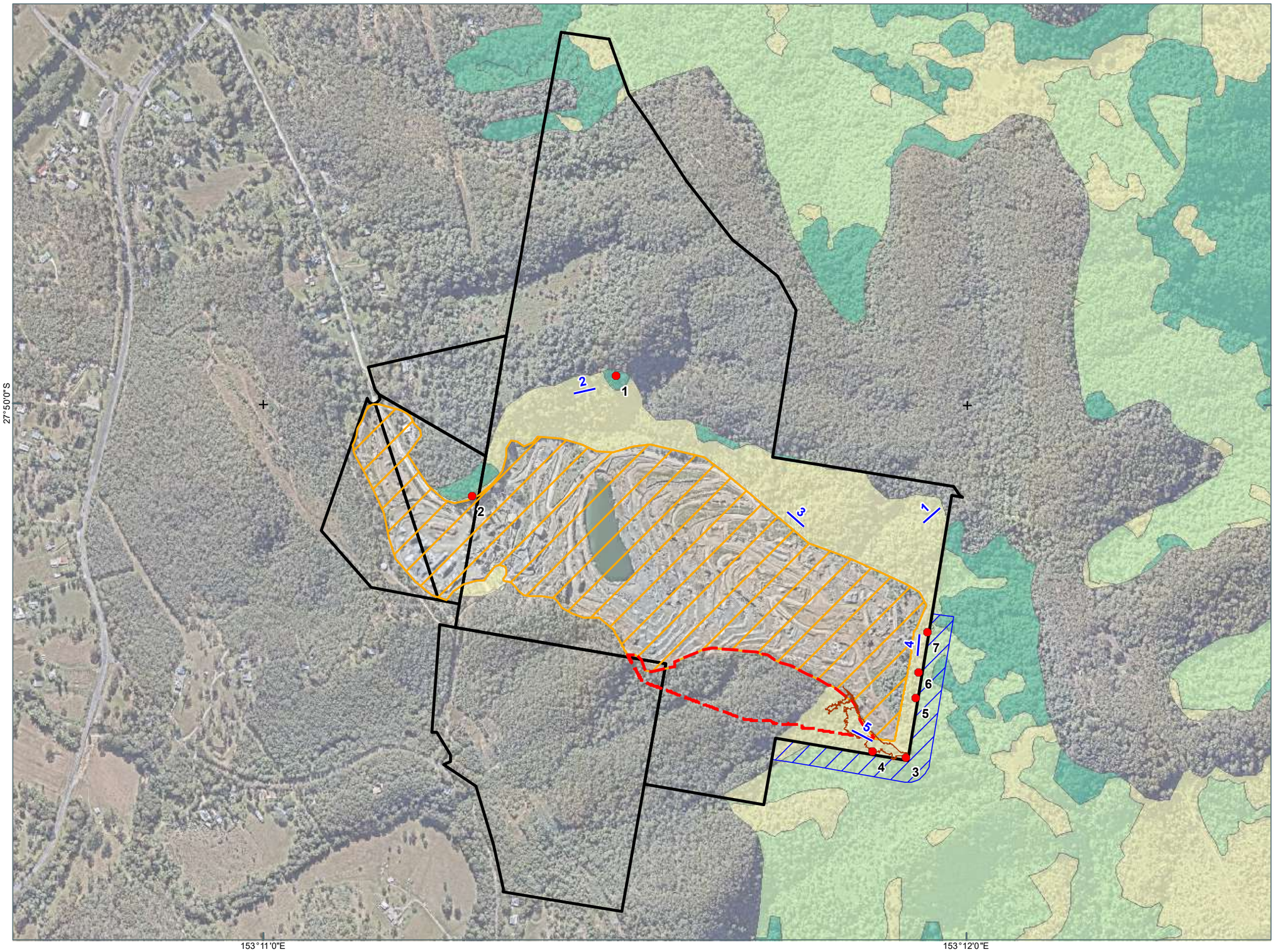
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Transverse Mercator
GDA 2020 | Zone 56
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@ A3

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14/10/2025

11390 E PD 04_4 Field Survey M A

PLAN A4.5. FIELD SURVEY EFFORT – LRSA TEC



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- VMA Category B - RE 12.11.10
- VMA Category C - RE 12.11.10
- VMA Category X - (preclear RE 12.11.10)
- Visual Survey extent
- Quaternary Survey location
- 50m TEC transect
- Meander surveys



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0 50 100 150 200 m
Transverse Mercator
GDA 2020 | Zone 56

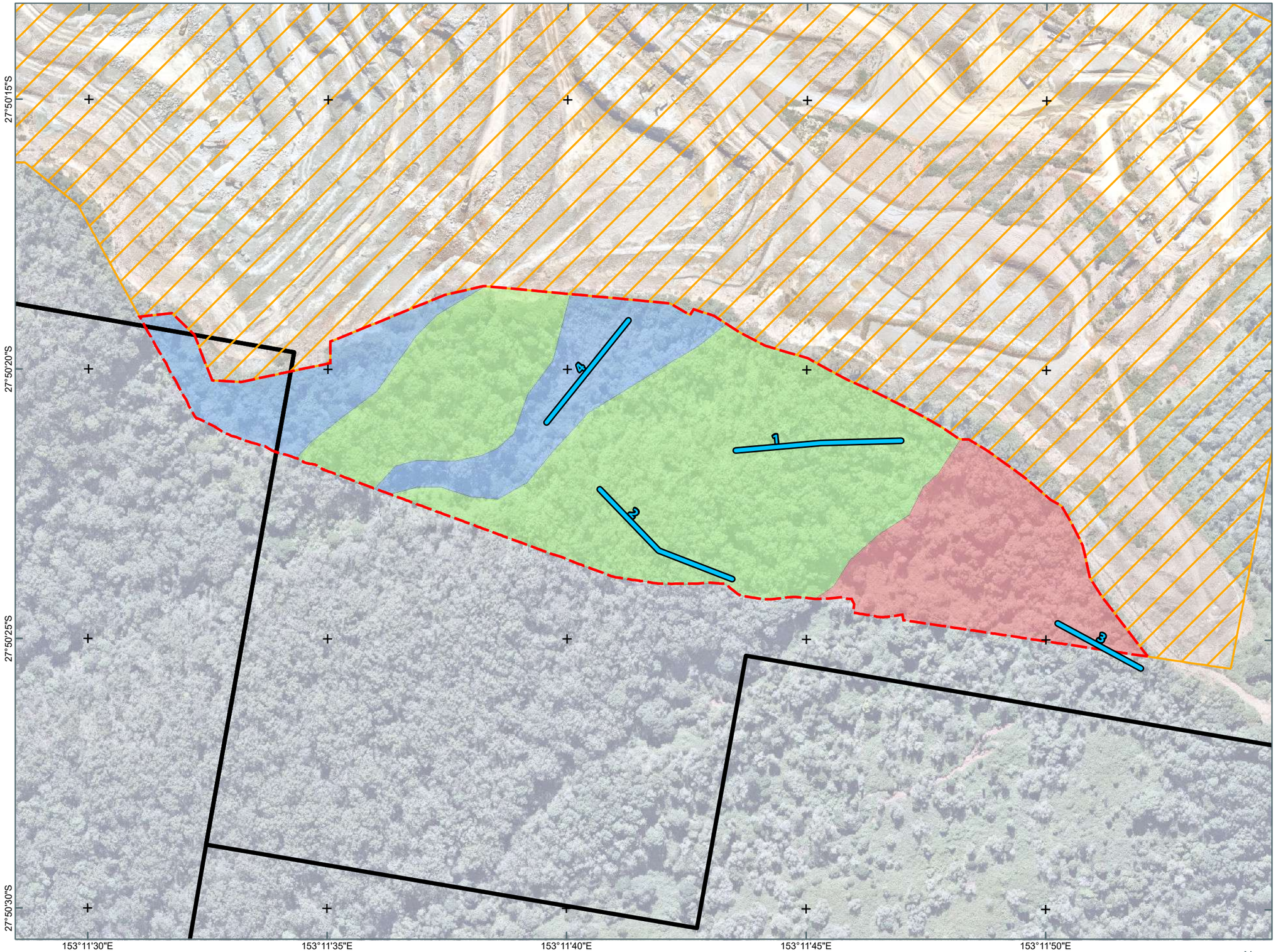
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1:9,000
@ A3

Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024
Lots 14-16 on RP151378

6/11/2025

11390 E PD 04_5 Field Survey TEC A

PLAN A5. ASSESSMENT UNITS AND VEGETATION COMMUNITIES



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]

Impacted Vegetation Communities

- **Assessment Unit 1:** **[3.5 ha]**
  Indicative of Remnant RE 12.11.3
- **Assessment Unit 2:** **[1.1 ha]**
  Regrowth RE 12.11.10
- **Assessment Unit 3:** **[1.3 ha]**
  Highly disturbed, dominated by weeds and Acacia regrowth
- MHQA Transects [4]



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0 20 40 60 m

Transverse Mercator
GDA 2020 | Zone 56

1:2,200
@ A3

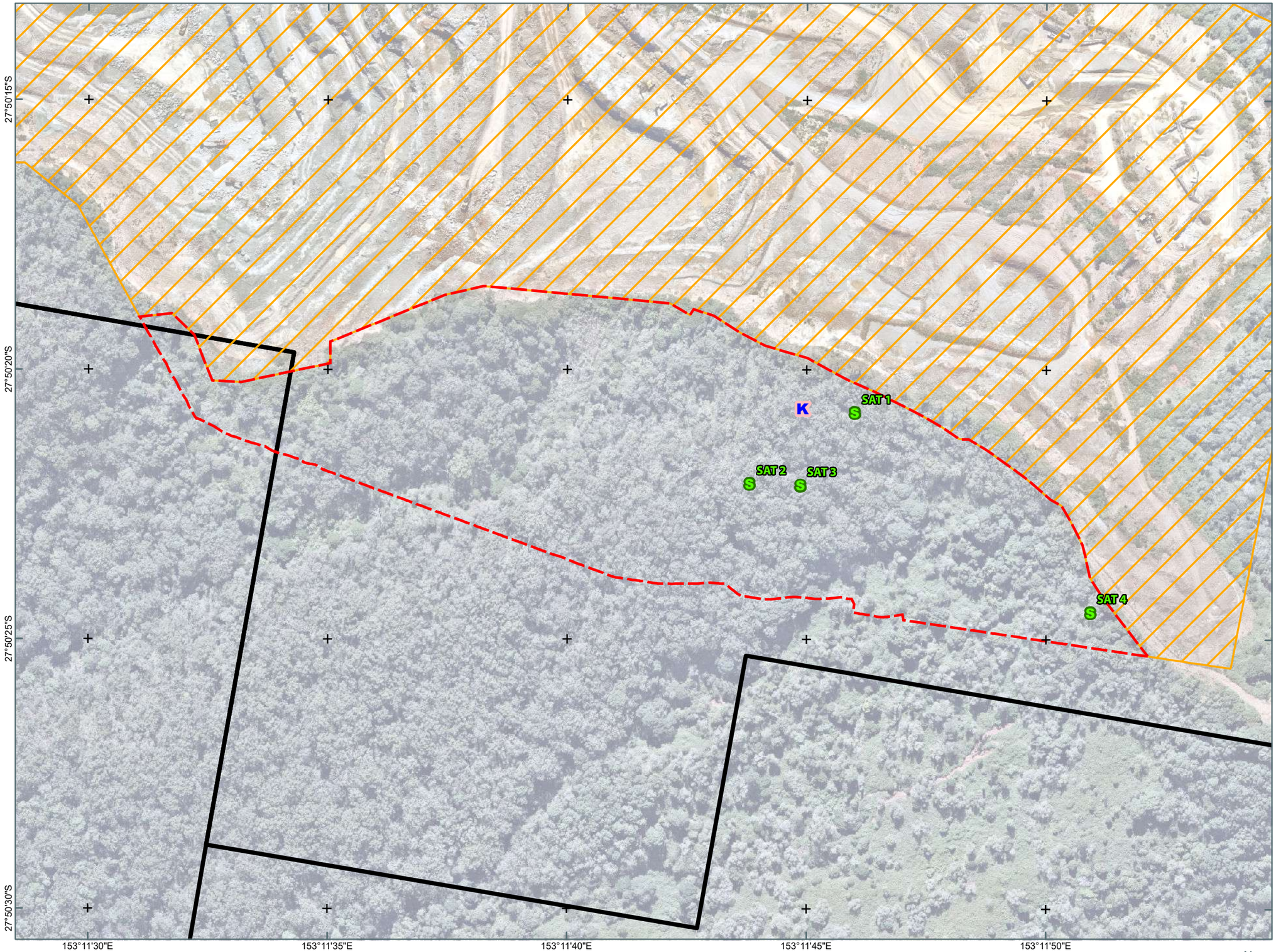
N

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7/10/2025

11390 E PD 05 AUs and Veg Coms A

PLAN A6.1. FIELD SURVEY RESULTS – KOALA



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- K Koala Sighting Location [1]
- SAT Survey Locations [4]

Results

- SAT1 = 'No use' 0/30
- SAT2 = 'No use' 0/30
- SAT3 = 'Low use' 2/30
- SAT4 = 'No Use' 0/30



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0 20 40 60 m

N

Transverse Mercator
GDA 2020 | Zone 56

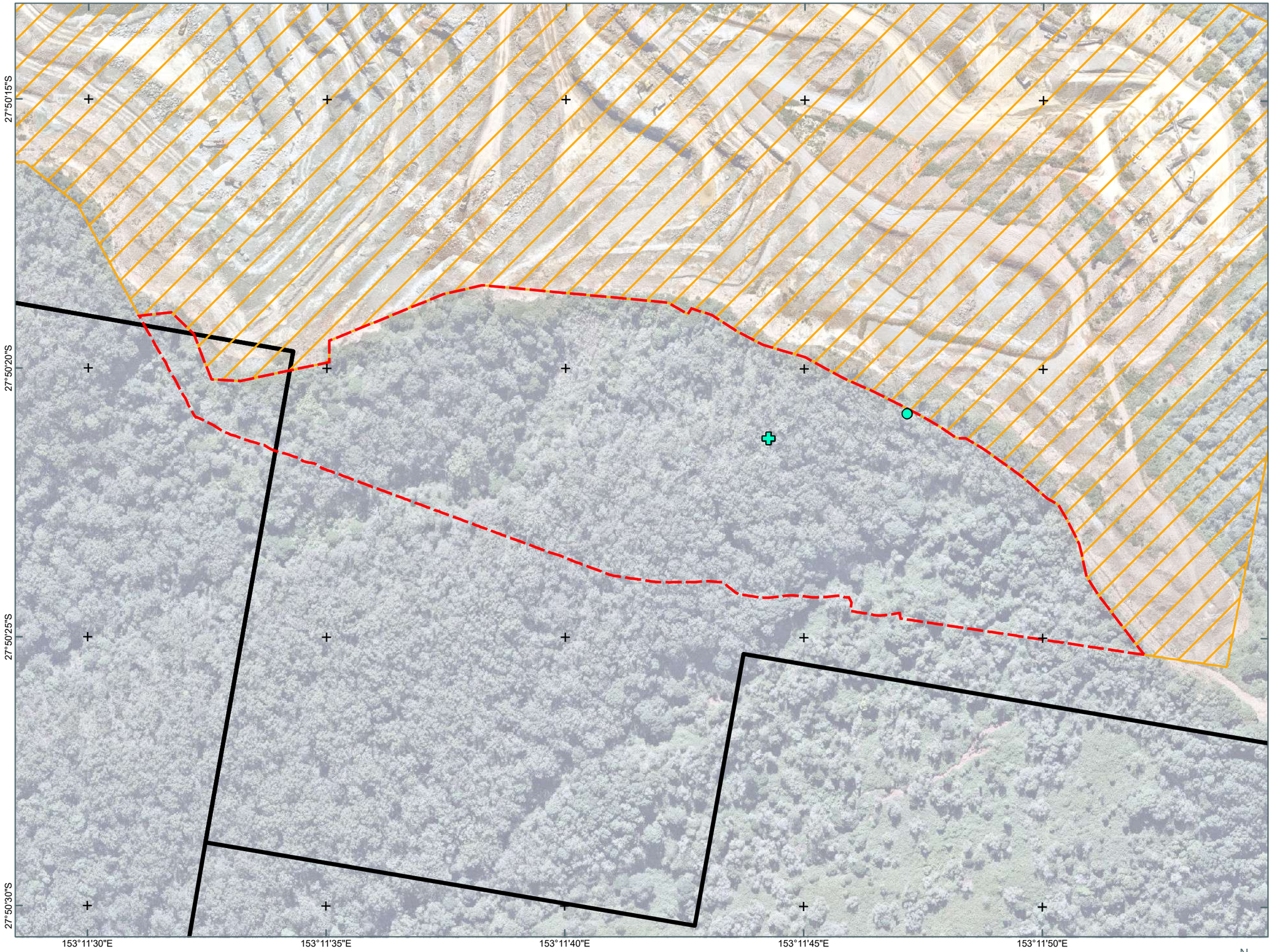
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7/10/2025

11390 E PD 06_1 Field Survey Results K A

PLAN A6.2. FIELD SURVEY RESULTS – GREATER GLIDER



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]

Alive Hollow-bearing tree locations [1]
Hollows
- Small (<100mm Diameter) [3]
- Medium (100-300mm Diameter) [0]
- Large (>300mm Diameter) [2]

Dead Hollow-bearing tree locations [1]
Hollows
- Small (<100mm Diameter) [0]
- Medium (100-300mm Diameter) [2]
- Large (>300mm Diameter) [0]



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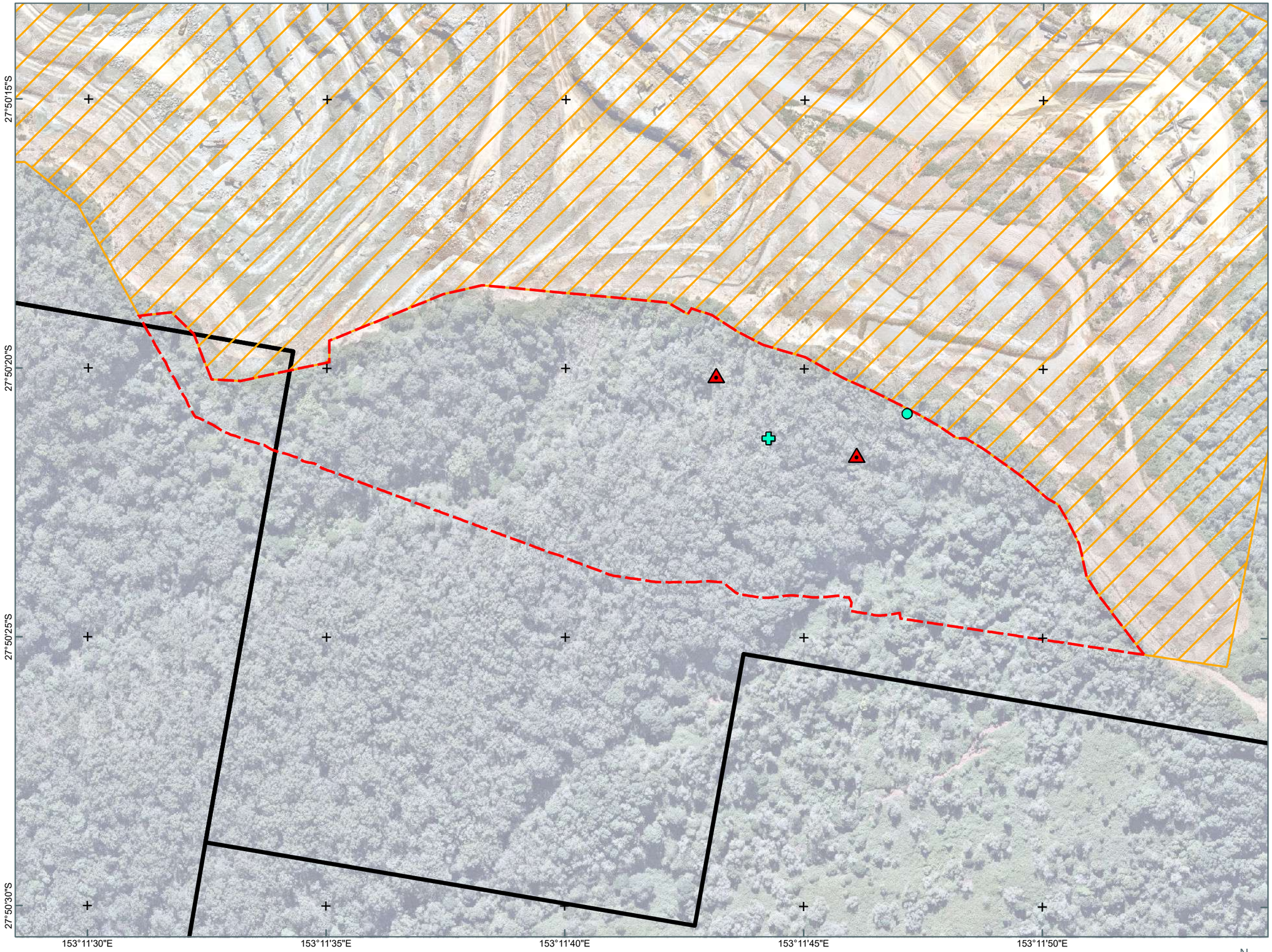
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1:2,200
@ A3

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14/10/2025

11390 E PD 06_2 Field Survey Results GG A

PLAN A6.3. FIELD SURVEY RESULTS – SOUTH-EASTERN GLOSSY BLACK-COCKATOO



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- Allocasurina torulosa located within referral area
  - *Specimen(s)* [8]
  - *Location(s)* [2]
- Alive Hollow-bearing tree locations [1]
  - Hollows
    - Small (<100mm Diameter) [3]
    - Medium (100-300mm Diameter) [0]
    - Large (>300mm Diameter) [2]
- Dead Hollow-bearing tree locations [1]
  - Hollows
    - Small (<100mm Diameter) [0]
    - Medium (100-300mm Diameter) [2]
    - Large (>300mm Diameter) [0]



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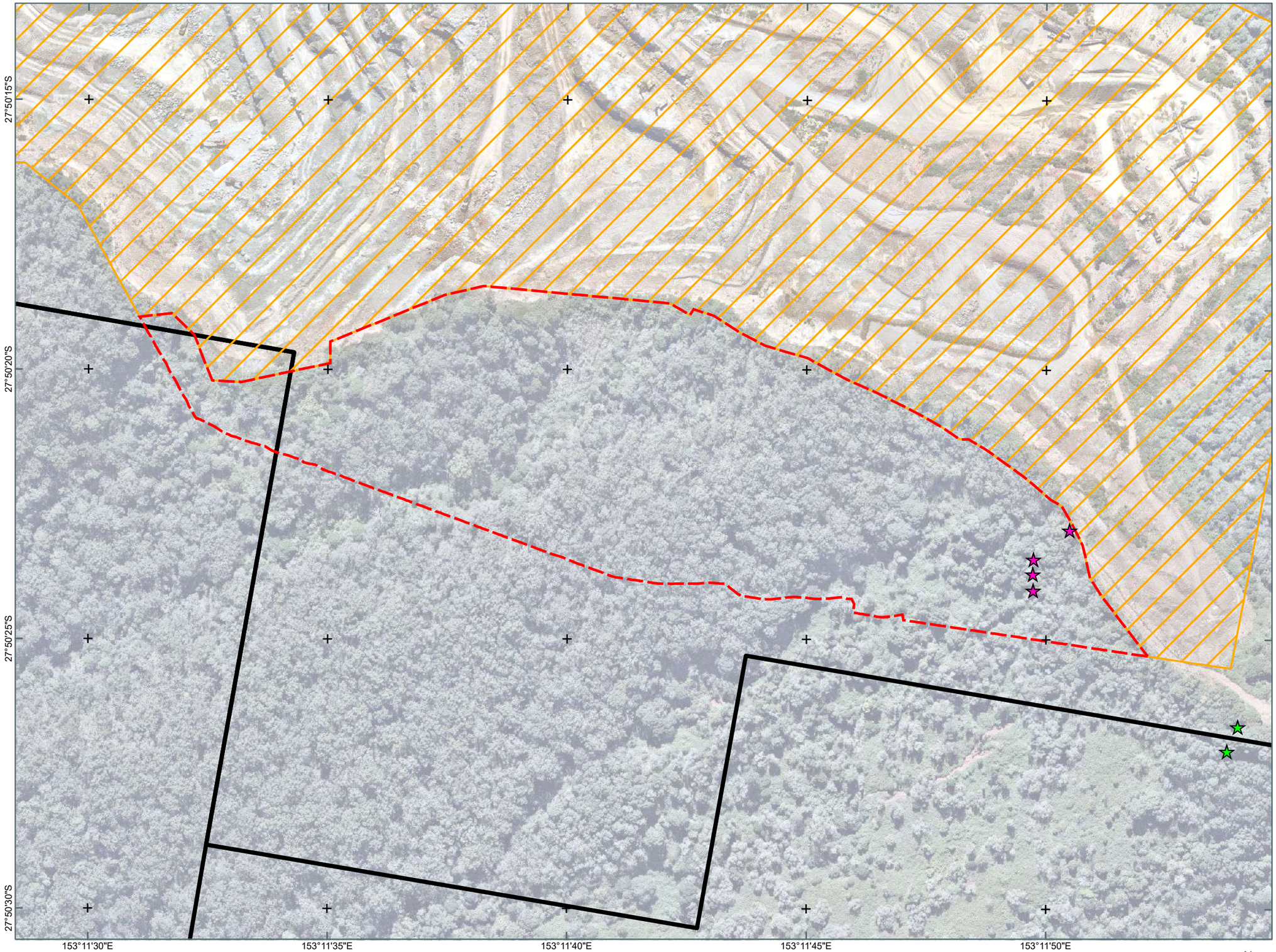
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GDA 2020 | Zone 56
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Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024
Lots 14-16 on RP151378

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11390 E PD 06_3 Field Survey Results GBC A

PLAN A6.4. FIELD SURVEY RESULTS – MACADAMIA



Notes:
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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- Macadamia integrifolia specimen(s) located within referral area
  - *Specimen(s)* [15]
  - *Location(s)* [4]
- Macadamia integrifolia specimen(s) located outside referral area
  - *Specimen(s)* [2]
  - *Location(s)* [2]



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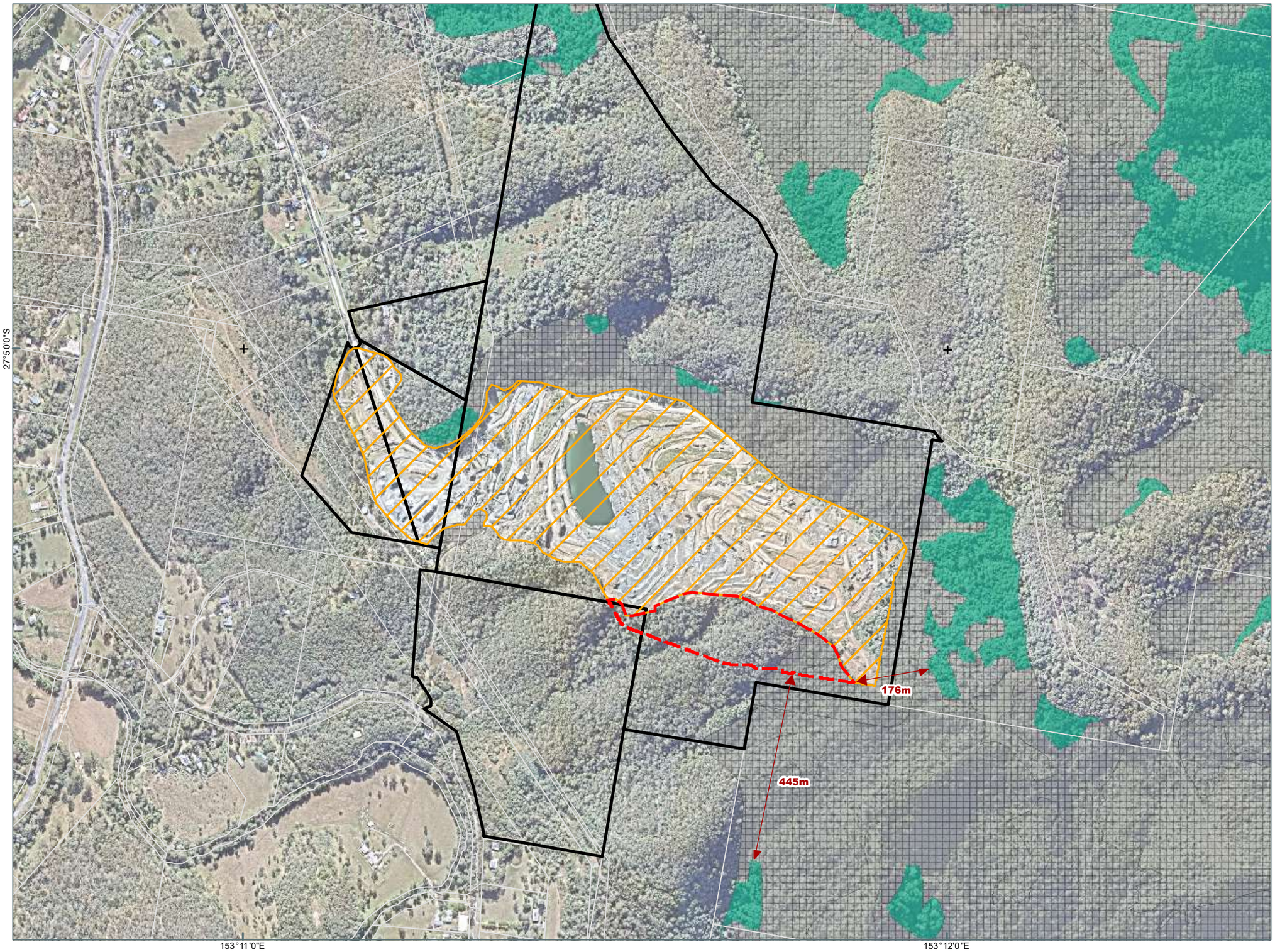
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Transverse Mercator
GDA 2020 | Zone 56
1:2,200 @ A3

Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024
Lots 14-16 on RP151378

14/10/2025

11390 E PD 06_4 Field Survey Results M A

PLAN A6.5. FIELD SURVEY RESULTS – LRSA TEC



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- VMA Category B - RE 12.11.10 - Potential TEC
- VMA Category C and Preclear 12.11.10 - confirmed not TEC



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0 50 100 150 200 m

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GDA 2020 | Zone 56

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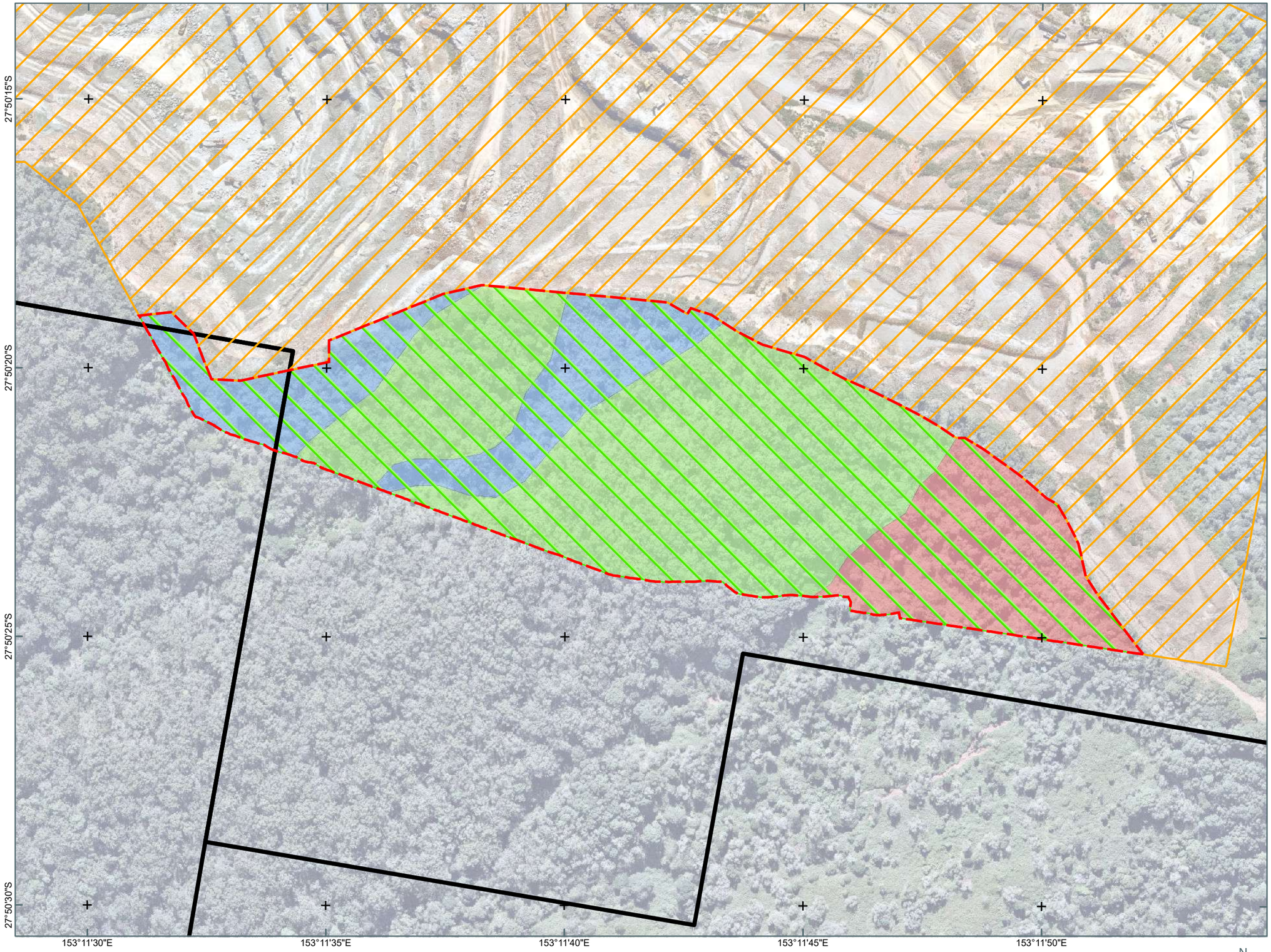
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Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024
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11390 E PD 06_5 Field Survey Results TEC A

PLAN A7. CRITICAL KOALA HABITAT



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- Impacted Critical Koala Habitat [5.9 ha]

Impacted Vegetation Communities

- **Assessment Unit 1:** **[3.5 ha]**
  Indicative of Remnant RE 12.11.3
- **Assessment Unit 2:** **[1.1 ha]**
  Regrowth RE 12.11.10
- **Assessment Unit 3:** **[1.3 ha]**
  Highly disturbed, dominated by weeds and Acacia regrowth



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0 20 40 60 m

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Transverse Mercator
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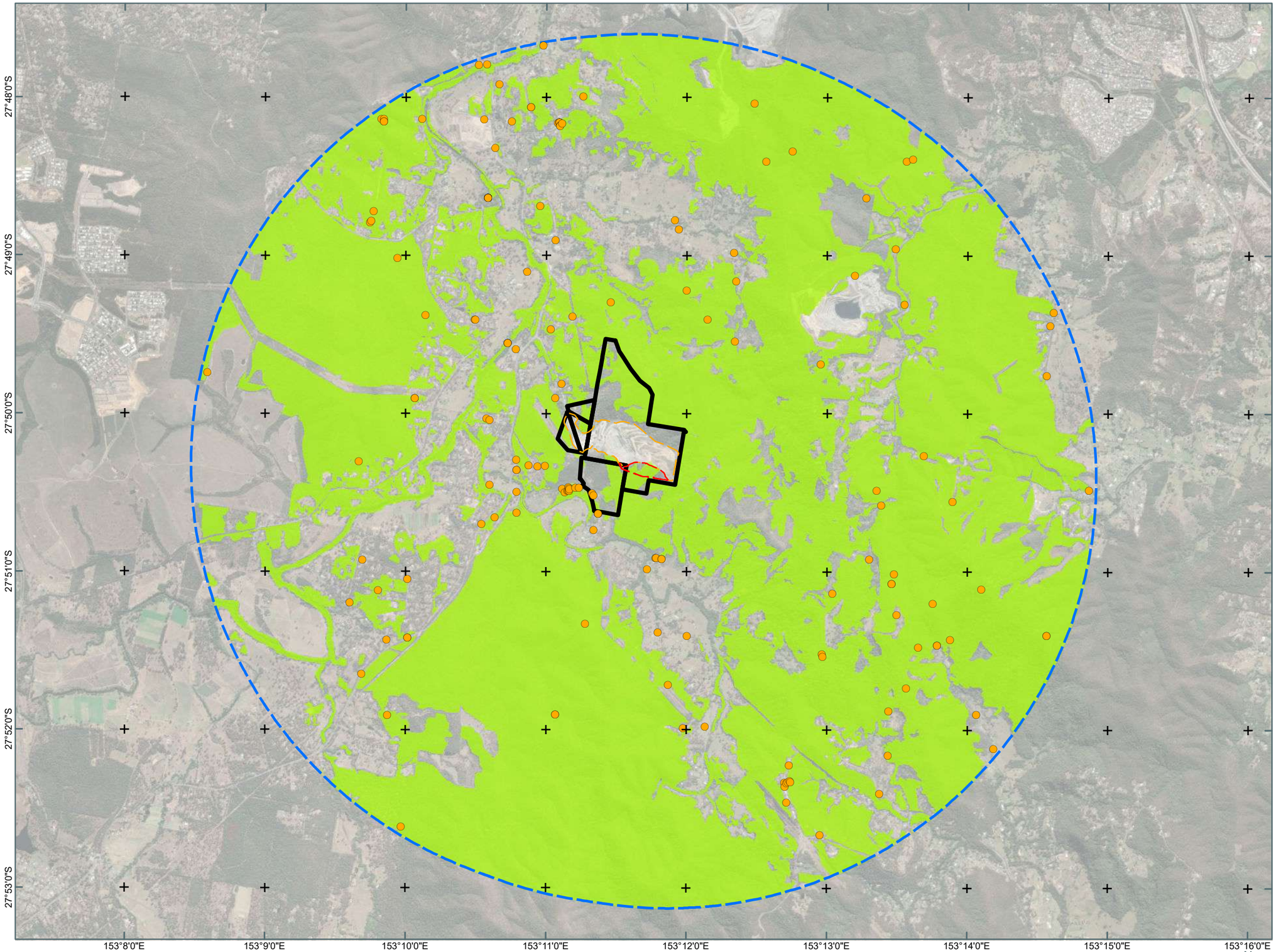
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11390 E PD 07 Critical Koala A

PLAN A8. KOALA HABITAT AND RECORDS



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- 5KM Referral Area Buffer
- Potential and known Koala foraging habitat [65% within 5km of site]
- Koala observational records within 5km of referral area recorded within past 20 years [174]



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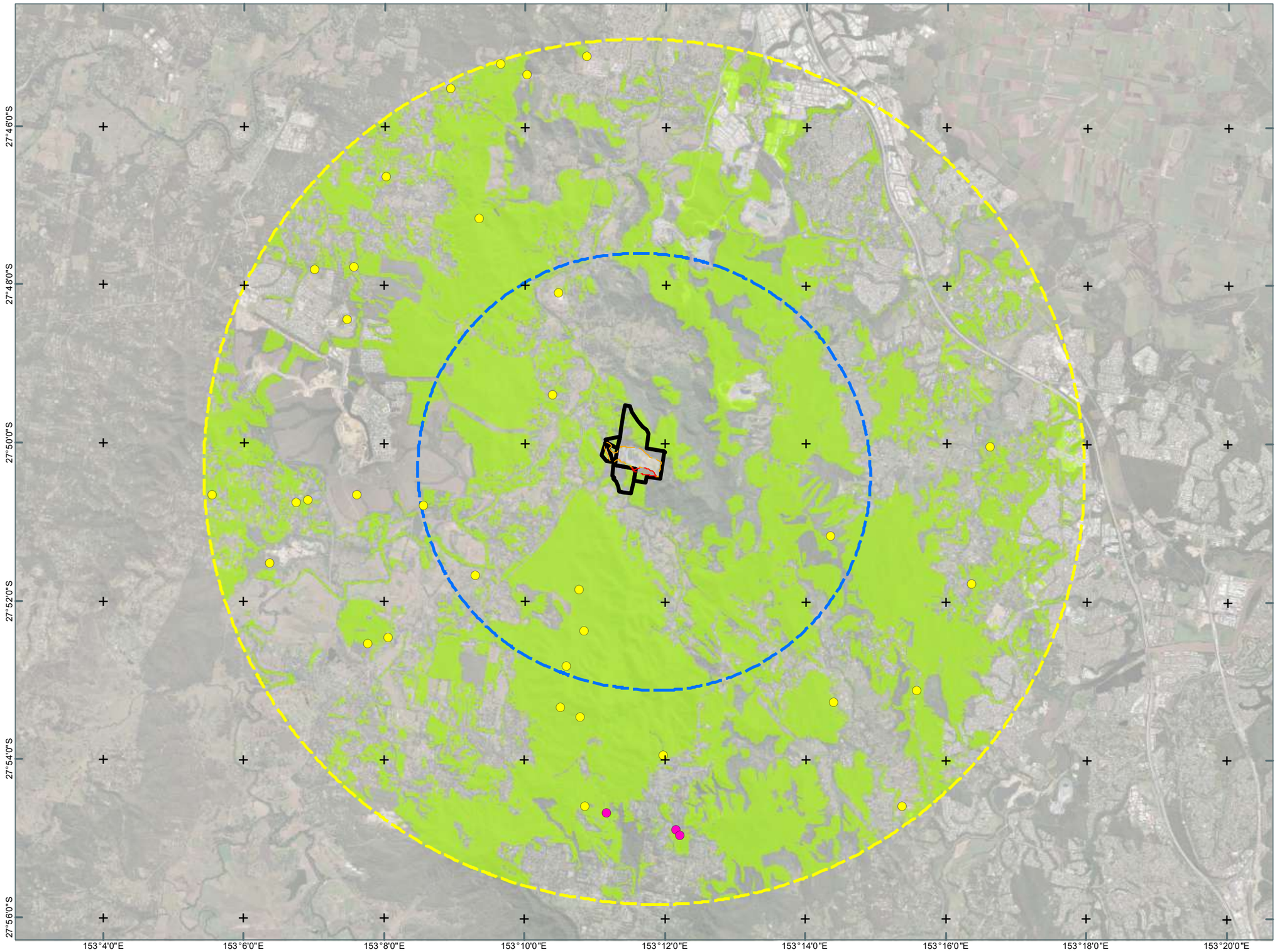
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GDA 2020 | Zone 56
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11390 E PD 08 Koala Hab and Rec A

PLAN A9. GREATER GLIDER HABITAT AND RECORDS



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- 5KM Referral Area Buffer
- 10KM Referral Area Buffer
- Potential and known Greater Glider foraging habitat [44% within 10km of site]
- Southern Greater Glider records within 20km of referral area recorded within past 20 years [3]
- Southern Greater Glider records within 20km of referral area recorded within past 20 years with Coordinate uncertainty to protect threatened taxon [33]



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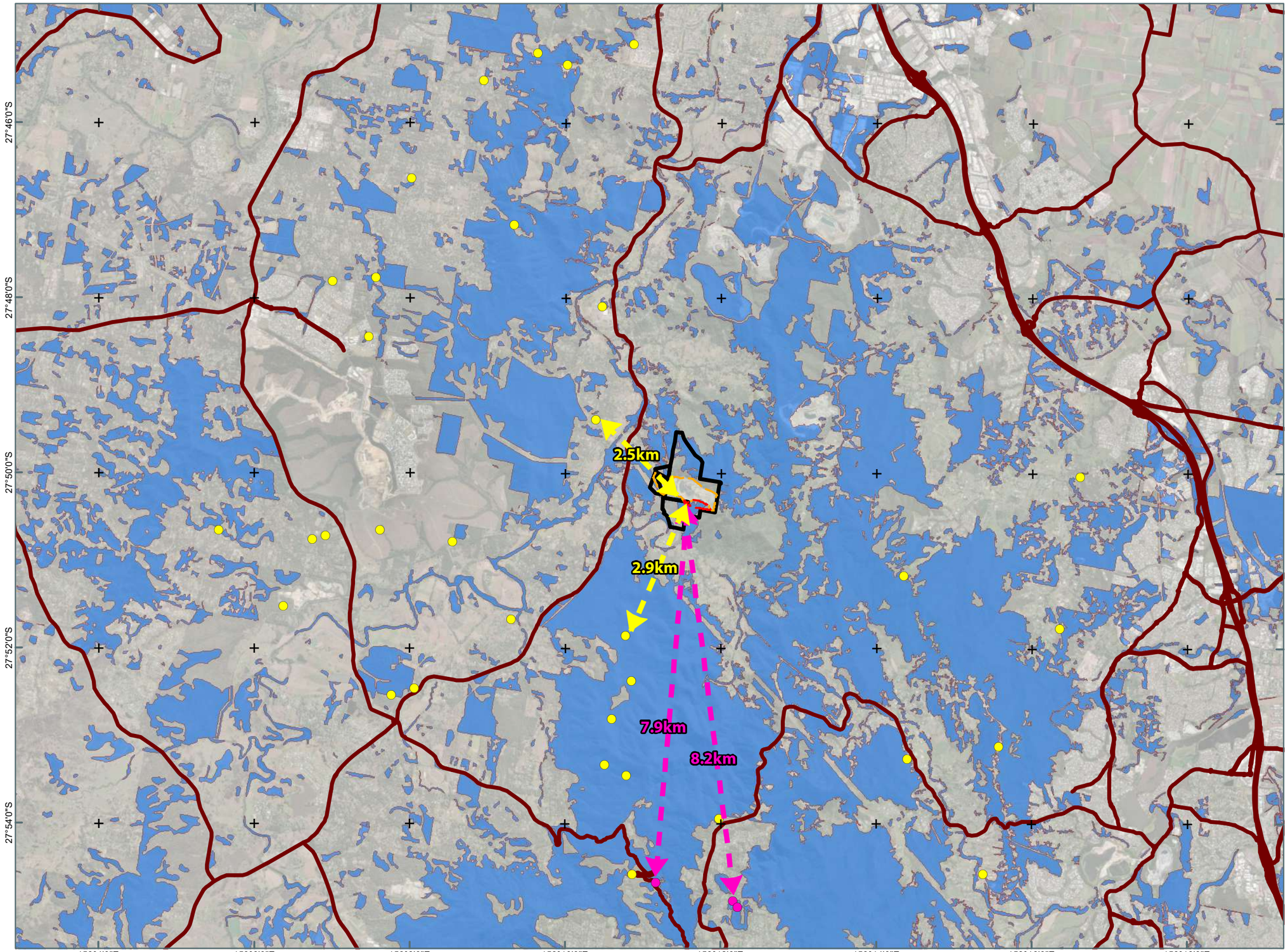
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GDA 2020 | Zone 56
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11390 E PD 09 GG Distribution A

PLAN A10. GREATER GLIDER RECORD DISTANCE



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- Category B Area - *Remnant Vegetation*
- Nearest Greater Glider Records to Referral Area
- Nearest Greater Glider Records to Referral Area with Coordinate uncertainty to protect threatened taxon
- Major Roads
- Measurements to spatially uncertain records
- Measurements to spatially certain records



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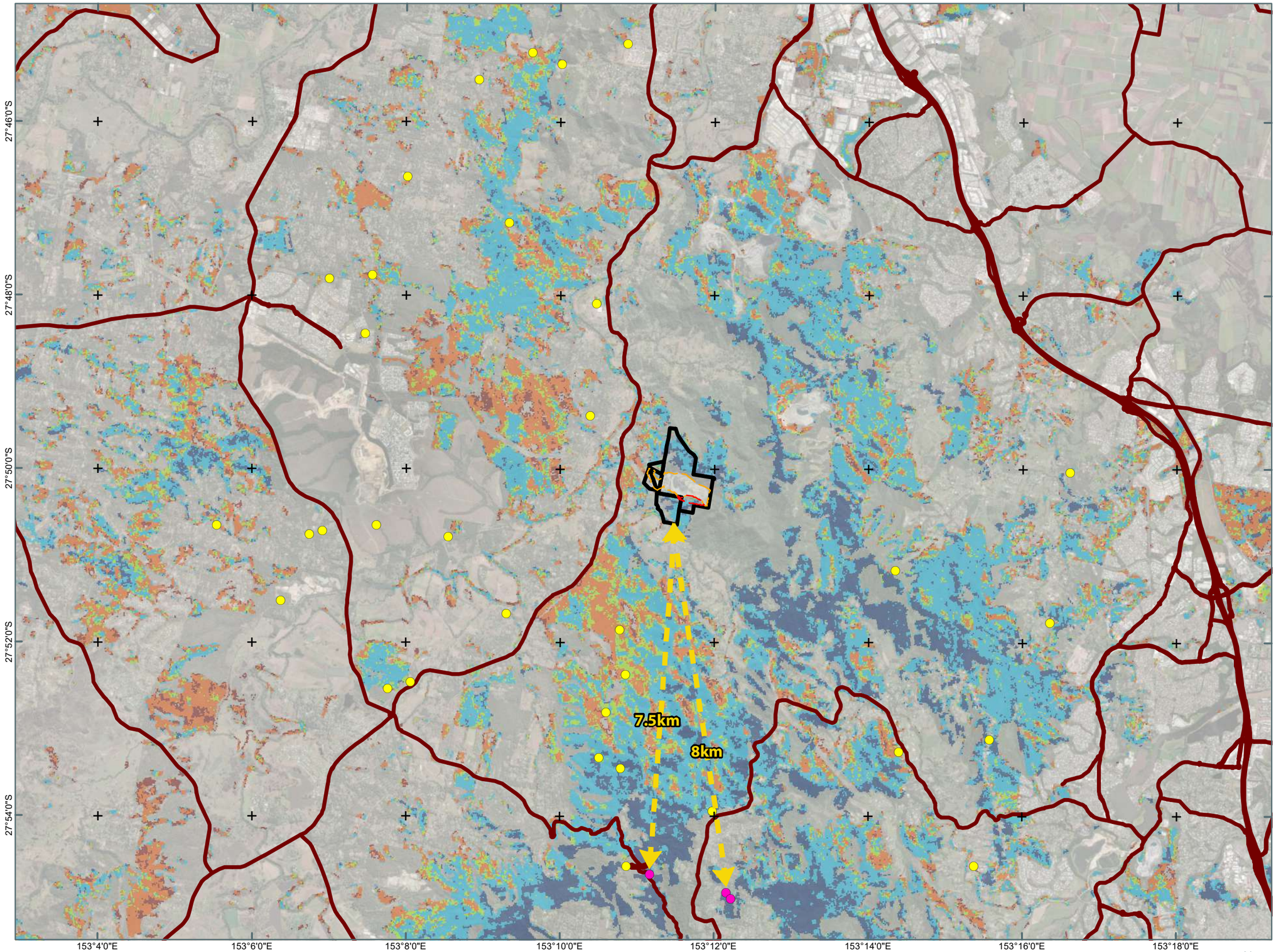
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Transverse Mercator
GDA 2020 | Zone 56
1:82,000
@ A3

Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024
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2/02/2026

11390 E PD 10 GG Rec Dist A

PLAN A11. FOREST MATURITY TYPE MAP (GRIFFITH UNIVERSITY)



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]

Forest Maturity

- Mature Vegetation
- *(Intermediate to Mature Aged Vegetation)*
- Intermediate Aged Vegetation
- *(Young to Intermediate Aged Vegetation)*
- Young Vegetation
- Nearest Greater Glider Records to Referral Area
- Nearest Greater Glider Records to Referral Area with Coordinate uncertainty to protect threatened taxon
- Major Roads
- Measurement



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0 1 2 km

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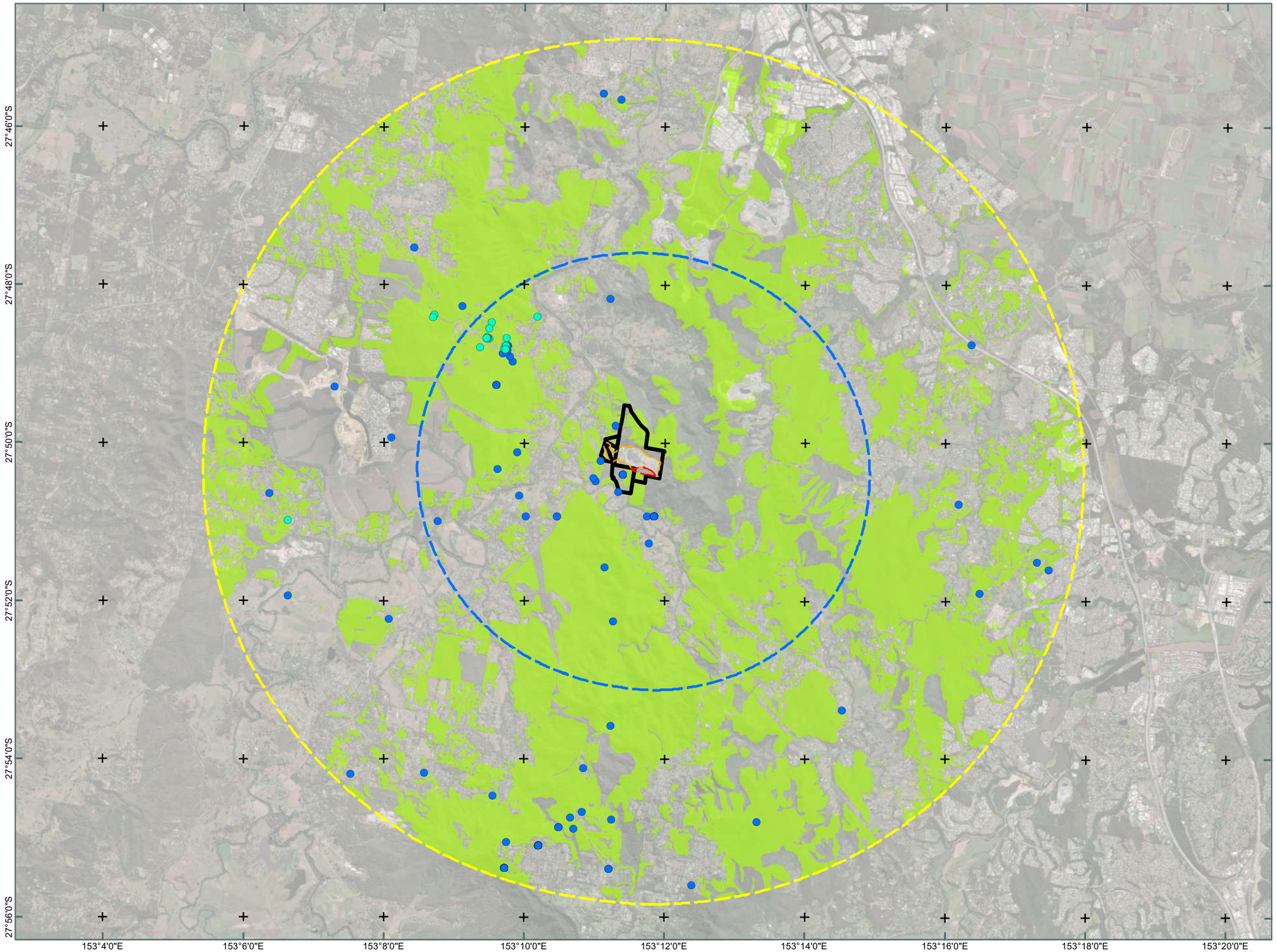
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@ A3

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27/02/2026

11390 E PD 11 Forest Maturity A

PLAN A12. SOUTH-EASTERN GLOSSY-BLACK COCKATOO HABITAT AND RECORDS



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- 5KM Referral Area Buffer
- 10KM Referral Area Buffer

Glossy Black-cockatoo Records and Habitat

- Glossy Black-cockatoo (South-eastern) records within 10km of referral area recorded within past 20 years [24]
- Glossy Black-cockatoo records within 10km of referral area recorded within past 20 years [211]
- Potential and known Glossy Black-cockatoo (South-eastern) foraging habitat [42% within 10km of site]



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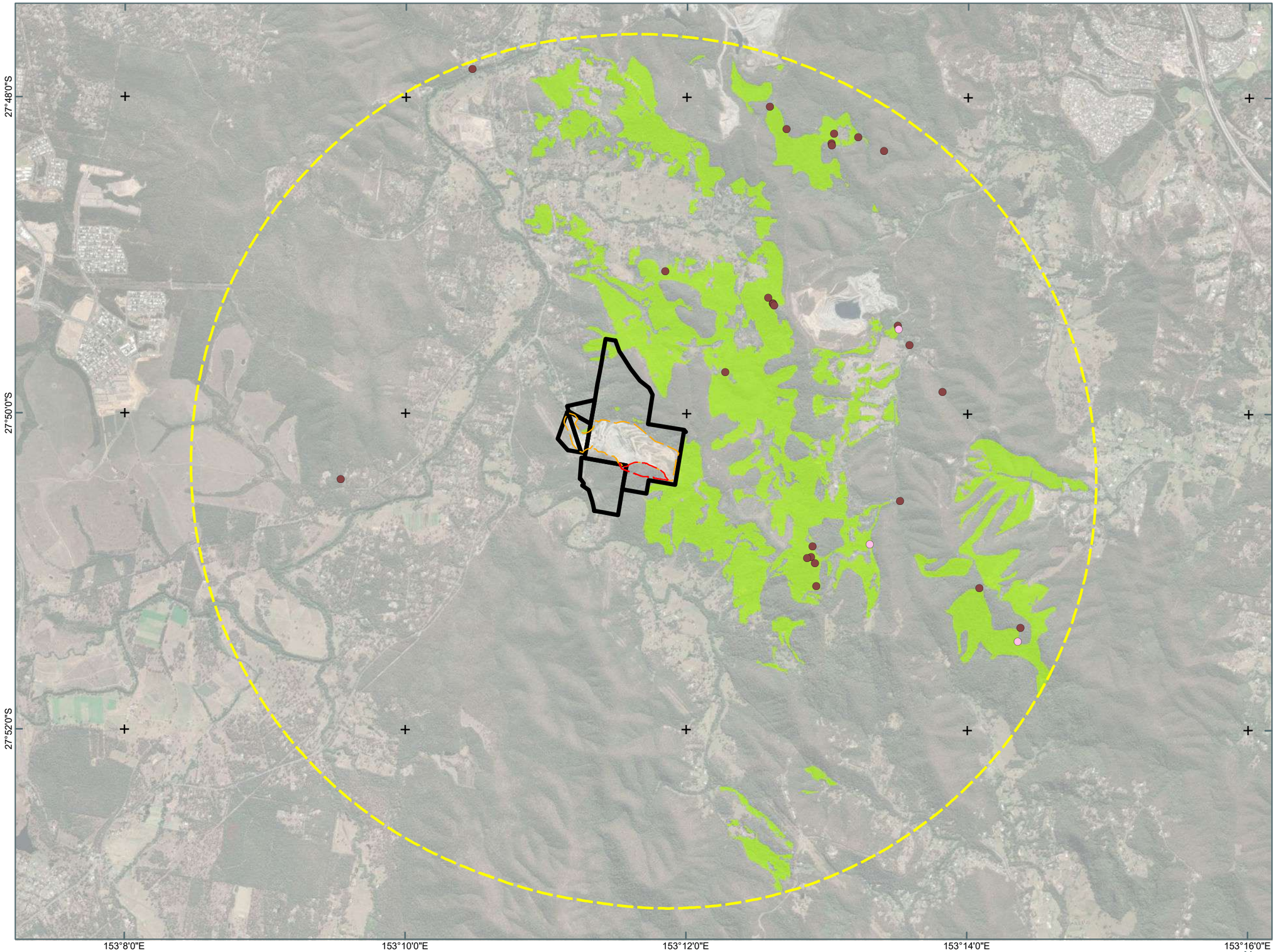
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GDA 2020 | Zone 56 @ A3

Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024
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11390 E PD 12 SEGBC Hab and Rec A

PLAN A13. MACADAMIA HABITAT AND RECORDS



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- 5KM Referral Area Buffer

Macadamia integrifolia Records and Habitat

- *Macadamia integrifolia* records within 10km of referral area recorded within past 20 years [24]
- *Macadamia tetraphylla* records within 10km of referral area recorded within past 20 years [11]
- Potential and known Macadamia habitat [11% within 5km of site]



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0 500 1,000 m
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1:45,000
@ A3

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7/10/2025

11390 E PD 13 MI Hab and Rec A

PLAN A14. LRSA TEC BUFFERS

27°5'0"S

153°11'0"E

153°12'0"E

85m

35m

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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- VMA Category B - RE 12.11.10 - Potential TEC
- VMA Category C and Preclear 12.11.10 - confirmed not TEC
- Precautionary principle dictates potential presence of LRSA TEC from desktop assessment only (no access)
- Proposed buffers to closest point of potential LRSA TEC utilising precautionary principle



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0 50 100 150 200 m

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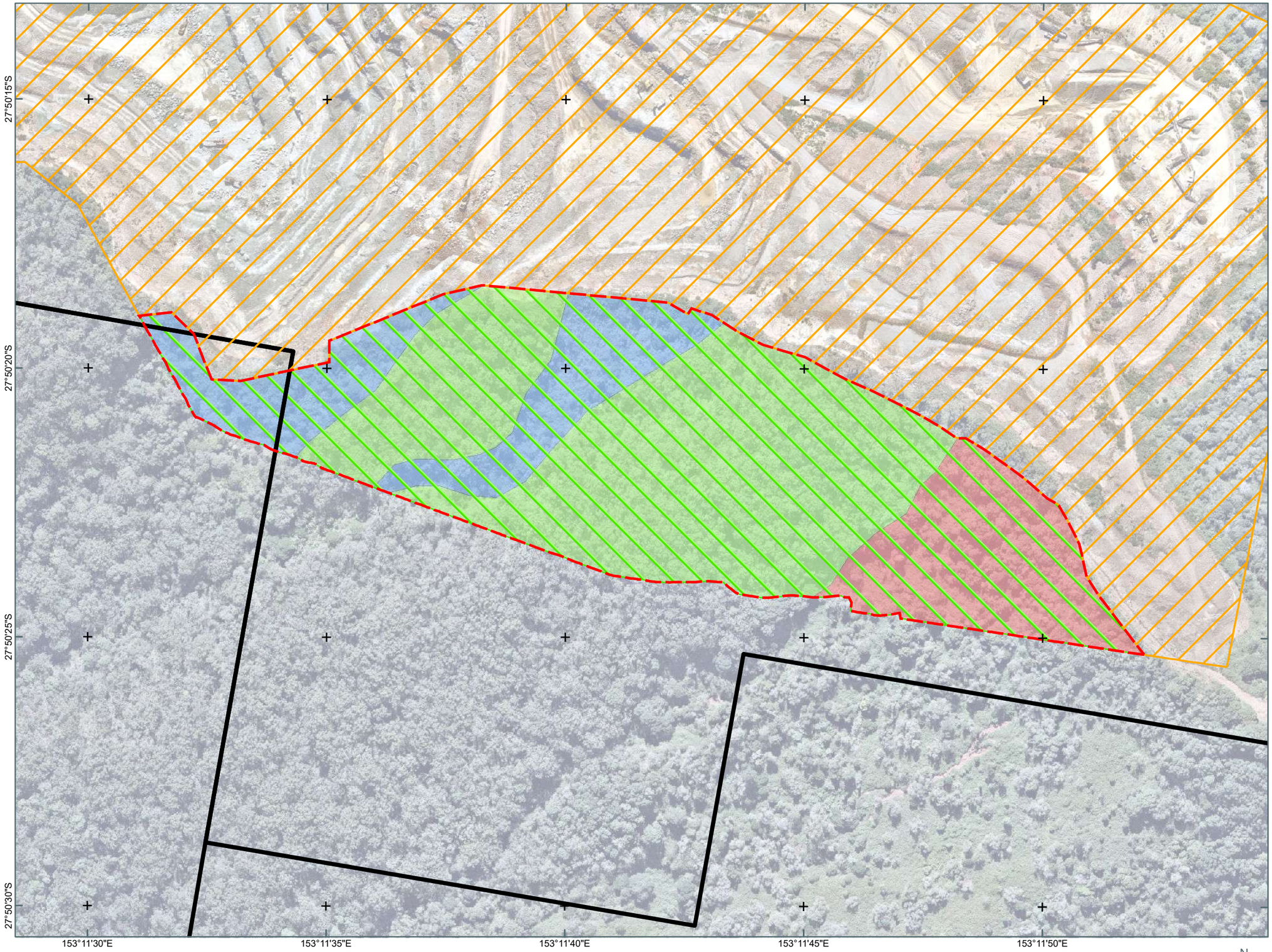
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17/11/2025

11390 E PD 14 TEC Buffers A

PLAN A15. KOALA IMPACT PLAN



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- Impacted Critical Koala Habitat [5.9 ha]

Impacted Vegetation Communities

- **Assessment Unit 1:** **[3.5 ha]**
  Indicative of Remnant RE 12.11.3
- **Assessment Unit 2:** **[1.1 ha]**
  Regrowth RE 12.11.10
- **Assessment Unit 3:** **[1.3 ha]**
  Highly disturbed, dominated by weeds and Acacia regrowth



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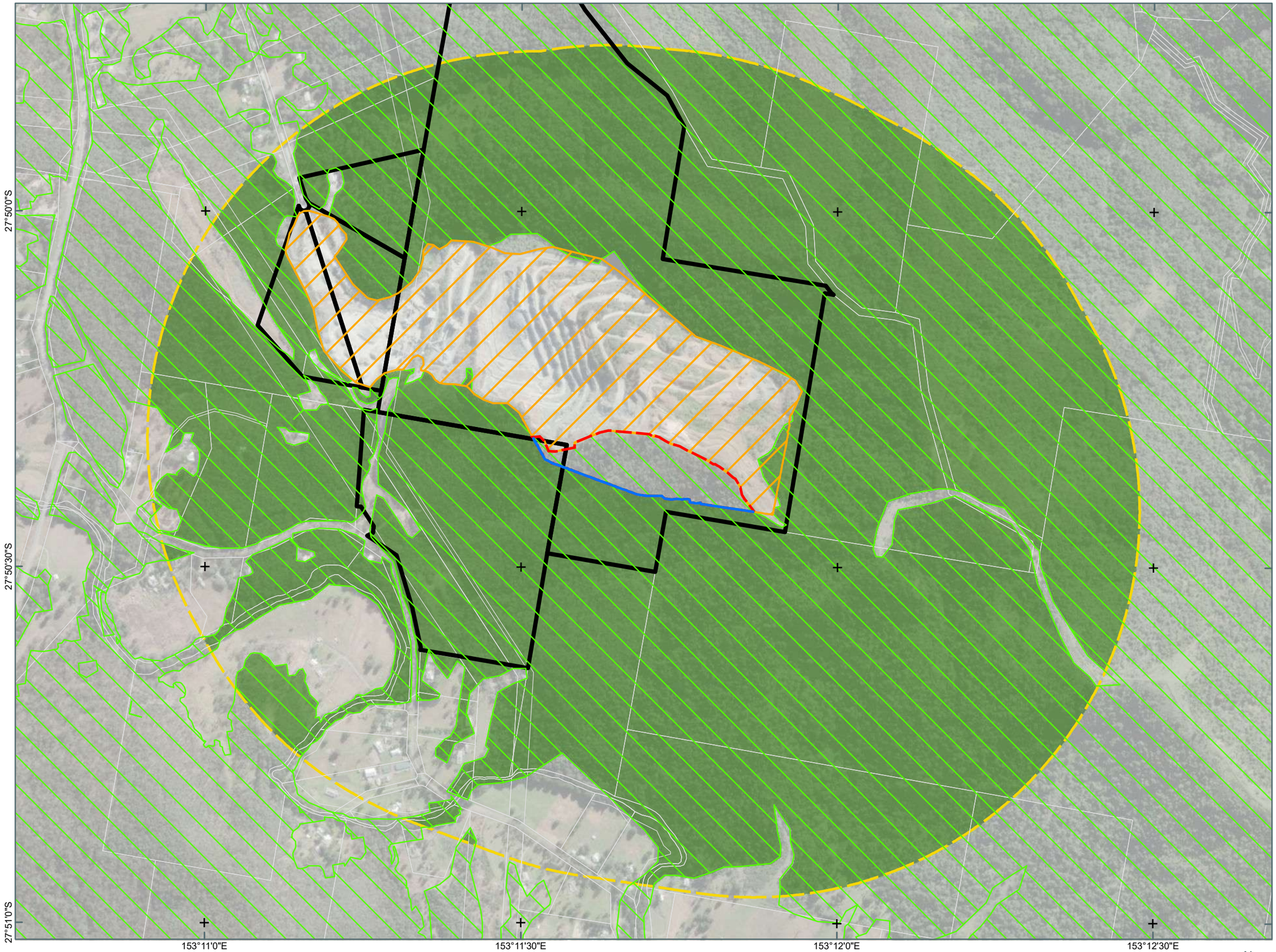
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Transverse Mercator
GDA 2020 | Zone 56
1:2,200 @ A3

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9/10/2025

11390 E PD 15 Koala Impact A

PLAN A16. KOALA CONTEXT ASSESSMENT



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LEGEND

- Qld DCDB
- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- 1km Referral Area Buffer
- Percentage of Referral Area boundary length supporting a Koala critical habitat connection off and on site [48%]
- Percentage of Koala critical habitat within 1km of Referral Area [79%]
- Size of Koala critical habitat patch >200m corridor connectivity [>500ha]



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0 100 200 300 m

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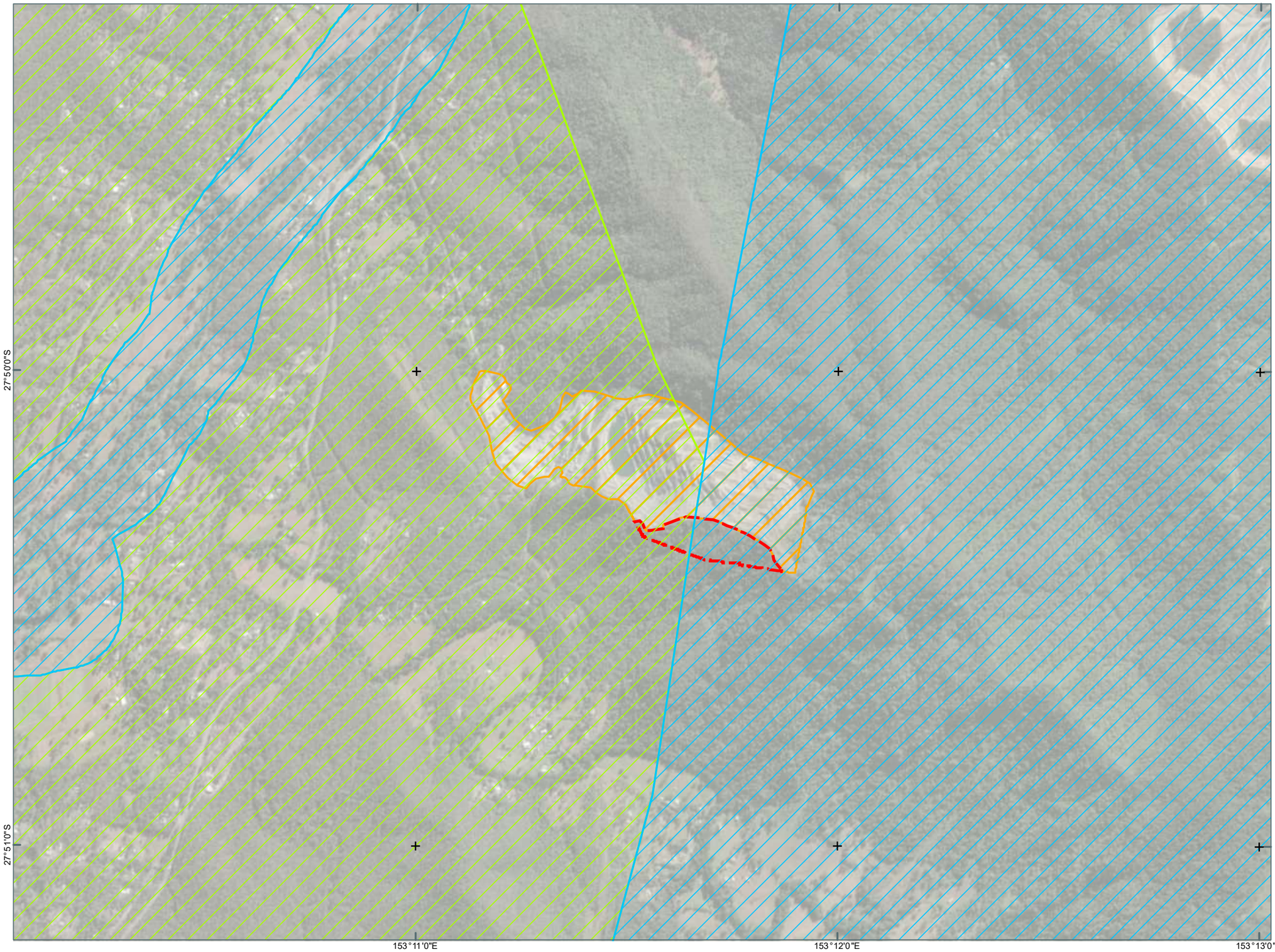
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7/10/2025

11390 E PD 16 Koala Context A

PLAN A17. ECOLOGICAL CORRIDORS



Notes:
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LEGEND

- Existing Quarry Area
- Referral Area [5.9 ha]
- Biodiversity Planning Assessment - Regional Significance Corridor
- Biodiversity Planning Assessment - State Significance Corridor



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Fulton Hogan

BLUE ROCK QUARRY, CEDAR CREEK

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Transverse Mercator
GDA 2020 | Zone 56

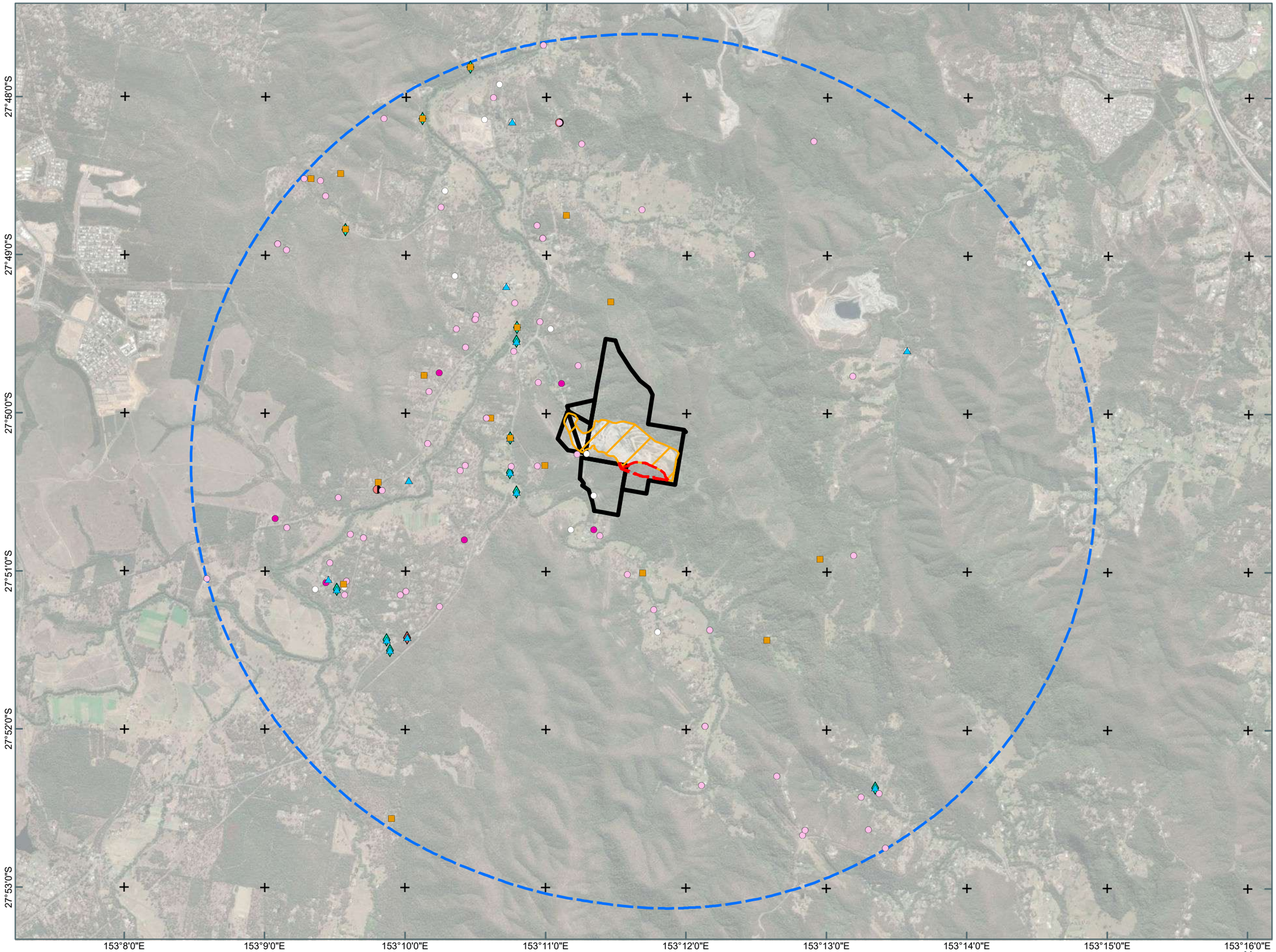
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17/11/2025

11390 E PD 17 Eco Corridors A

PLAN A18. KOALA HOSPITAL RECORDS



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LEGEND

- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]

QLD Koala Hospital Records (within 5km)

- Deceased [18]
- Injured [15]
- Sick and/or wasted [67]
- Sick & Injured [6]
- Vehicle hit [14]
- Orphaned [2]
- Vehicle hit & orphaned [1]
- Other incident type [101]



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11390 E PD 18 Koala Hospital A

PLAN A19. PROPOSED OFFSET AREA



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LEGEND

- Qld DCDB
- Offset Site Boundary
- Proposed Offset Area [40.0 ha]



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11390 E PD 19 Offset Area A

PLAN A20. PROPOSED OFFSET FIELD SURVEY



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LEGEND

- Qld DCDB
- Offset Site Boundary
- Proposed Offset Area [40.0 ha]
- AU1 – Non-remnant RE12.9-10.2 [40.0 ha]
- Camera Locations [4]
- SAT Survey Locations [2]
- Offset Weed Transects [2]
- Offset MHQA [2]



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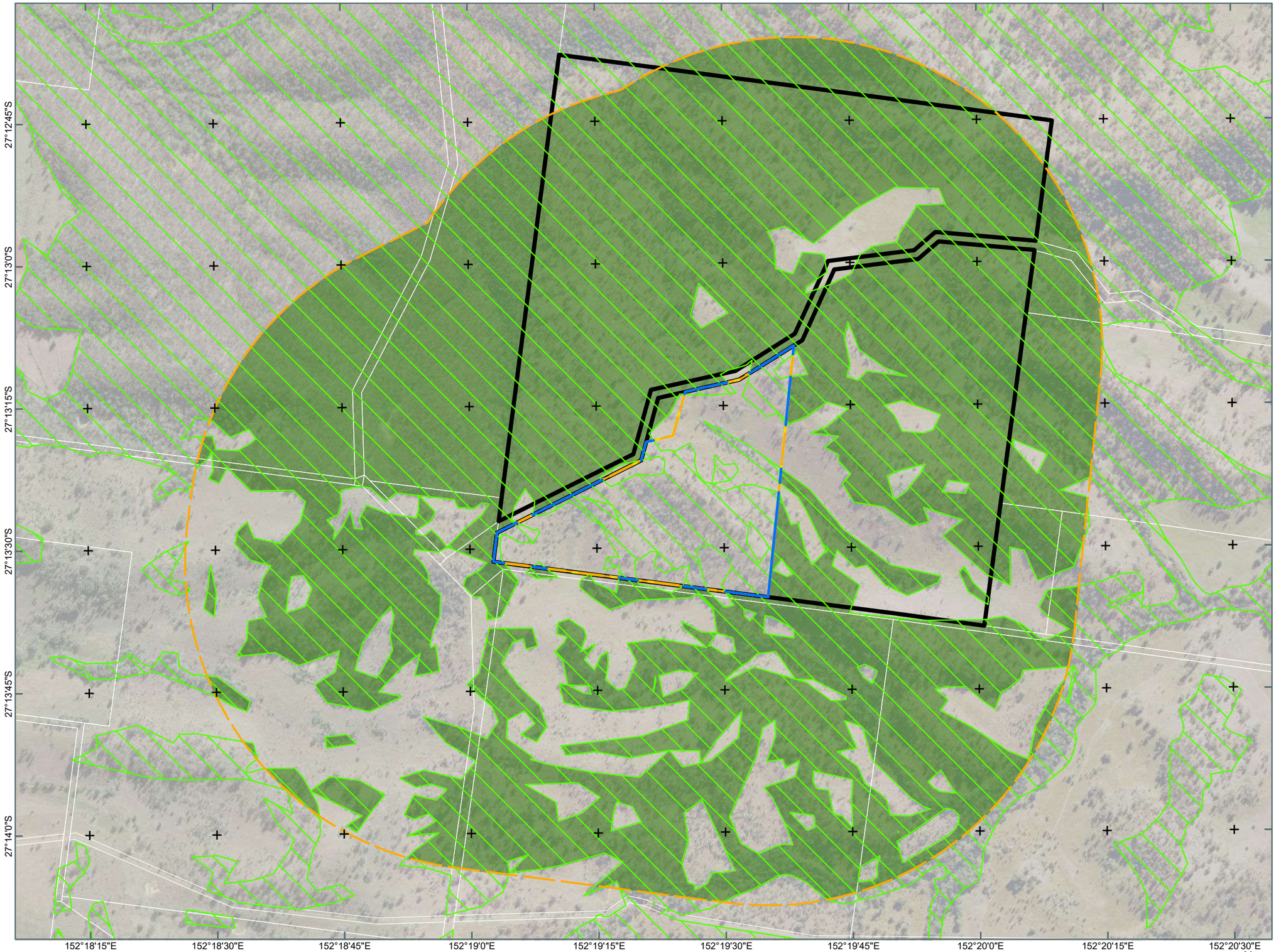
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11390 E PD 20 Offset Field Survey A_new

PLAN A21. PROPOSED OFFSET KOALA CONTEXT



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LEGEND

- Qld DCDB
- Offset Site Boundary
- Proposed Offset Area [40.0 ha]
- 1km Offset Site Buffer
- Percentage of Koala critical habitat within 1km of Offset Site [76%]
- Size of Koala critical habitat patch >200m corridor connectivity [>200ha]
- Percentage of Offset Site boundary length supporting a Koala critical habitat connection off and on site [58%]



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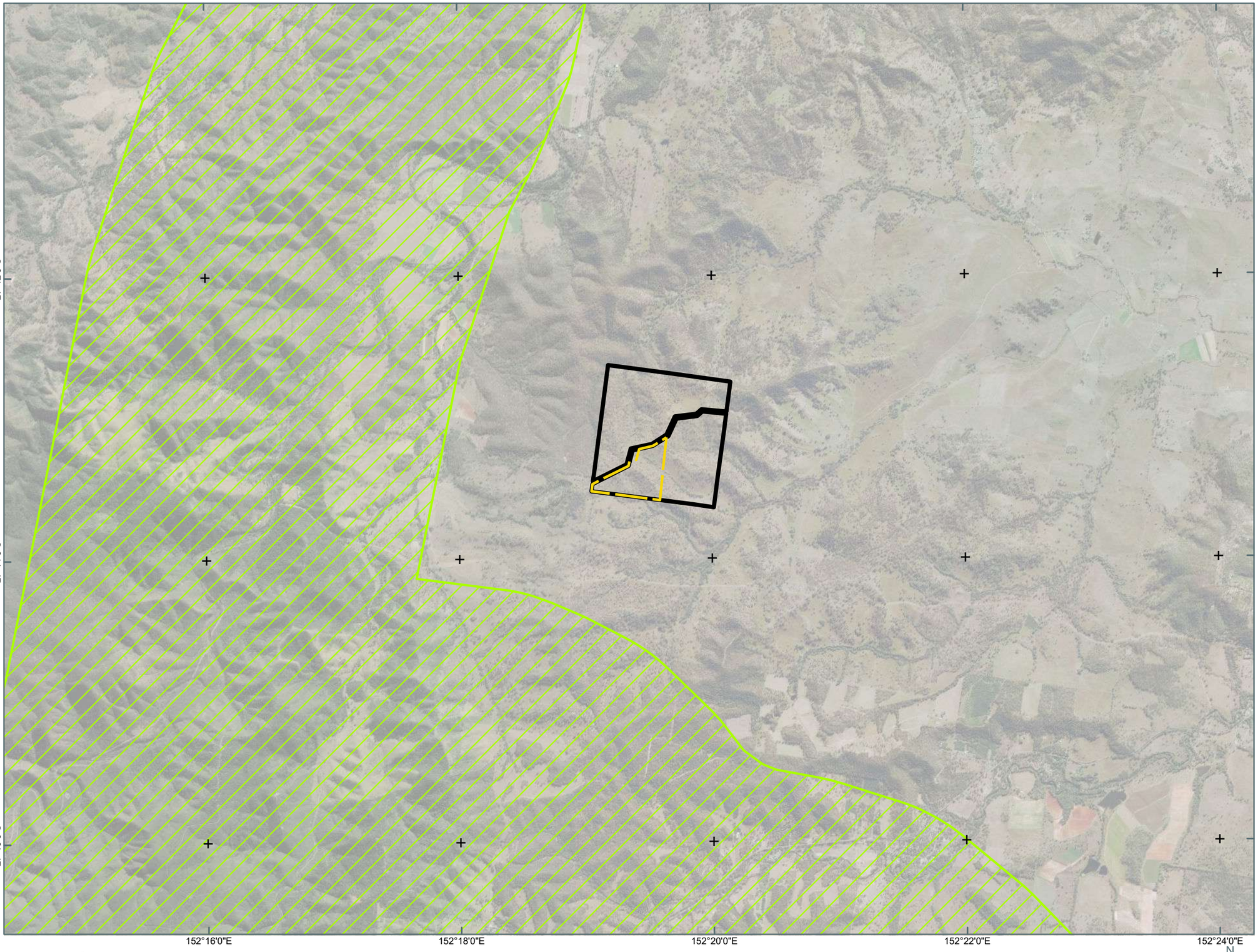
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11390 E PD 21 Offset Koala Context A_new

PLAN A22. PROPOSED OFFSET ECOLOGICAL CORRIDORS



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LEGEND

- Offset Site Boundary
- Proposed Offset Area [40.0 ha]

Statewide Corridors

- Regional Significance



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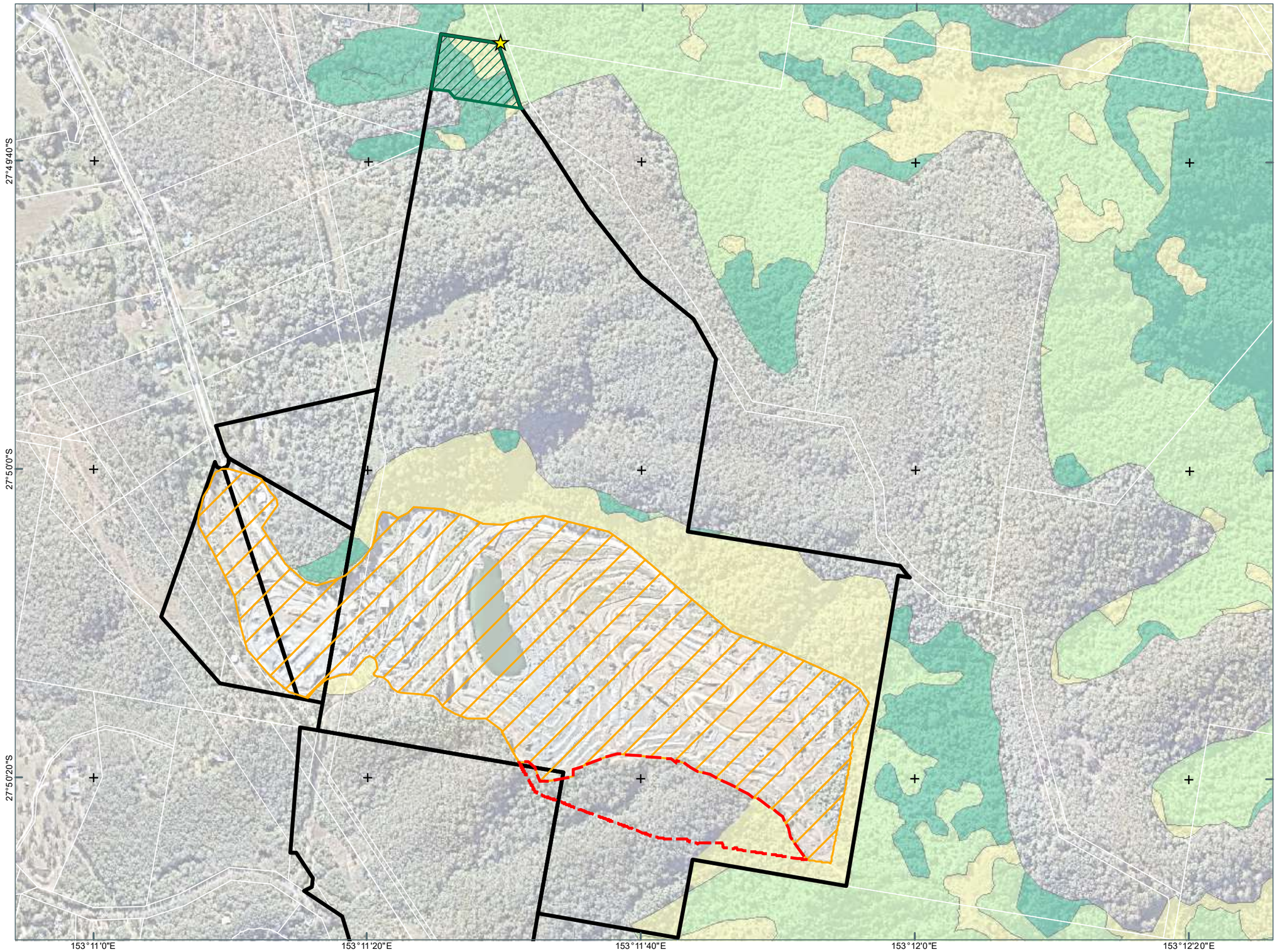
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7/10/2025

11390 E PD 22 Offset Eco Corridors A

PLAN A23. PROPOSED MACADAMIA OFFSET PLANTING AREA



Notes:
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LEGEND

- Qld DCDB
- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]

QLD VMA Mapping

- VMA Category B - RE 12.11.10
- VMA Category C - RE 12.11.10
- VMA Category X - (preclear RE 12.11.10)
- Planting Area [1.77 ha]
- *Macadamia integrifolia* Observation



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17/11/2025

11390 E PD 23 Proposed Planting A

Attachments

Attachment A1

EPBC Act Controlled Action Decision Notice

Attachment A2

PD additional information request

Attachment A3

Environmental Management Plan (EMP)

Attachment A4

Impact MHQA Raw Data

Attachment A5

Impact Raw SAT data

Attachment A6

LRSA TEC raw data

Attachment A7

Kipper Creek Offset Management Plan

Attachment A8

Macadamia integrifolia Impact Management Plan

Attachment A1

EPBC Act Controlled Action Decision Notice

Australian Government
Department of Climate Change, Energy, the Environment and Water

Notification of referral decision and designated proponent – controlled action – and assessment approach

Blue Rock Quarry Expansion Project, Cedar Creek, QLD (EPBC 2024/09844)

This decision is made under section 75 and section 87 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Proposed Action

designated proponent	Fulton Hogan Quarries Pty Ltd ACN: 004 475 076
proposed action	The expansion of the existing Blue Rock Quarry, located at Tamaree Road, Cedar Creek, QLD (See referral EPBC 2024/09844).

Referral decision: controlled action

status of proposed action	The proposed action is a controlled action. The project will require assessment and approval under the EPBC Act before it can proceed.
relevant controlling provisions	• Listed threatened species and communities (sections 18 and 18A)

Assessment approach decision

assessment approach	The project will be assessed by preliminary documentation

Person authorised to make decision

name and position	Declan O'Connor-Cox Branch Head Environment Assessments Queensland Branch
signature	
date of decision	24 July 2024

Attachment A2

PD additional information request

ATTACHMENT A
REQUEST FOR ADDITIONAL INFORMATION REQUIRED FOR ASSESSMENT BY PRELIMINARY DOCUMENTATION

Blue Rock Quarry Expansion Project, Cedar Creek, QLD (EPBC 2024/09844)

Under s95A(2) of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), further information is required to inform the assessment of impacts of this action, including information about strategies for avoiding and mitigating any adverse impacts.

The preliminary documentation for the proposal must include:

a) specified information included in the original referral.

b) additional information you provide in response to this request.

c) any other information specified in this request or provided during the referral or assessment process.

Please note the department may require further information, in addition to the information required below, should new issues come to light during the assessment stage.

The preliminary documentation must address the matters set out below.

1. General content, format and style

The preliminary documentation must be written so that any conclusions reached can be independently assessed, and:	
1.1.	Include a reference table indicating where to find information and links within the document to relevant sections. Where relevant information was provided in the referral, please incorporate, or cross-reference to this information as necessary in the preliminary documentation.
1.2.	Contain sufficient information to allow the Minister (or delegate) to make an informed decision on whether to approve, under Part 9 of the EPBC Act, the taking of the action for the purposes of each controlling provision. Contain sufficient information to enable interested stakeholders to understand the environmental consequences of the proposed development on matters of national environmental significance (MNES).
1.3.	Ensure all work and conclusions: a) are presented clearly, unambiguously, succinctly and objectively. b) are evidence based, and the evidence is provided. c) are supported by peer reviewed literature, with references provided, or expert opinion. d) use scientifically robust methodologies appropriate to the purpose, including a justification of why the methodology/s was selected; details of the methodology described in a manner that allows an independent suitably qualified

	practitioners to apply the method; and, state any limitations of the chosen approach. e) are supported by maps, plans, diagrams, baseline surveys or other descriptive detail. f) maps must clearly identify development footprints, buffer zones, and any conservation areas where impacts will be avoided, and areas of adjacent habitat that would be subject to indirect impacts, including areas that are to be retained within and adjacent to the site. g) use active language and state clear commitments (e.g., 'must' and 'will') where appropriate, particularly in describing avoidance, mitigation and management actions and outcomes. h) demonstrate the use of the most up to date statutory documents* including Approved Listing Advice(s), Conservation Advice(s), Recovery Plan(s), Threat Abatement Plan(s) or comparable policy guidelines, and approved survey methods. i) demonstrate the use of up-to-date; policy guidelines, scientific methods, information, data and species-relevant survey methods. j) appropriately reference all sources using the Harvard standard. The reference list must include the address of any internet pages used as data sources. **relevant documents include, but are not limited to, the resources found in the Species Profile and Threats Database (SPRAT database) and EPBC Act publications and resources*.
1.4.	Be able to read as a stand-alone document and must include summaries of all relevant information referenced or provided in appendices. Complex or detailed technical information, studies or investigations necessary to support the main text should be attached to the main document as appendices.

2. Description of the action

The preliminary documentation must include:	
2.1.	a) A description of all components of the proposed action (such as pre-construction, construction and operational), including the staging, sequencing, duration and timing. b) A description of the anticipated start and completion dates of all actions such as the extent, staging and timing of clearing undertaken over the construction period. c) The location, extent, and size (in hectares) of the total project footprint, disturbance/impact footprint, and of any adjoining areas (beyond the impact area) that may be subject to indirect or facilitated impacts, including edge effects, noise or light spill, vehicle access or other associated activities. d) A description, with supporting spatial information, detailing all site access

	roads and any other shared infrastructure with adjacent projects/areas to be constructed to facilitate the proposed action. *Please describe any changes to project or disturbance footprints that may have occurred since the original referral. Please note these changes may require a formal variation request.*
2.2.	Provide a description of the intended land uses proposed as part of the completed development, including of any proposed open space and/or conservation areas and associated ongoing activities, and details of the intended party that would be responsible for future management activities.
2.3.	Details of any local or State Government planning scheme, or plan or policy under any local or State Government planning system that applies or is likely to apply to the proposed action. Details should include (but are not limited to): a) what environmental assessment of the proposed action has been, or is being, carried out under the scheme, plan or policy? b) application/approval numbers for existing applications where relevant c) obtained approvals or additional approvals that are required.

3. Description of the environment and Matters of National Environmental Significance

Description of the environment The preliminary documentation must provide a description of the environment affected by and surrounding the proposed action area, over both the short and long term, including:	
3.1.	A description of the environment more broadly including previous and current land use within and surrounding the proposed action area.
3.2.	A description of any potential listed threatened species or ecological community (including but not limited to those listed in this request for information) that occur in the project area and adjacent areas. *Please ensure that a recent Protected Matters Search Tool report is generated and used during the assessment before finalising the draft preliminary documentation to identify any additional species (listed at the time of the controlled action area) that may be affected by the proposal.*
3.3.	For listed threatened species and ecological communities that have the potential, or are likely, to be present at and in the vicinity of the project site, including but not limited to those listed in this request, please provide a likelihood of occurrence assessment including the following: a) Information on the abundance, distribution, ecology and habitat preference of the species or communities. b) Quantification of the extent of habitat (including maps identifying known or

	potential habitat) on site and, where feasible, in the broader landscape. c) Quality and importance of known or potential habitat for the species or communities. d) Information detailing known populations or records within at least five kilometres of the development footprint and (if known) the size of these populations. e) Conclusions on the likelihood of occurrence of listed threatened species and ecological communities within the project site, or within an area of impacts outside the project site. *Likelihood or occurrence and habitat assessments must be informed by up-to-date desktop and field surveys and informed by relevant departmental documents (e.g., approved Conservation Advice, Recovery Plans, draft referral guidelines and Listing Advice, and SPRAT Database) and/or species experts.*
3.4.	Up to date baseline and survey data at the impact site(s), and if relevant, the proposed offset site(s) site, including: a) Information on the survey methodology or technique used (e.g., thermal detection, camera trapping, tree hollow search, SAT surveys etc) b) When surveys were conducted (e.g., dates, time of day, season, etc.) and survey effort (e.g., two hours for every one hectare within a 5-hectare area) c) Map/s of survey points or transects and how the survey points or transects were selected. d) An assessment of the adequacy of any surveys undertaken with reference to any relevant scientific literature and/or statutory documents. In particular, the extent to which these surveys were appropriate for the species and undertaken in accordance with relevant survey guidelines. e) Results of all surveys undertaken.
3.5.	Based on survey data and with reference to relevant statutory documents, provide a clear description of the total extent and quality of habitat present within and surrounding the proposed action area for each species or ecological community potentially present or impacted by the action. For all species with residual significant impacts the method used to quantitatively assess the quality of habitat must be discussed and endorsed by the department before being applied.

Survey requirements

Survey timing

Please note that some surveys can take more than a year to complete to ensure they are undertaken in the correct season. The department generally cannot accept survey data that's more than 5 years old because:

- populations of species can change due to fires, drought, flooding and land management changes.
- some species' ranges can shift due to climate change.

If your data is older than 4 years when you start planning your project, the department recommends you undertake further up to date surveys.

For information on survey methodologies approved by the Australian Government, please refer to https://www.dcceew.gov.au/environment/epbc/advice/surveys-and-data

Precautionary principle

Failing to survey appropriately for threatened species that may be present at a site could result in the department applying the precautionary principle with regard to residual significant impact determinations.

That is, if no supporting evidence (such as survey results) is presented to support the claim of species absence, then the department may assume that the species is in fact present. The department will not accept claimed species absence without effective validation such as through application of survey guidelines, other survey techniques (for example, a state guideline or an accepted industry guideline), or statements from relevant species experts. Where a claim of absence is made, proposals must provide a robust evaluation of species absence.

4. Impact assessment

Based on the information provided in the referral, additional information provided in support of the referral, information provided in the SPRAT database, and online observation records, the department considers the proposed action is likely to have a significant impact on the following controlling provision:

- Listed threatened species and communities (sections 18 and 18A)

Based on the information available in the referral, the proposed action is likely to have a significant impact on the following matters of national environmental significance, including but not limited to:

Koala (*Phascolarctos cinereus* (Combined populations QLD, NSW, and the ACT)) – endangered

- The proposed action will result in the loss of 5.9 ha of habitat critical to the survival of the Koala.

Based on all the information available to the department (including the PMST, which suggests the presence of the following species or communities in the area of the proposal), and without further detailed assessment of potential impacts, the department considers that the proposed action may significantly impact on other listed threatened species including but not limited to the following:

Macadamia Nut (*Macadamia integrifolia*) - vulnerable

- The department notes that survey efforts for the Macadamia Nut are currently not adequate, including for the categorisation of priority populations according to the National Recovery Plan for Macadamia Species. Further survey efforts are required in-line with the recovery plan, including habitat surrounding the referral area to detect presence of *Macadamia* species. The department also notes the referral documentation makes reference to an Impact Management Plan for the Macadamia Nut , which should now be provided in the assessment documentation. Information provided on these matters must be consistent with the recovery plan and Approved Conservation Advice for *Macadamia integrifolia* (Macadamia Nut). These statutory documents and other information can be found on the Species Profile and Threats Database.

South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*) - vulnerable

- Referral documentation states that this species was not assessed against Significant Impact Guidelines 1.1 - Matters of National Environmental Significance due to lack of hollow-bearing trees and foraging resources on site. However, the referral states that the species preferred food trees are found on site, thus, further survey and assessment is required to determine whether the site contains foraging resources. Further information is required regarding the survey methods used to determine the number of hollow-bearing trees on site, how many hollows are present, and how hollows have been assessed and categorised. Assessment of habitat for the species must align with information found in the Conservation Advice for *Calyptorhynchus lathami lathami* (South-eastern Glossy Black Cockatoo), including the species' specific hollow requirements. The department also notes that species names should be used consistently and be in-line with statutory documents. The conservation advice and other information can be found on the Species Profile and Threats Database.

Greater Glider (southern and central) (*Petauroides volans*) - endangered

- The referral states that targeted surveys for the Greater Glider were conducted and an assessment made of breeding habitat and foraging values on site. It provides that large, hollow-bearing trees are significantly limited across the referral area. However, as mentioned above, no information has been provided regarding the survey methods used to determine the number of hollow-bearing trees on site, how many hollows are present, or how hollows have been assessed and categorised. The referral also states that only assessment unit 1 (3.5 ha) should be considered potential habitat for the Greater Glider. The department notes that further information and justification is required regarding the exclusion of the remaining area as potential habitat for the species. Assessment of habitat onsite must align with information in the Conservation Advice for *Petauroides volans* (greater glider (southern and central)) which, along with other information, can be found on the Species Profile and Threats Database.

Lowland Rainforest of Subtropical Australia Threatened Ecological Community (TEC) – critically endangered

- The referral states that the area in assessment unit 2 does not meet the key diagnostic criteria to be considered Lowland Rainforest of Subtropical Australia TEC – namely due to a lack of species richness and community structure. Further information is required to

determine whether habitat in the referral area is part of a patch that meets the diagnostic criteria of this TEC. This area meets all other key diagnostic criteria and, while not meeting the threshold, the species richness in the broader area is relevant. Further, while the area in the referral site may not meet the threshold, it is potentially part of a larger patch. More extensive TEC surveys are required, including within the entirety of the referral area and in a broader area surrounding the site. Key information on the Lowland Rainforest of Subtropical Australia TEC can be found on the Species Profile and Threats Database.

Note that this may not be a complete list and it is your responsibility, as the proponent, to ensure that any species or ecological communities listed under the EPBC Act at the time of the controlled action decision, which may be present or potentially significantly impacted, are assessed as part of the preliminary documentation.

The preliminary documentation must include an up-to-date assessment of potential impacts that may occur as a result of the proposed action. Consideration of impacts must not be confined to the immediate area of the proposed action but must also consider the potential of the proposed action to impact on adjacent areas that are likely to contain populations and/or habitat for MNES.	
4.1.	Include a clear description of the total extent and quality of the following: a) project footprint (including the total extent of habitat present for each relevant protected matter) b) direct and indirect impact areas (including the total extent of habitat for each relevant protected matter to be impacted) a) total areas proposed to be retained/avoided (including the total extent of habitat present for each relevant protected matter to be avoided).
4.2.	To inform point 4.1, please provide an assessment of the direct, indirect, facilitated and cumulative impacts that may occur as a result of the proposed action at a local and regional scale. The assessment should include consideration of: a) the nature, likelihood, significance, and extent of impacts and whether any relevant impacts are likely to be unknown, unpredictable or irreversible. b) timing and whether the impact is temporary or permanent c) species specific habitat requirements such as hollow bearing trees, nest trees, refuge habitat, foraging and breeding habitat, sheltering or other microhabitat features relevant to the species within and surrounding the development footprint (if applicable). d) whether connectivity and movement opportunities in the surrounding area may be retained, removed or functionally lost or compromised. e) adjacent areas of habitat that may or will be subject to intensification of ongoing impacts (for example, through increased human and vehicle presence)

	f) indirect or facilitated impacts that may result from the proposed action, including but not limited to the following: i. Edge effects – including the potential for the introduction of weed species and pathogens in the referral area and adjacent environment. ii. Vehicle movement – potential increase of vehicles to strike fauna in the pre-construction, construction, and operation phase of the project. iii. Increased presence of dogs – pre-construction, construction and operation phases have the potential to increase dog presence in the referral area and adjacent environment. iv. Earthworks – potential to generate dust emissions from the removal of vegetation and movement of soil in the pre-construction and construction phase of the project. v. Disturbance from increased noise, artificial light, sediment generation and other relevant stressors during construction and operation of the residential development. g) cumulative impacts, where potential project impacts on MNES are in addition to existing impacts of other activities (including current or future developments by the proponent and other proponents in the region and vicinity)
Note:	Please review the following policy statement, providing guidance on what impacts constitute a 'indirect consequences(s)', under paragraph 527E(1)(b) of the EPBC Act. Facilitated impacts may include (but are not limited to) the risk of injury or mortality to MNES as a result of the introduction of domestic dogs in a residential area, vehicle strike as a result of increased residential car use and/or the development of swimming pools.
4.3.	Include current maps and coordinates/shapefiles showing the total project footprint, total disturbance/direct and indirect impact areas, areas of habitat for MNES proposed to be retained.
4.4.	Include details of any policy guidelines, relevant studies, surveys, or consultations with species experts/field specialists, which were not included in the referral or additional information provided in support of the referral.

5. Avoidance, mitigation and management measures

The information available in the referral indicates that there is substantial area within the project footprint with protected matters present or likely to be present.

The mitigation hierarchy is a process that is used to limit the amount of damage an action, such as a development, will have on the environment. There are three steps, and each step must be followed in order and to the greatest extent possible before moving on to the next. These steps are:

1. **avoid** harm to the environment within and surrounding the project area.
2. **reduce** or mitigate environmental damage within and surrounding the project area.
3. identify **offsets** within the region that compensate for the significant residual impacts to listed species or ecological communities.

The preliminary documentation must provide information on proposed avoidance, safeguards and mitigation measures to deal with the relevant impacts of the proposed action on MNES.

5.1.	Demonstrate that you have applied the mitigation hierarchy and exhausted all options to avoid and mitigate harm to protected matters, before resorting to environmental offsets. In doing this, you must demonstrate that any avoidance or mitigation measures will provide ecological benefits to the species in the long-term. For example, on-site avoidance/conservation areas must be connected or provide connectivity opportunities for species in the broader landscape, and must include enduring mitigation of impacts from adjacent development.
5.2.	Provide details (including a summary list or table) of avoidance and mitigation measures proposed to be undertaken to prevent or minimise impacts on protected matters (or their habitat) from the proposed action area, including: a) a description of avoidance measures that have been considered and applied. For example, project site selection to avoid valuable habitat, micro-siting of infrastructure to avoid impacts on habitat on site, or avoidance of any activity that may indirectly impact on essential lifecycle processes for species. b) a description of proposed safeguards and mitigation measures to minimise and manage relevant impacts of the action, with reference to relevant statutory or policy documents at the Commonwealth and State level (e.g., *Guideline: State Development Assessment Provisions (State Code 25)*) c) pre-clearance and clearance procedures to ensure that species are detected and managed to minimise mortality, stress, injury, or introduction of disease. d) measures to address the risk of species, such as the koala, entering the residential area and becoming trapped/isolated without resources for shelter whilst in the residential area and safe movement opportunities to get out of the residential area, along with sufficient information on the location and design of these measures. e) ongoing management of direct and indirect impacts due to increased likelihood of

	human presence, attacks by domestic dogs, and injury caused by negotiating various fence types. f) details of how speed reduction is to be achieved (e.g., traffic calming devices) and plans showing the locations of each of these features and the manner in which they will be implemented). g) information on safe road design and placement, including installation of crossing warning signs, wildlife threshold marking on road (include maps and imagery). h) the locations and size of any proposed fauna movement solutions, fire breaks, no-go or buffer zones (including buffers between the construction footprint or remaining habitat in the referral area and adjacent to the site), and potential fencing, including: i. the location of any movement solutions, fire breaks, buffer zones, or fencing. ii. the characteristics of the fauna movement solutions, fire breaks, buffer zones and fencing, (i.e., height, length, wildlife proof measures etc) iii. whether the proposed measures, such as fencing will provide a wildlife barrier to/from/within the proposed action area. i) a description of the environmental outcomes the measures are expected to achieve including details of any baseline data or proposed monitoring to demonstrate progress towards achieving these outcomes. j) information on the timing, frequency, and duration of the measures to be implemented. k) an actual or estimated cost of the mitigation measures.
5.3.	Provide an assessment of the predicted effectiveness of each proposed avoidance or mitigation measure, noting that the effectiveness of a particular measure is a reflection of confidence in the anticipated outcome. The assessment of effectiveness should be evidence based and include examples of demonstrated success of a particular measure to achieve the desired avoidance/mitigation outcome.
5.4.	For each measure proposed, indicate the: a) impacts that are being avoided and/or the significance of impacts being reduced through mitigation. b) Scientific basis for conclusions being drawn c) an evidence-based likelihood of success/risk assessment d) responsible party e) milestones / performance / completion criteria f) proposed monitoring and evaluation program.
5.5.	Describe any statutory or policy basis for the proposed measures, including reference to

	the SPRAT Database and relevant approved conservation advice, recovery plan or threat abatement plan, and a discussion on how the proposed measures are not inconsistent with relevant plans. For example, the National Recovery Plan for the Grey-Headed Flying Fox states an objective to: '*To improve the Grey-headed Flying-foxes national population trend by reducing the impact of the threats outlined in this plan on Grey-headed Flying-foxes through habitat identification, protection, restoration and monitoring'.* Please provide a discussion on how the proposed action is not inconsistent with relevant species' objectives or alternatively, how the proposed avoidance, mitigation/management and offsetting actions will compensate for any residual significant impacts, thereby ensuring consistency with the objective for relevant EPBC Act species.
5.6.	All proposed measures must consider the 'S.M.A.R.T' principle: S – Specific (protected matter-specific objectives, methods, outcomes, and repeatability) M – Measurable (baseline information, quantifiable, auditable) A – Achievable (timeframes, financial and human resources) R – Relevant (conservation advice, recovery plans, threat abatement plans) T – Time-bound (set implementation, performance and completion timeframes).

6. Proposed offsets

Where residual significant impacts to listed threatened species or ecological communities remain after application of all reasonable avoidance and mitigation measures, a compensatory environmental offset in accordance with the *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy* (EPBC Offsets Policy)[1] is required.

Offsets must be specific to the species or ecological community being impacted, must address the attribute of the protected matter that is impacted, and must deliver an outcome for the protected matter that is demonstrably equal or better than if neither the impact nor the offset occurred. Offsets are not intended to make proposed actions with unacceptable impacts, acceptable.

If an offset is required, prior to publication, the preliminary documentation must include an:

1. **Offset Proposal** – The Offset Proposal must provide detail about the proposed offset site or sites including baseline survey information, habitat or vegetation quality scores, how the offset will be managed, and evidence that the protected matter is present or uses the offset site. The Offset Proposal must demonstrate how the proposed offset is suitable and meets the principles of the EPBC Offsets Policy and must include sufficient information for the department to assess it using the EPBC Offsets Assessment Guide.
2. **Offset Management Plan (OMP)** – The OMP supports the Offset Proposal and must detail all the management activities to be undertaken at the offset site including setting environmental objectives, milestones, monitoring and reporting measures. Management

[1] https://www.dcceew.gov.au/environment/epbc/publications/epbc-act-environmental-offsets-policy

plans and activities must be targeted towards the specific plant, animal, ecological community, or place (protected matter) that is being offset. If there is more than one offset site, then a separate OMP must be prepared for each site.

For further details regarding offset requirements and the requirements of an Offset Proposal and OMP, see Attachment B.

7. Habitat quality assessment

A methodology that is suitable for each listed threatened species or threatened ecological community (i.e., endorsed by the department or supported by literature) where there is a residual significant impact must be used to assess habitat quality, noting the same scoring mechanism must be used at both impact and offset sites.

The department encourages proponents to consult and seek endorsement from the department on a proposed method prior to undertaking any habitat quality assessment at both impact and offset site(s).

The department currently prefers habitat quality scoring methods for each prescribed matters to be consistent with the Modified Habitat Quality Assessment (MHQA) method. The MHQA tool derives habitat quality scores using an adaptation of the Queensland Government's 'Guide to determining terrestrial habitat quality version 1.2 (DEHP Guide).

The MHQA aligns, as far as possible the DEHP Guide with the requirements of the EPBC Act Environmental Offsets Policy for determining habitat quality scores. In aligning with this policy, all habitat quality scoring methods are required to generate future scores for 'with' and without' offset scenarios. Forecast gains or loss in habitat quality score must be substantiated by scientific information and via the endorsed MHQA (or alternative) method.

To support the habitat quality assessment, a link to the DEHP Guide, a MHQA scoring guide, and a MHQA scoring spreadsheet template (.xlsx) are provided herein. When calculating offsets, please refer to the department's published guidance: How to use the Offsets Assessment Guide.

A precautionary approach to forecasting scores should be applied, with all limitations and uncertainties considered, documented and integrated within the 'Confidence in Result % (Quality)' value applied in the Offset Assessment Guide (offset calculator). Please also note the following:

- If you propose a habitat quality gain of more than 2 points, or an achieved future habitat quality score 'with offset' of 9 or 10, it becomes less certain that the conservation outcome can be achieved. The justification of effectiveness of your proposed management measures and associated habitat quality score improvements and (reflected in the confidence in result) must be supported by substantial evidence.
- Higher habitat quality gains will generally be associated with lower 'confidence in result' scores in the Offset Assessments Guide to reflect the difficulty associated with achieving the conservation outcomes. In these cases, it is likely that outcomes-based commitments will be required in the associated management plan for the site, including specifying binding metrics to be met to demonstrate quality improvement. For further information, please contact the department to discuss the metrics that will be used to demonstrate achievement of quality standards.

If you intend to propose an alternative methodology for assessing and scoring habitat quality for

any/all of the prescribed matters likely to experience significant residual impacts as a result of the proposed action, the alternative methodology must:

- directly relate to habitat requirements of the species and factors associated with the viability of the prescribed matter, and align with information contained in the SPRAT database and relevant statutory/departmental documents, and
- be substantiated with appropriate field surveys in accordance with the relevant survey guidelines or using a scientifically robust and repeatable methodology.

Where there are any inconsistencies between the habitat assessment approach and information contained in the SPRAT database, the inconsistencies must be discussed with the department prior to the submission of the assessment documentation and must be supported by scientific evidence including published research, independent expert advice and information derived from field surveys.

8. Economic and social matters

If not previously provided in the referral documentation, the preliminary documentation must:	
8.1.	Provide details on the social and economic costs and/or benefits of undertaking the proposed action, including the basis for any estimations of costs and/or benefits. Where possible, please include the total economic capital investment and economic ongoing value of the project.
8.2.	Identify if economic benefits and employment opportunities are in addition to what would have been expected if the action were not to take place.
8.3.	Provide details of any public stakeholder consultation activities, including the outcomes of those consultations.
8.4.	Provide details of any consultation with Indigenous stakeholders. **Indigenous engagement** Identify existing or potential native title rights and interests, including any areas and objects that are of particular significance to Indigenous peoples and communities, possibly impacted by the proposed action and the potential for managing those impacts. Describe any Indigenous consultation that has been undertaken, or will be undertaken, in relation to the proposed action and their outcomes. This should include: a) details regarding the specific Indigenous groups and Traditional Owners consulted and an indication of the areas, both tangible and intangible, of cultural significance across the project site; and b) a discussion about how impacts to areas and/or objects of Indigenous cultural significance (tangible and intangible) are avoided, mitigated or minimised. The department considers that best practice consultation, in accordance with the *Interim Engaging with First Nations People and Communities on Assessment and Approvals under the EPBC Act 1999 (2023)* includes:

	a) identifying and acknowledging all relevant affected Indigenous peoples and communities. b) committing to early engagement. c) building trust through early and ongoing communication for the duration of the project, including approvals, implementation and future management. d) setting appropriate timeframes for consultation and submission formats; and e) demonstrating cultural awareness and ensuring cultural safety. Describe any state requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action with regards to Indigenous peoples and communities.

9. Ecologically sustainable development

If not previously provided in the referral, the preliminary documentation must:	
9.1.	Provide a description of how the proposed action meets the principles of ecologically sustainable development, as defined in section 3A of the EPBC Act, which are as follows: (a) decision making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations. (b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. (c) the principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations. (d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making

10. Environmental record of the person proposing to take the action

Include details of any past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against:	
10.1.	the person proposing to take the action;
10.2.	for an action for which a person has applied for a permit, the person making the application;
10.3.	if the person is a body corporate—the history of its executive officers in relation to environmental matters; and

10.4.	if the person is a body corporate that is a subsidiary of another body or company (the parent body)—the history in relation to environmental matters of the parent body and its executive officers.

11. Ecological data provision

The preliminary documentation must include an appendix of occurrence records (both sightings and evidence of presence) for all listed threatened and migratory species identified during field surveys for the proposed action. This data may be used by the department to update the relevant species distribution models that underpin the publicly available Protected Matters Search Tool (PMST).

The species occurrence records must be provided in accordance with the department's *Guidelines for biological survey and mapped data* (2018) using the *species observation data template*. Sensitive ecological data must be identified and treated in accordance with the department's *Sensitive Ecological Data – Access and Management Policy V1.0* (2016) or subsequent revision.

ATTACHMENT B

INFORMATION REQUIREMENTS FOR EPBC ACT OFFSET PROPOSALS AND OFFSET MANAGEMENT PLANS

An EPBC Act offset proposal must demonstrate that the relevant species or ecological communities significantly impacted by the proposed action is not worse-off when compared to a situation where neither the impact nor the offset occurred.

1. Offset Proposal requirements

Further to Section 6 of the PD request, the offset proposal must include, but not be limited to, the following:	
1.1.	A detailed project description, including a site description and how and to what extent your action will impact on protected matters.
1.2.	Details of the protected matters being impacted by the proposed action, including the total number of individuals and/or extent of habitat being impacted.
1.3.	Details about the offset proposal/offset site, including: a) A description of the proposed offset site(s) including location, size, and relevant ecological/species habitat features, landscape context and cadastre boundaries of the offset site(s) (supported by mapping). b) Information about how the proposed offset/s area will provide connectivity with other relevant habitats and biodiversity corridors. c) Information how the proposed offset site/s contribute to relevant State and/or regional plan/s or initiatives for the conservation of the protected matter. d) Evidence of the presence of, or usage by, relevant MNES on, or adjacent to the proposed offset site(s) e) Evidence that the location of the offset site is suitable and provides a conservation benefit to the impacted protected matter. Note: The EPBC Offsets Policy states that in most cases, the offset site should be as close to the impact as possible. f) Up to date surveys and baseline data confirming the current condition/quality of vegetation on site (including number of hollow bearing trees if relevant), the extent and presence of weeds, and the extent of threats. g) Information about the ecosystems present, current usage of the site, its general condition and location in the landscape/region h) An assessment of how the offset and impacts sites are like-for-like, i.e., the environmental values for the MNES at the offset are of the same type or equivalent to that affected by the proposed action. i) The methodology, with justification and supporting evidence, used to inform the inputs of the Offsets Assessment Guide in relation to the offset site for each

	relevant MNES, including: a. total area of habitat (in hectares) b. habitat quality (as discussed in section 8) c. time over which loss is averted (max. 20 years) d. time until ecological benefit e. risk of loss (%) without offset f. risk of loss (%) with offset g. confidence in result (%). j) Details and execution timing of the mechanism to legally secure the environmental offset/s (under Queensland legislation or equivalent) to provide enduring protection for the potential offset area/s against development incompatible with conservation.
1.4.	The Offset Proposal must demonstrate how the offset meets the principles of the EPBC Offsets Policy and EPBC Offsets Assessment Guide to inform the Minister's decision on whether or not the project should be approved under the EPBC Act.
1.5.	Details of the actual or estimated cost of the offset proposal including costs associated with proposed mitigation and management measures onsite.
1.6.	Details of the protective mechanism proposed to be applied at any offset site/s to provide enduring protection to the site for at least the duration of the impact, including a draft of the protective mechanism and its terms.

2. Offset Management Plan (OMP) requirements

An offset management plan is a practical document that outlines what must be done to manage an offset site. A plan must detail all the management activities at the offset site and how progress will be monitored and reported. An OMP provides confidence that the outcomes described in an offset proposal can and will be achieved. The OMP must include, but may not be limited to:

2.	A description of the proposed offset site(s) including location, size, condition, existing and future tenure, and relevant ecological/species values present and surrounding land uses.
2.2.	Maps and shapefiles to clearly define the location and boundaries of the offset area/s, accompanied by the offset attributes (e.g., physical address of the offset area/s, coordinates of the boundary points in decimal degrees, the relevant MNES that the environmental offset/s compensates for, and the size of the environmental offset/s in hectares).
2.3.	Baseline survey information showing MNES presence and the extent and quality of the respective habitat(s) at the proposed offset site(s) in accordance with the relevant

	survey guidelines or using a scientifically robust and repeatable methodology.
2.4.	Summarised details of the nature of the conservation gain to be achieved for relevant MNES, including the creation, restoration and revegetation of habitat in the proposed offset area/s.
2.5.	Information about how the proposed offset area/s will provide connectivity with other habitats and biodiversity corridors and/or will contribute to a larger strategic offset for the relevant MNES. This should include information about how the proposed offset/s area contributes to any state and/or regional plan/s for the conservation of the protected matter.
2.6.	Mechanisms for protection, for at least the full duration of the impact, under a conservation covenant or otherwise accepted method, noting that protection mechanisms for permanent impacts should continue in perpetuity.
2.7.	Completion criteria and, if necessary, performance targets that evidence protection or improvement of EPBC Act listed communities, species and their habitat. For the purpose of the plan: a) completion criteria are longer term time-bound values, specified for measurable parameters, that if attained and maintained ensure the plan's environmental objectives are achieved; and For example: 'By Year 20, the approval holder must reduce non-native plant cover to within 5% of the benchmark value associated with each Regional Ecosystem.' b) performance targets are time-bound short and medium term targets, for management interventions and environmental condition, that are used to monitor, evaluate, review and improve the effectiveness of the plan to offset impacts. For example: 'By Year 10, the approval holder must reduce non-native plant cover to within 10% of the benchmark value associated with each Regional Ecosystem.'
2.8.	The plan includes management measures that will protect or improve EPBC Act listed threatened ecological communities and/or species and their habitat. Each management measure: a) is specifically linked to the attribute of the protected matter for which the management measure applies; b) has timeframes for implementation; c) is described sufficiently to avoid ambiguity and to inform plan implementation; d) is related to attaining/maintaining completion criteria and/or performance targets; and e) is derived from recognised principles, practice, or guidelines, and is justified - technically, scientifically and legally (e.g. by recommendation in a national recovery plan) – as an effective and appropriate measure to attain and/or maintain the

	plan's completion criteria and/or performance targets. Management activities must be targeted towards the needs of the protected matter that is offset, and must align with the recovery objectives for the species as identified in relevant National Recovery Plans or Conservation Advices.
2.9.	The plan identifies and manages uncertainty. To this end the plan specifies: a) key data/information used to formulate the plan; b) the limitations and/or uncertainty associated with the use of that data/information; c) the risks that limitation and/or uncertainty represents for plan failure; and d) how limitations and/or uncertainty, and associated risks, are mitigated during plan implementation. For example, where a margin of safety is applied to management measures until uncertainty is reduced to an acceptable level or performance targets/completion criteria are attained/maintained.
2.10.	The plan assesses the risk of failure to achieve the plan's performance targets and/or completion criteria. To this end the plan: a) states the plan's performance targets and/or completion criteria; b) identifies events or circumstances that prejudice attainment/maintenance of performance targets and/or completion criteria. The events or circumstances must address scientific/ecological uncertainty, stochastic events and legal/land use planning factors that may represent risks; c) includes a qualitative assessment of the likelihood and consequence of those events or circumstances, and the residual risk of failure to achieve those criteria due to identified events or circumstances (assuming management measures will be implemented); d) characterises risk as low, medium, high or severe, and derived from likelihood (highly likely, likely, possible, unlikely, rare) and consequence (minor, moderate, high, major and critical); and e) outlines how consequence, likelihood and risk level for each risk have been determined.
2.11.	The plan manages the risk of failure to achieve performance targets and/or completion criteria by: a) specifying management measures that will be implemented to attain/maintain the completion criteria and/or performance targets; b) enhancing monitoring and management measures for high risk events or circumstances, thereby providing a 'margin of safety' to detect, avoid or mitigate the likelihood and/or impacts of the event or circumstance; c) specifying measurable events or circumstances (management triggers) that detect actual or potential issues in a timely manner to avoid, minimise or mitigate adverse

	impacts; d) ensuring the monitoring program includes activities to detect management triggers, and explains how monitoring activities may inform the selection and implementation of corrective actions; e) specifying methods to be used to determine whether the management trigger is project attributable; f) specifying effective and appropriate corrective actions that may be implemented if a management trigger is realised; and g) monitoring the effectiveness of corrective actions and implementing appropriate responses in the event corrective actions are not effective.
2.12.	The plan assesses the risk of failure to achieve the plan's performance targets and/or completion criteria. To this end the plan: a) states the plan's performance targets and/or completion criteria; b) identifies events or circumstances that prejudice attainment/maintenance of performance targets and/or completion criteria. The events or circumstances must address scientific/ecological uncertainty, stochastic events and legal/land use planning factors that may represent risks; c) includes a qualitative assessment of the likelihood and consequence of those events or circumstances, and the residual risk of failure to achieve those criteria due to identified events or circumstances (assuming management measures will be implemented); d) characterises risk as low, medium, high or severe, and derived from likelihood (highly likely, likely, possible, unlikely, rare) and consequence (minor, moderate, high, major and critical); and e) outlines how consequence, likelihood and risk level for each risk have been determined.
2.13.	The plan describes the monitoring methods that will be implemented, and: a) demonstrates the relevance of the monitoring methods to the protection of the relevant aspect of the protected matter(s) for which the offset is implemented; b) includes quantitative (e.g. on-ground survey results) and qualitative baseline data (e.g. photo-point monitoring sites) that establish the start quality/condition of the environment and which can be used to measure performance against; c) describes the sampling strategy (including monitoring area, site selection and sampling intensity over space and time) and statistical analyses to be employed; d) justifies the sampling strategy/monitoring methods, including through: e) an assessment of effectiveness and constraints to use; f) capacity to detect change in environmental condition due to management

	interventions; g) capacity to demonstrate attainment of performance targets and/or completion criteria; and h) the statistical power of the strategy/method. i) commits to engage appropriately qualified experts to design and conduct monitoring and survey activities, and analyse monitoring results; j) accounts for seasonal/climatic variability; and k) details the location, nature and number of monitoring sites, including benchmark/reference sites to evaluate management performance.
2.14.	The plan includes commitments to report on plan implementation and success as well as opportunities for improvement. This is achieved by: a) if the project is approved, identifying relevant reporting obligations under the EPBC approval, or otherwise proposing appropriate regular reporting intervals, objectives and methods; b) specifying how plan/strategy implementation will be reported in accordance with those obligations; c) including a reporting template specifying key risk management, management measures, monitoring and adaptive implementation outcomes for the reporting period; and d) including a schedule and triggers for reporting types (e.g. annual compliance, incident, non-compliance, contingency).

Attachment A3

Environmental Management Plan (EMP)

Fulton Hogan

Environmental Management Plan

BLUE ROCK QUARRY

Environmental Management (EMP) - Plan - Blue Rock Quarry

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1. Introduction

1.1. Purpose

This Environmental Management Plan (EMP) has been developed to ensure the environmental performance of Fulton Hogan's Blue Rock Quarry. This Plan will ensure that activities are undertaken consistently and with minimal impact on the environment.

This EMP is founded upon Fulton Hogan's environmental and sustainability policies and processes. It is supported by the dedicated and qualified resources of Fulton Hogan.

Protection of the environment is integral to the philosophy of Fulton Hogan's ISO 14001:2015 accredited management systems. As such, Fulton Hogan's environment management system, defined in this Plan, is consistent with the ISO 14001 requirements and is independently certified as such.

The management framework outlined in this EMP provides clear guidelines for avoiding, reducing and managing environmental risks. It defines:

- Environment and Sustainability Policies,
- Objectives and Targets,
- Responsibilities,
- Environmental processes,
- Incident and emergency procedures,
- Monitoring, inspection and auditing regimes,
- Reporting processes,
- Rectification/improvement processes and
- Processes for the dissemination of information
- Environmental controls specific to the activities undertaken by Blue Rock Quarry.

All Blue Rock Quarry personnel will be familiar with the environmental requirements and their responsibilities. This ensures that all activities are undertaken in accordance with this EMP.

1.2. Scope

This EMP applies to all Blue Rock Quarry personnel and all activities undertaken by Blue Rock Quarry.

The Blue Rock Quarry undertakes the following activities onsite:

- Drill and blast
- Extraction
- Pit development
- Vegetation clearing
- Crushing and screening
- Product storage
- Dangerous goods and combustible liquids storage
- Community engagement
- Rehabilitation
- Cultural heritage
- Precoating aggregates

1.3. Definitions

The following terms, abbreviations and definitions are used in this plan.

▶ Table 1: Terms, abbreviations and definitions used in this plan

TERM	EXPLANATION
ECP	Environmental Control Plan – A document that supports the EMP with site specific controls, locations of controls and site plan. Typically a 1-2 page A3 plan.

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TERM	EXPLANATION
EMP	Environmental Management Plan – A detailed plan that provides framework for minimising environmental harm
Environment	Surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans and their interrelation.
Environmental Aspect	Elements of organisations: activities, products or services that could interact with the environment.
Environmental Impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products or services.
ERA	Environmental Risk Assessment – Document that analyses activities being undertaken by the business, their likely risk based on likelihood and consequence, controls to be implemented to mitigate risk and the residual risk.
EWMS	Environmental Work Method Statement – a site and activity specific environmental risk management document that complements the EMP but also provide extra details on mitigations where high risk activities exist
ISO14001	An international voluntary standard for environmental management systems, this is one standard in the ISO 14000 series of International Standards on environmental management.
NEPM	National Environmental Protection Measures - a special set of national objectives designed to assist in protecting or managing particular aspects of the environment.
Sustainable	Characteristic of a process or state, that can be maintained at a certain level indefinitely.
SWMS	Safe Work Method Statement is a systematic approach to the identification of work task related hazards and controls.

2. Resources, roles and responsibilities

2.1. Management leadership, commitment and responsibilities

The Fulton Hogan management team displays its leadership and commitment to the development and implementation of the management system and continually improving its effectiveness by:

- Taking accountability of the effectiveness of the management system
- Ensuring the environment and sustainability policies, objectives and targets are established for the management system and are compatible with the strategic direction and the context of the organisation
- Ensuring the environment and sustainability policies are communicated, understood and applied within the organisation
- Promoting awareness of the process approach
- Ensuring the resources needed for the management system are available
- Communicating the importance of effective environment and sustainability management and of conforming to the management system requirements
- Ensuring that the management system achieves its intended results
- Engaging, directing and supporting persons to contribute to the effectiveness of the management system

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- Supporting other relevant management roles to demonstrate their leadership as it applies to their areas of responsibility.

Management responsibilities are defined in the Fulton Hogan RASCI.

The acronym RASCI stands for:

R	Responsible	does the work
A	Accountable	has ultimate responsibility, signs off R's work
S	Supportive	provides resources / implementation support
C	Consulted	has information/perspective/capability used to complete the work
I	Informed	should be notified of outcomes but need not be consulted.

2.2. Operational responsibilities

The Operational RACI identifies the operational responsibilities for each position involved in the implementation of environmental management at Blue Rock Quarry. This has been developed in accordance with the Fulton Hogan Manage Roles and Responsibilities (RACI's) Process.

The Organisation chart for Blue Rock Quarry identifies the personnel fulfilling each of the roles identified.

2.3. Sub-contractors

All subcontractors shall be engaged as per Set up a Subcontract, Purchasing or Hiring Agreement – Process - Au. This procedure requires that all Subcontractors and Suppliers have a signed Subcontract Agreement and produce required documentation. The ongoing management of the Subcontractor is then to be managed in accordance with Subcontract Management and Administration – Process – Au.

In line with the conditions of our contracts, approvals and/or sites, Sub-contractors shall comply with all statutory and Fulton Hogan Environmental Management System requirements. Sub-contractors will be required to operate in a manner that is in line with the requirements of this EMP and any relevant ECP or EWMS/SWMS.

Fulton Hogan may request that Subcontractors provide an EMP or SWMS for their work activity, should their work activity provide a risk to the environment. NGER data may also be requested.

Subcontractors are required to report all incidents to their Fulton Hogan Supervisor as soon as practicable and safe to do so.

2.4. Authorities

In undertaking environmental works, persons may only undertake actions allowed under their Delegations and Limits of Authority. The 'Delegations and Limits of Authority' for roles in the organisation and information on how they are managed can be found in Authority to Make Decisions (DLoAs and CLoLs) - Process – Au.

3. Environmental and sustainability commitments

3.1. Organisational policy

Organisational commitments to the environment and sustainability are detailed within the Environmental Policy and the Sustainability Policy.

All operations shall be undertaken in a manner consistent with the Policies.

The Policies shall be taken into account during the setting of Blue Rock Quarry Objectives and Targets.

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3.2. Objectives and targets

3.2.1. Objectives and targets

The environmental objectives and targets of Blue Rock Quarry are:

▶ Table 2: Objectives and Targets

OBJECTIVE	KPI	TARGET	NOTES / DESCRIPTION
Positive Relationships with the Regulators	Number of environmental infringement notices	0	Infringements from the various environmental regulators (GCCC, DES, DEE).
Envirowise Training	Percentage of staff put through training.	70%	Percentage of relevant staff who have undertaken the FH Envirowise Training.
Compliance with Environmental Requirements	Compliance with approval conditions & EMP requirements	100%	EA issued by DES. This EMP document requirements.
Monthly Environmental Inspections	Inspections undertaken on a monthly basis	100%	Undertake monthly inspections and actin all observed improvement areas.

3.2.2. Measurement of objectives and targets

Ongoing tracking of performance against the objectives and targets shall be undertaken on a monthly basis as part of monthly internal reporting, as detailed later in this plan.

A more detailed assessment of the operations performance against the objectives and targets shall be undertaken on an annual basis as part of Management Reviews. Required improvements, in order to achieve the objectives and targets, should be identified as part of this review. Further information of management reviews is detailed later in this plan.

4. Planning and risk management

Environmental planning for Blue Rock Quarry has been undertaken utilising relevant documentation from Fulton Hogan's Environmental Management System, legislation, environmental guidelines and our industry experience.

4.1. Environmental legal and other requirements

Adherence to compliance obligations is essential to the success of Blue Rock Quarry. Blue Rock Quarry personnel will undertake measures to manage all environmental impacts, in compliance with all relevant environmental legislative requirements.

4.1.1. Legal, standards and guidelines register

The key pieces of environmental legislation, standards, guidelines and project specific approvals for Blue Rock Quarry are identified in the table below:

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▶ Table 3: Legal, Standards and Guidelines Register

ENVIRONMENTAL ELEMENT	REQUIREMENT
Noise	Environmental Protection (Noise) Policy 2019
	Environmental Protection Act 1994
Vibration	Environmental Protection Regulation 2019
	Environment Protection and Biodiversity Conservation Act 1999
Air Quality	Environmental Protection (Air) Policy 2019
	National Greenhouse and Energy Reporting Act (2007)
Erosion, Sedimentation and Water Quality	Environmental Protection Act 1994
	Planning Act 2016
	Environmental Protection (Water and Wetland Biodiversity) Policy 2019
Heritage	Environmental Protection Regulation 2019
	Queensland Heritage Act 1992
	Protection of Movable Cultural Heritage Act 1986
	Environment Protection and Biodiversity Conservation Act 1999
	Environmental Protection Regulation 2019
Waste Management	Environmental Protection Act 1994
	Waste Reduction and Recycling Act 2011
	Environmental Protection (Waste Management) Regulation 2019
	End of waste (EOW) guideline—ESR/2016/3323
Chemical Storage	Environmental Protection Act 1994
	Australian Standard NZS 4452-1997
	Dangerous Goods Safety Management Regulation 2001
	AS 1940 - Storage and Handling of Flammable and Combustible Liquids
	AS3780:2008 - The storage and handling of corrosive substances
Flora and Flora (including weeds)	Environmental Protection and Biodiversity Act (1999)
	Nature Conservation (Plants) Regulation 2020

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ENVIRONMENTAL ELEMENT	REQUIREMENT
	Nature Conservation Act 1992
	Biosecurity Act 2014

4.1.2. Legislative updates

Fulton Hogan subscribes to Environmental Essentials legal update service for the monitoring of all Commonwealth, State and Local Government legislation.

When relevant changes to legislation occur, the Environmental Manager, will distribute the information to the Quarry Manager. The Blue Rock Quarry will then facilitate the incorporation of any required changes into the operations management system. Any changes to legislation that have an impact on operations will be communicated via Toolbox, Green Alert and team meetings where applicable, to ensure operational changes are implemented.

4.1.3. Licences and approvals

The following licences and approvals have been obtained and are relevant to Blue Rock Quarry operations.

LICENCE / APPROVAL	REGULATORY OR OTHER BODY	DETAILS
P-EA-100268669	Department of Environment, Science, and Innovation (DESI)	Environmental Authority: Environmentally relevant activity 16, 2(b) – Extracting, other than dredging, in a year more than 100,000 tonne but less than 1,000,000 tonne of material. Environmentally relevant activity 16, 3(b) – Screening, in a year more than 100,000 tonne but less than 1,000,000 tonne of material.
PN129492/01/DA2	Gold Coast City Council (GCCC)	Material Change of Use (MCU) approval
Elvas 2011/006373	Department of Natural Resources, Mines and Energy (DNRME)	Permit to Clear Native Vegetation – Lots 1 and 89 only
2008/008614	Department of Natural Resources, Mines and Energy (DNRME)	Property Map of Assessable Vegetation (PMAV)
42418C	Department of Natural Resources, Mines and Energy (DNRME)	Water Licence
BIP-RIFA-160141	Department of Agriculture and Fisheries (DAFF)	Biosecurity Instrument Permit (Fire Ants)

The requirements for management of approval/licence conditions are identified in this EMP, Fulton Hogan's Environmental processes, and any relevant Environmental Control Plans or EWMS/SWMS.

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4.2. Stakeholders and Other Interested Parties

The following table details the sustainability and environmental needs of key stakeholders and interested parties to Blue Rock Quarry.

STAKEHOLDER / INTERESTED PARTY	NEEDS
Fulton Hogan Employees	To undertake operations within a safe and aesthetically pleasing environment and to be able to operate with appropriate training and environmental controls in place.
Fulton Hogan Management	To have a efficiently operating site with minimal risks (e.g. environment, health and safety, production)
Fulton Hogan Clients/Customers	To receive quality product and feel safe while attending site
Local residents / community	To not be unreasonably disturbed or unnecessarily inconvenienced by site operations.
Environmental regulator(s) (State & Local)	For operations to be conducted without harm to the environment or amenity and in compliance with all relevant approvals and/or legislative requirements.

The practices to satisfy the identified needs shall be detailed in this EMP, Fulton Hogan's Environmental processes, and any relevant Environmental Control Plans or EWMS/SWMS.

4.3. Environmental risk assessment's (ERA's)

4.3.1. Significant environmental aspects

Significant environmental aspects of Blue Rock Quarry operations have been identified through use of Develop Environmental Risk Assessment (ERA) - Process - Au and contained within the sites Environmental Risk assessment (ERA).

Aspects are deemed significant if they have a pre-controls risk rating of 7 (Med) or higher.

The key significant environmental aspects of Blue Rock Quarry are as follows:

- Generation of airborne contaminates (dust) from operational activities;
- Pollution of stormwater with sediment;
- Generation of excessive noise impacting local residents/community;
- Creation of waste materials (hazardous and non-hazardous)

4.3.2. Risk assessment

Risk assessment and management shall be undertaken in accordance with Management of Risk and Opportunity – Process – Au and Develop Environmental Risk Assessment (ERA) - Process - Au. Outcomes of the risk assessment are documented on the Environmental Risk Assessment, with the template available on theHub.

An ERA has been prepared for Blue Rock Quarry.

Risk assessments shall be reviewed on an annual basis or if the scope/activities change significantly.

In the event of a high risk activity, where the Blue Rock Quarry level risk assessment is not deemed to have appropriate coverage, a specific risk assessment shall be conducted for that activity. Dependant on the risk or activity, a standalone EMP, ECP, ERA, Safe Work Method Statement (SWMS) or Environmental Work Method Statement (EWMS) may be used – refer to the Environmental Risk Opportunity and Planning processes for further information.

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4.4. Environmental control plan's (ECP's)

Environmental Control Plans (ECPs) will be used to provide additional site specific controls based on the requirement for site specific controls being required where the department EMP does not provide adequate detail. Additionally, an ECP may be developed where a high risk activity may be required. This includes:

- Construction of waterway crossings
- Works over or abutting waterways
- Sites working in close proximity to significant flora/fauna
- Sites working in close proximity to areas of cultural significance
- Sites working with contaminated soil
- Sites working in close proximity to houses and other sensitive noise receivers

Environmental Control Plans shall be prepared in accordance with the Develop and Maintain Environmental Management Plans and Environmental Control Plans – Process – Au.

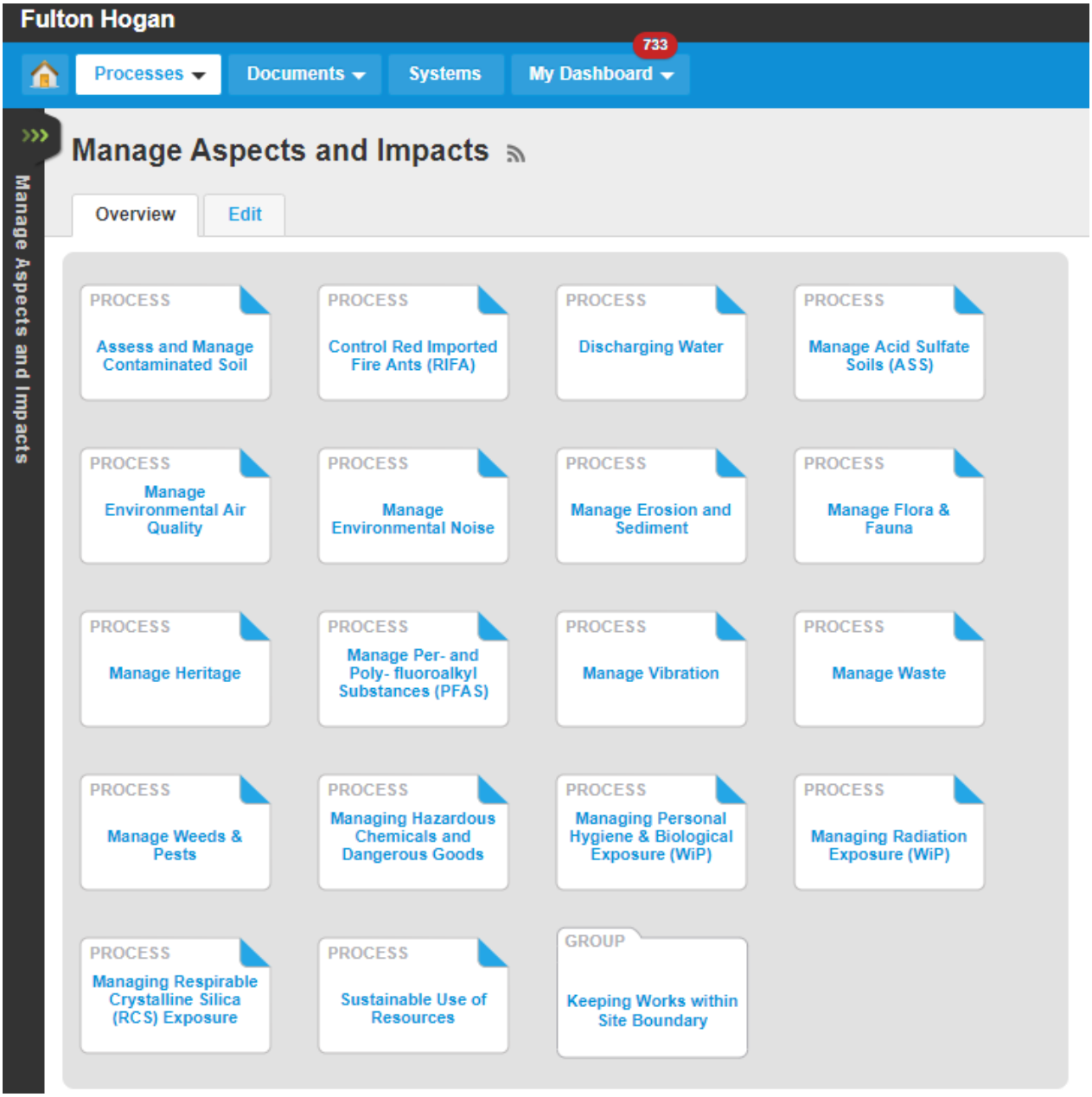
5. Environmental protection processes (managing environmental aspects & impacts)

5.1. National processes

National Fulton Hogan Environmental Protection processes are managed as part of 'Environment and Sustainability' in Fulton Hogan's management system (Our System).

These are managed using Promapp process mapping software and are made available through theHub, ensuring personnel always have access to the up to date version of the best practice environmental practices.

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These processes detail the best practice organisational approach to managing these aspects and avoiding associated impacts. Further information detailing the specific requirements for this Operation follows.

5.2. Site specific processes

This section of the EMP aims to provide general environmental controls and management principles that will be employed at the Blue Rock Quarry, to ensure compliance with site environmental licensing conditions and the General Environmental Duty. Where this EMP is not adequate to address site specific risks, additional risk mitigation shall be documented in ECPs or work instructions. Where a condition from a relevant permit for the site is referenced it will be displayed by using [] around the condition number (e.g. [Condition A1]).

5.2.1. Noise and vibration

The aim of noise management at the site is to minimise actual and potential noise disturbance to the surrounding noise sensitive receptors and comply with the required noise standards in the *Environmental Protection (Noise) Policy 2008*.

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Blue Rock Quarry is surrounded by residential properties located on Cedar Creek Road and Tamaree Road. Noise on the site is generated from activities including crushing and screening, blasting (and vibration), vehicle movements and maintenance activities.

This subplan complies with the EA condition N5-N7 and is considered the noise management plan for the

The processes Manage Environmental Noise - Process - Au and Manage Vibration - Process - Au are available on theHub and will be used to guide the development of the project specific EMP or ECP as required.

5.2.1.1. Objectives

- Carry out by all practicable means necessary to prevent the emission or likelihood of noise emissions that constitute annoyance.
- Limit quarry noise levels (except blasting) at sensitive sites to those as shown in Table 3
- To comply with the noise performance criteria contained in the *Environmental Protection (Noise) Policy 2019* or the other performance criteria as agreed

5.2.1.2. Performance Criteria/Indicators

- No noise complaints directly attributable to Blue Rock Quarry activities
- The noise emanating from quarry operations (other than blasting) to comply with EA condition N2 'Table 1 – Noise Limits' below
- The noise emanating from blasting operations, and vibration caused by blasting operations will be monitored at the quarry for every blast, to comply with EA condition N9 'Table 2 – Vibration and Airblast Overpressure Level' below

Table 4 - EA Condition N2: 'Table 1 - Noise Limits'

Noise level dB(A)	Day 7am – 6pm	Evening 6pm to 10pm	Night 10pm to 7am
Nuisance sensitive place			
$LA_{eq,\ adj,\ 1\ hour}$	45	35	35
$LA_{10,\ adj,\ 1\ hour}$	50	38	38
Commercial place			
$LA_{eq,\ adj,\ 1\ hour}$	50	40	40
$LA_{10,\ adj,\ 1\ hour}$	55	43	43

Parameter	Vibration and airblast overpressure measured at a 'sensitive place'		
	Monday to Friday 9am – 3pm[2]	Saturday 9am – 1pm[2]	Other times and public holidays
Vibration (peak particle velocity)	<5mm/s for 9 out of 10 consecutive blasts and mist not exceed 10mm/s for any blast.	<5mm/s for 9 out of 10 consecutive blasts and mist not exceed 10mm/s for any blast.	No blasting to occur.
Airblast overpressure level (dB linear peak)	<115dB (linear) peak for 9 out of 10 consecutive blasts and must not exceed 120dB (linear) peak for any blast.	<115dB (linear) peak for 9 out of 10 consecutive blasts and must not exceed 120dB (linear) peak for any blast.	No blasting to occur.

[2] Time limits may only be exceeded by one (1) hour in the event of extenuating circumstances that has otherwise prevented the timely detonation of deployed explosives. Extenuated circumstances are limited to inclement weather that will result in an exceedance of the vibration and/or airblast overpressure level, equipment malfunction, or technical circumstances that prevents the safe destination of explosives. The registered operator must notify the administering authority on these occasions.

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5.2.1.3. Requirements – Noise

NO.	REQUIREMENTS
1	Noise must not cause an environmental nuisance at any nuisance sensitive place or commercial place.[N1]
2	All noise from activities must not exceed the levels specified in Table 1 – Noise Limits.[N2]
	Noise monitoring
3	The administering authority may request monitoring and recording of the noise levels from the activities. Ensure monitoring and recording of noise levels as described in this EMP, is undertaken for the descriptors, characteristics and conditions detailed below: Other than blasting • LA eq, adj, 1 hour • LA 10, adj, 1 hour • LA 1, adj, 1 hour • The level and frequency of occurrence of impulsive or tonal noise • Atmospheric conditions including wind speed and direction • Effects due to extraneous factors such as traffic noise Location, date and time of recording.[N3]
4	The method of measurement must comply with the latest edition of the Noise Measurement Manual (DES).[N4]
	Noise management
5	Ensure all acoustic enclosures, barriers or controls are in place and operational.
	Vibration nuisance
6	Vibration must not cause an environmental nuisance at any nuisance sensitive place or commercial place.[N8]
7	Blasting will only occur in the times specified in Table 2 – Vibration and Airblast Overpressure Level. Monday to Friday 9am – 3pm Saturday 9am – 1 pm Other times and public holidays – no blasting.[N9]
8	All blasts will be designed and monitored by a suitably qualified person to achieve the criteria specified in Table 2 - Vibration and Airblast Overpressure Level.[N10]
9	Ensure blast notification are provided to residents that request them and may be impacted, prior to the scheduled blast.
	Vibration monitoring
10	When requested by the administering authority, vibration monitoring and recording must be undertaken in accordance with AS2187.2-1993 to investigate any complaint of vibration nuisance, and the results notified within 14 days to the administering authority. Monitoring must include:

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	a) Airblast overpressure (dB (linear) peak); b) Peak particle velocity (mm/s); c) Location of the blast/s within the site (including which bench level); d) Atmospheric conditions including temperature, relative humidity, wind speed and direction; e) The level and frequency of occurrence of impulsive or tonal noise; f) Effects due to extraneous factors; and Location, date and time of recording.[N11]
11	The ground-borne vibration transducer (or array) must be placed at a distance of at least the longest dimension of the foundations of a noise-affected building or structure away from such building or structure and between that building or structure and the site of the blasting.[N12]
	General site noise management
12	Ensure compliance with noise attenuation equipment as per manufacturer's specifications, on all Fulton Hogan vehicles, plant and machinery.
13	Trucks are not to be parked on the quarry access roads waiting to access the site or to be loaded. Vehicles should not be left idling.
14	Truck drivers should be instructed to operate equipment in a manner that does not generate unnecessary noise (i.e. limit the use of air brakes and excessive revving)
15	Onsite machines/ equipment should be turned off when not in use.
16	Ensure all loading of machinery occurs within a bunded/protected location if in close proximity to sensitive receptors.

** NOTE: For Blue Rock Quarry, the only noise sensitive places nearby are dwellings.*

A diagram of the quarry (Figure 1), showing the locations of nearby "Noise Sensitive Places" and "Commercial Places" will be updated if a change occurs, by the Quarry Manager or their delegate.

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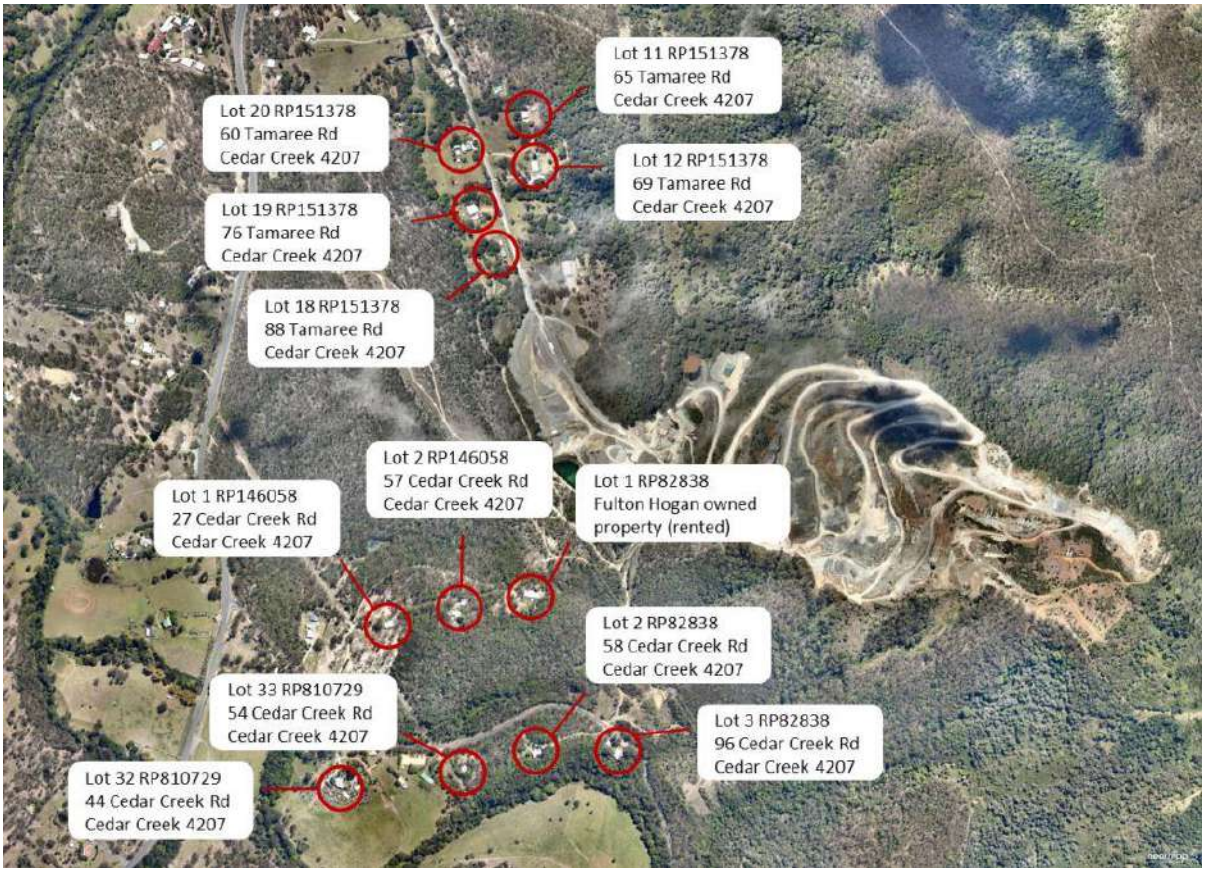


Figure 1 - Blue Rock Quarry - Nearest sensitive places

5.2.1.4. Corrective Actions

In the event that noise emissions become the basis of a complaint that is confirmed as neither vexatious nor frivolous, further strategies will be considered and implemented where practicable.

5.2.2. Air Quality

The residential properties or sensitive receptors surrounding Blue Rock Quarry consist of rural residential zoning and are located on Cedar Creek and Tamaree Roads. The potential for quarrying activities to adversely affect the air quality at these sensitive receptors includes the release of dust and particulate matter through activities such as, drill and blast, extraction, crushing, screening and haulage. Source.

5.2.2.1. Objectives

- Ensure that site air quality emissions do not adversely affect the health, welfare or amenity of neighbours or personnel.
- All dust deposition emissions must comply with 120mg/m²/day at the site's boundary.
- Compliance with the criteria contained in the *Environmental Protection (Air) Policy 2019*, or National Environment Protection Measures (NEPM).

5.2.2.2. Performance Criteria/Indicators

- No odour or air emission complaints/impacts directly attributable to site activities.
- Dust monitoring results to be within EA dust depositional parameters

5.2.2.3. Requirements – Air

NO.	REQUIREMENTS

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1	The release of dust and/or particulate matter resulting from an ERA to which this approval relates must not cause an environmental nuisance at any nuisance sensitive or commercial place[A1].
2	Dust must not exceed dust deposition of 120mg/m2/day when monitored in accordance with AS 3580.10.1 (2003 – or more recent) and when measured at a nuisance sensitive or commercial place[A2].
3	When requested by the administering authority, dust and particulate monitoring must be undertaken to investigate a complaint and the results notified within 14 days to the administering authority[A3].
4	A dust management plan must be developed within four weeks of the administering authority requesting the plan in relation to dust or particulate matter exceedances[A4].
	Dust control
5	All reasonable and practicable measures must be undertaken to minimise wind-borne dust and particulate emissions to the atmosphere from the ERA[A5].
	Nuisance
6	The release of noxious or offensive odours or any other noxious or offensive airborne contaminants resulting from the activity must not cause nuisance at any nuisance sensitive or commercial place[A6].
	Dust management
7	All trucks must cover their loads before leaving site.
8	The water cart must be employed during dry and/or windy weather to suppress dust on the haul roads and stockpiles and overburden stripping where necessary.
9	Undertake all overburden stripping in a staged approach, to minimise potential dust nuisance.
10	Where practicable, damp down all material before crushing to minimise dust generation.
11	The plant dust suppression system must be employed during dry and/or windy weather.
12	Load material in a bunded/protected location.
13	Check the filter bags in the pugmill regularly to ensure they are maintained.
14	Ensure the pug mill is operated in accordance with the relevant procedures.
15	Where dust suppression measures are not effective, the Quarry Manager will need to consider other options such as shrouding transfer points and/ or erecting dust barriers.
16	Maintain and implement the use of road sweeper trucks on sealed trafficked roads at the site (including entry/exit road) to minimise the release of particulate matter.
17	Wheel wash system to be used at the exit of the quarry to minimise dust tracking onto roadways.
18	Main trafficable areas within the quarry are sealed with bitumen or regularly maintained using a grader.
19	Completed areas in the quarry will be stabilised by landscaping or revegetation (see Section 4.9)

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	Monitoring
20	Periodical monthly dust deposition monitoring is to be undertaken in accordance with the Dust Monitoring Procedure.
21	Dust-Trak PM^{10} dust monitoring will be undertaken at the request of the administering authority.
22	Dust must not exceed dust deposition of 120mg/m^2/day when monitored in accordance with AS 3580.10.1 (2003 – or more recent) and when measured at a nuisance sensitive or commercial place[A2].

5.2.2.4. Corrective Actions

In the event that air quality becomes the basis of a complaint that is not vexatious or frivolous, or non-compliant, further strategies will be considered and implemented where practicable.

It is the responsibility of quarry personnel to ensure that the prevailing weather conditions are responded to appropriately and to ensure dust suppression activities are undertaken to prevent dust from leaving the site.

5.2.3. Storm Water Management

Fulton Hogan has developed and implemented the Blue Rock Quarry Stormwater Management Plan (SMP), which details how Fulton Hogan will effectively and appropriately manage quarrying activities to prevent, as far as reasonable and practicable, any contamination of stormwater and release of contaminated stormwater.

The SMP shall be updated periodically, as determined by the Quarry Divisional Manager based on site development, to incorporate changing practices and future options. The plan is developed with regard to the following hierarchy of preferred methods of dealing with stormwater in the table below to avoid, minimise, recycle, treat and release contaminated water (as a last option). Where reasonable and practicable, a method of dealing with stormwater which is higher in the hierarchy must be adopted over a lower method in the hierarchy.

The Quarry Divisional Manager shall ensure the Stormwater Management Plan provides details on the works to be implemented at the quarry and that the hierarchy of preferred methods of dealing with stormwater is incorporated at the quarry.

All works will assess the risks of sediment, erosion and water management in accordance with the processes Manage Erosion and Sediment - Process - Au and Discharging Water - Process - Au available on theHub.

To manage stormwater at Blue Rock Quarry for a 1 in 5 year, 24 hour event, major pieces of stormwater infrastructure has been implemented in the form of a High Efficiency Sediment (HES) basin and a 4ML batch treatment sediment basin. The HES basin is a flow through design coupled with an automated coagulant dosing system to enable greater volumes of water to be treated before being released off site.

The coagulant system is automated by the use of an ultrasonic flow meter that is installed in a specifically designed inflow channel that activates the dosing of the coagulant at a set flow rate. Once the coagulant system is activated, the stormwater flows into a forebay area uniquely designed to create turbulence and promote the performance of the coagulant in dropping out the sediments. The coagulant used is trademarked as Turbiclear, which is an aluminium chlorohydrate-based product and does not adversely impact the receiving environment (low aluminium residuals and minimal pH drop).

Both basins were designed with passive decant systems which are designed to empty the basins within a 72 hour period. Additional technology was included on the outlet pipe of the decant systems in the form of butterfly valves that are linked to inflow meters (turbidity) set to the site's water quality parameters.

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If the meters register that the outflows from the basins are outside of the site's water quality parameters, the butterfly valves shut off the discharge flows. The valves are opened periodically (every five minutes) to re-test the water for compliance, and then once compliant allow the basin to fully decant.

Management of the stormwater infrastructure is addressed in Section 5.2.3.3 and indicates the actions required to maintain the infrastructure.

5.2.3.1. Objectives

- To minimise stormwater entering chemical storage or production areas where it may become contaminated with hydrocarbons or sediment
- To provide and maintain drainage and adequate treatment infrastructure to manage, capture and treat impacted on-site water (Table 2)

5.2.3.2. Performance Criteria/Indicators

- Stormwater quality control measures on the site shall be maintained and operational to achieve compliance with EA condition W3 'Table 3 – Contaminant Release Limits to Water'.
- Water quality monitoring is undertaken at the quarry in accordance with the Water Monitoring Work Instruction and the SWMP.

Table 5 – EA Condition W3: 'Table 3 - Contaminant Release Limits to Water'

Quality characteristic	Discharge limit	Limit type	Monitoring frequency
pH	6.5-8.0	range	Monthly upon release
Dissolved oxygen	80-105% saturation	range	Monthly upon release
Turbidity	50 NTU	maximum	Monthly upon release
Suspended solids	50mg/L (90%ile < 100 mg/L)	maximum	Monthly upon release
Litter/ gross pollutants	None	minimum	Weekly upon release
Oil/ grease	No visible oil or grease	maximum	Weekly upon release
Total phosphorous	0.07 mg/L	maximum	Upon request of the administering authority
Total nitrogen	0.65 mg/L	maximum	Upon request of the administering authority

5.2.3.3. Requirements – Stormwater

NO.	REQUIREMENTS
1	Contaminants will not be directly or indirectly released from the site to any waters or the bed or banks of any waters except for those in accordance with 'Table 1 - Contaminants release limits to water'.[W1]
2	Release of contaminants may only occur at Discharge Locations B1 and B2. [W2]
	Inspection and monitoring
3	Monitoring must be undertaken in accordance with Water Monitoring Work Instructions – Blue Rock Quarry and records kept of contaminant releases to waters from Discharge Location B1 and B2 for the

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	quality characteristics, and not less frequently, than that specified in 'Table 3 - Contaminants release limits to water'.[W3]
	Stormwater treatment infrastructure
4	All stormwater infrastructure will be checked to ensure there is full design capacity available in the sediment basins and that all drainage lines are maintained to treat a 24 hour, 1 in 5 year storm event prior to the summer season (by 31 October annually).[W4]
5	Treatment and water quality monitoring system is to be regularly inspected to ensure it is operational, using Stormwater Monitoring Station Inspection Checklist - Form – Blue Rock Quarry and following the related Stormwater Monitoring Station Inspection - Work Instruction - BRQ
6	**Sediment basins** Design capacity of the stormwater infrastructure will be maintained throughout the summer wet season. Refer to the detailed designs for the sediment basins by O2 Environmental. **Auto-dosing coagulant system** The coagulant delivery lines to the ultrasonic sensor are clear and working and coagulant levels of the IBC will be checked monthly during the weekly/ monthly checks (Stormwater Monitoring Station Inspection Checklist - Form – Blue Rock Quarry) to ensure that there is adequate volume for stormwater treatment. Turbid are to be contacted to get a replacement IBC. **Pit sumps** The Quarry Manager will ensure that there is at least 29ML sump volume available in the pit/ bench area prior to the summer season (by 31 October annually). Refer to the Stormwater Management Plan by Groundwork Plus. All sediment sumps and basins will be maintained so that full storage capacity will be reinstated within 72 hours of the most recent rainfall event.[W5,W6]
7	Clean uncontaminated stormwater will not be allowed to enter the sediment control systems and sediment basins.[W7]
8	Erosion protection and sediment control measures are installed, operated and maintained to minimise erosion and the release of sediment from the site.[W8]
9	All drainage lines, diversion drains, channels and batter chutes are designed, constructed and maintained to convey flows for all rain events up to and including a 1 in 10 year Average Recurrence Interval storm event.[W9]
10	All areas of disturbed and exposed soil are managed to minimise the loss of sediment through revegetation and/or us of other stabilisation techniques.[W10]
11	The coagulant currently used on site (Turbiclear) does not cause environmental harm to receiving waters.[W11]
12	All stormwater released from the site must not: (a) Have any properties nor contain any organisms or other contaminants at concentrations which are capable of causing environmental harm; and Produce any slick or other visible evidence of oil or grease, nor contain visible floating oil, grease, scum, litter or other objectable matter. [W12]

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13	The release of stormwater from site must be controlled such that releases do not cause downstream erosion or scouring.[W13]
	Stormwater management plan
14	A stormwater management plan is in place and details how the operator will effectively and appropriately manage the site so as to prevent the contamination of stormwater and any release of contaminated stormwater, in accordance with conditions W1 to W16. To be reviewed as required.[W14]
15	A copy of the quarry SWMP is available electronically on theHub.[W15]
16	The Quarries Divisional Manager and the EC will check any amendments to the Stormwater Management Plan, prior to approval, to ensure they do not result in any contravention of any conditions of the EA.
	Water management
17	Where possible, ensure topsoil is stockpiled to ensure there is no offsite runoff in a rain event.
18	All completed area should be revegetation as soon as practicable.
19	Ensure that all overburden stripping in undertaken in a staged approach during a dry period.
20	Implement erosion and sediment control measures (e.g. bunding in response to weather conditions) at the site.
21	Ensure all spills are cleaned up immediately.
22	Ensure the mobile refuelling vehicle is checked regularly, and the process is followed as per the relevant SWMS.
23	All chemical waste must be disposed by a certified regulated waste disposal operator.
	Pre-coat area sub plan
24	Where possible, uncontaminated runoff will be diverted away from the pre coat production or storage areas.
25	Store pre-coat product under roofed area.
26	The 'footprint' of the pre-coat plant and pre-coat product stockpiles will be kept to a practical minimum.
27	Bunds will be used to contain incident runoff from pre-coat areas. The sump within the bunded area must be emptied regularly.
28	The integrity of precoat pipe delivery system will be checked annually
	Spills
29	Spill kits, personal protective equipment and emergency procedures will be provided for the management of wastes and chemicals on site.[G14]
30	All personnel will be trained in the use of a spill kit.[G15]

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	Reporting and records
31	If the Stormwater Management Plan is amended, a copy will be submitted to the administering authority when requested.
32	Records of triple interceptor and stormwater treatment system inspections and cleaning will be filed at the quarry office.

5.2.3.4. Corrective Actions

In the event of inadequate or impaired performance of the stormwater control measures and infrastructure, the identification, construction and/or implementation of suitable alternative measures will be undertaken.

Where necessary, corrective actions will be developed (in consultation with DES when required) for the following:

- Water quality of outflow fails to meet release criteria
- Complaints from the community about discharge water quality, odours or increased mosquito numbers.

5.2.4. Water Resources

Blue Rock Quarry holds a water licence (42418C) which authorises Fulton Hogan to impound the flows of water in Michie Creek on Lot 89 WD739 (Licence Reference No: 42418C). The water impoundment area is referred to as the 'top dam' on site. This licence is issued by the Department of Natural Resources and Water (DNRW now DNRME) and is granted in accordance with the provisions of the *Water Act 2000.* Under current activities, water is taken from this impoundment (top dam) via a water cart to be used on the site for dust suppression purposes.

5.2.4.1. Objectives

- To effectively manage the available water resource on site
- To utilise available water for dust suppression purposes

5.2.4.2. Performance Criteria/Indicators

- Maintained and sufficient water supply for site activities
- Compliance with the water licence conditions

5.2.4.3. Requirements – Water Resources

NO.	REQUIREMENTS
1	The maximum volume of water stored at the full supply level of the impounding dam will not exceed 3.9 ML (check with survey when maintaining).[42418C]
2	The maximum height of impounded water at full supply level will not exceed 4 metres above the natural bed level at the downstream limit of the impoundment (check with survey when maintaining).[42418C]
3	Any water flows from the watercourse into the impoundment authorised under this water licence, will be allowed to pass downstream of the impoundment at a rate equal to the rate at which water is entering the impoundment or at a rate equal to the unrestricted capacity of the outlet pipe or siphon pipe (with the downstream end of the pipe at bed level) whichever is the lesser or at such a rate as may be determined by the chief executive.[424183, 3.16]
	Monitoring and reporting
4	The licenced dam will be assessed to ensure that it complies with the requirements (impoundment height, volume, flow conditions) detailed in the water licence.[42418C]

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5	Site water usage will be reviewed and efficiency measures will be implemented as required.

5.2.4.4. Corrective Actions

If an inefficient use of site water resources or non-conformance with a water licence condition is identified, then a review of current measures will be undertaken to determine the corrective actions for implementation.

5.2.5. Waste and resource use

Due to the nature of the quarry operation and the ability to recycle materials via licenced transporters and disposal facilities the generation of waste materials is not considered to be a significant environmental issue on the site.

The site's waste management strategy ensures the regular removal of any generated wastes on site including regulated wastes. Regulated waste likely to be generated on site includes:

- Waste oil and fuel
- Tyres
- Batteries
- Septic waste
- Oily rags, used oil filters, other oily waste
- Spilt hazardous substances
- Used drums for storing hazardous waste
- Material impacted by spills

Implement the waste hierarchy as per Manage Waste AU process (see Figure 2) to minimise waste to landfill.

5.2.5.1. Objectives

- To limit the impacts of waste on the surrounding area.
- To responsibly manage resources and minimise waste generation in accordance with the waste management hierarchy - avoid, reuse; recycling; recover; dispose – (*Waste Reduction and Recycling Act 2011, Waste Reduction and Recycling Regulation 2011*)
- Seek opportunities for recycling

5.2.5.2. Performance Criteria/Indicators

- Successful implementation of waste management, recycling and disposal processes
- No unnecessary waste generation.
- Reduction in waste going to landfill

5.2.5.3. Requirements – Waste

NO.	REQUIREMENTS
1	Where practicable, office waste facilities, including crib areas, will include recycling for: ▪ Office paper ▪ Cardboard ▪ Comingled waste (i.e. domestic recycling) ▪ Toner cartridges ▪ Batteries (where available)

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	Waste receptacles will be secure and serviced regularly.
	Waste handling
2	Waste shall not be burned at the quarry or allow any person to do so, or allow any waste to be removed from the quarry and burnt elsewhere.[WA1]
3	All wastes generated must be minimised, recycle, sorted, handled and transferred in a proper and efficient manner. All waste disposal must be at a lawful facility to accept such waste.[WA2]
4	All regulated waste must be removed by a person who holds a current approval to transport such waste under the provisions of the *Environmental Protection Act 1994*. [WA3]
5	Regulated and/ or trackable wastes will only be removed by licensed operators and a "Waste Transport Certificate" will be obtained from the operator for each removal (pink copy) or confirmation of an agreed electronic system. This certificate will be completed to record the following: ▪ the date, quantity and type of waste removed ▪ name of the waste transporter and/or operator that removed the waste the intended treatment or disposal destination of the waste[WA4]
	Notification of improper disposal of regulated waste
6	Where regulated waste has not been disposed of lawfully, the administering authority must be notified immediately and be provided with all known facts of the incident.[WA5]
	Waste records
7	All pink copies of "Waste Transport Certificates" will be kept for at least 5 years in the Quarry Office. Green copies will be sent to Waste Tracking (DES) as required by the registered waste transporter or Fulton Hogan.

5.2.5.4. Corrective Actions

- Increase the frequency of waste collection from the site
- Covering of waste bins and clean up of waste collection areas
- Increased monitoring of waste collection and documentation may be required as necessary
- If it is known that a person has removed regulated waste from the place and disposed of the regulated waste in a manner which is not authorised by this approval or is improper or unlawful, then the administering authority shall be notified of all relevant facts, matters and circumstances known concerning the disposal as soon as practicable that the person becomes aware of the facts

5.2.6 Chemical management

The Fulton Hogan Managing Hazardous Chemicals and Dangerous Goods - Process - Au details the management of hazardous substances on the site including storage, transfer and disposal. The following hazardous substances or dangerous goods are likely to be stored on the site:

- Diesel
- Precoat agent
- Oxygen/Acetylene

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- Engine oil and grease (new & used)
- Detergents, cleaners, degreasers, paints
- Cement

The locations of where chemicals and dangerous goods are stored on site can be found in the Incident and Emergency Response Plan – Blue Rock Quarry.

5.2.5.5. Objectives

- Ensure all hazardous and dangerous goods are stored, transferred and disposed in accordance with EA conditions and as specified by the manufacturer
- Ensure that where spills occur, they are cleaned up immediately as per spill response training

5.2.5.6. Performance Criteria/Indicators

- No non-compliances or major incidents in relation to hazardous chemicals and dangerous goods
- Spills to be cleaned up immediately
- No contamination to land, water or air

5.2.5.7. Requirements – Chemicals

NO.	REQUIREMENTS
1	Appropriate spill kits, personal protective equipment and relevant operator instructions/ emergency procedure guides for the management of wastes and chemicals associated with the ERA must be kept at the site.
2	All site personnel must be trained in the use of a spill kit on an annual basis.
3	Contents of spill kits are to be maintained on a regular basis.
	Preventing contaminant release to land
4	Contaminants must not be released to land unless otherwise prescribed by a condition of the EA.
5	Spillage of all chemicals and fuels must be contained within an onsite containment system and controlled in a manner that prevents environmental harm.
6	All petroleum product storages must be designed, constructed and maintained in accordance with AS 1940- Storage and Handling of Flammable and Combustible Liquids.
	Bunding
7	Bunding is to be in accordance with AS 1940 - Storage and Handling of Flammable and Combustible Liquids.
8	All fuel and chemical tank vehicle delivery areas must be designed to contain a spill quantity of 110% of the volume of the largest vehicle tanker compartment.
9	All pipework to and from the bunded areas must be directed over the bund walls and not through them.
10	All empty drums must be stored on a hardstand area with their closures in place.
11	All bunded areas must be roofed where practicable.

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	Stormwater treatment devices/s
12	Triple interceptors/ separators (or devices of greater efficiency) must be installed at the chemical storage facilities and be operated and maintained such that collected waste oil and sludge from the devices is removed by an approved contractor as often as necessary to ensure the effective operation of the devices.
	Overfill protection measures
13	Ensure effective and appropriate practical measures are used to prevent overfilling of vessels or containers (including fuel tanks) and prevent spillage of fuel / lime/ cement during transfer operations.
	Inspections, monitoring and reporting
14	Bunds and chemical storage areas are to be inspected on at least a monthly basis.
15	In the event of a spill, the spill is to be cleaned up immediately and reported as per the procedure.

5.2.5.8. Corrective Actions

The circumstances of any spill incidents will be investigated and appropriate corrective actions will be identified and implemented.

Follow the Incident and Emergency Response Flowchart, Chemical Oil and Fuel Spills, which will form part of the Emergency Response Plan.

5.2.6. Flora and flora

The Development Plan – Blue Rock Quarry (January 2011) (QDP) outlines the staged approach applied to quarry development and is reviewed as required as the quarry development progresses. The QDP guides the requirements for vegetation clearance, stripping, and rehabilitation on the site.

Blue Rock Quarry hold a certified Property Map of Assessable Vegetation (PMAV) which determines the accessibility of native vegetation on the property and shows those areas requiring approval to clear under the *Vegetation Management Act 1999*. This map shall be consulted prior to any clearing applications or activities at Blue Rock Quarry.

Fulton Hogan's aim is to minimise the impact the quarry development and associated vegetation clearing on flora and fauna in the local environment. Fulton Hogan currently holds a Permit to Clear Native Vegetation for extractive industry purposes for the mapped vegetation area shown as Permit A in the figure below. This approval was issued in 2010 by the Department of Natural Resources and Mines (DNRM) and contains relevant approval conditions to protect the local environment, which are outlined in the table below. The permitted and non-permitted clearing areas are clearly detailed within the clearing approval document (i.e. Permit area A and Permit area B). In February 2017, the permit was reissued by the Department of Infrastructure, Local Government, and Planning (DILGP) under the *Sustainable Planning Act 2009* with amended lot and plan details for the permitted areas. **Note: clearing can only occur in compliance with the associated conditions within the clearing permit.**

In addition, where required, Fulton Hogan must obtain Operational Works Permits – Vegetation Clearing with Gold Coast City Council (GCCC) and in accordance with MCU conditions.

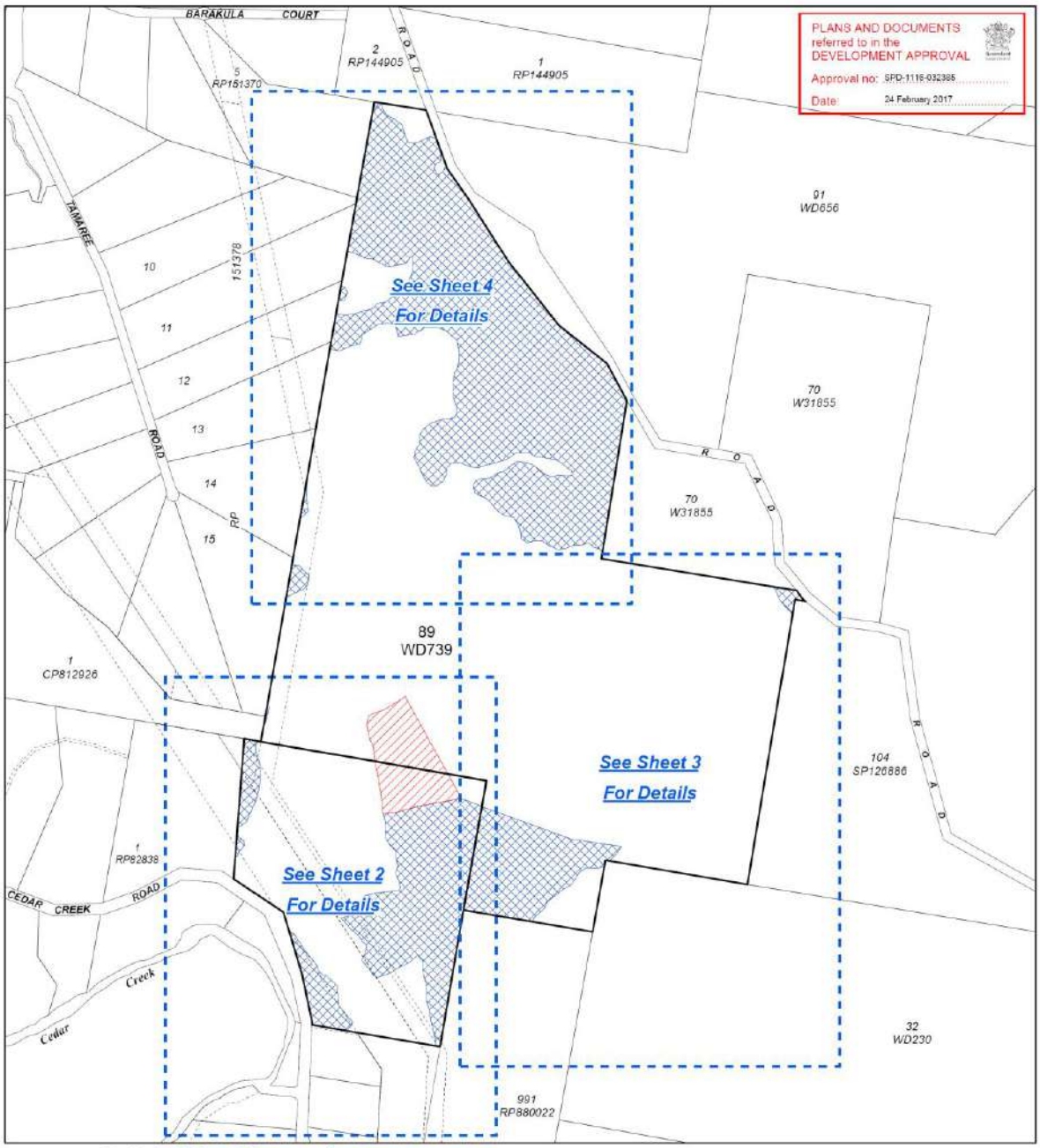
The Quarries Inspection and Test Plan – Vegetation Clearance is used for all clearing and grubbing works on site and is available on TheHub. It details the procedure to be followed to minimise clearing effects on the local environment.

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Fire ant management is highly important on this site as it falls within the Biosecurity Zones. A biosecurity permit has been issued to the site and must be followed at all times in order to minimise the risk of spreading fire ants off site through their successful eradication on site. (insert permit number with link to doc)



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Scale 1:8000 at A3 paper size

0 100 200 400 600 800 m

Projection: UTM (MGA Zone 56) Datum: GDA94

Note: This is a colour plan and should only be reproduced in colour. All Derived Coordinate Points continue sequentially when labels are missing.

Note: Derived Coordinate Points are provided to aid in the location of the permitted clearing boundaries. Responsibility for locating these boundaries lies solely with the landholder and delegated clearing contractor(s).

The property boundaries shown on this plan are APPROXIMATE ONLY. They are NOT an accurate representation of the legal boundaries.

Note: This plan must be read in conjunction with Decision Notice 2009/008426.

LEGEND

- Derived Coordinate Point.
- Subject Lots.
- Permit A - Approved to be Cleared. See Amended Decision Notice 2009/008426 for Details.
- Permit B - Not Approved to be Cleared. See Amended Decision Notice 2009/008426 for Details.

Development Permit Plan

Plan of Permit A and Permit B in Lot 89 on WD739 and ~~Lot 4 on RP82838~~ Lot 1 on SP238024

Total area approved to clear must not exceed: 44.3 ha

N

Queensland Government

CENTRE: IPSWICH **LOCALITY: CEDAR CREEK**	**REGION: SOUTH EAST** **LGA: CITY OF GOLD COAST**
Map Reference: 9542	For data compilation sources see SER/016771/GIS
Keeper Reference: SER/016771	Prepared by: NWF Date: 01 Febuary 2010

AMENDED DPP 2009/008426

Sheet 1 of 6 Sheets

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5.2.6.1. Objectives

- To minimise impact of vegetation clearing on local environment
- To minimise injury/damage to fauna, flora or habitat.
- To minimise the spread of fire ants to and from the site.

5.2.6.2. Performance Criteria/Indicators

- No removal / damage to unapproved vegetation
- All clearing undertaken according to conditions in clearing approval
- No harm to any fauna, or damage to any fauna habitiat
- Quarries Inspection and Test Plan – Vegetation Clearance is followed for all clearing and grubbing works

5.2.6.3. Requirements – Flore and Fauna

NO.	REQUIREMENTS
1	Quarries Inspection and Test Plan – Vegetation Clearance is to be prepared, approved and followed for all clearing and grubbing works
	DNRME Vegetation clearing permit (Elvas 2011/006373)
2	Vegetation clearing will be undertaken in Permit A area only as detailed in the Permit to Clear Native Vegetation
3	Vegetation clearing will not be undertaken in Permit B area at any time.
4	Clearing will be staged in line with operational needs to restrict clearing to current operational areas.
5	Within Permit Area A, clearing will only commence once the clearing area has been clearly defined.
6	Any clearing or activities associated with clearing in Area A must not adversely impact on vegetation not approved to be cleared.
7	Clearing in Permit Area A will be limited to the area from which material will be extracted within the term of the development approval (vegetation clearing permit).
8	Any clearing, or activities associated with clearing within Permit Area A must be undertaken in accordance with the EMP to ensure biological diversity loss is prevented, land degradation does not occur, and ecological processes are maintained.
9	All soil erosion, sediment and drainage controls will be installed prior and working prior to any vegetation removal to ensure land degradation does not occur and ecological processes are maintained.
10	Land clearing debris must not be pushed in gullies, watercourses, other drainage lines or waterlogged areas.
11	Any person involved in the clearing of any vegetation under this permit will be provided a copy of the permit and will comply with the requirements and not clear any vegetation not approved to be cleared under the permit.
12	A spotter/catcher will be used for all vegetation clearing activities. If fauna is injured during site activities, the fauna spotter catcher will coordinate any requirements. Alternatively, it will be managed in accordance with the Incident Investigation, Reporting and Notification Procedure

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	Rehabilitation requirements
13	Progressive rehabilitation of Permit Area A must commence once terminal batters are reached and must be undertaken in accordance with the EMP and other EA conditions. Rehabilitation planting in Permit Area A must use native species consistent with the existing vegetation Rehabilitated sites must be maintained (including but not limited to watering, weeding, fertilising) until plant communities are self-maintaining.
	Fire Ant Requirements
14	Conduct a thorough inspection of all storage areas, original stockpiles, and raw/unprocessed material locations for signs of fire ant activity, such as ant mounds or trails. Any nests which have been identified must be reported and effectively treated by a licensed pest company.
15	Disturbance of stockpiles must occur every 21 days and recorded in the disturbance register.
16	There must be a person on site at all times during business hours who can clearly explain the nature of the carrier movements from the site and risk mitigation measures being undertaken.
17	The application of Insect Growth Regulator (IGR) must be applied quarterly and documented.

5.2.6.4. Corrective Actions

The circumstances of any incidents will be investigated and appropriate corrective actions will be identified and implemented.

In the event that unexpected fauna or flora is encountered refer to the sites Emergency Response Plan and the Incident and Emergency Response Flowchart – Encountering Wildlife (including snakes).

5.2.7. Heritage

The aim at Blue Rock Quarry is to manage cultural heritage in accordance with the *Aboriginal Cultural Heritage Act 2003*. All site activities are to be managed to ensure the protection and preservation of Indigenous and non-Indigenous cultural heritage artefacts, sites and values within the quarry.

The Quarries Inspection and Test Plan – Vegetation Clearance is used for all clearing and grubbing works on site and is available on theHub. It details the procedure to be followed to minimise clearing effects on the local environment and includes measures to identify potential cultural heritage sites within proposed clearing areas.

An artefact scatter (culturally significant site) has previously been identified within Blue Rock Quarry on Lot 1 SP238024. This location is distanced from current quarrying activities and will be protected in the event of any activities occurring within its vicinity

5.2.7.1. Objectives

- To identify culturally significant sites prior to the occurrence of clearing/disturbing activities
- To manage and protect culturally significant sites

5.2.7.2. Performance Criteria/Indicators

- No disturbance to culturally significant sites
- No clearing activities undertaken prior to completion of the Aboriginal cultural heritage protection measures

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5.2.7.3. Requirements – Heritage

NO.	REQUIREMENTS
1	Any person on site will take all reasonable and practical measures not to harm Aboriginal cultural heritage. If a potential Aboriginal cultural heritage site and/or human remains are encountered, it will be managed in accordance with the Fulton Hogan Incident Investigation, Reporting and Notification Procedure.
2	Aboriginal cultural heritage site protection measures detailed in the Quarries Inspection and Test Plan – Vegetation Clearance will be undertaken prior to the occurrence of clearing activities.
3	All personnel on site must be trained in general environmental awareness, including cultural and heritage aspects.
	Emergency Response
4	If cultural and heritage items are discovered, works must be immediately ceased (if applicable). The area must be cordoned off, and notification must be provided to the Regional Environment Manager.
5	Fulton Hogan's Incident and Emergency Response Flowchart - Encountering Cultural Heritage Sites and/or human remains should be following in the event any items of heritage or cultural significance are identified on site.
6	If required, a Cultural Heritage body may be commissioned to inspect the site to determine a suitable management of the find.

5.2.7.4. Corrective Actions

The circumstances of any incidents will be investigated and appropriate corrective actions will be identified and implemented.

5.2.8. Rehabilitation

The Rehabilitation Management Plan - BRQ defines the revegetation requirements for the front three lots of the site (Lots 14, 15 and 16 on RP151378) and was developed as part of the MCU approval. The plan also sets out weed management requirements for these lots.

Any earthworks, stripping and vegetation clearing activities on the site will be conducted in accordance with relevant acquired approvals and associated conditions. Control measures will be incorporated into the activities prior to commencement

5.2.8.1. Objectives

- To minimise impact of quarry works on the local environment
- Stabilise exposed and cleared areas as soon as possible after activities
- Revegetate completed areas with native and indigenous plant species
- To manage weeds effectively on site

5.2.8.2. Performance Criteria/Indicators

- Compliant dust emissions from the site during earthworks, stripping or vegetation clearing (see Section **Error! Reference source not found.**.2)
- Compliant water quality discharge from site during earthworks, stripping or vegetation clearing (see Section **Error! Reference source not found.**)
- Compliance with related approval conditions for the activity
- Self-maintaining native and indigenous rehabilitated vegetation communities preventing weed infestations to take hold

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5.2.8.3. Requirements – Rehabilitation

NO.	REQUIREMENTS
1	The staging areas of the quarry must be designed to facilitate progressive and final rehabilitation. [R1]
	Progressive rehabilitation
2	Rehabilitation of disturbed areas must take place progressively as works are staged and new areas of extraction are commenced. [R3]
3	Works must commence within three (3) months of the completion of works within a disturbed area to achieve compliance with R3. [R5]
4	Records of rehabilitation measures implemented must be maintained and an annual report is to be submitted to the administering authority detailing the progress of the rehabilitation program in the preceding twelve (12) months. [R6]
5	A progressive Rehabilitation Strategy must be prepared and implemented addressing conditions R1 – R6. [R7]
	Final rehabilitation and decommissioning report
6	A Final Decommissioning and Rehabilitation Report must be submitted to the administering authority at twelve (12) months prior to ceasing the environmentally relevant activity. [R8]
	Weed management
7	All reasonable and practicable measures must be taken to control and eradicate noxious weeds and declared plants on site and to prevent the spread of weeds beyond the boundary of the site. [L18]
8	Ensure a rehabilitation plan is developed prior to commencement of clearing to ensure weeds are management effectively.
9	Any required revegetation shall only include nominated native plants in the process.
10	Routine weed spraying/management will be undertaken in active quarry areas.
11	A wheel wash must be operational at the site and used by relevant machinery leaving the site. Regular checks must be undertaken to verify the effectiveness of the wash.
12	Any material brought to site should be verified as weed and pest free prior.

5.2.8.4. Corrective Actions

- Rehabilitate disturbed areas once completed
- Incorporate rehabilitation into quarry planning
- Install sediment and erosion controls prior to activities
- Implement weed management strategies

5.3. Maintenance and removal of environmental protection measures

All environmental protection measures are to be maintained to ensure they are performing as originally intended when installed.

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If protection measures are no longer required they shall be removed and disposed in accordance with Manage Waste - Process - AU.

6. Awareness, training, competence and communication

The requirements stipulated in this EMP and all subordinate environmental documents must be conveyed to all persons involved in the works carried out by Blue Rock Quarry. Commitment shall be sought from these individuals that these requirements will be adhered to.

6.1. REALity culture

A culture of providing sound environmental performance is an integral part of the overall Fulton Hogan culture program. Fulton Hogan's REALity program highlights the integral values of the company.

- Respect;
- Energy and Effort;
- Attitude; and
- Leadership.

Each of these directly impact on the manner in which Fulton Hogan's operations interact with the environment.

6.2. Induction

Environmental induction is integrated within Fulton Hogan's Induction processes.

6.2.1. Company induction

All new salaried employees must undergo the Company Induction Process. The Company Induction must be completed in accordance with the Fulton Hogan On boarding and Induction process.

6.2.2. Site / facility induction

Blue Rock Quarry undertakes inductions accordance with Conducting Site Induction - Process - Au. The induction, given on the first day on site, shall give detail to the key environmental risks and requirements of the site. Every person on site shall have some form of approved induction, including site visitors, who must be escorted around the site.

6.3. Communication

Communication shall be undertaken in accordance with Fulton Hogan's Communications processes. In particular;

6.3.1. Toolbox

Toolbox meetings shall be the main form of communication to address changes to the environmental requirements, as well as a platform for staff to raise suggestions and innovative ideas to their direct management. Tool Box meetings shall be undertaken every day and must be undertaken and documented in accordance with Conduct Toolbox Meetings - Process - Au.

6.3.2. Environmental (green) alerts

Environmental (Green) Alerts shall be used to communicate significant environmental incidents, innovations or changes in requirements. These allow the learning's and any required changes to be shared across all operations across Australia.

The Quarry Manager shall ensure that learning's from Green Alerts are communicated to all relevant personnel.

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6.4. Training

Training shall be undertaken and records shall be maintained in accordance with the Fulton Hogan Learning, Development and Training processes. Training shall be undertaken to ensure staff are aware of their obligations under the *Environmental Protection Act 1994*.

6.4.1. EnviroWise

All Fulton Hogan Personnel are required to undertake Fulton Hogan's internal Environmental Training Program- EnviroWise. Key subcontractors may also be invited to attend this training.

This 2-3 hour training package details the environmental requirements, risk and controls to personnel to ensure they have a good baseline environmental awareness and knowledge for the undertaking of their works.

6.4.2. Continued training

Continued training will be carried out as necessary to ensure staff are adequately competent and understand their role in ensuring sustainable outcomes.

7. Monitoring, inspection and audits

Regular monitoring, inspections and audits shall be conducted to assure compliance with the requirements of this EMP and any regulatory requirements.

7.1. Monitoring and inspection schedule

A Monitoring and Inspection Schedule for Blue Rock Quarry shall be developed and maintained. This will identify the key monitoring and inspections required for the operation. This shall be developed and managed in accordance with Implement a Monitoring and Inspection Schedule - Process - Au.

7.2. On-going visual monitoring

Environmental monitoring, including monitoring of subcontractors' activities, must be conducted as an on-going activity during the normal (continuous) course of supervision of works.

Records of such surveillance should be kept if any environmental issues are observed. These should be documented as an environmental incident/ non-conformance in CAMs or a diary note as appropriate.

7.3. Site inspections

In addition to periodic inspections, additional inspections must be undertaken prior to significant weather events (i.e. rain, wind etc) to ensure the site is safe and the weather will not create an environmental incident.

Areas for inspection must include:

- The Site - to identify if any additional areas require measures
- The Environmental Protection Measures - to identify if they are working effectively (i.e. are they appropriate for the location, installed correctly or require maintenance?)
- The processes of work – to identify if people are undertaking correct work practices
- The Receiving Environment - to identify if any impact is occurring

Quarry activities are regularly inspected and recorded by site staff through the Safety and Environmental Inspection Checklist - BRQ. This site specific checklist is designed to:

- Ensure the required weekly or daily checks are undertaken as per EMP and EA conditions.
- Identify and close out site specific health, safety and environmental risks
- Promote awareness to personnel of site risks

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Plant and equipment may also be inspected and where applicable environmental controls/ aspects checked. These include:

- Stormwater Monitoring Station Inspection Checklist
- Plant/ equipment prestart checklists (various)
- Conveyors – water sprays, greasing, etc.

In addition, inspections of the site shall be conducted by the relevant area supervisor as soon as practicable following storm events or incidents which could cause environmental harm or damage to controls and when significant weather events are forecasted as a proactive approach

The Safety and Environmental Inspection Checklist - BRQ available on the Inspections application within Salesforce should be used for documenting all environmental inspections. In the event that specific elements that are not covered by the Safety and Environmental Inspection Checklist - BRQ Inspection, an additional inspection or update to the Safety and Environmental Inspection Checklist - BRQ Inspection should be uploaded to Salesforce that adequately addresses the risks.

7.4. Physical / chemical and resource monitoring

7.4.1. Water quality monitoring

Conduct Water Quality Monitoring - Process – AU outlines the process for undertaking water quality monitoring.

Associated monitoring requirements:

- Monitoring location and release points must be situated and maintained in accordance with plan totled 'Water Quality Sampling and Monitoring Locations' – document number 982.122 (rev 1) – Groundwork Plus – 4 December 2012.
- Monitoring must be in accordance with the methods prescribed in the current edition of the administering authority's *Monitoring and Sampling Manual.*
- Water and sediment samples must be representative of the general condition of the water body or sediments.
- All determinations must employ analytical practical quantification limits of sufficient sensitivity to enable comparisons to be made against water quality objectives/triggers/limits relevant to the particular water or sediment quality characteristics.
- Monitoring must be undertaken during a release and at the frequency stated.
- All monitoring devices must be calibrated and maintained according to the manufacter's instruction manual.

7.4.2. Air quality monitoring

The release of dust and/or particulate matter resulting from the ERA must not cause an environmental nuisance at any nuisance sensitive or commercial place. Dust and particulate matter must not exceed the following levels when measured at any nuisance sensitive or commercial place.

- Dust deposition of 120 miligrams per square meter per day, when monitored in accordance with Australian Standard As 3580.10.1 of 2003 (or more recent editions); OR
- A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometre (µm) (PM10) suspended in the atmosphere of 50 micrograms per cubic metre over a 24 hour averaging time, at a nuisance sensitive or commercial place downwind of the site, when monitored in accordance with:

  Australian Stantard – FROM EA AMMENDED

Conduct Environmental Air Quality Monitoring - Process – AU outlines the process for undertaking environmental air quality monitoring.

7.4.3. Noise monitoring

Conduct Environmental Noise Monitoring - Process – AU outlines the process for undertaking environmental noise monitoring.

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Noise monitoring may be required to be undertaken at the request of the Administering Authority.

7.5. Audits

7.5.1. Internal audits

Audits of the application of the EMP and ECP's shall be undertaken by the Environmental Manager. The Environment Manager shall maintain an Audit Schedule in the Salesforce Self-Assessment Tool application, with audits to be scheduled on a risk based approach.

The audit will be conducted using an appropriate template relevant for the scope of the audit on the Self-Assessment Tool application in Salesforce.

7.5.2. ISO14001 certification audits

As part of Fulton Hogan's ISO 14001 certification, the operation may be required to participate in certification audits. This will occur if the operation is randomly sampled for audit.

7.5.3. External audits

When requested, DES, Gold Coast City Council (GCCC) or other administering authorieis may undertake audits to ensure compliamce with approval conditions. At all reasonable times and to the satisfaction of an authorised person, the Quarries Divisional and Operational Managers will provide access to all relevant documents for environmental management and maintain access to the site for authorised persons to check compliance.

8. Incident and emergency preparedness and response

Incident and emergency planning and response shall be managed in accordance with Fulton Hogan's Conduct Incident & Emergency Response Planning - Process - Au and Manage Incident Response, Notification & Investigation - Process - Au. These processes detail how to:

- Plan for incidents and emergencies by preparing a site specific Emergency Response Plan. This contains site specific procedures to follow in the event of emergency scenarios;
- Notify required persons;
- Report; and
- Undertake incident investigation.

In accordance with the requirements of these processes, an Incident and Emergency Response Plan has been developed for this operation and should be referred to for further information.

9. Reporting

9.1. Non-conformance

All environmental non-conformances must be raised, actioned and recorded in accordance with Fulton Hogan's Nonconformity process.

Non-conformance records are to be raised in CAMs.

9.2. Monthly environmental reporting

Environmental statistics shall be complied and trend analysis shall occur every month, as part of Fulton Hogan's monthly internal Environmental and Sustainability reporting. As part of this process, an assessment is made on the performance of the Objectives and Targets. Reporting shall be undertaken and managed in accordance with Monthly Environmental & Sustainability Reports - Process – Au.

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10. Review and continuous improvement

Blue Rock Quarry management will review the environment and sustainability management system as outlined in this plan, annually as a minimum, to ensure its continuing suitability, adequacy and effectiveness via Management Review - Process - Au.

Other triggers for update may include legislative change, approval change, client change, operational change, incident or innovation improvement.

The Environmental Manager will revise this plan as necessary to reflect any amendment to the Fulton Hogan Quality System or to capture identified areas of improvement.

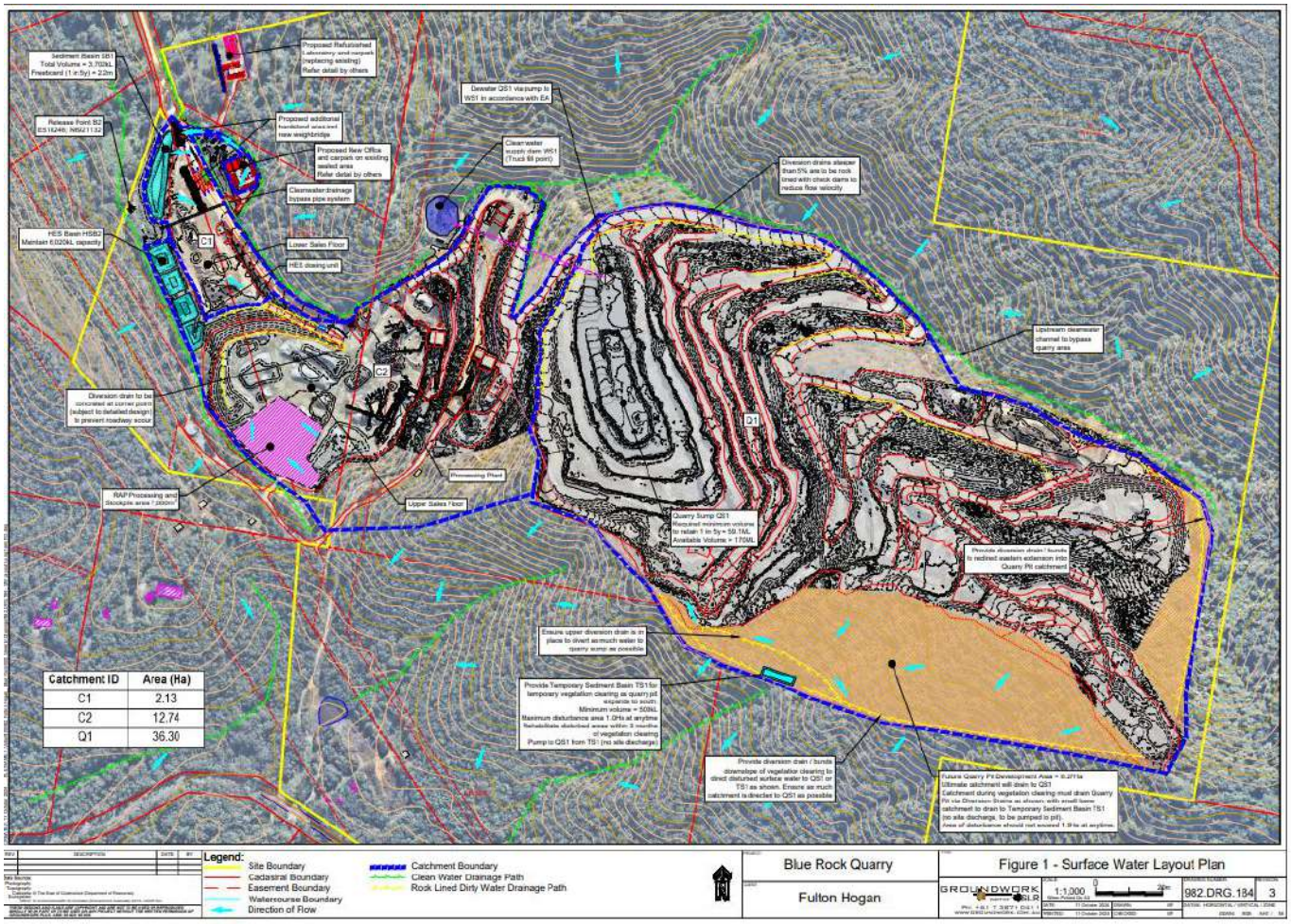
11. Document control – documents, data and records

All documentation specifically relating to the management of environment and sustainability, including this plan, are to be stored and maintained in accordance with Control of Documents, Data and Records - Process - AU and the project specific requirements detailed in the Quality Management Plan.

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12. Appendices

Appendix 1. Stormwater Management Plan



13. Revision history

DATE	AUTHOR	BRIEF DESCRIPTION OF CHANGE
07/06/2010	Sara Hansen	Initial Development of EMP

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DATE	AUTHOR	BRIEF DESCRIPTION OF CHANGE
22/09/2011	Aaron Hinttala	Separation from Quarries EMP to Blue Rock Quarry EMP with major changes throughout.Rewritten to comply with ISO14001:2004
28/03/2012	Sara Hansen	Updated table of contents. No other content change
27/10/2014	Samantha Smith	Updated document in line with approval changes and business name change to FH Quarries.
30/03/2014	Sara Hansen	Transferred from TheHub
4/12/2015	Carol Bartlett	Updates throughout:general grammatical changes; update to reflect new environmental policy; roles & responsibilities converted to RASCI; added CCP procedure in air quality.
26/2/2016	Fern Dorricott	Reviewed and updated RASCI, added fire ant subplan and reordered subplans.
05/05/2016	Sara Hansen	3.3.1 – Updated hyperlink to BRQ approval
22/06/2018	Marnie Dugmore	Review and update document for grammar and formatting. Updated all links and permit references, and legislation subscription details. Added stakeholder section to compile with ISO14001.
23/4/2019	Fern Dorricott	Further updates for vegetation clearing/approvals and water quality / stormwater treatment management. Minor other changes throughout (grammar, links), updated internal audit section and fire ant permit requirements.
12/02/2020	Donna Ghoussain	Update of links to theHUB from info link, edit of sub plans and check list. Hyperlinks re linked
02/08/2022	Andrew Gurnett	Transfer of document to new corporate template including additional sections. Update of broken hyperlinks. Addition of new EA and update to reflect current practices.
02/10/2024	Romany Burns	Annual Review: Updated links, fixed page numbers, updated legislation.
25/10/2024	Romany Burns	Updated to include fire ant requirements New Stormwater Management Plan added into appendices

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Attachment A4

Impact MHQA Raw Data

Habitat Quality Assessment Unit Score Sheet

Part A - Administrative

Transect ID	T1	Job Number / Property	11390 - Blue Rock Quarry

Part B - Site Data

Recorders	LB and DH	Date	5/06/2023

Assessment Unit:	Assessment Unit Area (ha)	RE	Bioregion Number
na		12.11.3	12

Site description and Location (including details of discrete polygons within the assessment unit)
AU1 - Cat B (12.11.3) Eucalyptus crebra dominated with Eucalyptus tereticornis, Eucalytus microcorys and Eucalyptus propinqua. Moderatly/highly weedy shrub layer

Part C - Native Species Richness: (*list species below)

Tree species richness:				
Total number of species	12			EDL / Dom / R
Scientific Name	*Eucalyptus crebra*	Common Name	Narrow-leaved Ironbark	EDL/Dom/R
Scientific Name	*Eucalyptus microcorys*	Common Name	Tallowwood	
Scientific Name	*Eucalyptus tereticornis*	Common Name	Forest Red Gum	
Scientific Name	*Corymbia intermedia*	Common Name	Pink Bloodwood	
Scientific Name	*Eucalyptus propinqua*	Common Name	Grey Gum	
Scientific Name	*Corymbia citriodora*	Common Name	Spotted Gum	
Scientific Name	*Acacia disparrima*	Common Name	Hickory Wattle	
Scientific Name	*Alphitonia excelsa*	Common Name	Soap Tree	
Scientific Name	*Allocasuarina littoralis*	Common Name	Black She-oak	
Scientific Name	*Glochidion ferdinandi*	Common Name	Cheese Tree	
Scientific Name	*Lophostemon confertus*	Common Name	Brush Box	
Scientific Name	*Eucalyptus acmenoides*	Common Name	White Mahogany	

Shrub species richness:			
Total number of species	6		
Scientific Name	*Erythrina vespertilio*	Common Name	Batwing Coral Tree
Scientific Name	*Mallotus philippensis*	Common Name	Red Kamala
Scientific Name	*Grewia latifolia*	Common Name	Dog's Balls
Scientific Name	*Breynia oblongifolia*	Common Name	Coffee Bush
Scientific Name	*Alphitonia excelsa*	Common Name	Soap Tree
Scientific Name	*Hibiscus heterophyllus*	Common Name	Rosella
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	

Grass species richness:			
Total number of species	3		
Scientific Name	*Imperata cylindrica*	Common Name	Blady Grass
Scientific Name	*Themeda triandra*	Common Name	Kangaroo Grass
Scientific Name	*Oplismenus aemulus*	Common Name	Creeping Beard Grass
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	

Forbs and others (non grass ground) species richness:			
Total number of species	13		
Scientific Name	*Plectranthus sp.*	Common Name	
Scientific Name	*Pandorea pandorana*	Common Name	Wong Wonga Vine
Scientific Name	*Smilax australis*	Common Name	Barbed-wire Vine
Scientific Name	*Eustrephus latifolius*	Common Name	Wombat Berry
Scientific Name	*Cayratia clematidea*	Common Name	Slender Grape
Scientific Name	*Lobelia purpurascens*	Common Name	White Root
Scientific Name	*Parsonsia straminea*	Common Name	Monkey Rope
Scientific Name	*fern**	Common Name	
Scientific Name	*Dianella caerulea*	Common Name	Blue Flax-lily
Scientific Name	*Big leaf vine**	Common Name	
Scientific Name	*Platycerium superbum*	Common Name	Staghorn
Scientific Name	*Drynaria rigidula*	Common Name	Basket Fern
Scientific Name	*Stephania japonica*	Common Name	Tape Vine

Part D - Non-Native Plant Cover: (*list species below)

Total percentage cover within plot	70.00%		
Scientific Name	*Lantana camara*	Common Name	Lantana
Scientific Name	*Chloris gayana*	Common Name	Rhodes Grass
Scientific Name	*Paspalum mandiocanum*	Common Name	Broad-leaved Paspalum
Scientific Name	*Passiflora suberosa*	Common Name	Corky Passion
Scientific Name	*Solanum seaforthianum*	Common Name	Brazilian Nightshade
Scientific Name	*Asparagus aethiopicus*	Common Name	Ground Asparagus
Scientific Name	*Melinis minutiflora*	Common Name	Molasses Grass

Scientific Name	*Eragrostis curvula*	Common Name	African Love Grass
Scientific Name		Common Name	
Scientific Name		Common Name	

Part E - Coarse Woody Debris: (*list lengths of individual logs in meters)

Total Length of Course Woody Debris (Meters per hectare)	11.40		
1	2.20	26	
2	1.50	27	
3	1.50	28	
4	1.40	29	
5	2.60	30	
6	2.20	31	
7		32	
8		33	
9		34	
10		35	
11		36	
12		37	
13		38	
14		39	
15		40	
16		41	
17		42	
18		43	
19		44	
20		45	
21		46	
22		47	
23		48	
24		49	
25		50	

Part F - Native perennial grass cover, organic litter: (*provide percentage cover within each quadrat, and provide average cover)

Ground Cover	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5	Average
Native perennial grass cover	25%	40%	0%	0%	0%	13%
Native other grass						
Native forbs and other species	5%	2%	3%	15%	7%	6%
Native shrubs						
Non-native grass	20%	0%	0%	0%	0%	4%
Non native forbs and shrubs	0%	3%	30%	0%	1%	7%
Litter	50%	55%	67%	75%	40%	57%
Rock						
Bare Ground				10%	52%	31%
Cryptogram						
Total	100%	100%	100%	100%	100%	100%

Part G- Number of large trees , tree canopy height, recruitment of woody perennial species:

Eucalypt Large tree DBH benchmark used :	450	Number of large eucalypt trees:	E.acminoides 470 E.tereticornis 450, 470, 450, 450 E.microcorys 560, 460
Non- Eucalypt Large tree DBH benchmark used:	200	Number of large non eucalypt trees:	A.littoralis 240, 220
Total Number Large Trees: per ha	14		

Median Tree Canopy Height Measurements	Canopy:	19	Sub-canopy:	8	Emergent:	NA

Percentage of ecologically dominant layer species regenerating:	100

Part H - Tree canopy cover, Shrub canopy cover

Tree canopy cover %	Canopy:	77.5%	Sub-canopy:	35.60%	Emergent:	NA
Shrub canopy cover %	11.60%					

Layer	Start	End	Interval	Layer	Start	End	Interval
T1	0.0	8.3	8.3	T2	0.0	5.2	5.2
T1	8.3	12.9	4.6	T2	5.2	11.0	5.8
T1	16.0	21.6	5.6	T2	21.4	23.0	1.6
T1	22.3	29.5	7.2	T2	24.0	26.4	2.4
T1	32.0	39.4	7.4	T2	37.9	40.7	2.8
T1	39.8	43.3	3.5	T2	57.4	63.5	6.1
T1	43.3	47.3	4.0	T2	63.5	67.2	3.7
T1	47.3	49.0	1.7	T2	69.0	71.3	2.3
T1	49.0	54.1	5.1	T2	77.3	76.3	-1.0
T1	54.7	58.3	3.6	T2	75.5	77.0	1.5
T1	58.3	63.3	5.0	T2	80.0	81.9	1.9
T1	63.3	71.4	8.1	T2	87.5	89.0	1.5
T1	71.4	75.9	4.5	T2	92.2	94.0	1.8
T1	82.0	86.1	4.1	T2			0.0
T1	94.0	97.3	3.3	T2			
T1	98.5	100.0	1.5	T2			0.0

Layer	Start	End	Interval	Layer	Start	End	Interval
Shrub	2.3	4.2	1.9	Shrub	71.7	72.4	0.7
Shrub	14.5	15.4	0.9	Shrub	84.5	85.4	0.9
Shrub	16.9	17.1	0.2	Shrub	91.5	92.8	1.3
Shrub	22.4	23.3	0.9	Shrub	95.2	96.7	1.5
Shrub	38.0	39.3	1.3	Shrub			0.0
Shrub	50.9	52.6	1.7	Shrub			0.0
Shrub	57.0	57.3	0.3	Shrub			0.0

Note: Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present *If trees are in the same layer and continuous along the transect you can group them

Part I: GHFF Stem Count

Species Name	Stem Count
Eucalyptus crebra	22
Corymbia intermedia	4
Allocasuarina littoralis	4
Eucalyptus tereticornis	15
Eucalyptus microcorys	9
Acacia disparrima	9
Eucalyptus acmenoides	10
Eucalyptus propinqua	9
Lophostemon confertus	4

Attach Landscape Photos Here

North



South



East





West



Habitat Quality Assessment Unit Score Sheet

Part A - Administrative

Transect ID	T2	Job Number / Property	11390 - Blue Rock Quarry

Part B - Site Data

Recorders	LB and DH	Date	1/11/2023

Assessment Unit:	Assessment Unit Area (ha)	RE	Bioregion Number
na		12.11.3	12

Site description and Location (including details of discrete polygons within the assessment unit)
AU1 - Cat B (12.11.3) Eucalyptus crebra dominated with Eucalyptus tereticornis, Eucalytus microcorys and Eucalyptus propinqua. Moderatly/highly weedy shrub layer

Part C - Native Species Richness: (*list species below)

Tree species richness:				
Total number of species	11			EDL / Dom / R
Scientific Name	*Eucalyptus crebra*	Common Name	Narrow-leaved Ironbark	Dom / R
Scientific Name	*Eucalyptus microcorys*	Common Name	Tallowwood	
Scientific Name	*Eucalyptus tereticornis*	Common Name	Forest Red Gum	R
Scientific Name	*Corymbia intermedia*	Common Name	Pink Bloodwood	
Scientific Name	*Eucalyptus propinqua*	Common Name	Grey Gum	
Scientific Name	*Corymbia citriodora*	Common Name	Spotted Gum	R
Scientific Name	*Acacia disparrima*	Common Name	Hickory Wattle	R
Scientific Name	*Alphitonia excelsa*	Common Name	Soap Tree	R
Scientific Name	*Allocasuarina littoralis*	Common Name	Black She-oak	R
Scientific Name	*Eucalyptus acmenoides*	Common Name	White Mahogany	
Scientific Name	*Lophostemon confertus*	Common Name	Brush Box	R
Scientific Name		Common Name		

Shrub species richness:			
Total number of species	4		
Scientific Name	*Jacksonia scoparia*	Common Name	Dogwood
Scientific Name	*Mallotus philippensis*	Common Name	Red Kamala
Scientific Name	*Leucopogon juniperinus*	Common Name	Prickly Heath
Scientific Name	*Hibiscus heterophyllus*	Common Name	Rosella
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	

Grass species richness:			
Total number of species	2		
Scientific Name	*Imperata cylindrica*	Common Name	Blady Grass
Scientific Name	*Themeda triandra*	Common Name	Kangaroo Grass
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	

Forbs and others (non grass ground) species richness:			
Total number of species	9		
Scientific Name	*Lomandra multiflora*	Common Name	Many Flowered Mat Rush
Scientific Name	*Geitonoplesium cymosum*	Common Name	Scrambling Lily
Scientific Name	*Smilax australis*	Common Name	Barbed-wire Vine
Scientific Name	*Lomandra longifolia*	Common Name	Long-leaved Matrush
Scientific Name	*Dianella caerulea*	Common Name	Blue Flax-lily
Scientific Name	*Bursaria spinosa*	Common Name	Black Thorn
Scientific Name	*Cheilanthes distans*	Common Name	Bristle Cloak Fern
Scientific Name	*Lepidosperma laterale*	Common Name	Variable Saw Sedge
Scientific Name	*Dendrobium speciosum*	Common Name	King Orchid
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	

Part D - Non-Native Plant Cover: (*list species below)

Total percentage cover within plot	60.00%		
Scientific Name	*Lantana camara*	Common Name	Lantana
Scientific Name	*Chloris gayana*	Common Name	Rhodes Grass
Scientific Name	*Abrus precatorius*	Common Name	Gidgee Gidgee
Scientific Name	*Passiflora suberosa*	Common Name	Corky Passion
Scientific Name	*Lantana montevidensis*	Common Name	Creeping Lantana
Scientific Name	*Eragrostis curvula*	Common Name	African Love Grass
Scientific Name	*Purple Pea*	Common Name	

Scientific Name		**Common Name**	
Scientific Name		**Common Name**	
Scientific Name		**Common Name**	

Part E - Coarse Woody Debris: (*list lengths of individual logs in meters)

Total Length of Course Woody Debris (Meters per hectare)	**22.40**		
1	2.20	**26**	
2	1.50	**27**	
3	2.50	**28**	
4	2.00	**29**	
5	6.50	**30**	
6	2.50	**31**	
7	1.00	**32**	
8	3.20	**33**	
9	1.00	**34**	
10		**35**	
11		**36**	
12		**37**	
13		**38**	
14		**39**	
15		**40**	
16		**41**	
17		**42**	
18		**43**	
19		**44**	
20		**45**	
21		**46**	
22		**47**	
23		**48**	
24		**49**	
25		**50**	

Part F - Native perennial grass cover, organic litter: (*provide percentage cover within each quadrat, and provide average cover)

Ground Cover	**Quadrat 1**	**Quadrat 2**	**Quadrat 3**	**Quadrat 4**	**Quadrat 5**	**Average**
Native perennial grass cover	40%	25%	0%		25%	23%
Native other grass						
Native forbs and other species						
Native shrubs						
Non-native grass						
Non native forbs and shrubs						
Litter	60%	75%	95%	40%	55%	65%
Rock						
Bare Ground			5%	60%	20%	28%
Cryptogram						
Total	100%	100%	100%	100%	100%	100%

Part G- Number of large trees , tree canopy height, recruitment of woody perennial species:

Eucalypt Large tree DBH benchmark used :	450	**Number of large eucalypt trees:**	C.citriodora 470, 460 E.propinqua 460
Non- Eucalypt Large tree DBH benchmark used:		**Number of large non eucalypt trees:**	
Total Number Large Trees: per ha	6		

Median Tree Canopy Height Measurements	**Canopy:**	22	**Sub-canopy:**	11	**Emergent:**	NA

Percentage of ecologically dominant layer species regenerating:	**100**

Part H - Tree canopy cover, Shrub canopy cover

Tree canopy cover %	**Canopy:**	74.1%	**Sub-canopy:**	26.80%	**Emergent:**	NA
Shrub canopy cover %	4.90%					

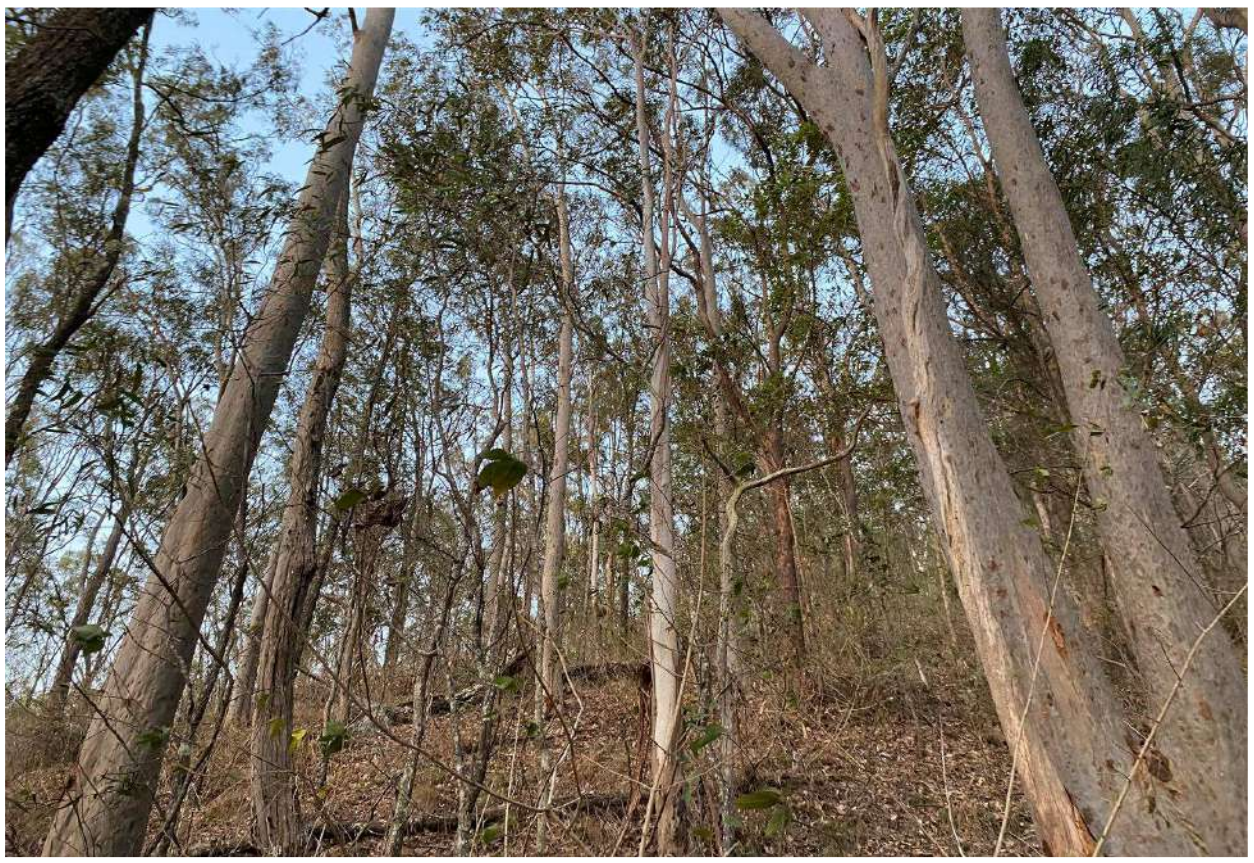
Layer	**Start**	**End**	**Interval**	**Layer**	**Start**	**End**	**Interval**
T1	0.0	8.8	8.8	**T2**	5.2	11.7	6.5
T1	12.7	19.7	7.0	**T2**	22.2	23.8	1.6
T1	26.8	39.8	13.0	**T2**	36.8	39.8	3.0
T1	43.0	49.0	6.0	**T2**	52.6	59.6	7.0
T1	50.0	55.2	5.2	**T2**	77.7	80.0	2.3
T1	61.2	81.3	20.1	**T2**	81.3	82.7	1.4
T1	86.0	100.0	14.0	**T2**	86.0	91.0	5.0
T1			0.0	**T2**			0.0
T1			0.0	**T2**			0.0
T1			0.0	**T2**			0.0
T1			0.0	**T2**			0.0
T1			0.0	**T2**			0.0
T1			0.0	**T2**			0.0
T1			0.0	**T2**			0.0
T1			0.0	**T2**			
T1			0.0	**T2**			0.0

Layer	**Start**	**End**	**Interval**	**Layer**	**Start**	**End**	**Interval**
Shrub	5.1	5.3	0.2	**Shrub**			0.0
Shrub	17.8	18.4	0.6	**Shrub**			0.0
Shrub	33.7	35.6	1.9	**Shrub**			0.0
Shrub	42.3	43.0	0.7	**Shrub**			0.0
Shrub	49.0	49.6	0.6	**Shrub**			0.0
Shrub	55.7	56.6	0.9	**Shrub**			0.0
Shrub			0.0	**Shrub**			0.0

Note: Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present *If trees are in the same layer and continuous along the transect you can group them

Attach Landscape Photos Here

North



South



East





West



Habitat Quality Assessment Unit Score Sheet

Part A - Administrative

Transect ID	T3	Job Number / Property	11390 - Blue Rock Quarry

Part B - Site Data

Recorders	LB and DH	Date	22/10/2024

Assessment Unit:	Assessment Unit Area (ha)	RE	Bioregion Number
na		12.11.10	12

Site description and Location (including details of discrete polygons within the assessment unit)
AU2 - Regrowth RE12.11.10 Steep vine thicket regrowth. Very steep rocky terrain prevent a full length transect being completed. A 50m transect was used and deemed suitable given the small area and inaccessible terrain (1.1ha). Relevant attributes were extrapolated for scoring purposes.

Part C - Native Species Richness: (*list species below)

Tree species richness:				
Total number of species	6			EDL / Dom / R
Scientific Name	*Mallotus philippensis*	Common Name	Red Kamala	D, r
Scientific Name	*Grevillea robusta*	Common Name	Silky Oak	
Scientific Name	*Acacia melanoxylon*	Common Name	Australian Blackwood	
Scientific Name	*Croton verreauxii*	Common Name	Croton	
Scientific Name	*Acacia disparrima*	Common Name	Hickory Wattle	
Scientific Name	*Lophostemon confertus*	Common Name	Brush Box	
Scientific Name		Common Name		
Scientific Name		Common Name		
Scientific Name		Common Name		
Scientific Name		Common Name		
Scientific Name		Common Name		
Scientific Name		Common Name		

Shrub species richness:			
Total number of species	8		
Scientific Name	*Macadamia integrifolia*	Common Name	Macadamia Nut
Scientific Name	*Mallotus philippensis*	Common Name	Red Kamala
Scientific Name	*Jagera pseudorhus*	Common Name	Foambark
Scientific Name	*Hibiscus heterophyllus*	Common Name	Rosella
Scientific Name	*Aphananthe philippinensis*	Common Name	Native Elm
Scientific Name	*Cordyline rubra*	Common Name	Palm Lily
Scientific Name	*Alchornia ilicifolia*	Common Name	Native Holly
Scientific Name		Common Name	Native Citrus
Scientific Name		Common Name	
Scientific Name		Common Name	

Grass species richness:			
Total number of species	1		
Scientific Name	*Oplismenus aemulus*	Common Name	Creeping Beard Grass
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	

Forbs and others (non grass ground) species richness:			
Total number of species	7		
Scientific Name	*Adiantum hispidulum*	Common Name	Rough Maidenhair Fern
Scientific Name	*Passiflora herbertiana*	Common Name	Native Passion Flower
Scientific Name	*Smilax australis*	Common Name	Barbed-wire Vine
Scientific Name	*Maclura cochinchinensis*	Common Name	Cockspur Vine
Scientific Name	*Platycerium superbum*	Common Name	Strag Horn
Scientific Name	*Stephania japonica*	Common Name	Tape Vine
Scientific Name	*Pteridium esculentum*	Common Name	Bracken Fern
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	

Part D - Non-Native Plant Cover: (*list species below)

Total percentage cover within plot	70.00%		
Scientific Name	*Lantana camara*	Common Name	Lantana
Scientific Name	*Solanum mauritianum*	Common Name	Wild Tobacco
Scientific Name	*Solanum torvum*	Common Name	Devil's Fig
Scientific Name	*Passiflora suberosa*	Common Name	Corky Passion
Scientific Name	*Solanum chrysotrichum*	Common Name	Giant Devil's Fig
Scientific Name	*Megathyrsus maximus*	Common Name	Guinea Grass
Scientific Name	*Ambrosia artemisiifolia*	Common Name	Annual Ragweed

Scientific Name	*Solanum seaforthianum*	Common Name	Brazillian Nightshade
Scientific Name	*Ardisia crenata*	Common Name	Coral Berry
Scientific Name		Common Name	

Part E - Coarse Woody Debris: (*list lengths of individual logs in meters)

Total Length of Course Woody Debris (Meters per hectare)	8.20		
1	1.80	26	
2	3.00	27	
3	1.80	28	
4	1.60	29	
5		30	
6		31	
7		32	
8		33	
9		34	
10		35	
11		36	
12		37	
13		38	
14		39	
15		40	
16		41	
17		42	
18		43	
19		44	
20		45	
21		46	
22		47	
23		48	
24		49	
25		50	

Part F - Native perennial grass cover, organic litter: (*provide percentage cover within each quadrat, and provide average cover)

Ground Cover	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5	Average
Native perennial grass cover	0%	0%	0%	0%	0%	
Native other grass	0%	0%	0%	0%	0%	
Native forbs and other species	0%	0%	0%	0%	0%	
Native shrubs	0%	0%	0%	0%	0%	
Non-native grass	0%	0%	0%	0%	0%	
Non native forbs and shrubs	0%	80%	70%	40%	90%	56%
Litter	70%	20%	30%	40%	10%	34%
Rock	0%	0%	0%	10%	0%	2%
Bare Ground	30%	0%	0%	10%	0%	8%
Cryptogram	0%	0%	0%	0%	0%	
Total	100%	100%	100%	100%	100%	100%

Part G- Number of large trees , tree canopy height, recruitment of woody perennial species:

Eucalypt Large tree DBH benchmark used :	N/A	Number of large eucalypt trees:	
Non- Eucalypt Large tree DBH benchmark used:	330	Number of large non eucalypt trees:	Grevillea robusta 360
Total Number Large Trees: per ha	4		

Median Tree Canopy Height Measurements	Canopy:	N/A	Sub-canopy:	9	Emergent:	NA

Percentage of ecologically dominant layer species regenerating:	100

Part H - Tree canopy cover, Shrub canopy cover

Tree canopy cover %	Canopy:	0.0%	Sub-canopy:	70.00%	Emergent:	NA
Shrub canopy cover %	2.40%					

Layer	Start	End	Interval	Layer	Start	End	Interval
T1			0.0	T2	0.0	2.0	2.0
T1			0.0	T2	2.0	3.2	1.2
T1			0.0	T2	3.2	8.7	5.5
T1			0.0	T2	8.7	12.6	3.9
T1			0.0	T2	12.7	15.1	2.4
T1			0.0	T2	15.1	19.9	4.8
T1			0.0	T2	21.8	35.0	13.2
T1			0.0	T2	48.0	50.0	2.0
T1			0.0	T2			0.0
T1			0.0	T2			0.0
T1			0.0	T2			0.0
T1			0.0	T2			0.0
T1			0.0	T2			0.0
T1			0.0	T2			0.0
T1			0.0	T2			
T1			0.0	T2			0.0

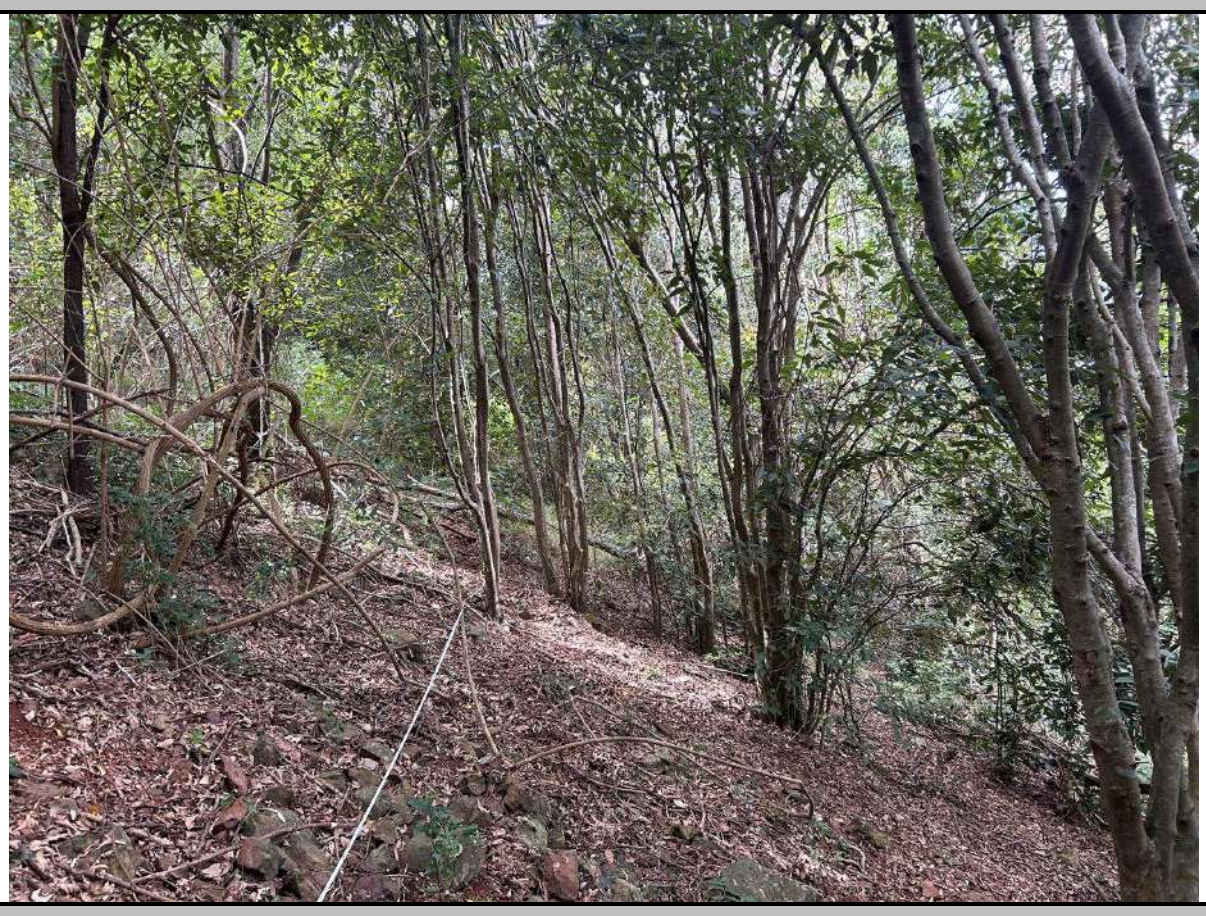
Layer	Start	End	Interval	Layer	Start	End	Interval
Shrub	0.6	1.2	0.6	Shrub			0.0
Shrub	26.4	27.0	0.6	Shrub			0.0
Shrub			0.0	Shrub			0.0
Shrub			0.0	Shrub			0.0
Shrub			0.0	Shrub			0.0
Shrub			0.0	Shrub			0.0
Shrub			0.0	Shrub			0.0

Note: Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present *If trees are in the same layer and continuous along the transect you can group them

Part I: GHFF Stem Count

Attach Landscape Photos Here

North



South



East





West



Habitat Quality Assessment Unit Score Sheet			

Part A - Administrative

Transect ID	T4	Job Number / Property	11390 - Blue Rock Quarry

Part B - Site Data

Recorders	LB and DH	Date	21/10/2024

Assessment Unit:	Assessment Unit Area (ha)	RE	Bioregion Number
na		12.11.3	12

Site description and Location (including details of discrete polygons within the assessment unit)
AU3 Non-remnant RE12.11.3. Steep south facing drainage line dominated by weeds

Part C - Native Species Richness: (*list species below)

Tree species richness:				
Total number of species	6			EDL / Dom / R
Scientific Name	*Macaranga tanarius*	Common Name	Macaranga	D, r
Scientific Name	*Melia azedarach*	Common Name	White Cedar	
Scientific Name	*Eucalyptus tereticornis*	Common Name	Forest Red Gum	
Scientific Name	*Corymbia intermedia*	Common Name	Pink Bloodwood	
Scientific Name	*Lophostemon confertus*	Common Name	Brush Box	
Scientific Name	*Acacia disparrima*	Common Name	Hickory Wattle	
Scientific Name		Common Name		
Scientific Name		Common Name		
Scientific Name		Common Name		
Scientific Name		Common Name		
Scientific Name		Common Name		
Scientific Name		Common Name		

Shrub species richness:			
Total number of species	3		
Scientific Name	*Macaranga tanarius*	Common Name	Macaranga
Scientific Name	*Melia azedarach*	Common Name	White Cedar
Scientific Name	*Acacia melanoxylon*	Common Name	Australian Blackwood
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	

Grass species richness:			
Total number of species	1		
Scientific Name	*Themeda triandra*	Common Name	Kangaroo Grass
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	

Forbs and others (non grass ground) species richness:			
Total number of species	4		
Scientific Name	*Lomandra longifolia*	Common Name	Long-leaved Matrush
Scientific Name	*Stephania japonica*	Common Name	Tape Vine
Scientific Name	*Rubus probus*	Common Name	Native Rasberry
Scientific Name	*Pteridium esculentum*	Common Name	Bracken Fern
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	
Scientific Name		Common Name	

Part D - Non-Native Plant Cover: (*list species below)

Total percentage cover within plot	90.00%		
Scientific Name	*Lantana camara*	Common Name	Lantana
Scientific Name	*Solanum chrysotrichum*	Common Name	Giant Devil's Fig
Scientific Name	*Solanum torvum*	Common Name	Devil's Fig
Scientific Name	*Ageratina riparia*	Common Name	Mist Flower
Scientific Name	*Megathyrsus maximus*	Common Name	Guinea Grass
Scientific Name	*Melinis repens*	Common Name	Red Natal Grass
Scientific Name	*Solanum mauritianum*	Common Name	Wild Tobacco

Scientific Name	*Ageratum houstonianum*	**Common Name**	Blue Billy Goat
Scientific Name	*Gomphocarpus physocarpus*	**Common Name**	Balloon Cotton Bush
Scientific Name	*Melinis minutiflora*	**Common Name**	Molasses Grass
Scientific Name	*Lantana montevidensis*	**Common Name**	Creeping Lantana
Scientific Name		**Common Name**	

Part E - Coarse Woody Debris: (*list lengths of individual logs in meters)

Total Length of Course Woody Debris (Meters per hectare)	**0.00**		
1		**26**	
2		**27**	
3		**28**	
4		**29**	
5		**30**	
6		**31**	
7		**32**	
8		**33**	
9		**34**	
10		**35**	
11		**36**	
12		**37**	
13		**38**	
14		**39**	
15		**40**	
16		**41**	
17		**42**	
18		**43**	
19		**44**	
20		**45**	
21		**46**	
22		**47**	
23		**48**	
24		**49**	
25		**50**	

Part F - Native perennial grass cover, organic litter: (*provide percentage cover within each quadrat, and provide average cover)

Ground Cover	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5	Average
Native perennial grass cover	5%	0%	0%	0%	0%	1%
Native other grass	0%	0%	0%	0%	0%	
Native forbs and other species	0%	0%	0%	0%	0%	
Native shrubs	0%	0%	0%	0%	0%	
Non-native grass	0%	25%	10%	100%	100%	47%
Non native forbs and shrubs	95%	75%	90%	0%	0%	52%
Litter	0%	0%	0%	0%	0%	
Rock	0%	0%	0%	0%	0%	
Bare Ground	0%	0%	0%	0%	0%	
Cryptogram	0%	0%	0%	0%	0%	
Total	100%	100%	100%	100%	100%	100%

Part G- Number of large trees , tree canopy height, recruitment of woody perennial species:

Eucalypt Large tree DBH benchmark used :	450	**Number of large eucalypt trees:**	0
Non- Eucalypt Large tree DBH benchmark used:		**Number of large non eucalypt trees:**	0
Total Number Large Trees: per ha	0		

Median Tree Canopy Height Measurements	**Canopy:**	N/A	**Sub-canopy:**	7	**Emergent:**	NA

Percentage of ecologically dominant layer species regenerating:	**100**

Part H - Tree canopy cover, Shrub canopy cover

Tree canopy cover %	**Canopy:**	0.0%	**Sub-canopy:**	18.20%	**Emergent:**	NA
Shrub canopy cover %	5.40%					

Layer	Start	End	Interval	Layer	Start	End	Interval
T1			0.0	**T2**	0.0	4.5	4.5
T1			0.0	**T2**	6.7	7.7	1.0
T1			0.0	**T2**	36.0	37.3	1.3
T1			0.0	**T2**	51.7	52.9	1.2
T1			0.0	**T2**	69.9	71.0	1.1
T1			0.0	**T2**			0.0
T1			0.0	**T2**			0.0
T1			0.0	**T2**			0.0
T1			0.0	**T2**			0.0
T1			0.0	**T2**			0.0
T1			0.0	**T2**			0.0
T1			0.0	**T2**			0.0
T1			0.0	**T2**			0.0
T1			0.0	**T2**			0.0
T1			0.0	**T2**			
T1			0.0	**T2**			0.0

Layer	Start	End	Interval	Layer	Start	End	Interval
Shrub	7.6	8.1	0.5	**Shrub**			0.0
Shrub	37.3	38.0	0.7	**Shrub**			0.0
Shrub	50.9	51.7	0.8	**Shrub**			0.0
Shrub	69.8	70.5	0.7	**Shrub**			0.0
Shrub			0.0	**Shrub**			0.0

Shrub			0.0	**Shrub**			0.0
Shrub			0.0	**Shrub**			0.0

Note: Only assess Emergent (E) or Subcanopy (S) layers if the benchmark document stipulates that layers are present *If trees are in the same layer and continuous along the transect you can group them

Attach Landscape Photos Here

North



South



East





West



Attachment A5

Impact Raw SAT data

Tree No.	Species	DBH	Scats (Y/N)	SAT 1
1	*Eucalyptus aceminoides*	230	N	
2	*Eucalyptus tereticornis*	350	N	
3	*Eucalyptus tereticornis*	400	N	
4	*Eucalyptus tereticornis*	220	N	
5	*Eucalyptus tereticornis*	210	N	
6	*Eucalyptus propinqua*	230	N	
7	*Eucalyptus microcorys*	360	N	
8	*Corymbia intermedia*	300	N	
9	*Eucalyptus tereticornis*	300	N	
10	*Eucalyptus tereticornis*	120	N	
11	*Eucalyptus microcorys*	130	N	
12	*Eucalyptus tereticornis*	250	N	
13	*Eucalyptus microcorys*	230	N	
14	*Eucalyptus microcorys*	250	N	
15	*Eucalyptus tereticornis*	120	N	
16	*Eucalyptus tereticornis*	250	N	
17	*Eucalyptus microcorys*	100	N	
18	*Eucalyptus tereticornis*	450	N	
19	*Eucalyptus microcorys*	210	N	
20	*Erythrina vespertilio*	280	N	
21	*Eucalyptus siderophloia*	200	N	
22	*Eucalyptus tereticornis*	320	N	
23	*Allocasuarina littoralis*	100	N	
24	*Eucalyptus microcorys*	210	N	
25	*Eucalyptus siderophloia*	100	N	
26	*Eucalyptus siderophloia*	100	N	
27	*Eucalyptus tereticornis*	300	N	
28	*Eucalyptus microcorys*	100	N	
29	*Eucalyptus microcorys*	230	N	
30	*Eucalyptus aceminoides*	150	N	
			0 of 30	

Tree No.	Species	DBH	Scats (Y/N)	SAT 2
1	*Eucalyptus propinqua*	350	N	
2	*Lophostemon confertus*	400	N	
3	*Eucalyptus siderophlioa*	200	N	
4	*Eucalyptus acemenoides*	140	N	
5	*Eucalyptus siderophlioa*	200	N	
6	*Lophostemon confertus*	200	N	
7	*Lophostemon confertus*	210	N	
8	*Lophostemon confertus*	210	N	
9	*Eucalyptus acemenoides*	180	N	
10	*Eucalyptus microcorys*	230	N	
11	*Eucalyptus tereticornis*	170	N	
12	*Eucalyptus siderophlioa*	170	N	
13	*Eucalyptus acemenoides*	180	N	
14	*Eucalyptus microcorys*	250	N	
15	*Eucalyptus acemenoides*	180	N	
16	*Eucalyptus siderophlioa*	450	N	
17	*Eucalyptus microcorys*	180	N	
18	*Eucalyptus acemenoides*	160	N	
19	*Eucalyptus acemenoides*	360	N	
20	*Eucalyptus acemenoides*	200	N	
21	*Eucalyptus acemenoides*	230	N	
22	*Eucalyptus siderophlioa*	250	N	
23	*Eucalyptus tereticornis*	350	N	
24	*Eucalyptus microcorys*	120	N	
25	*Lophostemon confertus*	210	N	
26	*Eucalyptus propinqua*	310	N	
27	*Eucalyptus acemenoides*	200	N	
28	*Allocasuarina littoralis*	210	N	
29	*Eucalyptus siderophlioa*	180	Y	
30	*Eucalyptus siderophlioa*	190	N	
			0 of 30	

Tree No.	Species	DBH	Scats (Y/N)	SAT 3
1	*Eucalyptus propinqua*	350	Y	
2	*Eucalyptus crebra*	200	N	
3	*Eucalyptus crebra*	270	N	
4	*Eucalyptus microcorys*	380	Y	
5	*Eucalyptus crebra*	220	N	
6	*Eucalyptus microcorys*	300	N	
7	*Eucalyptus microcorys*	260	N	
8	*Eucalyptus microcorys*	320	N	
9	*Eucalyptus microcorys*	300	N	
10	*Eucalyptus tereticornis*	180	N	
11	*Corymbia intermedia*	190	N	
12	*Eucalyptus microcorys*	230	N	
13	*Eucalyptus crebra*	100	N	
14	*Eucalyptus propinqua*	330	N	
15	*Eucalyptus acmenoides*	300	N	
16	*Eucalyptus crebra*	180	N	
17	*Eucalyptus microcorys*	140	N	
18	*Eucalyptus crebra*	200	N	
19	*Eucalyptus tereticornis*	160	N	
20	*Lophostemon confertus*	330	N	
21	*Lophostemon confertus*	200	N	
22	*Eucalyptus crebra*	140	N	
23	*Eucalyptus crebra*	230	N	
24	*Eucalyptus tereticornis*	150	N	
25	*Eucalyptus crebra*	300	N	
26	*Eucalyptus crebra*	200	N	
27	*Lophostemon confertus*	190	N	
28	*Eucalyptus crebra*	300	N	
29	*Eucalyptus crebra*	220	N	
30	*Eucalyptus crebra*	260	N	
			2 of 30	

Tree No.	Species	DBH	Scats (Y/N)	SAT 4
1	*Mallotus philippensis*		N	
2	*Mallotus philippensis*		N	
3	*Mallotus philippensis*		N	
4	*Mallotus philippensis*		N	
5	*Mallotus philippensis*		N	
6	*Mallotus philippensis*		N	
7	*Mallotus philippensis*		N	
8	*Mallotus philippensis*		N	
9	*Mallotus philippensis*		N	
10	*Mallotus philippensis*		N	
11	*Alphitonia excelsa*		N	
12	*Grevillea robusta*		N	
13	*Acacia disparrima*		N	
14	*Mallotus philippensis*		N	
15	*Mallotus philippensis*		N	
16	*Acacia melanoxylon*		N	
17	*Acacia disparrima*		N	
18	*Acacia disparrima*		N	
19	*Acacia disparrima*		N	
20	*Mallotus philippensis*		N	
21	*Mallotus philippensis*		N	
22	*Mallotus philippensis*		N	
23	*Mallotus philippensis*		N	
24	*Mallotus philippensis*		N	
25	*Mallotus philippensis*		N	
26	*Mallotus philippensis*		N	
27	*Mallotus philippensis*		N	
28	*Acacia disparrima*		N	
29	*Mallotus philippensis*		N	
30	*Mallotus philippensis*		N	
			0 of 30	

Attachment A6

LRSA TEC raw data

Lowland Rainforest of Subtropical Australia Threatened Ecological Community sample assessment

Transect Number: 1 **Date:** 02/09/2025 **Recorders:** DH and LB

50 m transect

Canopy Cover	Interval (m)	Species Name	Common Name	Height (m)
0 – 11.4	11.4	*Mallotus philippensis*	Red Kamala	8.3
5.9 – 10.5	4.6	*Aphananthe philippinensis*	Rough-leaved Elm	17.0*
10.5 – 14.7	4.2	*Alphitonia excelsa*	Soap Tree	17.0*
25.6 – 31.4	5.8	*Acacia disparrima*	Hickory Wattle	9.0
47.5 - 50	2.5	*Mallotus philippensis*	Red Kamala	7.5
Total canopy cover ≥10m height	**8.8 m or 17.6%**			

*canopy coverage calculated only from specimens ≥10 m in height as per the Conservation Advice for LRSATEC

50 m x 20 m sample area

Species List		
Scientific Name	**Common Name**	**Species included in Appendix A**
Mallotus philippensis	Red Kamala	x
Macadamia integrifolia	Macadamia Nut	x
Acacia disparrima	Hickory Wattle	
Aphananthe philippinensis	Rough-leaved Elm	x
Toona ciliata	Red Cedar	x
Maclura cochinchinensis	Cockspur Vine	x
Melia azedarach	White Cedar	x
Alphitonia excelsa	Soap Tree	x
Eustrephus latifolius	Wombat Berry	x
Macaranga tanarius	Macaranga	
Pteridium esculentum	Bracken Fern	
		8 (total number of species from Appendix A)

Weed cover percentage: 85% - High disturbance and dominated by *Lantana camara* (Lantana).

Evidence of regeneration: Suppression by weeds, limited evidence of native species recruitment

North



South



Lowland Rainforest of Subtropical Australia Threatened Ecological Community sample assessment

Transect Number: 2 **Date:** 02/09/2025 **Recorders:** DH and LB

50 m transect

Canopy Cover	Interval (m)	Species Name	Common Name	Height (m)
0 - 11	11	*Ficus watkinsiana*	Strangler Fig	16.5*
11 – 16	5	*Cinnamomum camphora*	Camphor Laurel	15.0*
16 - 27	11	*Syzygium floribundum*	Weeping Lilly Pilly	16.0*
39 – 43	4	*Acacia disparrima*	Hickory Wattle	12.0*
Total canopy cover ≥10m height	**31 m or 62%**			

*canopy coverage from specimens ≥10m in height as per the Conservation Advice for LRSATEC

50 m x 20 m sample area

Species List		
Scientific Name	**Common Name**	**Species included in Appendix A**
Mallotus philippensis	Red Kamala	x
Asplenium australasicum	Bird's Nest Fern	x
Acacia disparrima	Hickory Wattle	
Melia azedarach	White Cedar	x
Alphitonia excelsa	Soap Tree	x
Jagera pseudorhus	Foambark	x
Ficus watkinsiana	Strangler Fig	x
Syzygium floribundum	Weeping Lilly Pilly	x
Cinnamomum camphora	Camphor Laurel	
Smilax australis	Barbed-wire Vine	x
		8 (total number of species from Appendix A)

Weed cover percentage: 90% - High disturbance and dominated by *Lantana camara* (Lantana).

Evidence of regeneration: Suppression by weeds, limited evidence of native species recruitment

North



South



Lowland Rainforest of Subtropical Australia Threatened Ecological Community sample assessment

Transect Number: 3 **Date:** 02/09/2025 **Recorders:** DH and LB

50 m transect

Canopy Cover	Interval (m)	Species Name	Common Name	Height (m)
0 – 6.5	6.5	*Acacia disparrima*	Hickory Wattle	11.0*
6.5 – 14.1	7.6	*Acacia disparrima*	Hickory Wattle	9.0
16.8 – 21.6	4.8	*Acacia disparrima*	Hickory Wattle	10.5*
26.5 – 29.6	3.1	*Acacia disparrima*	Hickory Wattle	11.0*
34.2 – 38.5	4.3	*Mallotus philippensis*	Red Kamala	7.5
44.3 – 49.7	5.4	*Acacia disparrima*	Hickory Wattle	8.5
Total canopy cover ≥10m height	**14.4 m or 28.8%**			

*canopy coverage from specimens ≥10m in height as per the Conservation Advice for LRSATEC

50 m x 20 m sample area

Species List		
Scientific Name	**Common Name**	**Species included in Appendix A**
Mallotus philippensis	Red Kamala	x
Maclura cochinchinensis	Cockspur Vine	x
Acacia disparrima	Hickory Wattle	
Jagera pseudorhus	Foambark	x
		3 (total number of species from Appendix A)

Weed cover percentage: 60% - High disturbance and dominated by *Lantana camara* (Lantana).

Evidence of regeneration: Suppression by weeds, limited evidence of recruitment confined to primarily acacia regrowth with species not recognised to reflect the LRSA TEC

North



South



Lowland Rainforest of Subtropical Australia Threatened Ecological Community (LRSA TEC) sample assessment

Transect Number: 4 **Date:** 02/09/2025 **Recorders:** DH and LB

50 m transect

Canopy Cover	Interval (m)	Species Name	Common Name	Height (m)
0 - 9	9	*Araucaria cunninghamii*	Hoop Pine	21.0*
9 – 15.5	6.5	*Acacia disparrima*	Hickory Wattle	12.5*
16 – 23	7	*Acacia disparrima*	Hickory Wattle	16.0*
36 - 42	6	*Acacia disparrima*	Hickory Wattle	16.0*
Total canopy cover ≥10m height	**28.5 m or 57%**			

*canopy coverage from specimens ≥10m in height as per the Conservation Advice for LRSATEC

50 m x 20 m sample area

Species List		
Scientific Name	**Common Name**	**Species included in Appendix A**
Araucaria cunninghamii	Hoop Pine	x
Acacia disparrima	Hickory Wattle	
Macaranga tanarius	Macaranga	
Hibiscus heterophyllus	Rosella	
Acacia melanoxylon	Australian Blackwood	
		1 (total number of species from Appendix A)

Weed cover percentage: 70% - High disturbance and dominated by *Lantana camara* (Lantana) up hillside to east

Evidence of regeneration: Suppression by weeds, limited evidence of recruitment with area dominated by Acacia regrowth further east. Acaca species not reflective of LRSA TEC

North



South



Lowland Rainforest of Subtropical Australia Threatened Ecological Community sample assessment

Transect Number: 5 **Date:** 22/10/2024 **Recorders:** DH and LB

50 m transect

Canopy Cover	Interval (m)	Species Name	Common Name	Height (m)
0.0 – 2.0	2	*Mallotus philippensis*	Red Kamala	9.0
2.0 – 3.2	1.2	*Hibiscus heterophyllus*	Rosella	5.0
3.2 – 8.7	5.5	*Acacia disparrima*	Hickory Wattle	10.0*
8.7 – 12.6	3.9	*Mallotus philippensis*	Red Kamala	7.5
12.7 – 15.1	2.4	*Mallotus philippensis*	Red Kamala	7.0
15.1 – 19.9	4.8	*Mallotus philippensis*	Red Kamala	8.0
21.8 – 35.0	13.2	*Mallotus philippensis*	Red Kamala	7.5
48.0 – 50.0	2	*Acacia melanoxylon*	Australian Blackwood	8.0
Total canopy cover ≥10m height	**5.5 m or 11%**			

*canopy coverage from specimens ≥10m in height as per the Conservation Advice for LRSA TEC

50 m x 20 m sample area

Species List		
Scientific Name	**Common Name**	**Species included in Appendix A**
Mallotus philippensis	Red Kamala	x
Grevillea robusta	Silky Oak	x
Acacia melanoxylon	Australian Blackwood	
Croton verreauxii	Croton	
Acacia disparrima	Hickory Wattle	
Lophostemon confertus	Brush Box	x
Macadamia integrifolia	Macadamia Nut	x
Jagera pseudorhus	Foambark	x
Hibiscus heterophyllus	Rosella	
Aphananthe philippinensis	Rough-leaved Elm	x
Cordyline rubra	Palm Lily	x
Alchornia ilicifolia	Native Holly	
Adiantum hispidulum	Rough Maidenhair Fern	
Passiflora herbertiana	Native Passion Flower	
Smilax australis	Barbed-wire Vine	x
Maclura cochinchinensis	Cockspur Vine	x
Platycerium superbum	Stag Horn	x
Stephania japonica	Tape Vine	x
Pteridium esculentum	Bracken Fern	
		11 (total number of species from Appendix A)

Weed cover percentage: 70% - High disturbance and dominated by *Lantana camara* (Lantana) and *Ardisia crenata* (Coral berry)

Evidence of regeneration: Some evidence of regeneration species typical of this community. However, a range of species that reflect the community (i.e. tall, closed forest with representative species composition and species diversity) was limited. Suppression by dense weeds.

North



South



Lowland Rainforest of Subtropical Australia Threatened Ecological Community (LRSATEC) Quaternary Surveys and Photo Points

Quaternary Number: 1 **Date:** 02/09/2025 **Recorders:** DH and LB

Location: North of quarry footprint Mapped community: Remnant RE12.11.10

Species	Approximate Height (m)
T1	
Eucalyptus propinqua	>20m
Lophostemon confertus	
T2	7 – 8 m
Lophostemon confertus	
Grevillea robusta	
Acacia disparrima	
Shrub	<2 m
Acacia disparrima	
Hibiscus heterophyllus	
Lantana camara (weed)	
Ground	N/A
Smilax australis	
Eustrephus latifolius	
Passiflora suberosa (weed)	
Other Notes/observations	

- Despite this vegetation being mapped as remnant RE12.11.10, species indicative of notophyl vine thicket/rainforest vegetation were limited.
- Vegetation was more reflective of a wet sclerophyll community indicating variations in the mapped extent of RE12.11.10 in the broader landscape
- Evidence of clearing and high disturbance were observed.





Lowland Rainforest of Subtropical Australia Threatened Ecological Community (LRSA TEC) Quaternary Surveys and Photo Points

Quaternary Number: 2 **Date:** 02/09/2025 **Recorders:** DH and LB

Location: Nort-west of quarry footprint **Mapped community:** Remnant RE12.11.10

Species	Approximate Height (m)
T1	
Eucalyptus tereticornis	>25m
T2	
Mallotus philippensis	7 – 8 m
Macaranga tanarius	
Shrub	<2 m
Trema tomentosum	
Lantana camara (weed)	
Acacia melanoxylon	
Tekoma stans (weed)	
Ground	N/A
Smilax australis	
Passiflora suberosa (weed)	
Cardiospermum grandiflorum (weed)	
Callisia fragrans (weed)	
Symphoricarpos orbiculatu (weed)	
Other Notes/observations	

- Vegetation mapped as remnant RE12.11.10. Large *Eucalyptus tereticornis* present
- Species indicative of notophyl vine thicket/rainforest vegetation were limited.
- Exotic vines (Balloon Cottom) dominated the area supressing native species richness and diversity.
- Evidence of clearing and high disturbance were observed.

North-west



North-east



Lowland Rainforest of Subtropical Australia Threatened Ecological Community (LRSA TEC) Quaternary Surveys and Photo Points

Quaternary Number: 3 **Date:** 02/09/2025 **Recorders:** DH and LB

Location: Property boundary east of referral area **Mapped community:** Regrowth RE12.11.10

Species	Approximate Height (m)
T1	
Absent	Absent
T2	
Mallotus philippensis	7 - 8 m
Acacia disparrima	
Aphananthe philippinensis	
Shrub	<2 m
Lantana camara (weed)	
Ground	N/A
Smilax australis	
Symphoricarpos orbiculatu (weed)	
Other Notes/observations	

- Vegetation reflective of regrowth RE12.11.10 with evidence of historical clearing
- Canopy cover limited to *Mallotus philippensis* (Red Kamala) regrowth at <8m in height which is not considered part of the canopy layer for this Community
- Dense weed infestations at the shrub and ground layer significantly supressing regenerating native species. As such, limited evidence of recruitment observed at a diversity indicative of this community.

Facing south into neighbouring property



Lowland Rainforest of Subtropical Australia Threatened Ecological Community (LRSA TEC) Quaternary Surveys and Photo Points

Quaternary Number: 4 **Date:** 02/09/2025 **Recorders:** DH and LB

Location: Property boundary east of referral area **Mapped community:** Regrowth RE12.11.10

Species	Approximate Height (m)
T1	
Absent	Absent
T2	
Mallotus philippensis	7 - 8 m
Acacia disparrima	
Aphananthe philippinensis	
Hibiscus heterophyllus	
Shrub/ground	<2 m
Lantana camara (weed)	
Hibiscus heterophyllus	
Maclura cochinchinensis	
Other Notes/observations	

- Acess is not possible to the neighbouring property so observations have been made from the boundary
- Vegetation is mapped as regrowth RE12.11.10 however the significant amount of historical clearing that has occurred and subsequent weed infestations has reduced the species diversity and maturity of the area.
- Canopy (≥ 10 m) was equally limited with the majority of vegetation <8m in height and consisting of regrowth acacia and *Mallotus philippensis*.
- Dense weed infestations at the shrub and ground layer significantly supressing regenerating native species. As such, limited evidence of recruitment observed at a diversity indicative of this community.
- The southern facing slope and contours within this area means it is possible to observe much further south and conclude the extent of highly disturbed, weed dominated vegetation extends into the neighbouring property.

South facing into neighbouring property



Lowland Rainforest of Subtropical Australia Threatened Ecological Community (LRSA TEC) Quaternary Surveys and Photo Points

Quaternary Number: 5 **Date:** 02/09/2025 **Recorders:** DH and LB

Location: Property boundary east of referral area **Mapped community:** Regrowth RE12.11.10

Species	Approximate Height (m)
T1	
Acacia disparrima	10-12m
T2	
Mallotus philippensis	7 - 8 m
Acacia disparrima	
Alphionia excelsa	
Hibiscus heterophyllus	
Shrub/ground	<2 m
Lantana camara (weed)	
Hibiscus heterophyllus	
Maclura cochinchinensis	
Macaranga tanarius	
Other Notes/observations	

- Access is not possible to the neighbouring property to the east so observations have been made from the boundary
- Vegetation is mapped as regrowth RE12.11.10 however the significant amount of historical clearing that has occurred and subsequent weed infestations has reduced the species diversity and maturity of the area.
- Canopy species primarily consisted of Acacia regrowth and various pioneer species (*Macaranga tanarius)* which are not indicator species of notophyl vine thicket (RE12.11.10) or the LRSA TEC.
- Canopy was generally observed to be <10 m in height and species diversity was lacking
- Dense weed infestations at the shrub and ground layer significantly supressing regenerating native species. As such, limited evidence of recruitment observed at a diversity indicative of this community.
- Vegetation mapped similarly as regrowth RE12.11.10 was assessed in detail where present on-site (refer Transect 1-4). Results of these assessments identified a clear lack of canopy coverage and species richness with specific reference to Appendix A of the LRSA TEC Conservation Advice
- The low canopy height of vegetation in this area and topography in a eastern direct enables observations to be made for a significant portion of the neighbouring vegetation and conclusion that this area does not meet the LRSA TEC key diagnostic requirements.

Facing east into neighbouring property



Lowland Rainforest of Subtropical Australia Threatened Ecological Community (LRSA TEC) Quaternary Surveys and Photo Points

Quaternary Number: 6 **Date:** 02/09/2025 **Recorders:** DH and LB

Location: Property boundary east of referral area **Mapped community:** Regrowth RE12.11.10

Species	Approximate Height (m)
T1	
Absent	-
T2	
Acacia disparrima	7 - 8 m
Acacia melanoxyn	
Alphionia excelsa	
Shrub/ground	
Solanum chrysotrichum (weed)	<2 m
Lantana camara (weed)	
Hibiscus heterophyllus	
Solanum mauritianum (weed)	
Macaranga tanarius	
Other Notes/observations	

- Access is not possible to the neighbouring property to the east so observations have been made from the boundary
- Vegetation is mapped as regrowth RE12.11.10 however the significant amount of historical clearing that has occurred and subsequent weed infestations has reduced the species diversity and maturity of the area.
- Limited evidence of species reflectinve of RE12.11.10
- Native species primarily consisted of Acacia regrowth and various pioneers species (*Macaranga tanarius)* which are not indicator species of notophyl vine thicket (RE12.11.10) or the LRSA TEC.
- Canopy was observed to be <10 m in height and species diversity was lacking
- Dense weed infestations at the shrub and ground layer significantly supress regenerating native species. As such, limited evidence of recruitment observed at a diversity indicative of this community.
- Vegetation mapped similarly as regrowth RE12.11.10 was assessed in detail where present on-site (refer Transect 1-4). Result of these assessments identified a clear lack of canopy coverage and specific richness with specific reference to Appendix A of the LRSA Conservation Advice
- The low canopy height of vegetation in this area and topography in an eastern direction enables observations to be made for a significant portion of the neighbouring vegetation and conclusion that this area does not meet the LRSA TEC key diagnostic requirements.

Facing east into neighbouring property



Lowland Rainforest of Subtropical Australia Threatened Ecological Community (LRSA TEC) Quaternary Surveys and Photo Points

Quaternary Number: 7 **Date:** 02/09/2025 **Recorders:** DH and LB

Location: Property boundary east of referral area **Mapped community:** Regrowth RE12.11.10

Species	Approximate Height (m)
T1	
Acacia disparrima	10-12m
T2	
Mallotus philippensis	7 - 8 m
Acacia disparrima	
Alphionia excelsa	
Shrub/ground	<2 m
Lantana camara (weed)	
Hibiscus heterophyllus	
Maclura cochinchinensis	
Macaranga tanarius	
Solanum mauritianum (weed)	
Other Notes/observations	

- Access is not possible to the neighbouring property to the east, so observations have been made from the boundary
- Vegetation is mapped as regrowth RE12.11.10 however the significant amount of historical clearing that has occurred and subsequent weed infestations has reduced the species diversity and maturity of the area.
- Some residual trees of RE12.11.10 (Hoop Pine) were observed > 100m to the east.
- Canopy species primarily consisted of Acacia regrowth and various pioneer species (*Macaranga tanarius) which are not indicator species of notophyl vine thicket (RE12.11.10).*
- Canopy was generally observed to be <10 m in height and species diversity was lacking
- Dense weed infestations at the shrub and ground layer significantly supress regenerating native species. As such, limited evidence of recruitment observed at a diversity indicative of this community.
- Vegetation mapped similarly as regrowth RE12.11.10 was assessed in detail where present on-site (refer Transect 1-4). Result of these assessments identified a clear lack of canopy coverage and specific richness with specific reference to Appendix A of the LRSA Conservation Advice
- The low canopy height of vegetation in this area and topography in an eastern direction enables observations to be made for a significant portion of the neighbouring vegetation and conclusion that this area does not meet the LRSA TEC key diagnostic requirements.

Facing east into neighbouring property



Attachment A7

Kipper Creek Offset Management Plan



Offset Management Plan (EPBC 2024/09844)

Blue Rock Quarry Expansion Project, Cedar Creek, Queensland
(Little Kipper Creek Road Offset Area)

Prepared for Fulton Hogan Quarries Pty Ltd and KFF1 Pty Ltd ATF KFF1 Sub Trust as the offset provider
8 April 2026

Saunders Havill
PATHWAYS TO SUCCESS

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Document Information

This Offset Management Plan (EPBC 2024/09844) has been prepared by Saunders Havill Group on behalf of the proponent Fulton Hogan Quarries Pty Ltd and implemented by KFF1 Pty Ltd ATF KFF1 Sub Trust, dated 8 April 2026.

Issue

Issue	Date	Prepared By	Checked By
Draft	7.04.2025	LS	LB
Issue A	12.06.2025	LB	SM
Issue B	18.11.2025	LS	LB
Issue C	11.03.2026	LB	SM
Issue D	8.04.2026	LB	SM

Executive Summary

Fulton Hogan Quarries Pty Ltd, the proponent, has engaged KFF1 Pty Ltd ATF KFF1 Sub Trust as offset provider to coordinate and deliver a biodiversity offset to compensate for significant impacts to Matters of National Environmental Significance (MNES) as part of a quarry expansion project at Blue Rock Quarry Cedar Creek, Queensland (herein referred to as the Project). The Project was referred under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) (EPBC 2024/09844). The Department of Climate Change, Energy, the Environment and Water (DCCEEW) has assessed that biodiversity offsets are required for Koala (*Phascolarctos cinereus*).

The purpose of this Offset Management Plan (OMP) is to provide the objectives, key commitments including milestones and measurables (performance targets) and completion criteria necessary to fulfil a statutory requirement for the provision of an offset for *Phascolarctos cinerus* (Koala) under the EPBC Act.

Habitat quality within both the impact and offset areas was quantified in accordance with the *Guide to Determining Terrestrial Habitat version 1.2* (DEHP, 2017) in conjunction with the Modified Habitat Quality Assessment (MHQA) method. Baseline habitat quality metrics and scores for the offset area were established which formed the basis for proposed increases to be achieved as part of the offset delivery. These are summarised in **Table ES1** and **Table ES2** below.

Table ES1: Impact area Koala habitat quality scores – summary

AU	Area (ha)	Koala Habitat Quality Score
1	3.5	6.35
2	1.1	5.00
3	1.3	4.68
	5.9	**Weighted score 5.73 (rounded to 6)**

Table ES2: Offset area Koala habitat quality baseline and future scores – summary

AU	Area (ha)	Koala Habitat Quality Score	
		Baseline	Future
1	40	6	8

Six management actions are proposed to deliver the offset and proposed environmental outcomes over a 20-year period which includes proposed actions, completion criteria and monitoring actions. The management actions consist of:

1. Legal securement of the offset area
2. Non-Native Vertebrate Pest Management
3. Management of Weeds of National Significance
4. Develop and implement Bushfire Management Plan
5. Habitat Creation and Regeneration; and
6. Fencing and signage

Interim milestone targets have been created for proposed environmental outcomes for Koala to provide an indication of the relative success of management measures. A monitoring and reporting schedule has been prepared to assist in achieving these outcomes. Additionally, an adaptive management framework and corrective action triggers are proposed whereby it is demonstrated that management measures are not effective in achieving results.

The Proponent plans to acquit **151.32%** of its MNES offset requirement through direct land-based offsets. Overall, the proposed offset is considered suitable in accordance with the EPBC Act and utilising the Offset Assessment Guide (OAG) (DCCEEW, 2023).

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Acronyms

ACR	Annual Compliance Report
ATF	As Trustee For
AU	Assessment Unit
BMP	Bushfire Management Plan
DAWE	Department of Agriculture, Water and Environment (Commonwealth, former)
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DEHP	Department of Heritage and Protection (Qld, former)
DETSI	Department of Environment, Tourism, Science and innovation
EDL	Ecologically Dominant Layer
EOP	EPBC Act Environmental Offset Policy (2012)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GPS	Global Positioning System
ha	hectare
KFF	Koala Farmland Fund
km	kilometres
LGA	Local Government Area
m	metre
MHQA	Modified Habitat Quality Assessment
mm	millimetres
MNES	Matters of National Environmental Significance
OAG	Offset Assessment Guide
OAAR	Offset Area Annual Report
OMP	Offset Management Plan
OMU	Operational Management Unit
QI	Quantum Impact
RAI	Relative Abundance Index
RE	Regional Ecosystem
RVPDA	Ripley Valley Priority Development Area
SAT	Spot Assessment Technique
SEQ	South East Queensland
SEQERF	Southeast Queensland Ecological Restoration Framework
SPP	Used when referring to multiple species within a genus
SRC	Somerset Regional Council
SSR	Species Stocking Rate
VDEC	Voluntary Declaration
VMA	*Vegetation Management Act 1999*
WONS	Weeds of National Significance

Definitions

Proponent – Fulton Hogan Quarries Pty Ltd

Offset Provider – KFF1 Pty Ltd ATF KFF1 Sub Trust

Impact area – The area where clearing will occur. This is located on part of Lot 89 on WD739 and Lot 1 on SP238024

Milestone Report – A report prepared by a suitably qualified person before the end of Years 5, 10, 15 and 20 of the offset assessing against the interim milestone achievements and completion criteria.

Offset area – The 40 ha area within the offset property where the specific offset will be implemented and consists of a single assessment unit

Offset property – Means 'Little Kipper Offset Property,' Kipper Creek Road, Biarra Qld 4313

Year 1 of the offset: the 12 month period following legal securement of the offset area

Years 2 to 20 of the offset – The 12-month period following each anniversary of the legal securement of the offset area.

Declaration of Accuracy

In making this declaration, I am aware that section 491 of the *Environmental Protection and Biodiversity Cconservation Act 1999* (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.



Principle Environmental Scientist

Offset Provider Consent

The Offset Provider agrees to the offset being undertaken over the land identified in Section 6 of this Offset Management Plan, and in the manner outlined in Section 9.

Offset Provider

1. Introduction

1.1. Background

Saunders Havill Group (SHG) have prepared this Offset Management Plan (OMP) on behalf of the proponent, Fulton Hogan Quarries Pty Ltd, to be implemented by the offset provider, KFF1 Pty Ltd ATF KFF 1 Sub Trust, in accordance with the Preliminary Documentation Request provided for EPBC Application 2024/09844. The OMP has been prepared to address the impacts associated with the quarry expansion project to the existing Blue Rock Quarry at Cedar Creek, Queensland. The expansion area was referred under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and subsequently declared a "Controlled Action" on the 24 July 2024 by the Department of Climate Change, Energy, the Environment and Water (DCCEEW), requiring assessment by "Preliminary Documentation" pursuant to section 18 and 18A (listed threatened species and communities) (EPBC 2024/09844).

The Offset Provider will deliver the overall '*conservation gain*' for Koala as part of a single site offset solution located as part of Lot 112 on CA311003 at Little Kipper Creek Road, Biarra, Queensland (referred to as the 'offset area'). The proposed offset area is within the northern portion of the wider Little Kipper Creek Offset Property (referred to as the 'offset property'), which contains a range of approved Federal offsets for the Koala and other species managed by the Offset Provider. The proposed offset area will combine with these surrounding approved and commenced offsets in the Little Kipper Creek Offset Property to consolidate a larger conservation outcome.

The impact area is a total of 5.9 hectares (ha) which is all considered a Matter of National Environmental Significance (MNES) as it provides critical habitat for the Koala as defined under the EPBC Act. The OMP includes the dedication and rehabilitation of a total of 40 ha of land. The offset area as proposed will acquit the required impacts and provide additional benefit for the species. Details of the offset area are provided in **Section 4.**

1.2. Purpose of the Management Plan

The purpose of this OMP is to provide the objectives of the plan, key commitments including milestones and measurables (performance targets) and completion criteria to compensate for significant residual impacts on Koala. The plan must include (but is not limited to):

i. the ecological outcomes of the offset area (including baseline survey results);
ii. management measures proposed to achieve the ecological outcomes;
iii. for each management action and monitoring outcome, detail how and when performance will be quantified, measured and monitored; and
iv. detail contingency measures to be implemented if some or all of the specified are not achieved.

1.3. Report Structure

This OMP contains the following sections:

- Section 2: Roles and Responsibilities
- Section 3: Overview of Impact area
- Section 4: Overview of Offset Area
- Section 5: Offset Area Suitability
- Section 6: Baseline Surveys
- Section 7: Environmental Outcomes

- Section 8: Monitoring and Reporting Schedule
- Section 9: Management Framework
- Section 10: Adaptive Management
- Section 11: References
- Section 12: Appendices
    - Appendix A – Impact area – MHQA (Koala) results
    - Appendix B – Offset area – MHQA (Koala) baseline reuslt and raw data
    - Appendix C – Offet Area – raw weed mapping data
    - Appendix D – RE 12.9-10.2 technical description (Ryan 2001)
    - Appendix E – Offset area – baseline raw SAT data
    - Appendix F – Offset Assessment Guide Calculator Results and Justification
    - Appendix G - Risk Assessment

2. Roles and Responsibilities

Excluding the regulatory role completed by the Commonwealth Government for the assessment and approval of the offset and the Queensland Government for registering and declaring the Voluntary Declaration and covenant the following people and entities retain key responsibilities for the implementation of this OMP.

A list of key contacts for the project is contained in **Table 1** and responsibilities/cost assignment.

Table 1: Key personnel and responsibilities

Role	Nominated Person	Company / Entity	Contact details
Proponent/Approval Holder	Andrew Lyndon	Fulton Hogan Quarries Pty Ltd	andrew.lyndon@fultonhogan.com.au
Offset Provider	Rob Martyn	KFF1 Pty Ltd	rob.martyn@koalafarmlandfund.com.au
Administering Authority	N/A	DCCEEW Compliance Monitoring Branch	EPBCMonitoring@dcceew.gov.au
Suitably qualified person/contractor	Appointed as required by either the proponent or the Offset Provider	Appointed as required by either the proponent or the Offset Provider	Appointed as required by either the proponent or the Offset Provider

Action		Description	Responsibility & Cost Assignment
Preparation of documents	Offset Management Plan (OMP)	Drafted for the offset site, specific to the Proponent's project	Proponent
	Review OMP before finalisation	Any plan to be implemented onsite must be reviewed and approved by KFF	KFF (offset provider)
	Draft & Execute Offset Agreement	Draft Offset Agreement supplied by KFF and negotiated by both parties	Each party at their own cost
Management Plan Actions	Legally binding mechanism	Secure legally binding mechanism over offset area (VDEC and/or amendment order under EOPA)	KFF (offset provider)
	Preparation of other management plans as required by OMP	Weed management plan, pest management plan and bushfire management plan	KFF (offset provider)
	Review Management Plans before finalisation	Any plan to be implemented onsite must be reviewed and approved by KFF	KFF (offset provider)
	Undertake general on-ground management activities in accordance with the various Management Plans	Includes fencing, access tracks, signage, fire management, weed control, pest control and revegetation	KFF (offset provider)

	Installation, management and monitoring of habitat specific features	Some management plans include additional actions to those listed above. For example, DCCEEW may require the installation of greater glider nest boxes, koala poles or coarse woody debris	KFF (offset provider)
Audits/Monitoring and Reporting	Undertake annual or periodic ecological monitoring activities in accordance with the various Management Plans and produce associated mapping and reporting	Includes baseline and annual/periodic surveys such as (but not limited to): targeted species surveys, weeds, pests and habitat quality assessments. Also includes mapping and reporting associated with ecological monitoring activities	KFF (offset provider)
	Provide Annual Offset Report (or on-ground management actions)	Provide an annual report outlining management activities undertaken in the reporting year including fencing, fire management, weed control, pest control and revegetation activities	KFF (offset provider)
	Offset Management Plan audits	Every 5 years	Proponent
	Annual Compliance Report (EPBC Approval conditions)	Prepare annual report outlining compliance with EPBC approval conditions (i.e., not just limited to offset conditions)	Proponent

3. Overview of Impact Area

3.1. Project and Site

The project at Blue Rock Quarry, Cedar Creek Road, Cedar Creek (described as part of Lot 89 on WD739 and Lot 1 on SP238024) is located approximately 12 kilometres (km) south of Beenleigh. The impact area is a largely vegetated, steep south facing slope immediately south of the current Blue Rock Quarry footprint (refer **Figure 1** and **Figure 2**). The impact area is located within an area zoned as 'extractive industry' with an existing state environmental authority.

The entire 5.9 ha referral area is proposed to be cleared for the quarry expansion area. Therefore, the project will include 5.9 ha impact to MNES, specifically Koala habitat. **Table 2** provides details on the impact area.

Table 2: Details of impact area

Address	Cedar Creek Road, Cedar Creek
Impact area	5.9 ha
MNES impact area	5.9 ha (refer **Plan 1**)



LEGEND

- Qld DCDB
- Site Boundary
- Referral Area [5.9 ha]
  Quarry Expansion Area

FIGURE 1

IMPACT SITE AERIAL

CLIENT

Fulton Hogan

PROJECT
CEDAR CREEK, QLD

COORDINATE SYSTEM
GDA 2020 MGA Z56

SCALE (A4)
1:11,419

N

0 120 240 360 480 m

Saunders Havill

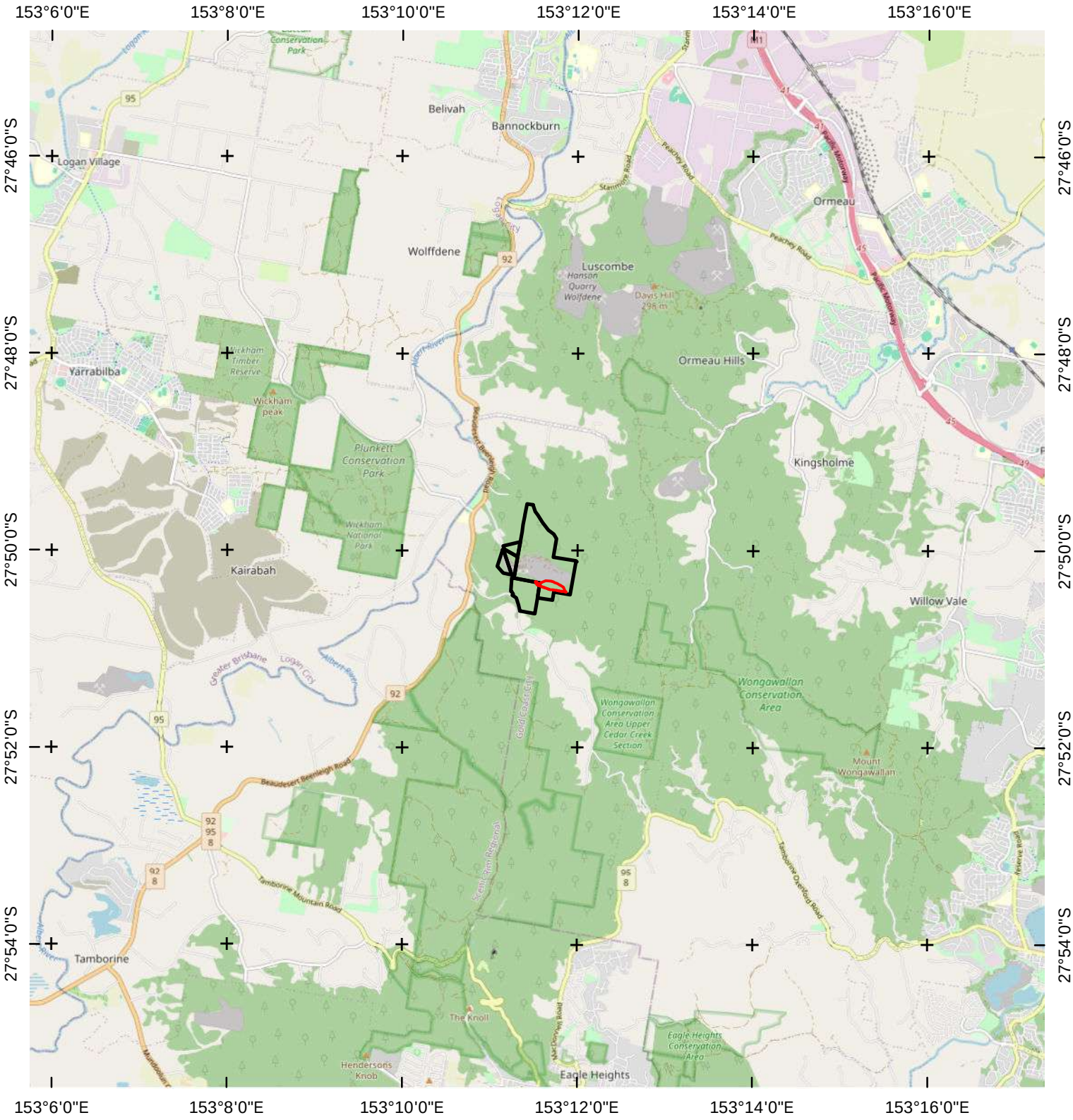
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FILE REFERENCE
11390 E Figure 1 Impact Aerial D_SHG

DATE 9/10/2025



LEGEND

Site Boundary

Referral Area [5.9 ha]
Quarry Expansion Area

FIGURE 2

IMPACT SITE CONTEXT

CLIENT

Fulton Hogan

PROJECT
CEDAR CREEK, QLD

COORDINATE SYSTEM
GDA 2020 MGA Z56

SCALE (A4)
1:100,000

N

0 1,100 2,200 3,300 4,400 m

Saunders Havill

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FILE REFERENCE
11390 E Figure 2 Impact Context D_SHC

DATE 9/10/2025

3.2. Summary of Matters Requiring Offset

The impact area involves directly impacting 5.9 ha of critical Koala habitat. Vegetation communities within the impact area are summarised below

3.2.1 Vegetation communities impacted

The habitat quality and quantum of the 5.9 ha area has been assessed. Vegetation within the impact area was observed to be varying in value and composition. Vegetation containing known Koala habitat in the form of Eucalypt and Corymbia trees is mapped as Category B (remnant) RE12.11.3 (AU1) Queensland *Vegetation Management Act 1999* (VMA). The balance of the site is mapped as Category X (non-remnant) vegetation with pre-clear indicating part of the area as regrowth RE12.11.10 (AU2) and part as highly disturbed regrowth of pre-clear RE12.11.3 (AU3).

The mapped and pre-clear vegetation communities located within the MNES impact area is described in **Table 3**.

Table 3: Mapped pre-clear regional ecosystem present within MNES impact area

Pre-clear RE	VMA status	Description
12.11.3	Least Concern	*Eucalyptus siderophloia, E. propinqua +/- E. microcorys, Lophostemon confertus, Corymbia intermedia, E. acmenoides* open forest on metamorphics +/- interbedded volcanics
12.11.10	Least Concern	*Notophyll and notophyll/microphyll* vine forest +/- *Araucaria cunninghamii.* Characteristic species include *Argyrodendron trifoliolatum, Argyrodendron sp.* (Kin Kin W.D.Francis AQ81198), *Backhousia subargentea, Dissiliaria baloghioides, Brachychiton discolor, Beilschmiedia obtusifolia, Diospyros pentamera, Grevillea robusta, Gmelina leichhardtii and Ficus macrophylla forma macrophylla.* Occurs on Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics. Not a Wetland. (BVG1M: 2a).

3.3. Habitat Quality Scoring Methods

3.3.1 Koala – Modified Habitat Quality Assessment methodology

The quantum and quality of habitat for the Koala within the impact area was assessed using a modified version of the Queensland State Governments *Guide to determining terrestrial habitat quality: A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy* Version 1.2 April 2017 (herein referred to as the 'Habitat Quality Guideline'). This assessment approach utilises the site condition assessment method framework established under the *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland* Version 2.2 February 2015 (Eyre et al. 2015) combined with site context and species stocking rate assessments to determine the habitat quality of the impact area. The guideline is a step-by-step methodology explaining how to measure habitat quality for land-based offsets. This methodology has been adopted and tailored/modified to assess the impacts and offsets relating to MNES.

The traditional terrestrial habitat quality assessment assesses three (3) core indicators:

1. site condition – a general condition assessment of vegetation compared to a benchmark;
2. site context – an analysis of the site in relation to the surrounding environment; and
3. species habitat index – the ability of the site to support a species.

The MHQA for Koala combines the three (3) core indicators into two (2) (site condition and site context) with each attributed an equal weighting of 30% of the final score. The balance of the weighting (40%) has been attributed to the third indicator – Species Stocking Rate (SSR) – which is independent of the traditional habitat quality assessment. The species stocking rate has been added to the MHQA to better incorporate MNES, and for the purpose of this project, the endangered-listed Koala MNES. The following subsections detail the methodology utilised to assess the site condition, site context, and SSR under the MHQA.

Site Condition (30%)

Assessing site condition is an integral step in determining specific quantification of impacts, while also determining whether an offset site is suitable to establish a desired capacity to support the prescribed environmental matters being offset. The on-site condition is a key element of habitat quality and has a direct influence on the biodiversity it supports. Site condition is assessed using a suite of attributes to describe the structure and function of the vegetation community and is benchmarked against the expected range for a relatively undisturbed community.

The site condition assessment under the MHQA is assessed using fifteen (15) condition characteristics being:

Table 4: Koala site condition scoring attributes (BioCondition Manual)

Site condition attribute	*Scoring and benchmark percentage*				
*(1) Recruitment of woody perennial species in ecologically dominant layer in EDL**	Score	0	3		5
	Benchmark	<20%	≥20-75%		≥75%
(2) Native plant species richness – trees	Score	0	2.5		5
	Benchmark	<25%	≥25-90%		≥90%
(3) Native plant species richness – shrubs	Score	0	2.5		5
	Benchmark	<25%	≥25-90%		≥90%
(4) Native plant species richness – grasses	Score	0	2.5		5
	Benchmark	<25%	≥25-90%		≥90%
(5) Native plant species richness – forbs	Score	0	2.5		5
	Benchmark	<25%	≥25-90%		≥90%
(6) Tree canopy height	Score	0	3		5
	Benchmark	<25%	≥25-70%		≥70%
(7) Tree canopy cover	Score	0	2	3	5
	Benchmark	<10%	≥10%-<50%	≥200%	≥50-200%
(8) Shrub canopy cover	Score	0	3		5
	Benchmark	<10%	≥10%-<50% or ≥200%		≥50-<200%
(9) Native perennial grass cover	Score	0	1	3	5
	Benchmark	<10%	≥10-50%	≥50-90%	≥90%
(10) Organic litter	Score	0	3		5
	Benchmark	<10%	≥10%-50% or ≥200%		≥50-<200%
(11) Large trees	Score	0	5	10	15
	Benchmark	0%	0-50%	≥50-100%	≥100%

Site condition attribute	*Scoring and benchmark percentage*				
(12) Coarse woody debris	Score	0	2		5
	Benchmark	<10%	<50% or ≥200%		≥50% or <200%
(13) Non-native plant cover	Score	0	3	5	10
	Benchmark	>50%	≥25-50%	≥5-25%	<5%

Assessment methodology of the above condition characteristics mostly do not differ from the traditional terrestrial habitat quality assessment. In developing the MHQA to better incorporate MNES, two (2) species habitat index characteristics, being (1) 'quality and availability of food and foraging habitat', and (2) 'quality and availability of shelter', have been added to the site condition indicator.

Quality and Availability of Food and Foraging Habitat

Food-tree availability is consistently identified as one of the most important determinants of koala population dynamics, owing to their highly specialised folivorous diet and dependence on a narrow subset of Eucalyptus species (Kavanagh et al., 2007).

To reflect the importance of food trees to koala habitat, the quality and availability of foraging habitat has been assessed using two parameters:

- Abundance of koala food trees
- Tree canopy cover

These two parameters provide an indication of the number of trees available for koalas to forage in and the amount of resource available from those trees. Weighting of the parameters in the assessment is 80% for food tree abundance and 20% for canopy cover as koalas are known to graze on trees of any size and established smaller trees will grow to provide a larger canopy area over time.

All koala food trees (eucalypt, corymbia and angophora species) with a DBH >100mm were counted within a 100m x 20m plot at each habitat transect to estimate abundance. The count is multiplied by 5 to produce a stem density per hectare which is averaged across the assessment unit. The count is then compared to the average stem density per hectare identified in the regional ecosystem technical descriptions combining T1 and T2 layers (Ryan 2019) with a score out of 8 calculated (refer **Table 5**).

Table 5: Stem density percentage and relevant score – quality and availability of foraging habitat

Stem density as percentage compared with benchmark	Score
<1%	0/8
1% - 24.99%	2/8
25% - 49.99%	4/8
50% - 74.99%	6/8
75% - 100%+	8/8

Canopy in Southeast Queensland Eucalypt woodland is dominated by koala food tree species, therefore, the tree canopy cover collected a part of the site condition assessment provides an accurate estimate of



food source availability, and if anything would overestimate food availability giving a conservative baseline score. Canopy cover (T1 layer) has been averaged and compared to the benchmark for the regional ecosystem. A score out of 2 has been calculated (refer **Table 6**):

Table 6: Canopy overage percentage and relevant score - quality and availability of foraging habitat

Canopy cover as percentage compared with benchmark	Score
<1%	0/2
1% - 24.99%	0.5/2
25% - 49.99%	1/2
50% - 74.99%	1.5/2
75% - 100%+	2/2

The scores for food tree abundance and canopy cover are then added together to provide an overall score out of 10 for quality and availability of food sources. For the purposes of the MHQA condition assessment, scores have been categorised (refer **Table 7**).

Table 7: Combined stem density and canopy coverage score – quality and availability of foraging habitat

Combined score for stem density and canopy cover	Final Score
0 – 2.99/10	1
3 – 6.99/10	5
7 – 10/10	10

Quality and Availability of Shelter Habitat

Koalas choose shelter in trees that provide thermal protection, safety from predators, and access to preferred food trees (Briscoe et al 2014; Ellis et al 2012; Law et al 2022). Studies have found shelter trees are not necessarily food species such as eucalypts with a range of ancillary species used as long as they are near a food source. Trees selected are often larger with a DBH 0f 30cm – 60cm.

Two parameters have been used to assess shelter habitat values at the impact and offset sites:

- Abundance of koala food trees and ancillary trees (hereby referred to as shelter trees)
- Abundance of large shelter trees (food and ancillary species)

These two parameters provide an indication of the number of koala shelter trees available on the impact and offset sites as well as existing larger trees that can be preferred while resting through the day. Weighting of the parameters in the assessment is 60% for shelter tree abundance and 40% for large trees.

All shelter trees with a DBH >100mm were counted within a 100m x 20m plot at each MHQA transect completed at the impact and offset sites to estimate abundance. The count is multiplied by 5 to produce a stem density per hectare which is averaged across the assessment unit. The count is then compared to

the average stem density per hectare identified in the regional ecosystem technical descriptions combining T1 and T2 layers (Ryan 2019) with a score out of 6 calculated (refer **Table 8**).

Table 8: Stem density percentage and relevant score – quality and availability of shelter habitat

Stem density as percentage compared with benchmark	Score
<1%	0/6
1% - 24.99%	1.5/6
25% - 49.99%	3/6
50% - 74.99%	4.5/6
75% - 100%+	6/6

Large shelter trees are counted over a 100m x 50m plot at each MHQA transect completed at the impact and offset sites to estimate abundance of large trees. The count is multiplied by 2 to produce a density per hectare which is averaged across the assessment unit and compared to the benchmark for the regional ecosystem. A score out of 4 is calculated (refer **Table 9**):

Table 9: Large tree percentage and relevant score – quality and availability of shelter habitat

Large Trees as percentage compared with benchmark	Score
<1%	0/4
1% - 24.99%	1/4
25% - 49.99%	2/4
50% - 74.99%	3/4
75% - 100%+	4/4

The scores for shelter tree abundance and large trees are then added together to provide an overall score out of 10 for quality and availability of shelter. For the purposes of the MHQA condition assessment, scores will be categorised (refer **Table 10**):

Table 10: Combined stem density and large tree score – quality and availability of shelter habitat

Combined score for stem density and large trees	Final Score
0 – 2.99/10	1
3 – 6.99/10	5
7 – 10/10	10

Site condition within the impact area was assessed by delineating the impact area into assessment units (AU) as required by the Queensland environmental offsets framework. The impact area was delineated into three (3) AUs based on on-ground vegetation assessments, summarised in **Table *11***. Site condition was measured through the completion of modified habitat quality transects (MHQA). Assessment at multiple locations per AU is necessary to measure vegetation condition at representative locations across the spatial extent of the AU, except where the small size of an AU does not allow for multiple transects.



Site condition was assessed at a total of four (4) transect locations within the impact area, completed by suitably qualified Ecologists. The locations of MHQA transects within the impact area are provided on **Plan 1**. Notably, only 1 transect was completed within AU3 and AU2 given the small AU area. A modified transect (50m) was completed in AU2 given the small overall area and inaccessible terrain. This is an acceptable method of habitat assessment so long as the attributes are adjusted accordingly to allow for scoring comparisons.

Table 11: Summary of assessment units and MHQA transects – impact area

Assessment unit	Vegetation community	Impact area (ha)	MHQA transect
AU1	RE12.11.3 (remnant)	3.5	Transects 1 and 2
AU2	RE12.11.10 (pre-clear)	1.1	Transect 3
AU3	RE12.11.3 (pre-clear)	1.3	Transect 4

Site context (30%)

The site context assessment considers the landscape characteristics adjoining the site. Site context is measured using a suite of attributes to describe the location of the habitat within the surrounding landscape and the influence of its associated threats. This assessment also considers the influence of adjacent vegetated areas and ecological corridors. Under the MHQA, site context is measured using seven characteristics. In developing the MHQA, three species habitat index characteristics were nominated to form part of the site context characteristics: role of site location to overall species population in the state, threats to the species, and species mobility capacity. The seven characteristics are listed below with details of how each are measured in accordance with the *Guide to determining terrestrial habitat quality: A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy* (version 1.2).

- Size of patch – Measured as the area of vegetation in which the assessment unit(s) is contained, and add on all other directly connecting areas of koala habitat. The calculation of the area of the patch size uses the method outlined in the BioCondition assessment manual v2.2 that considers the patch to be areas connected by corridors greater than 200 m wide within a 1 km radius of the site. This methodology includes use of a "segmentation" process that removes areas connected to the assessment area by narrow corridors)
- Connectedness – Relates to the capacity that the species have to disperse through the landscape. This attribute is calculated using GIS by measuring the length koala habitat along the boundary of the site, calculated as a percentage
- Context – The context score is calculated by GIS to quantify the amount of vegetation immediately surrounding the assessment site. It is measured as the percentage of koala habitat within a 1 km radius of the site
- Ecological corridors – This attribute is as per the methods of the Guide to determining terrestrial habitat quality V1.2 and is used to determine if a site is located within or shares a boundary with an ecological corridor that facilitates long term ecosystem function by connecting large patches of remnant vegetation with sufficient tract size (corridor width in relation to the fragmentation of the landscape) (EHP 2014). These corridors support the habitat of MNES by providing opportunity for long term dispersal of habitat species following landscape level changes in climate. Although the

ecological corridors allow for the dispersal of MNES themselves, for example, Koala, this is not their primary function when assessing the attribute. An 'ecological corridor' is represented as any 'Riparian' or 'Terrestrial' feature within the 'CORR_TYPE' attribute table of the 'Queensland biodiversity and vegetation offsets special features' map. The mapping can also be viewed on Queensland Globe in the 'Statewide Biodiversity Corridors' layer

- Role of site location to species overall population in the state – This attribute is based on the observed role of the site in relation to the overall population of the species. The scoring table considers the species' use of the site – such as whether it is used for feeding and/or nesting and the effect that damage to or removal of the site would have to the likelihood of the species' overall population survival.
- Threats to the species – This attribute identifies the presence and severity of threatening processes observed at or adjacent to the site which may include clearing associated with development, creation of a barrier to movement, introduction or spread of disease or pathogens, risk of high-intensity fires, degradation of habitat from hydrological change and introducing or increasing mortality attributed to vehicle strike or dog attacks as references in the *Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory*. The highest threat level is given to a site if it isolated from other Koala habitat, or if major roads without exclusion measures, or residential encroachment is within 1500 m of the site boundary. A risk matrix relative to the conservation advice for the Koala was applied to determine threats to species:
    - Habitat loss is considered 'Very High Risk' under the Koala conservation advice. Clearing and degradation of habitat is scored Low, Moderate and High and weighted according to risk factor relative to the expected threat score for each (summed vertically as 15 for Low, 7 for Moderate or 1 for High).
    - High intensity bushfire is considered 'Very High Risk' under the Koala conservation advice. Inappropriate fire regimes is scored Low, Moderate and High relative to the implementation of an endorsed bushfire management plan and fuel load weighted according to risk factor relative to the expected threat score for each (15, 7 or 1).
    - Vehicle strike is considered 'Moderate Risk' under the Koala conservation advice. Vehicle strike is scored Low, Moderate and High relative to the presence and severity of road use within 1 km of the site and weighted according to risk factor relative to the expected threat score for each (15, 7 or 1).
    - Dog attack is considered 'Moderate Risk' under the Koala conservation advice. Dog attack is scored Low, Moderate and High relative to the presence of dogs and level of cover available and weighted according to risk factor relative to the expected threat score for each (15, 7 or 1).
- Species mobility capacity – The Guide to Determining Terrestrial Habitat Quality version 1.2 states that this attribute is scored based on the presence and severity of factors that would contribute to a reduction in the mobility of the species. The scoring is based on a percentage reduction of mobility ranging from minor restriction (0-25% reduction) to severely restricted (76-100%). A score of 1, 4, 7 or 10 may be attributed depending on the level of restriction (refer **Table 12**) for scoring as provided in the guideline.

The Guideline references the presence and severity of factors that would contribute to a reduction in the mobility of the species. This can include barrier that would result in a long-term reduction in genetic fitness or access to important resources. DCCEEW defines a barrier for Koala as an impediment to the genetic dispersal of Koalas over multiple generations such as escarpments or inhospitable landscapes. However, it is noted that the presence or absence of barriers alone do not exclusively determine the percentage reduction in mobility. Other factors such as roads, cleared areas and dense weed infestations (i.e Lantana) will contribute to a reduced mobility capacity and are still relevant when scoring this attribute as 'presence and severity.' Under the Habitat Quality Guideline, species mobility capacity is measured in terms of a percentage reduction. A method for calculating percentage reduction is detailed below:

Factors that may limit or impede mobility for the koala used to inform this assessment include:

- The presence of large stretches of cleared land where uses are incompatible with koala movement. This may include intensive agriculture (e.g. cropping) or commercial uses (e.g. hardstand or carparks).
- The presence of thick lantana infestations in woodland or gullies.
- Waterways larger than 40 m wide.
- Roads such as 4-lane arterial roads or smaller connectors that are highly trafficked and safe koala movement features such as underpasses are not present.
- The presence of a non-climbable fences and other small-scale infrastructure.
- The presence of a rail corridor or other linear infrastructure with regular anthropogenic uses.

While the guideline identifies features that restrict mobility, they are not attributed a category of restriction. A literature review has been completed to identify which features would be considered to have the potential to be a severe, high or moderate restrictions to dispersal. The outcomes are summarised in **Table 12**

Potential severity assumes a 'worst case' scenario and site-specific condition need to be considered for the assessment. For example, a rural property surrounded by barbed wire with timber fencing and small infrastructure littered throughout the property may only be considered to provide a moderate impediment to koala movement whereas urban areas with timber fencing present in several areas around the site would be considered a high or severe impediment.

Table 12: Severity of Mobility Restrictions

Potential Severity	Impediment	Primary Effect on Mobility	References
Severe	**Habitat Loss & Fragmentation**	Isolates habitat patches; reduces canopy connectivity; forces ground travel. The site must be isolated from any other vegetation cleared land with uses incompatible to koala movement.	Rhodes et al. 2006 McAlpine et al. 2006 Youngentob 2021

Potential Severity	Impediment	Primary Effect on Mobility	References
Severe	Roads & Vehicle Traffic	Roads act as hard physical barriers; vehicle strikes kill dispersing koalas. Dual lane or high trafficked roads with no or limited koala movement features such as underpasses are considered a high barrier to dispersal.	Rhodes et al. 2006 Lunney et al. 2002
High	Fencing & Small-Scale Infrastructure	Fences can prevent koalas from reaching adjacent habitat patches, particularly when too high or lacking climbable surfaces.	NSW Department of Planning and Environment (2022) McAlpine et al. 2006
High	Human Disturbance & Noise	Koalas and other small mammals tend to avoid habitats close to major roads, construction sites, and other loud human activities. If major anthropogenic noise sources are located adjacent the site it is considered a high barrier to dispersal.	McAlpine et al. 2006 Blickley and Patricelli 2010
Moderate	Dense weed infestation	Weed invasion alters vegetation structure, reduces habitat quality, and can significantly influence how koalas move through the landscape.	NSW Department of Planning and Environment (2022)
Moderate	Waterways	Waterways can impede koala movement primarily by creating physical gaps in canopy connectivity, forcing koalas to travel on the ground where they are more vulnerable to predation and vehicle strikes. Large waterways (>40 m wide) are considered a significant barrier because they isolate habitat patches and reduce safe dispersal routes.	Rhodes et al. 2006 McAlpine et al. 2006

Species mobility capacity will be calculated using the following method:

- The site will be spit into four quadrants (north, south, east and west).
- Each quadrant will be reviewed using a combination of desktop and field assessment (where possible) to identify if any restriction to mobility is present.
- Restriction will be allotted a percentage score based on severity as follows:
    - No or any minor restriction not listed in **Table *12*** – 0%
    - Moderate restriction – 40%
    - High restriction – 65%
    - Severe restriction – 90%
- Percentages will be added together and divided by 4 to obtain an overall percent reduction in mobility for the site. A score will then be allotted according to the mobility restriction severity scoring in **Table 13**.

Table 13: Koala site context scoring attributes

Site context attribute	*Scoring and benchmark percentage*				
Size of patch	0	2	5	7	10
	<5 ha	5-25 ha	26-100 ha	101-200 ha	>200 ha
Connectedness	0	2	4		5
	0-10%	>10-<50%	50-75%		>75% or >500 ha
Context	0	2	4		5
	<10% habitat	>10-30% habitat	>30-75% habitat		>75% habitat
Ecological corridors	0	4	6		
	Not within	Sharing a common boundary	Within (whole or part)		
Role of the site location to species overall population in the state	1	4	5		
	Not or unlikely to be critical to survival of the koala	Likely to be critical to survival of the koala	Critical to the survival of the koala		
Threats to the species	1	7	15		
	High threat level	Moderate threat level	Low threat level		
Species mobility capacity	1	4	7	10	
	Severely restricted (76-100% reduction)	High restricted (51-75% reduction)	Moderately restricted (26-50% reduction)	Minor restriction (0-25% reduction)	

Species Stocking Rate (40%)

The MHQA incorporates species stocking rate as an attribute not discussed under the traditional terrestrial habitat assessment methodology. Species stocking rates are estimates of the koala carrying capacity of the site at the time of undertaking the survey. Given the discreet nature of the Koala and limited to no published literature on habitat carrying capacity of the species, the species stocking rate scoring methodology has been derived through the collation of site-specific surveys and surrounding contextual habitat analysis. Species stocking rate is calculated using the following parameters:

- Species presence on or adjacent to the site – whether or not evidence of koala has been recorded within or adjoining the site. Evidence may be direct in the form of observation of Koalas, or indirect via the presence of scats.
- Specie usage of the site (habitat type and evidenced usage) – the type of habitat includes vegetation structure such as whether it contains remnant, regrowth or non-remnant vegetation values, and evidenced usage is the confirmed presence or use of the species within the habitat. Both factors are used to inform the species usage of the site. Depending on the level of variability in vegetation and usage patterns across the site, this characteristic may be scored differently for assessment units.

- Approximate density of the species on the site – measured through the use of Spot Assessment Technique (SAT) (Phillips *et al.* 2011) and targeted searches with a high probability of detection. The combination of methods produces a higher reliability of data when extrapolating Koala density. The SAT method is an industry recognised technique for identifying presence/absence of Koala and measuring activity. SAT survey results are interpreted using the broad population categories provided in the Australian Koala Foundation Koala activity level classification table to infer an activity level or approximate density. These categories being 'East Coast (low)', 'East Coast (med-high)' and 'Western (med-high)' are shown in **Table *15***. Depending on the population category applied, Koala activity is described as 0%, 'low', 'moderate', or 'high'.
- Role/importance of species population on site – the extent to which the site is considered a key source population for breeding, dispersal, is necessary for maintaining genetic diversity or near the limit of the species' range.

For subjective criteria where it is unclear whether a particular attribute score is achieved, the precautionary approach is applied to favour the higher score. **Table 14** outlines the attributes utilised to assess species stocking rate.

Table 14: Koala Species Stocking Rate Scoring

Attribute	*Scoring and criteria*				
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	Score (/10)	0	5	10	
		No	Yes – adjacent to site	Yes – on-site	
Species usage of the site (habitat type and evidenced usage)	Score (/15)	0	5	10	15
		Not habitat	Dispersal habitat	Foraging habitat	Breeding habitat
Approximate density (per ha)	Score (/30)	0	10	20	30
		0%	Low	Medium	High
*Role/importance of species population on site**	Score (/15)	0	5	10	15
		0	5-15	20-35	40-45
Total SSR	/70				
SSR Score	/4				

**Species Stocking Rate supplementary table – Total supplementary score 0 = 0, 5-15 = 5, 20-35 = 10, 40-45 = 15*			
Key source population for breeding	Score (/10)	0	10
		No	Yes/Possibly
Key source population for dispersal	Score (/5)	0	5
		No	Yes/Possibly
Necessary for maintaining genetic diversity	Score (/15)	0	15
		No	Yes/Possibly
Near the limit of the species range	Score (/15)	0	15
		No	Yes

Scoring Weight Justification

Site Condition and Site Context were given a weighted score out of three (3), while Species Stocking Rate was given a weighted score out of four (4).

Species Stocking Rate was assigned the highest weighting as it is considered the greatest determinant of site suitability for the Koala. Species Stocking Rate is an important component when assessing the overall habitat quality of a site as it indicates species usage.

Site Condition and Site Context were assigned the equal weighting (scored out of 3). The Koala is known to occupy a variety of habitats, ranging from non-remnant regrowth eucalypt forest/woodland through to old growth remnant forest/woodland, however, the site condition of the habitat is considered to directly influence the long-term Koala carrying capacity. Site Context is considered an important component when assessing the Koala as it directly relates to the long-term survival rate of the species. The proximity of the site to other areas of suitable habitat, the movement pattern through the landscape of the Koala (and/or barriers inhibiting movement) and threats to the species are important attributes to assess when considering the overall functionality of the site.

It is considered that the provision of this weighted scoring most accurately quantifies the ecological requirements of the Koala, which will then assist in determining whether an offset site is suitable to establish a desired capacity to support the prescribed environmental matters being offset.

Baseline Koala presence surveys for SSR

Koala presence and activity levels were determined through utilising the Spot Assessment Technique (SAT) (Phillips *et al.* 2011). The SAT method is an industry recognised technique for identifying presence/absence, density and habitat usage of Koala at a site and is specified as an appropriate survey method in the former *EPBC Act Referral Guidelines for the Vulnerable Koala* (DofE 2014). Results from SAT surveys are compared against current available published scientific literature to identify an estimated Koala carrying capacity (stocking rate).

SAT survey results are interpreted using the broad population categories provided in the Australian Koala Foundation Koala activity level classification table. These categories being 'East Coast (low)', 'East Coast (med-high)' and 'Western (med-high)' are shown in **Table 15** and are used to estimate Koala activity within a given area. Depending on the population category applied, Koala activity is described as 'low', 'moderate', or 'high'. Population categories are assigned as follows:

- Sites considered to be suitable or have high suitability for Koalas are assigned the 'East Coast (med-high)' category;
- Sites considered to have low suitability are assigned the 'East Coast (low)' category; and
- The 'Western (med-high)' category does not apply to South East Queensland local government areas.

Table 15: Koala activity level classification (Phillips and Callaghan 2011)

Activity	East Coast (low)	East Coast (med-high)	Western (med-high)
Low	<3.33%	<22.5%	<35.8
Moderate	3.33-12.6%	22.5-32.8%	35.8-46.7

High	>12.6%	>32.8	>46.7

A total of four (4) SAT surveys were completed across the MNES impact area, two (2) on 05 December 2022, one (1) on 05 June 2023 and one (1) on 22 December 2024. Inaccessible terrain limited locations where a SAT could be completed. A Koala was directly observed within the impact area during surveys, however results from the SATs completed were assessed under the 'East Coast (med-high)' category and retuned a value of 'low usage' indicating limited suitable habitat.

3.3.2 Discussion

The habitat quality scores for each AU were determined using a combination of Site Condition, Site Context and Species Stocking Rate technical data and scoring. The site was given an overall weighted habitat quality score of **5.73** out of the total of 10 which is considered a moderate habitat quality score. This score is calculated based on the combined weighted habitat quality scores for each assessment unit.

Refer to **Table 16** for a summary of the results. The complete MHQA data is provided at **Appendix A**.

Table 16: Impact area koala MHQA final weighted score summary

MHQA Final Weighting	AU1	AU2	AU3
Site Condition (/3)	1.82	1.04	0.72
Site Context (/3)	2.25	2.25	2.25
Species Stocking Rate (/4)	2.29	1.71	1.71
Assessment Unit Area (Impact) (ha)	3.50	1.10	1.30
Total Impact Area (ha)	5.90	5.90	5.90
AU weighted Score	0.593	0.186	0.220
Total weighted score	**5.73 (rounded to 6)**		

Site Condition

Site condition varied across the referral area as a result of non-remnant vegetation and high levels of disturbance. **Table 17** to **Table 22** details an assessment of Quality and availability of food and foraging resources and Quality and availability of shelter habitat.

Table 17: Koala Food Tree Abundance – Impact

Impact Assessment Unit	RE	Benchmark (trees/ha)	Site Count (trees/ha)	Benchmark Percentile	Score
AU1	12.11.3	544	395	73%	6/8
AU2	12.11.10	No benchmark, RE does not have Koala food trees as part of technical description	No Koala food trees	Not applicable	0/8
AU3	12.11.3	544	110	20%	2/8

Table 18: Canopy Cover – Impact

Impact Assessment Unit	RE	Benchmark (% cover)	Site (% cover)	Benchmark Percentile	Score
AU1	12.11.3	72	75.8	105%	2/2
AU2	12.11.10	47	No T1 canopy layer	0%	0/2
AU3	12.11.3	17	No T1 canopy layer	0%	0/2

Table 19: Final score for *Quality and availability of food and foraging resources*

Assessment unit	Total score	MHQA score
AU1	8/10	10
AU2	0/10	1
AU3	2/10	1

Quality and availability of shelter

Table 20: Shelter Tree Abundance – Impact

Impact Assessment Unit	RE	Benchmark (trees/ha)	Site Count (trees/ha)	Benchmark Percentile	Score
AU1	12.11.3	544	395	73%	4.5/6
AU2	12.11.10	No benchmark, RE does not have Koala food trees as part of technical description	No Koala food trees	Not applicable	0/6
AU3	12.11.3	544	110	20%	1.5/6

Table 21: Large Trees abundance – Impact

Impact Assessment Unit	RE	Benchmark (trees/ha)	Site (trees/ha)	Benchmark Percentile	Score
AU1	12.11.3	67	10	15%	1/4
AU2	12.11.10	88	4	5%	1/4
AU3	12.11.3	67	0	0%	0/4

Table 22: Final score for *Quality and availability of shelter*

Assessment unit	Total score	MHQA score
AU1	5.5/10	5/10
AU2	1/10	1/10
AU3	1.5/10	1/10

Site Context

→Size of patch

This attribute is a measure of the size of the patch of vegetation in which the assessment unit is located. The scoring reflects the importance of large patches in the landscape and is based on the size of the patch of critical Koala habitat connected to the site in this instance. This attribute is scored such that is reflects the fact that larger patches are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller patches. The size of patch attribute was calculated using GIS and determined the referral area to be part of a patch size of larger than 500 ha. This achieved a score of **10 out of 10** (>200 ha Koala Habitat as per the Queensland BioCondition Assessment methodology) (refer **Plan 2**).

→Connectedness
As a landscape level attribute, connectedness aims to assess the degree to which the assessment unit is connected to adjacent native vegetation. Connectedness relates to the capacity of the species to disperse through the landscape between sustainable patches of habitat, and therefore has important implications for species persistence. Connectedness was calculated using GIS, with the percentage of referral area boundary length supporting a Koala critical habitat connection off and on-site was calculated at 48 %, and consequently this attribute scored a **2 out of 5** as per the Queensland BioCondition Assessment methodology (refer **Plan 2**).

→Context
The context attribute refers to the amount of critical koala habitat that is retained within a 1 km buffer of the site being assessed and is calculated using GIS. Each assessment unit achieved the same scores for Site context. Existing critical koala habitat within a 1 km buffer of the site was calculated at 79%, and therefore the context attribute achieved a score of **5 out of 5** as per the Queensland BioCondition Assessment methodology (refer **Plan 2**).

→Ecological Corridors
GIS was utilised to identify the role of the site in any ecological corridors on or adjacent to the site. A score of **6 out of 6** was given to the Ecological Corridors component of Site Context as the site is within state and regional corridors (refer **Plan 3**).

→Role of site location to species overall population in the State
This attribute aims to quantify the importance of the site for state Koala populations through a combined approach that considers the activity and usage across the site and the importance of habitat for fulfilling the Koala's life cycle (i.e., foraging and breeding) and thus the effect that removal of habitat would have on a local population and the species as a whole. This attribute achieved a score of **5 out of 5** as it was determined that the referral area contains habitat critical to the survival of the species. While habitat within the referral area is highly disturbed and site-specific surveys found low Koala activity, any habitat that meets the definition of critical koala habitat under the EPBC Act is also considered potential breeding habitat.

→Threats to the species
The 'threats to the species' attribute aims to quantify potential risks to the survival of Koala existing within and adjacent to the referral area. Key known threats to the survival of the Koala include habitat degradation and proximity to main roads increasing the risk of motor vehicle strike, as well as predation by wild or domestic dogs.

Table 23 provides a risk matrix relative to the conservation advice for the Koala to determine threats to the species. Essentially, each of the threats identified within the conservation advice is weighted relative to the identified level of risk, with the weighted scores summed to provide the threat score, noting the MHQA allows for only scores of 1 (high), 7 (moderate) or 15 (low) for threats. An analysis of the scoring attributes for the site is provided below which retuned a 'high-risk' level. Consideration is given to the precautionary principle in favour of a higher habitat value score. Therefore, a score of **7 out of 15** or 'moderate risk' is considered appropriate for the site.

- Clearing and degradation of habitat – the referral area is zoned as 'extractive industry' under the GCCC city plan. Additionally, the referral area holds current approvals under state and local



legislation for extraction. A high-level mapping exercise indicates approximately 30-50% of the surrounding area (within 5 km) is disturbed land, predominantly for the rural and extractive uses (refer **Insert 1**). The high-level threat for the referral area is attributed to existing environmental approvals and zoning as part of an existing quarry footprint. Therefore, a weighted score of **0.4** or 'high risk' is appropriate.

- Inappropriate fire regimes – The GCCC city plan identifies the majority of the referral area as 'very high potential bushfire hazard' and 'high potential bushfire hazard.' A non-Koala specific Bushfire Management Plan is not in place for the referral area which is considered to have high fuel load as a result of dense *Lantana camara* (Lantana) infestation throughout. Therefore, a weighted score of **0.4** or 'high risk' is appropriate.
- Vehicle strike – There is a mix of main roads and internal industry roads located proximal to the referral area. The referral area is located 550 m east of Cedar Creek Road which is signposted as an 70 km p/hr vehicle speed and 1.3 km east of Beaudesert Beenleigh Road which is signposted as an 80 km p/hr vehicle speed. The risk of vehicle strike is considered low-moderate and therefore, a weighted score of **1.5** or 'low risk' is appropriate.
- Dog attack – Wild Dog was recorded within the referral area. Refuge for Koala is present across the majority of the site as intact canopy (i.e >70% coverage compared with benchmark) therefore, a weighted score of **0.7** or 'moderate' is appropriate.

Table 23: Koala Threat Scoring Matrix (green shading indicates applicable scores for the site)

Metric	Low	Moderate	High
Threat Thresholds			
Clearing and Degradation of Habitat	Apply one of the following options in order of priority: 1. Apply a current legal protective mechanism. 2. The site is zoned for conservation purposes or clearing is not permitted. 3. If ≤30% of the area within a 5 km buffer of the site is cleared or disturbed land.	In the absence of justification for scoring as high or low and if: >30% and <70% of the area within a 5km buffer of the site is cleared or disturbed land.	Apply one of the following options in order of priority: 1. The site is zoned for development. 2. If ≥ 70% of the area within a 5 km buffer of the site is cleared or disturbed land.
Score Weighting	**6**	**2.8**	**0.4**
Inappropriate Fire Regimes Very High Risk	Current Government endorsed Bushfire Management Plan (BMP) to protect the Koala is in effect.	Non-Koala specific BMP in effect. or; Low fuel load and low fire risk.	Site has a high fuel load and/or high fire risk.
Score Weighting	**6**	**2.8**	**0.4**

Metric	Low	Moderate	High
Vehicle Strike Moderate Risk	Low volume of cars, unsealed, no Koala accessibility, fencing, and mitigation measures in place, negligible Koala mortality.	Site-specific and evidence-based qualitative assessment of these considerations	High volume of cars, sealed, accessibility for Koala, no fencing, and no mitigation measures in place, high Koala mortality
Score Weighting	**1.5**	**0.7**	**0.1**
Dog Attack Moderate Risk	No dogs recorded on site.	Dogs recorded on site and adequate refuge for Koalas (>70% canopy cover).	Dogs recorded on site and limited refuge for Koalas (<70% canopy cover)
Score Weighting	**1.5**	**0.7**	**0.1**
Threats to Species			
Threshold Analysis	≥13.5	>5 and <13.5	≤5
Score	**15**	**7**	**1**



Insert 1: High level assessment of degraded land within 5 km of the referral area (between 30 and 50%)

→Species mobility capacity

Species mobility capacity is used to quantify the ability of the species to move from the site and through the surrounding landscape to meet survival needs. Species mobility capacity is considered particularly important in response to rapid changes to the surrounding environment, such as the commencement of land clearing. Assessment has been carried out in accordance with method provided in Section 4.3.2 with outcomes provided in **Table 24**. The site is considered moderately restricted giving it a score of 7/10.

Table 24: Impact site species mobility capacity assessment

Direction	Description of restriction	Restriction score
North	The existing quarry operations are present to the north presenting an extensive barrier tom species mobility.	Severe – 90%
South	Land to the south contains existing native vegetation	No restriction
East	Land to the east is partially restricted by existing quarry operations but predominantly contains existing vegetation. A significant portion of this area is densely infested with Lantana which does contribute to reduced species mobility for the Koala	Moderate – 40%
West	Land to the west is partially restricted by existing quarry operations but predominantly contains existing vegetation	No restriction
Total restriction score		130 / 4 = 32.5% (moderately restricted or **7 out of 10**)

Species Stocking Rate (40%)

The final component of the MHQA technique is species stocking rate. Species stocking rates are estimates of the Koala carrying capacity of the site at the time of undertaking the survey. Species stocking rate is ordinarily considered for the site as whole. However, this project includes considerably variations in vegetation values and communities that have significantly different habitat for Koala.

- *Species presence on or adjacent to the site* – A Koala was directed observed within the referral area, therefore this attribute scored **10 out of 10**.
- Species usage of the site (habitat type and evidenced usage) – The referral area contains three (3) distinct vegetation communities. AU1 reflects eucalypt woodland with evidence of usage, therefore this assessment unit aligns with potential breeding habitat and scores **15 out of 15** for species usage. AU2 contains notophyll vine forest vegetation which is not recognised as Koala habitat owing to the omission of Koala habitat trees. Therefore, AU2 only provides a dispersal role for the species and scores a **5 out of 15**. AU3 is highly degraded and recently cleared non-remnant vegetation consisting of only weeds and some regrowth acacia species, this AU also only provides a dispersal role for the species and scores a **5 out of 15**.
- Approximate density of the species on the site – measured through the use of Spot Assessment Technique (SAT) (Phillips *et al.* 2011) and targeted searches with a high probability of detection.

The SAT method is an industry recognised technique for identifying presence/absence of Koala and measuring activity. A total of four (4) SATs were completed across the referral area between 2022 and 2024. SAT results indicated 'low' usage based on utilising the East coast (med-high) criteria (Phillips and Callaghan, 2011).

- Role/importance of species population on site – the extent to which the site is considered a key source population for breeding, dispersal, is necessary for maintaining genetic diversity or near the limit of the species' range. The site is not considered to be a key source population for breeding or genetic diversity based on low usage recorded and is not near the limit of the species range. There is potential that the site is a key source population for dispersal and therefore scores a 5.

A species stocking rate score of **40 out of 70** was attributed to AU1 and **30 out of 70** for AU2 and AU3.

3.3.3 Total Quantum Impact – Koala

The proposed action will result in the clearing and functional loss of **5.9 ha** of vegetation identified as critical habitat for the Koala. With a weighted habitat quality score of 5.73 rounded to **6.00**, the proposed development will result in an overall Quantum Impact of **3.54 ha**.

PLAN 1. REFERRAL AREA IMPACTS



Notes:
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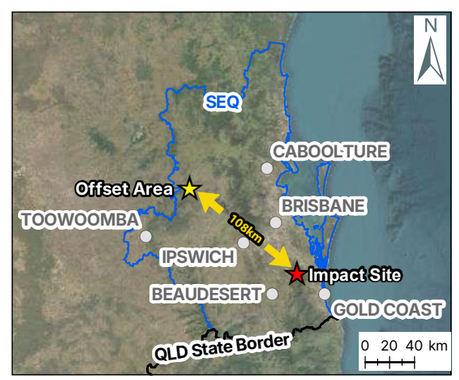
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LEGEND

- Site Boundary
- Referral Area
- Impact Extent
- Koala Habitat [5.9 ha]

Vegetation Communities Impacted

- **Assessment Unit 2:** Indicative of Remnant RE 12.11.3 [3.5 ha impacted]
- **Assessment Unit 2:** Regrowth RE 12.11.10 [1.1 ha impacted]
- **Assessment Unit 3:** Highly disturbed, dominated by weeds and Acacia regrowth [1.3 ha impacted]
- MHQA Transect



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BLUE ROCK QUARRY, CEDAR CREEK

0 20 40 60 m
Transverse Mercator
GDA 2020 | Zone 56
1:2,200 @ A3

Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024 Lots 14-16 on RP151378

9/10/2025

11390 E 01 Referral Area Impact D_SHG

PLAN 2. IMPACT SITE KOALA CONTEXT ASSESSMENT



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LEGEND

- Qld DCDB
- Site Boundary
- Referral Area [5.9 ha]
- 1km Referral Area Buffer
- Percentage of Referral Area boundary length supporting a Koala critical habitat connection off and on site [48%]
- Percentage of Koala critical habitat within 1km of Referral Area [79%]
- Size of Koala critical habitat patch >200m corridor connectivity [>500ha]



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BLUE ROCK QUARRY, CEDAR CREEK

0 100 200 300 m

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Transverse Mercator
GDA 2020 | Zone 56

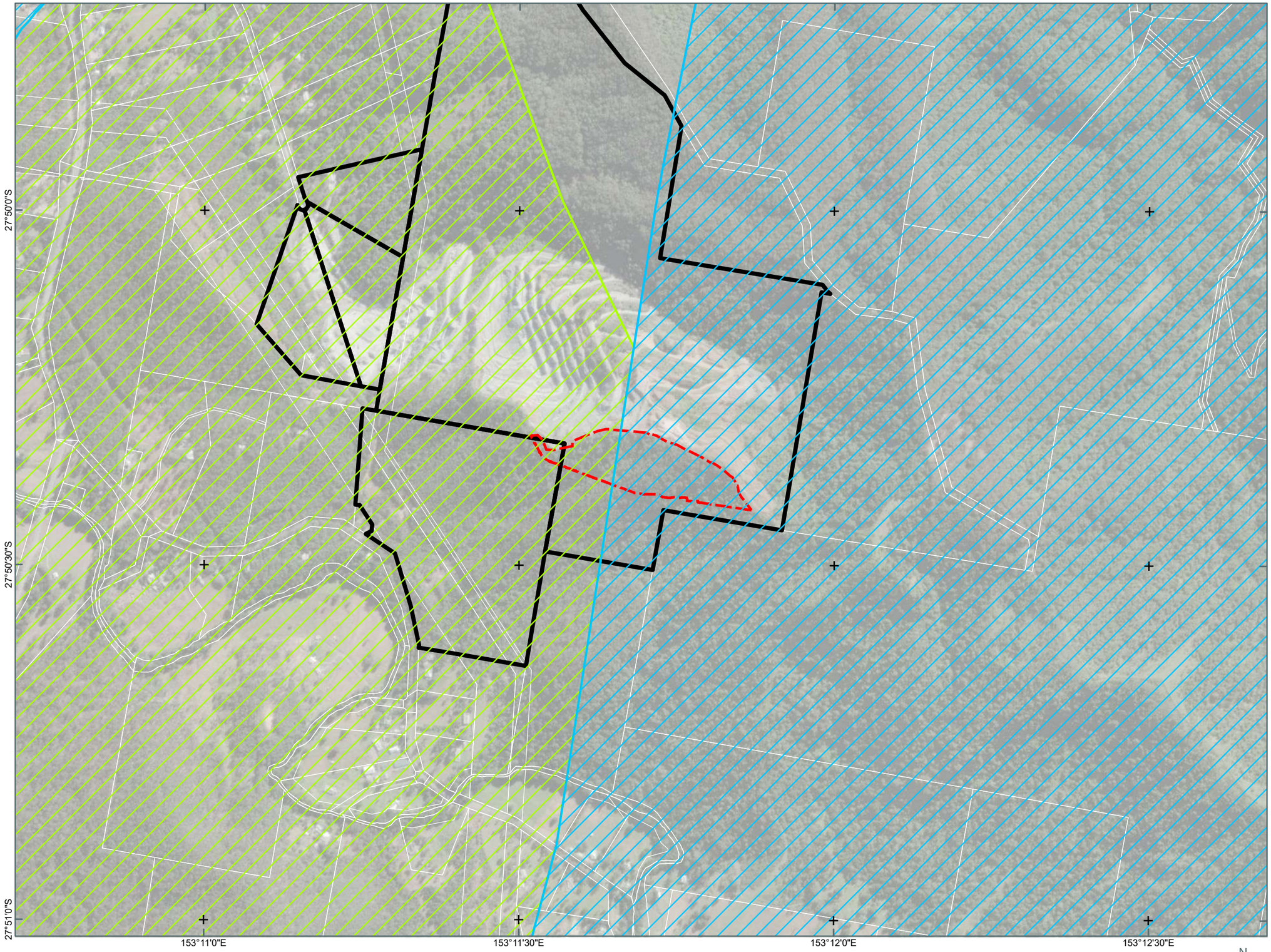
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Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024
Lots 14-16 on RP151378

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11390 E 02 Impact Koala Context D_SHG

PLAN 3. IMPACT SITE ECOLOGICAL CORRIDORS



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LEGEND

- Qld DCDB
- Site Boundary
- Referral Area [5.9 ha]

Statewide Corridors

- Regional Significance
- State Significance



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11390 E 03 Impact Eco Corridor D_SHG

4. Overview of Offset Area

4.1. Offset Property Description and Tenure

The offset area (refer **Plan 4**) is located at Little Kipper Creek Road, Biarra, within the Somerset Regional Council (SRC) Local Government Area (LGA), approximately 11 km west of the Queensland town of Esk. The proposed offset area comprises part of Lot 112 on CA311003. The offset area is located approximately 108 km north-west of the proposed impact area (refer Figure 3 and Figure 4). The offset area is currently zoned as 'Rural' under the SRC Planning Scheme. Key details relating to the offset area are provided in Table 25.

Table 25: Little Kipper Creek Road Offset Area summary

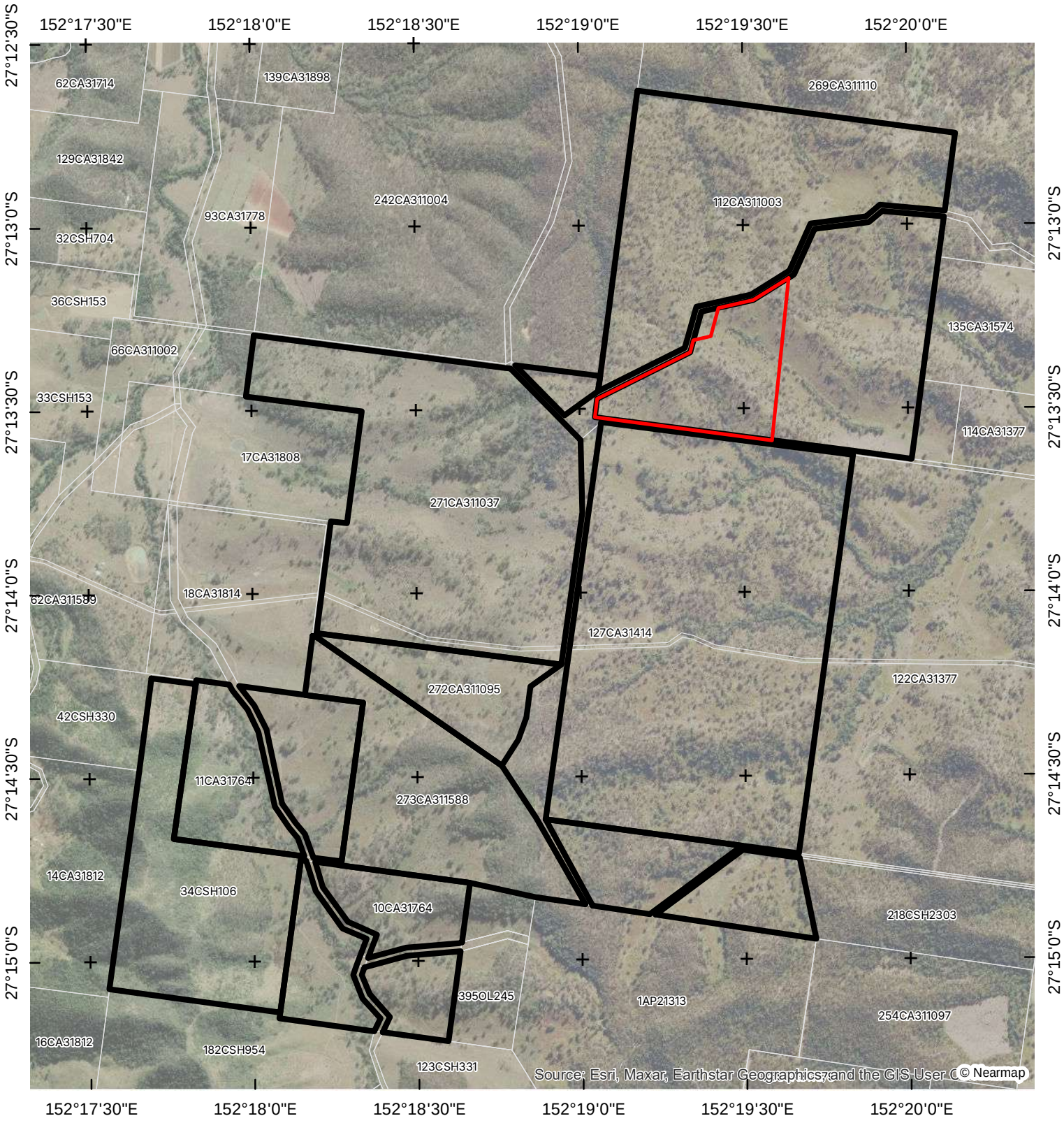
Offset Area Details	
Address	Little Kipper Creek Road, Biarra, Queensland, 4313
Lot / Plan	Part of Lot 112 on CA311003
Area	40 ha
Tenure	Freehold
Local Government Area	Somerset Regional Council

The proposed offset area forms part of the broader Little Kipper Creek Road Offset Property, which totals >800ha (refer **Figure 3**). The proposed offset area contains a single vegetation community defined as non-remnant vegetation mapped as pre-clear RE12.9-10.2 under the VMA. A review of historical aerial imagery was undertaken to assist with the broad delineation of vegetation communities and identification of historical land management patterns that potentially affect current local vegetation values (refer to **Plan 5**). The offset area has been cleared extensively since at least the 1940s with agricultural uses and associated land management continuing to the current day.

The offset area is highly disturbed as a result of grazing activities and dominated by pasture grasses with scattered Eucalypts and regrowth. Weeds were recorded across the offset area including *Melinis repens* (Red Nata Grass), *Opuntia sp*. (Velvet Tree Pear), *Gomphocarpus physocarpus* (Balloon Cotton) and *Sporobolis spp.* (Giant Rat's Tail Grass), however WONS were largely limited with only very sparse individual *Lantana camara* (Lantana) and *Opuntia sp* observed.

The proposed offset area is considered to have the capacity to meet the offset requirements given the location of the area amongst other offset sites with Koala trees and records present. The proposed offset area can act as receiving area for rehabilitation and the creation/improvement of habitat value. Additionally, this offset area sits in the northern extent of KFF's Littler Kipper Creek Property adjacent to Statewide biodiversity corridors with current approved offsets directly to the south and west (~ 175 ha total) and ~ 180 ha approximately 700 m to the south also mapped Category A. The Pine Cliffs Nature Refuge is also located within the nearby biodiversity corridor, about 3 km west of the site. The location of the proposed offset area near to a regional biodiversity corridor and within the same sub-bioregion as the impact area ensures the land will continue to provide habitat and fauna connectivity within the greater landscape.

Upon EPBC Act Approval, the offset will be protected by the mechanism chosen by DCCEEW. Most likely this will be via a Voluntary Declaration under the *Vegetation Management Act 1999* followed by a covenant either under the *Land Act 1994* or *Land Titles Act 1994*, which will provide protection for the duration of the impact. An assessment of the suitability of the proposed offset area is provided in **Section 5**.



LEGEND

- Qld DCDB
- Offset Site
- Offset Area [40.0 ha]

FIGURE 3

OFFSET SITE AERIAL

CLIENT

Fulton Hogan

PROJECT
CEDAR CREEK, QLD

COORDINATE SYSTEM
GDA 2020 MGA Z56

SCALE (A4)
1:26,578

N

0 300 600 900 1,200 m

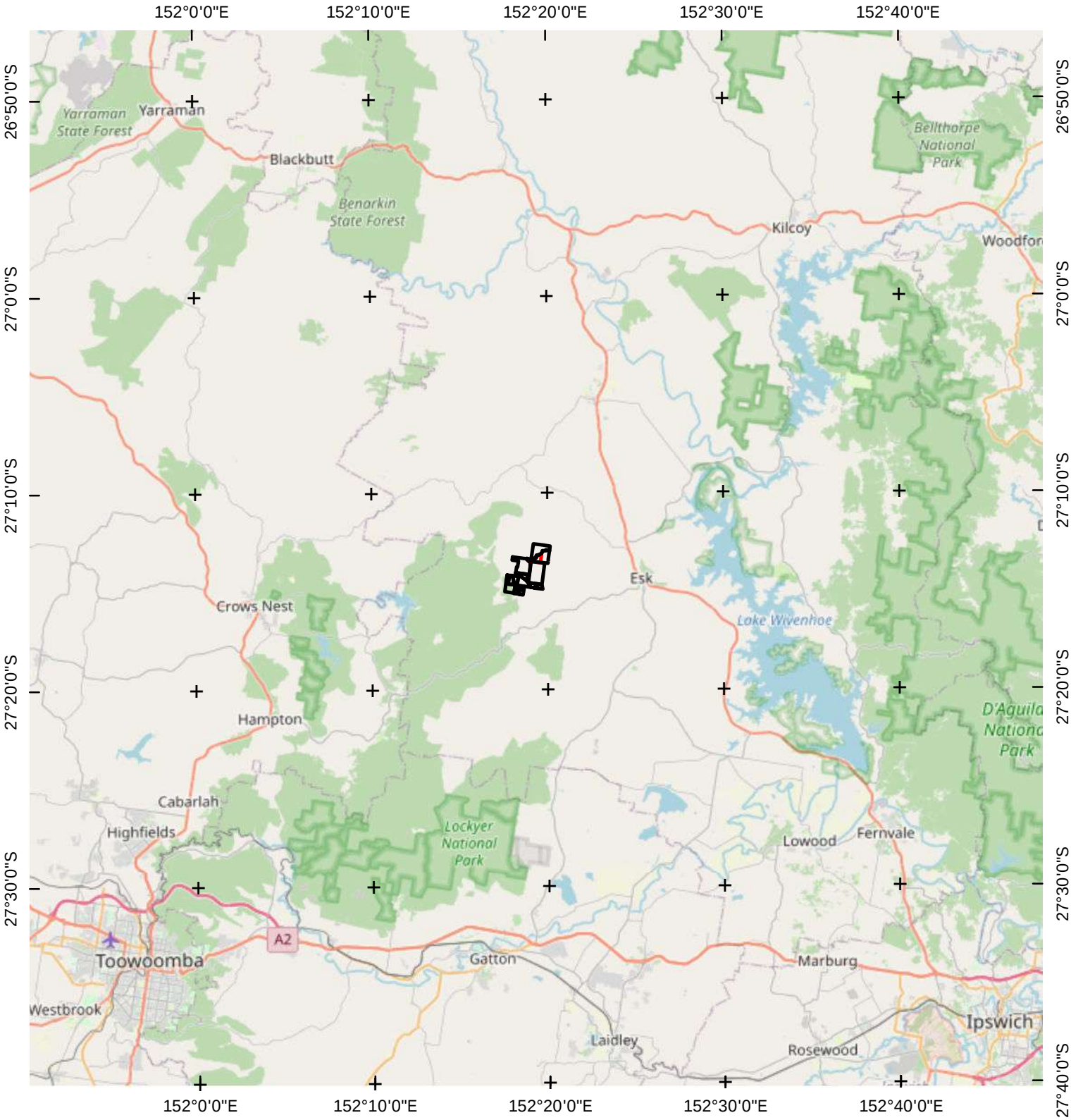
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FILE REFERENCE
11390 E Figure 3 Offset Aerial D_SHG

DATE 9/10/2025



LEGEND

Offset Site

Offset Area [40.0 ha]

FIGURE 4

OFFSET SITE CONTEXT

CLIENT

Fulton Hogan

PROJECT
CEDAR CREEK, QLD

COORDINATE SYSTEM
GDA 2020 MGA Z56

SCALE (A4)
1:500,000

N

0 5,800 11,600 17,400 23,200 m

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11390 E Figure 4 Offset Context D_SHG

DATE 9/10/2025

PLAN 4. PROPOSED OFFSET AREA



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LEGEND

- Qld DCDB
- Offset Site Boundary
- Proposed Offset Area [40.0 ha]



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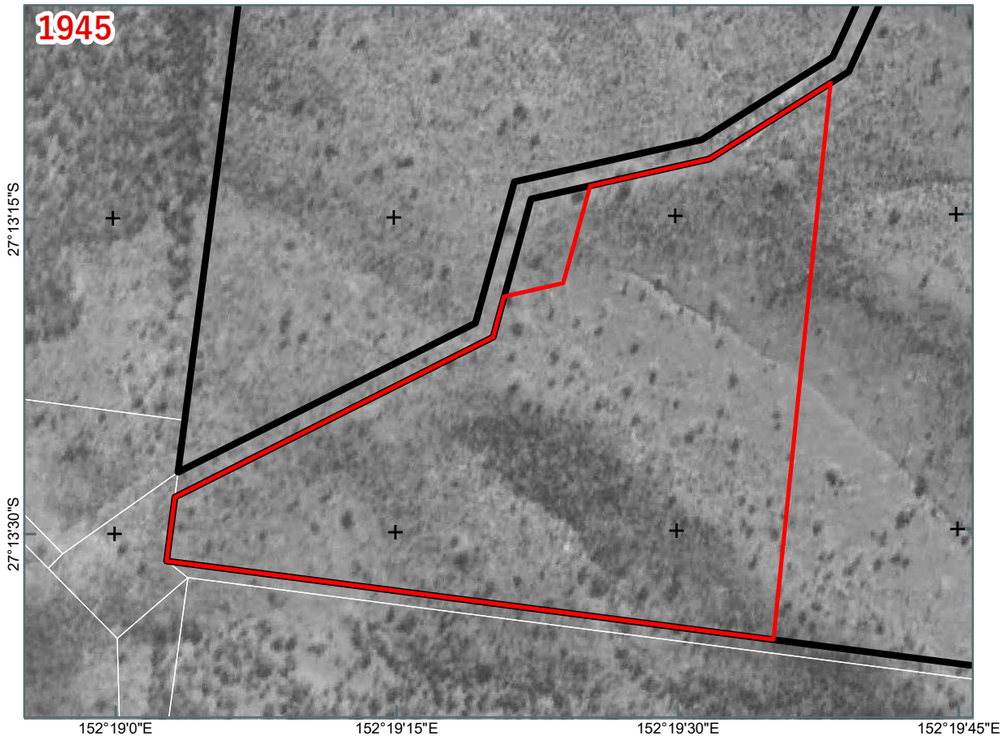
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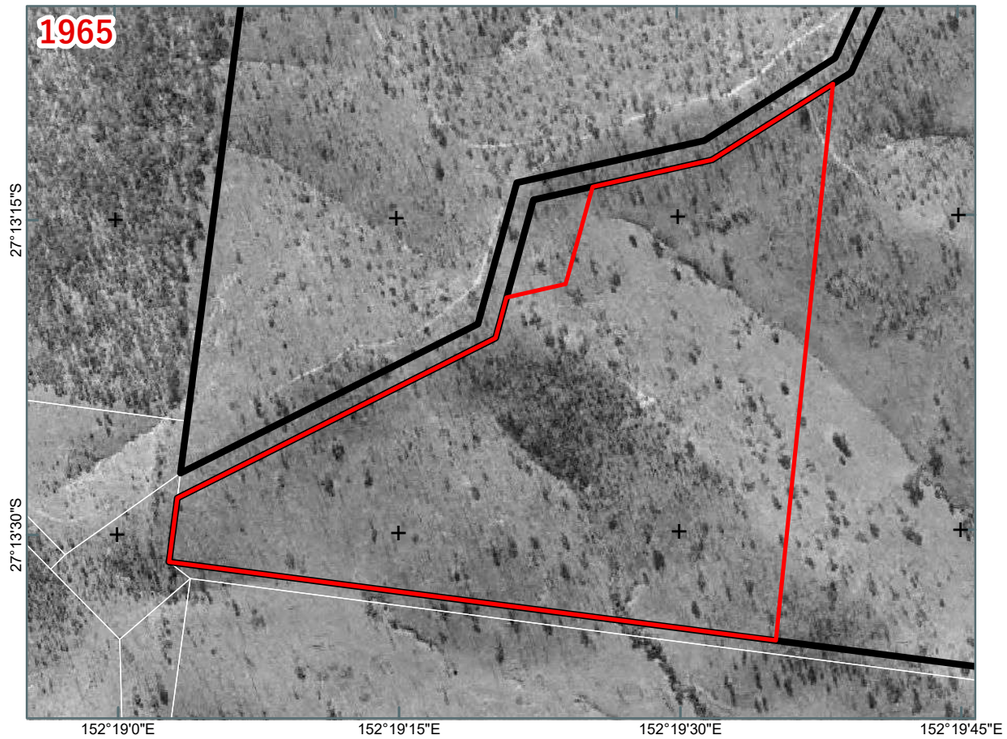
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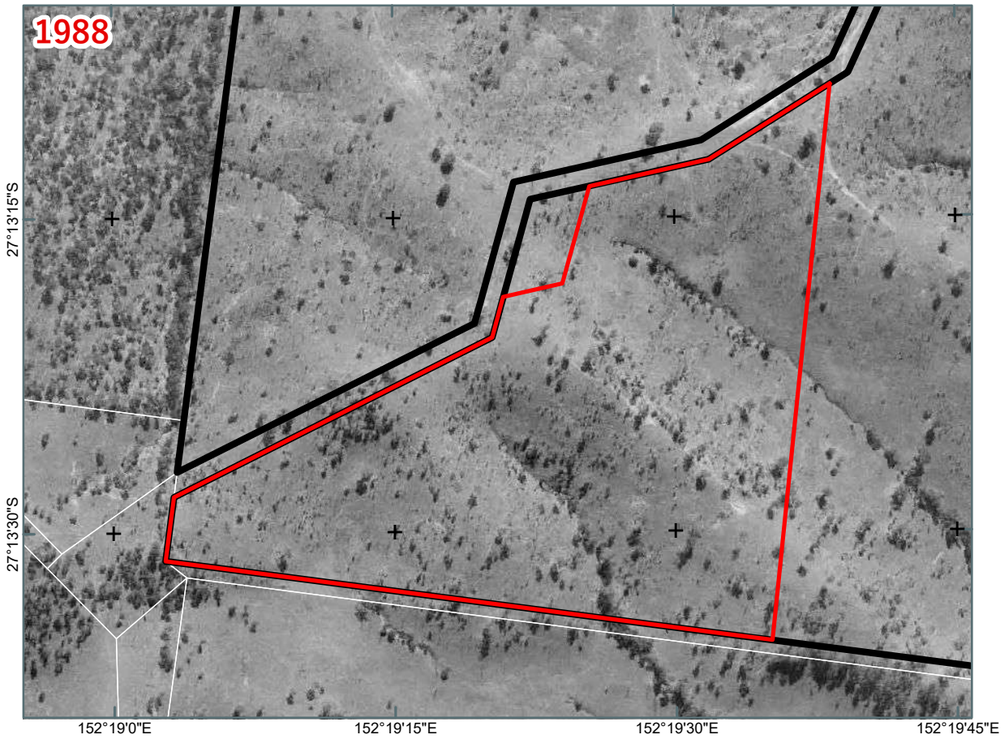
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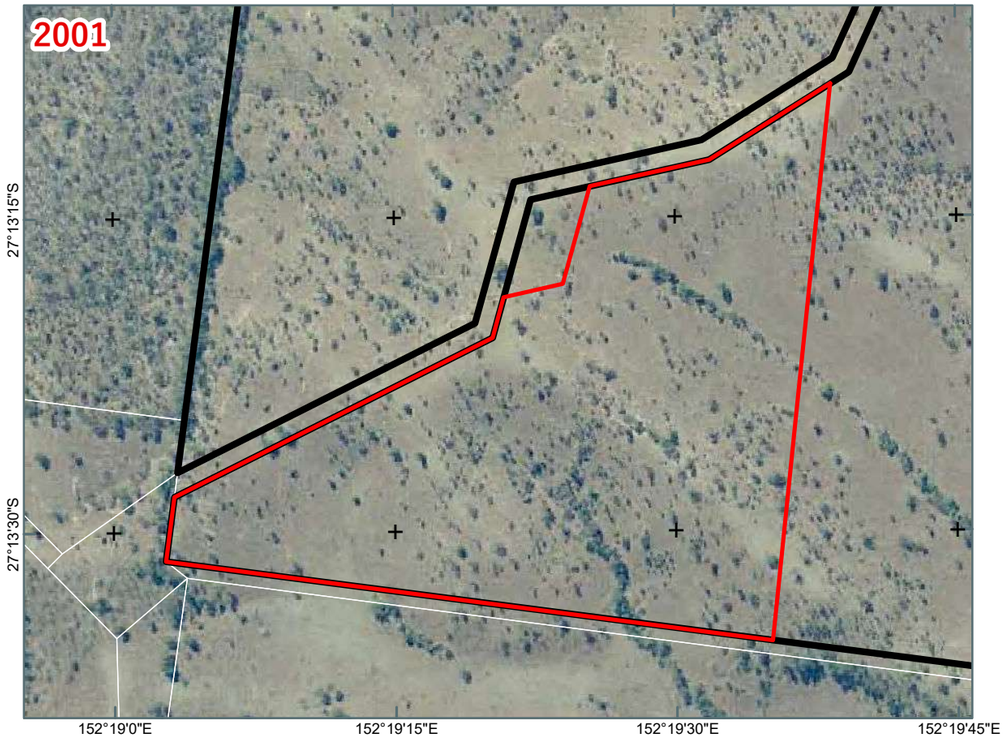
11390 E 04 Offset Area D_SHG

PLAN 5. OFFSET AREA HISTORICAL AERIAL IMAGERY









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LEGEND

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- Proposed Offset Area [40.0 ha]



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11390 E 05 Offset Historical D_SHG

5. Offset Area Suitability

As detailed in **Section 4**, one (1) offset area has been selected to be secured to wholly acquit the impacts to MNES proposed under the EPBC application (EPBC 2024/09844) and provide benefit additional to the required compensation for residual impacts. The suitability of the proposed offset area is discussed within this section and considers the bioregional context of the site, ecological values, water resources and topography, and existing habitat values for Koala.

5.1. Bioregional Context

Queensland is divided into 13 biogeographical areas to identify biodiversity features at a regional scale. The proposed offset area is located in the South East Queensland (SEQ) Bioregion. The SEQ Bioregion shares its western boundary with the Brigalow Belt Bioregion and extends from the Border Ranges on the New South Wales border, north to the dry coastal corridor between Gladstone and Rockhampton (DEHP 2016). The McPherson Range borders the southern boundary of the bioregion while the Great Dividing Range is to the west. Ranges extend north-south through the central region creating an altitudinal gradient from the coast. Small volcanic plugs remain in the landscape offering distinctive conditions for taxa and ecosystems (DEHP 2016). Large sand islands off the coast offer unique environments and create sheltered bays and passages within which marine and coastal plants and animals thrive (DEHP 2016). The impact area and proposed offset area are both in the same sub-bioregion, being the Moreton Basin.

5.2. Offset Area Values

5.2.1 Regional and landscape context

The proposed offset area sits adjacent to the Biodiversity Planning Assessment regional corridor and South East Queensland Regional Plan (*'ShapingSEQ 2023'*) regional biodiversity corridor which spans from the Noosa headland in the north, down to Mount Barney and Lamington National Park on the Queensland border (refer **Plan 6**). The corridor aims to encompass large tracts of vegetation, terrestrial connectivity, aquatic connectivity, species richness, diversity and refugia, ecosystem representation and uniqueness and climate resilience areas (Queensland Government 2017).

The regional biodiversity corridor forms part of the Great Eastern Ranges terrestrial corridor which extends from the mountains of Victoria to the Atherton Tablelands in far north Queensland (Mackay *et al.* 2010). The Great Eastern Ranges corridor provides habitat and movement for a range of species that have Federal, State and Local significance, supports significant cultural heritage values and offers scenic amenity and outdoor recreation opportunities (Mackay *et al*. 2010).

The proposed offset area will conserve freehold land surrounding the regional biodiversity corridor, extending the habitat within the adjoining legally bound environmental offset areas and that is generally available around the remnant vegetation within the regional biodiversity corridor. The proposed offset site is well positioned to provide high conservation values once rehabilitated through the management actions proposed in this OMP and contribute to the provision of protected, well-connected, and high-quality Koala habitat in the region. By assisting the natural revegetation, replanting, and removing pests, weeds, and threats, the property will provide biodiversity offsets that ensure an ecological gain on the residual impacts resulting from the impact area which aligns with offset principle 1 of the EOP.

5.2.2 Topography

The proposed offset area has varied topography characterised by open paddock and gently sloping hills. The topography of the proposed offset area ranges from 295m Above Sea Level within the higher points to 205m above sea levels in the gully line areas. Refer to **Plan 7.**

5.2.3 Water resources

The proposed offset area contains a central watercourse which flows downstream west-east. Additional gully lines are present across the proposed offset area which are not mapped as waterways. This watercourse can be observed in **Plan 7**. Vegetation is consistent across the proposed offset area.

5.2.4 Koala habitat

The proposed offset area comprises low quality Category X (non-remnant) vegetation which is mapped as a single pre-clear vegetation community RE12.9-10.2. The site does contain scattered Koala habitat trees and regrowth vegetation but contains significant cleared open paddock with pasture grasses throughout. Existing vegetation within the offset area consists of predominantly *Corymbia citriodora* (Spotted Gum) with *Eucalyptus crebra* (Narrow-leaved Ironbark), *Corymbia intermedia* (Pink Bloodwood) and *Angophora subvelutina* (Broad-leaved Apple). Species present are indicative of the pre-clear vegetation community of RE12.9-10.2 described in **Table 26** and **Photo set 1**.

Table 26: Regional ecosystem descriptions

Regional Ecosystem	Description (Queensland Herbarium)
12.9-10.2	*Corymbia citriodora subsp. variegata* open forest or woodland usually with *Eucalyptus crebra*. Other species such as *Eucalyptus tereticornis*, *E. moluccana*, *E. acmenoides* and *E. siderophloia* may be present in scattered patches or in low densities. Understorey can be grassy or shrubby. Shrubby understorey of *Lophostemon confertus* (whipstick form) often present in northern parts of bioregion. Occurs on Cainozoic and Mesozoic sediments. Not a Wetland. (BVG1M: 10b).

The dominance of vegetation communities containing foraging habitat values for the Koala suggests the proposed offset area can provide value for this species with targeted restoration techniques.

5.2.5 Current management arrangement

Presently, the proposed offset area is utilised for cattle grazing and is managed through various farming practices. This includes the use of the following management activities:

- Controlled grazing to ensure ground cover levels are maintained, subsoil moisture is retained, and pasture grass growth is encouraged
- Invasive and noxious weed control in grazing areas targeting WONS where practicable, and;
- Establishing and maintaining adequate firebreaks across the property.

5.2.6 Current threats

The wider Little Kipper Creek Road offset property is and has been utilised in various ways for agriculture, which attracts threats to both livestock and native wildlife. The major and obvious threat within the proposed offset area and broader offset property is Wild Dogs. The SRC lists wild dogs as abundant and

widespread throughout the region and has also listed Wild Dogs (*Canis familiaris dingo*, *Canis familiaris dingo* X *Canis familiaris*, *Canis familiaris*) as declared pest animals. The SRC website documents that wild dog numbers are at an all-time high across the SRC area. Further, residents are increasingly engaged in raising livestock and poultry, resulting in a readily available food sources for wild dogs.

The Queensland WildNet database identifies 2 confirmed records of *Canis* sp. and/or *Canis familiaris* and 3 records of European foxes within 20 km of the proposed offset area, located within connected vegetation. Wild dogs are known to travel up to 20 km seeking prey with home ranges of individuals likely to overlap with the offset area. Further, as discussed in detail in **Section 6,** both motion-sensor camera traps that were placed on site for the baseline surveys directly recorded wild dogs.

Presently, under the Queensland *Biosecurity Act 2014*, there is a 'general biodiversity obligation' for landholders to manage biosecurity risks that are under their control and take reasonable and practical steps in doing so. To determine the extent of management and whether it is necessary to take reasonable steps in managing the biosecurity risk, the landholder is required to assess the risk and its potential harm (*i.e.,* extensive productivity loss). Currently, the landholder does not undertake feral animal control as it is assessed under the 'general biosecurity obligation' of the *Biosecurity Act 2014*, that feral animal threat to productivity does not have a positive cost benefit to the current land use (*i.e.,* the expenditure to undertake feral animal control would not result in enough economic gain in productivity to warrant implementation). Other threats include:

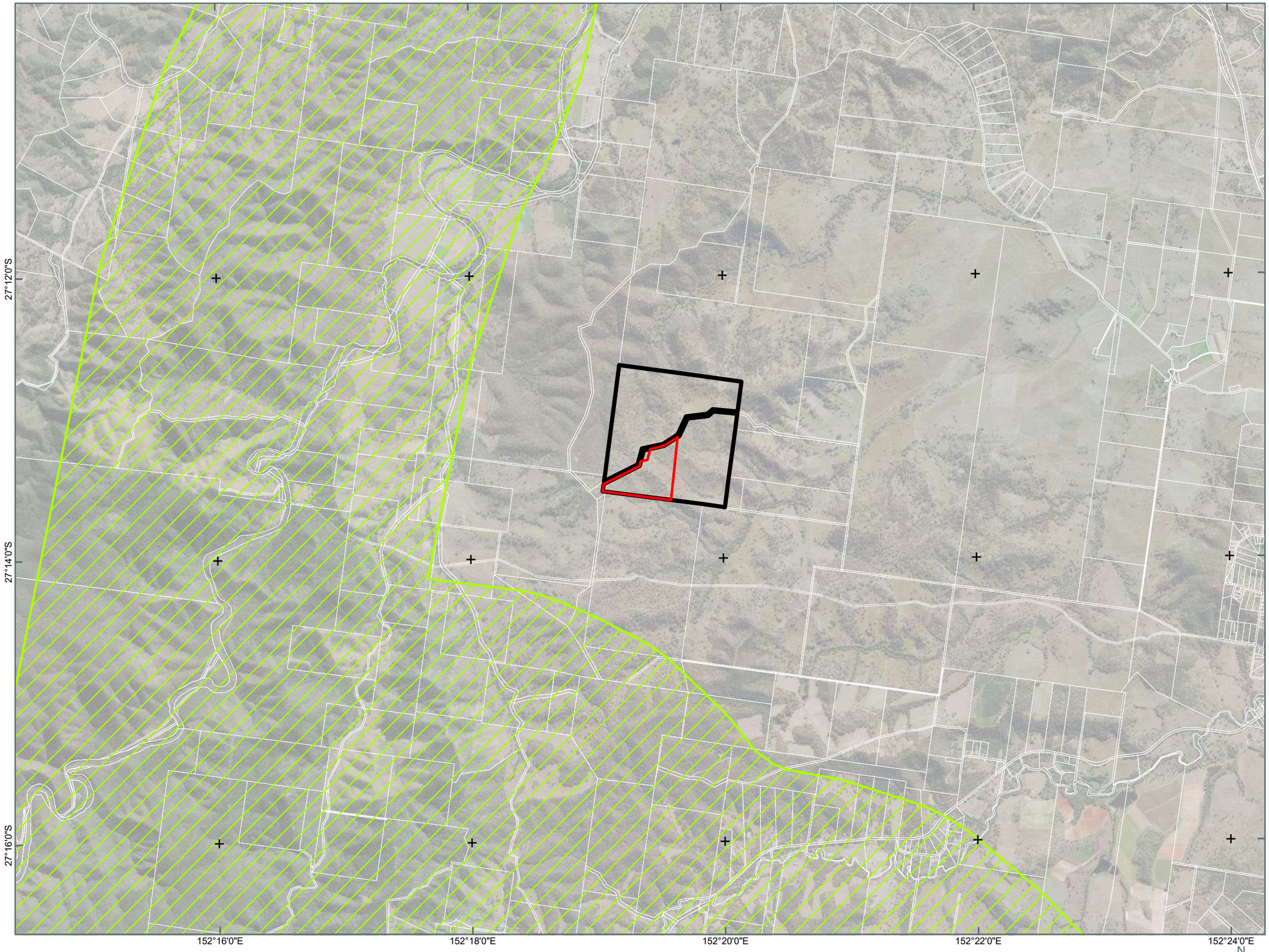
- clearing and harvesting of timber for pastoral uses
- uncontrolled wildfire, and;
- barbed wire.





Photo set 1: AU1 – Non-remnant RE12.9-10.2

PLAN 6. OFFSET SITE ECOLOGICAL CORRIDORS



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LEGEND

- Qld DCDB
- Offset Site Boundary
- Proposed Offset Area [40.0 ha]

Statewide Corridors

- Regional Significance



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11390 E 06 Offset Eco Corridor D_SHG

PLAN 7. OFFSET SITE TOPOGRAPHY



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LEGEND

- Qld DCDB
- Offset Site Boundary
- Proposed Offset Area [40.0 ha]
- 5m Contours



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11390 E 07 Offset Topography D_SHG

5.3. Suitability Analysis – Environmental Offset Policy

The objective of this OMP is to outline appropriate management actions to achieve the offset outcomes specified within the EPBC Act and provide an overall improved conservation outcome and net gain in Koala habitat, thereby ensuring the long-term viability of this species. **Table 27** lists the principles of the EPBC Act EOP and describes how the proposed offset has been developed to adhere to these principles.

Table 27: Offset suitability analysis – Environmental Offsets Policy

EOP Requirements Suitable offsets must:	Delivery
Deliver an overall conservation outcome that improves or maintains the viability of the protected matter	The offset area will directly contribute to the ongoing viability of the Koala (*Phascolarctos cinereus*). Protection, enhancement and management of the offset area in accordance with this OMP will deliver an overall conservation benefit and net gain in Koala habitat. Prior to the impact, the offset area was not protected or managed for conservation outcomes. Actions outlined in this OMP will commence the regeneration and restoration of habitat, contributing to a connected corridor with reduced threats. In doing so, the OMP aims to encourage the use of restored and new areas of habitat through increasing the numbers and area of Koala food trees, maintaining low abundance of weeds and reducing predator abundance. The proposed offset aims to contribute to the resilience of the Koala by increasing landscape connectivity provided through the protection of the offset properties.
Be built around direct offsets but may include other compensatory measures	The offset is built around direct offsets and easily compensates for the potential impact. The offset area will be legally secured for conservation purposes prior to the impact occurring and will endure for the duration of the impact. Legally securing and managing the offset area in accordance with this OMP protects the areas from incompatible land uses and contributes to the viability of the Koala.
Be in proportion to the level of statutory protection that applies to the protected matter	The OAG lists the probability of annual extinction of the Koala as 1.2%. The use of this measurement in the OAG ensures that the appropriate level of statutory protection is applied. All threats to Koalas outlined in the Department's Species Profile and Threats Database and EPBC Act Conservation Advice and Recovery plan for the Koala have been addressed within this OMP.
Be of a size and scale proportionate to the residual impacts on the protected matter	Permanent protection and management until the proposed outcomes are achieved will deliver a conservation gain adequately compensating for the quantum impact for each matter. The total offset area for protection and management is 40 ha, delivering a 151.32% offset for the Koala, thus satisfying the 90% minimum direct offset area. Management actions outlined within this OMP aim to protect and enhance Koala habitat, compensating for and exceeding habitat quality of the impact. The offset and management actions will provide: • Legally secured and long-term protection of 40 ha of Koala habitat.



EOP Requirements Suitable offsets must:	Delivery
	• Improvement of habitat through revegetation and natural regeneration of Koala food trees and removal of weeds. • Contribution to a large contiguous protected habitat and biodiversity corridor with reduced threats. • Long-term reduction in threats, through the removal of incompatible land uses. • Reduced risk of Koala mortality or injury due to vehicle strike. • Reduced risk of Koala mortality or injury due to predators, through control of non-native predators. • Reduced risk of high intensity fire through management of fuel loads. • Reduced risk of the spread of diseases and/or pathogens.
Effectively account for and manage the risks of the offset not succeeding	Confidence in the success of the offset is high (≥75%) given the detail and intensity of the management actions outlined within this OMP. The confidence is supported by the offset area selection, design of management actions, and clear monitoring and reporting procedures. The offset area contains well-maintained access tracks that will facilitate access to planting areas. Risks associated with the offset delivery will be mitigated and managed through the detailed management actions outlined in **Section 9**. Management actions have been drawn from offset targets which aim to protect and conserve large, connected areas of Koala foraging habitat to support viable populations.
Be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs	Legally securing the offset area for the duration of the impact will ensure existing and future owners are prohibited from conflicting land uses, including clearing. Management beyond minimum legislative requirements is proposed across the whole area to ensure loss of habitat values does not occur through intensification of weeds causing loss of connectivity, destruction of habitat via hot, intense fires, or increased risk of mortality or injury by dog attack.
Be efficient, effective, timely, transparent, scientifically robust, and reasonable	Efficient and Effective: • The offset area is surrounded by a landscape of connected Koala habitat, and more directly by potential habitat that is being actively rehabilitated as offsets. Management actions will ensure efficient delivery of outcomes over the offset area and proactive management, monitoring and reporting will ensure response/corrective actions are timely and focused. • Prior to the EPBC Act process, the offset area was not protected or managed for conservation outcomes. Protection and management of the offset area in accordance with this OMP aims to deliver an overall



EOP Requirements Suitable offsets must:	Delivery
	improved conservation outcome and net gain in Koala habitat. Timely: • The mix of paddock and scattered trees within the offset area allows for the achievement of immediate and long-term conservation outcomes. The offset area will be legally secured prior to the commencement of clearing at the project site. • Following the approval and implementation of this OMP, management actions outlined within **Section 9** will commence. Adaptive management processes will ensure management actions respond to technology improvements, natural events and potential risks identified in the risk assessment. Transparent: • The baseline surveys established the survey methodology to be used for the monitoring and reporting required for the lifetime of the approval. A clear monitoring and reporting framework is established within this OMP (refer **Section 6**). Monitoring and reporting of the offset area will be summarised within the Offset Area Annual Report provided by the Offset Provider which is then included in the Annual Compliance Reports for project. Scientifically robust: • The proposed offset area was assessed by suitable qualified and experienced Ecologists. Ongoing management and monitoring actions will be conducted in collaboration with other qualified Ecologists and regeneration specialists to achieve the outcomes specified within the EPBC Act approval and this OMP. • The baseline surveys conducted for the offset area follows standard, accepted monitoring methodology and are considered scientifically robust, reliable and repeatable. This will ensure the monitoring and compliance reporting are consistent and relate back to the overall outcomes specified within the EPBC Act approval. Reasonable: • The offset is considered reasonable as the offset areas are greater than the significant residual impact on both Koala habitat and provide a 151.32% offset for the Koala based on the quantum impact (using the OAG). • This OMP outlines appropriate management actions to achieve the offset outcomes specified within the EPBC Act approval and an overall improved conservation outcome and net gain in Koala habitat, ensuring the long-term viability of the protected matters.



EOP Requirements Suitable offsets must:	Delivery
Have transparent governance arrangements including being able to be readily measures, monitored, audited and enforced	This OMP provides a detailed monitoring and reporting framework, performance criteria and corrective actions (refer **Table 14** and **Sections 6 and 7**). These provide minimum requirements for success/failure of management actions and triggers for corrective actions. The approval holder will engage qualified and experienced consultants and specialists periodically throughout the offset delivery to ensure the offset outcomes are achieved. Section 491 of the EPBC Act makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. As such, engaged consultants and specialists are required to complete a declaration of accuracy in reports provided to the Department, acknowledging their responsibility and accountability for information provided to the Department. Annual Compliance Reports must be published on the approval holder's website in accordance with an EPBC Act approval and may be subject to audit by the Department by an independent auditor in accordance with section 458 of the EPBC Act, and/or used to verify compliance with the conditions. Summaries of the result of an audit may be published on the Department's website or through the general media.

5.3.1 Recovery plans and advice

Koala Conservation Advice and National Recovery Plan

Conservation Advice for *Phascolarctos cinereus* (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (Threatened Species Scientific Committee, 2010).

The Conservation Advice came into effect on 12 February 2022. It lists six conservation and recovery actions that are categorised into 'supporting strategies' which provide governance to coordinate actions, led by the Australian Government in partnership with the States and Territories, and 'on-ground (direct) strategies' which relate to improving habitat quality and restoration, implemented at the site level.

The impact and offset are considered to be consistent with the on-ground strategies detailed in the Conservation Advice and recovery Plan:

- Strategy 3: Increase habitat protection
- Strategy 5: Strategic habitat restoration
- Strategy 6: Active metapopulation management

Strategy 3: Increase habitat protection

Land-use change is the most significant threat to the Koala through habitat loss, fragmentation, and degradation. Increasing the total area of protected, connected, quality Koala habitat is important to protect and recover Koala populations.

The proposed offset area will create a net gain of Koala habitat, with improved habitat quality, connectivity, and longevity over the impact area. The eventual dedication of the offset site will protect this gain in Koala



habitat in perpetuity, securing it from the threat of land-use change or increases in the intensity of current grazing practices.

Strategy 5: Strategic habitat restoration

Restoration increases the overall habitat available for Koalas and increases the connectivity between areas of habitat to contribute to ensuring the long-term survival of Koala populations. It involves restoring lost and degraded habitat to improve environmental functions.

While the project proposes to impact 5.9 ha of Koala habitat, the habitat within the impact area consists of a mixture of moderate and low value habitat as a result of high levels of disturbance and poor value habitat. At approximately five times the size of the impact area and with greater contextual suitability that will be protected, the rehabilitation of the proposed offset site will provide a net gain of Koala habitat by strategic habitat restoration. As it is surrounded by other offset sites and adjacent to a regional biodiversity corridor, this habitat is located well to maximise the projected benefit to Koala.

Strategy 6: Active metapopulation management

Metapopulation management concerns the movement of individuals and genes between populations. Consideration of metapopulation management is reflected in the design of the development, specifically the creation and rehabilitation of conservation areas to promote connectivity and Koala movement within the landscape, and through the removal of hazards to Koala.

Although the project will involve the removal of habitat critical to the survival of the Koala, all significant residual impacts are to be compensated through the provision of land-based offsets. Proposed offsets will be located amongst Koala-occupied areas of connected and resilient habitat, and within the same sub-bioregion as the impact area.

South East Queensland Koala Conservation Strategy

The South East Queensland Koala Conservation Strategy 2020-2025 (the Strategy) (DES 2020) came into effect on 16 February 2020 and addresses the key threats facing Koalas and outlines strategies to stop the decline of Koala numbers and set in train the species' recovery. Issues addressed in the Strategy include:

Habitat protection

The project requires impacts of 5.9 ha to Koala habitat. However, the impact area sits adjacent to an existing quarry and is within an extractive industry with an existing state environmental approval (EA-100268669). Therefore, assessment under the Strategy is not triggered.

All vegetation clearing under the project will be governed by impact and pre-clearing management protocols, including preparation of site-based management plans and pre-start checklists.

Habitat restoration for Koalas

The project requires impacts of 5.9 ha to Koala habitat. However, the referral area sits adjacent to an existing quarry and is within a extractive industry with an existing state environmental approval (EA-100268669). Proposed offsets will be located in areas of connected and resilient habitat, and significant uplift in habitat quality is possible given the non-remnant, cleared condition it currently exists in as a result of extensive historical rural land uses.

Threat management

Section 4.8 lists the relevant threats to Koala (vehicle strike, dog attack and weed invasion) and effective mitigation measures to reduce risks during the construction and operational phases of the project. Mitigation measures are to be incorporated into Vegetation Conservation and Management Plans, and Fauna Management Plans. All contractors and visitors are to undertake site inductions to address threats and risks to MNES.

Improved mapping, monitoring, research and reporting

Not applicable.

Strong community engagement and partnerships

Not applicable

Partnerships and strategic coordination

Not Applicable.

In conclusion, the project has considered the avoid, mitigate and offset hierarchy. The proposed quarry extension is directly adjacent to the existing quarry footprint within land that Is zoned as extractive industry and covered by a state environmental approval. The project will result in the removal of 5.9 ha of Koala habitat including 2.4 ha of extremely low value vegetation offering only a dispersal role to the species. All vegetation clearing under the proposal will be government by State requirements for fauna management and the significant residual impacts will be compensated through land-based offsets, in an area surrounded by other offsets and a nearby regional biodiversity corridor that will ensure connectivity and longevity of the rehabilitated habitat is protected.

6. Baseline Surveys

6.1. Offset Area Baseline Surveys – Methodology

Baseline field surveys to determine habitat quality for Koala, non-native vertebrate pest presence and weed mapping was completed on 18 and 19 February and 4 March 2025. Refer to **Table 28** and the subsections below for specific details on survey dates for each method applied.

Table 28: Offset area baseline field surveys methods summary

Date	Temperature	Rainfall	Methods implemented
18 February 2025	17.6°C min – 32.0°C max	0 mm	MHQA transects, camera installation, SAT surveys.
19 February 2025	19.1°C min – 32.7°C max	0 mm	MHQA transects, SAT surveys
4 March 2025	17.3°C min – 32.0°C max	0 mm	Camera collection and weed mapping

NB: Temperature data sourced from Bureau of Meteorology (BoM) – Station 040082 University of Queensland Gatton.

6.1.1 Habitat quality – Koala

The Koala habitat quality assessment methods used for the impact area (described in **Section 0**) were also applied to the proposed offset area. Site condition within the proposed offset area was assessed using the BioCondition method as recommended under the Queensland environmental offsets framework within a single AU identified in the proposed offset area as shown in **Table 29** and shown in **Plan 8**. Assessment at multiple locations is necessary where possible to measure vegetation condition at representative locations across the spatial extent of the proposed offset area. Field survey effort is provided as **Plan 9**.

Site condition was assessed through the completion of a total of two (2) MHQA transects within the proposed offset area to account for minor variations in conditions.

Table 29: Summary of assessment units and MHQA transects – offset area

Assessment unit	Vegetation community	Area (ha)	MHQA transect
AU1	Non-remnant pre-clear RE12.9-10.2	40	Transects 1 and 2

6.1.2 Spot Assessment Technique surveys

Baseline Koala activity levels were determined through utilising the SAT surveys (Phillips et al. 2011). The SAT method is an industry recognised technique for identifying presence/absence of Koala at a site. Results from the SAT surveys are compared against current available published scientific literature to identify an estimated Koala carrying capacity (stocking rate) to be determined. A total of two (2) SAT surveys were completed across the proposed offset area in conjunction with MHQA transects 1 and 2 (refer **Plan 9**) to target presence of Koala.



PLAN 8. OFFSET ASSESSMENT UNITS



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LEGEND

- Qld DCDB
- Offset Site Boundary
- Proposed Offset Area [40.0 ha]
- AU1 – Non-remnant RE12.9-10.2 [40.0 ha]



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0 50 100 m
N
Transverse Mercator
GDA 2020 | Zone 56
1:3,700
@ A3

Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024
Lots 14-16 on RP151378

9/10/2025

11390 E 08 Offset AUs D_SHG

PLAN 9. OFFSET BASELINE FIELD SURVEY



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LEGEND

- Qld DCDB
- Offset Site Boundary
- Proposed Offset Area [40.0 ha]
- GPS Track Log
- MHQA Transect
- SAT Survey
- Motion Camera



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11390 E 09 Baseline Field D_SHG

6.1.3 Motion-triggered camera trapping

Surveys for non-native vertebrate pest presence, primarily targeting wild dogs which are the primary threat to Koala, were completed via the use of infrared motion-triggered camera trapping. Camera trapping involves setting up a fixed digital camera to capture images or video of animals that pass in front of a camera with an infrared trigger. This survey technique identifies fauna activity beyond the scope of direct observational studies and with the absence of potential observer impacts. The method for determining camera locations utilise the standard grid-based system which is common practice on sites where access is good. In lieu of any published guidelines from DCCEEW for monitoring wild dogs, the number of cameras/distances between cameras was driven by several case studies and existing guidelines (refer **Table 30**). The literature states that as a result of extensive home ranges and large daily movements, a recommended camera spacing of between 500 m and 1 km is advised to capture activity.

The field survey design utilised the lower threshold of approximately 500 m as a guide for camera placement/number of cameras ensuring surveys are adequate for species detection. The ultimate camera trapping locations were driven by site specific factors. Cameras were directed to animal trails which are more likely to support fauna. Heavy, loose vegetation was avoided to reduce the chance of false triggering, and the camera was aimed to avoid sun shining directly onto the lens. Cameras were attached 30-100 cm from the ground on a tree or post and directed towards landscape features.

Table 30*:* ***Camera spacing justification***

Target Animal	Approx. Home Range	References	Spacing Recommendations
Wild Dog	>250ha	• Department of Primary Industries, NSW Government (2018), Guidelines for camera trapping wild dogs, foxes and feral cats	• 1 km
		• Northern Territory Government (2015), A guide for the use of remote cameras for wildlife survey in northern territory	• 500 m
		• Contardo, J. E. (2017). Occupancy of free-ranging dogs in relation to infrastructure and habitat on Navarino Island, Cape Horn Reserve, Chile	• 700 m
		• Department of Industry, (2017). NSW Wild Dog Management Strategy 2022-2027	• 700 m
		• McNeill et al (2016), Dingoes at the Doorstep: Home Range Sizes and Activity Patterns of Dingoes and Other Wild Dogs around Urban Areas of North Eastern Australia	• 700 m

Four (4) camera traps were installed across the proposed offset area for a period of 14 nights from 18 February 2025 to 4 March 2025, baited with chicken necks to target wild dogs and other known potential threats to MNES in the broader area. Refer to **Plan 9** for the location cameras and **Table 31** for a description of camera deployment locations.

Table 31: Fauna camera summary (18 February to 4 March 2025)

ID	Latitude	Longitude	Photo	Description of location
1	-27.219665°	152.326939°		Camera 1 was deployed in the northern extent of the proposed offset area.
2	-27.223256°	152.324111°		Camera 2 was deployed in the central portion of the proposed offset area along the main ridgeline where a historical access track is present.

3	-27.225374°	152.324137°		Camea 3 was deployed in a gully line in the south-east of the proposed offset area.
4	-27.224549°	152.318177°		Camera 4 is located in the south-west corner of the proposed offset area adjacent to the main access track.

6.1.4 Relative Abundance Index

The results of the motion-triggered camera detection survey (recorded species and number of occurrences over days of camera deployment) were utilised to provide relative abundance of non-native vertebrate pest species over the proposed offset area, reducing bias and increasing repeatability.

A relative abundance index (RAI) is then calculated for feral animal abundance, using the formula **RAI= D/TN x 100**, where D is number of individual detections and TN is the total number of camera-trap nights (all cameras combined). This methodology ensures that the surveys are representative of the entire area and are repeatable for future monitoring requirements. A higher RAI indicates a higher pest presence.

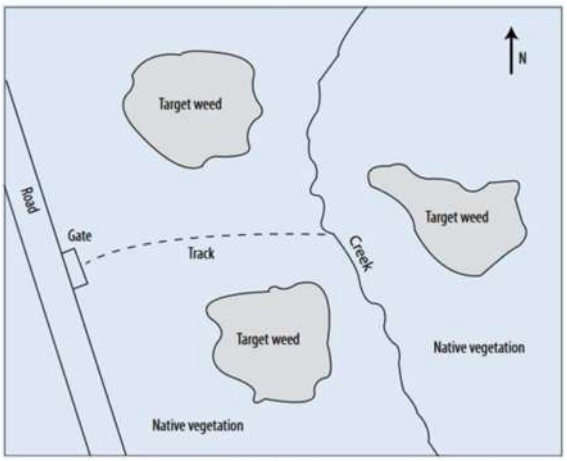
6.1.5 Weed cover

WONS are considered the primary focus of this assessment. However, WONS were observed in low abundance and therefore this assessment included the mapping of any non-native flora species. Mapping non-native flora is ideally done by directly delineating every plant to provide an exact percentage coverage for the site. However, this method is often not feasible given the abundance of weeds and the mixture of flora species across the site. Therefore, the percentage cover of weeds was determined using a two-step method detailed in the *Guidelines for Monitoring Weed Control and recovery of native vegetation* (Auld 2009).

Step 1: Delineate weed patches

Using an antenna-based GPS system, the spatial extent or patches of weeds (including WONS) within the proposed offset area was mapped on-ground as polygons to produce a 'mud map' of the site (refer **Extract**

1). Each polygon was given an initial visual estimate of weed cover percentage. This step is completed to define patches of weeds and subsequently guide the placement of targeted weed transects as a means of accurately estimating percentage cover within a given patch. The entirety of the proposed offset area was observed to contain consistent weed coverage in the form on non-native pasture grasses throughout.



Extract 1: 'Mud map' from Auld (2009) – Figure 1.

Step 2: Line-transect method

To quantify the percentage cover within each mapped area the line-transect methodology presented in the *Guidelines for Monitoring Weed Control and recovery of native vegetation* (Auld 2009) was implemented.

In this methodology, the ground cover of a weed is a measure of the perpendicular projection of aerial parts of plants to the ground. This method minimises user variability as cover calculations are not reliant on estimations, as cover is instead accurately measured against the tape, typically standardised at 100 metres in length. With this technique, the percentage cover of all weed species (WONS and non-WONS) along the line transect is recorded.

The entirety of the proposed offset area was observed as consistent vegetation communities and ground covers as a result of widespread cattle grazing. Two (2) 100 m transects were established across the proposed offset area to obtain quantifiable data. Auld (2009) does not prescribe a minimum number of line-transects, a feature of other transect methods such as the BioCondition Assessment Manual. Due to the relatively small size of the proposed offset area and consistent conditions, the location of transects are considered adequate to represent the general condition of the proposed offset area. Refer **Plan 10** to for the location of transects and the extent of initial mapped weed polygons.

Surveys to estimate the weed cover using the vegetation cover classes proposed by Auld (2009) will be undertaken by suitably qualified persons before the end of Years 5, 10, 15, and 20 of the offset and are recommended at Year 8, in addition to Modified Habitat Quality Assessment transects which also involve a component of weed cover estimation. Due to the location and size of weed patches during baseline surveys, only one transect was required to be completed for each patch category, but if additional transects are required as part of future surveys, the average cover percentage for a patch should be calculated. Results and progress against the management and monitoring actions will be reported on as part of the Annual Compliance Report.

6.2. Offset Area Baseline Assessment Results

6.2.1 Assessment unit description

Assessment Unit 1

The entirety of the proposed offset area was identified as a single assessment unit categorised as non-remnant vegetation of pre-clear RE12.9-10.2. While gully lines are present, these are the upper catchments and do not contain a significant change in vegetation to be considered a separate assessment unit. The entirety of the proposed offset area is reflective of land zone 9-10 (sedimentary rocks). The majority of the proposed offset area consists of cleared paddocks dominated by pasture grasses at near 100% coverage. Ground cover species present are predominantly native species including *Heteropogon contortus* (Black Spear Grass), *Imperata cylindrica* (Blady Grass), *Chrysocephalum apiculatum* (Yelow buttons), *Cymbopogon refractus* (Barbed Wire Grass), *Panicum decompositum* (Native Millet). Exotic weed species include *Gomphocarpus physocarpus* (Balloon Cotton Bush), *Sporobolus pyramidalis* (Giant Rat's Tail Grass), *Melinis repens* (Red Natal Grass) and *Opuntia tomentosa* (Velvet Tree Pear). Where trees are present these are reflective of pre-clear RE12.9-10.2 including *Corymbia citriodora* (Spotted Gum), *Eucalyptus crebra* (Narrow-leaved Ironbark), *Corymbia intermedia* (Pink Bloodwood) and *Angophora subvelutina* (Broad-leaved Apple). **Photo set 2** shows the vegetation present within this AU.



Photo set 2: Cleared paddocks and scattered trees across the entire offset area.

6.2.2 Feral animal abundance survey

There were six (6) individual sightings of non-native animals over a combined total of fifty-six (56) survey nights as part of preliminary baseline surveys (refer **Table 32**). Non-native predator species were detected, being *Canis lupis familiaris* (Wild Dog) (refer **Photo set 3**) no other feral animal species were recorded. Any non-native animal was recorded as a new individual if >1 hour had elapsed between sightings.

A baseline RAI was calculated using the formula **RAI = D/TN x 100**, where D is numbers of detection and TN is the total number of camera-trap nights (all cameras combined). This methodology ensures that the surveys are representative of the entirety of the proposed offset area and are repeatable for future monitoring requirements.

The RAI for non-native predators is **10.71** (refer **Table 32**). All other feral animal species would have a RAI of 0.

Table 32: Non-native pest survey results summary

Camera	Species	Survey Duration (nights)	Detection	RAI
1	-	14	-	**10.71**
2	-	14	-	
3	*Canis lupis familiaris (Wild Dog)*	14	2	
4	*Canis lupis familiaris (Wild Dog)*	14	4	
Total		56	**6**	



Photo set 3: Multiple *Canis lupis familiaris* (Wild Dog) observed within the offset area

6.2.3 Weed cover

Ground coverage on site is heavily dominated by pasture grasses as a result of historical land-uses including *Heteropogon contortus* (Black Spear Grass), *Imperata cylindrica* (Blady Grass), *Cymbopogon refractus* (Barbed Wire Grass), *Panicum decompositum* (Native Millet) *Sporobolus pyramidalis* (Giant Rat's Tail Grass), *Melinis repens* (Red Natal Grass) (refer **Photo set 4**). Scattered patches of *Opuntia sp* (Velvet Tree Pear) were observed (refer **Photo set 5**). Native grasses were observed to dominate the ground cover across the offset site. Importantly, there was a significant lack of WONS across the offset site. **Table 33** presents the summary of weed coverage transect data.

Results of the two (2) weed cover transects all retuned consistent results of between 15 and 25% weed cover across the proposed offset area (refer Photo set). The results of the baseline weed surveys are displayed on **Plan 10** and raw data provided at **Appendix C**.

Table 33: Weed coverage transects summary

	Total dominant species coverage (%)		Area (ha)	Relative cover of non-native flora (ha)	WONS cover
	Non-native species	Native species			
Transect 1	16	84	40	**7.36**	**<5% (refer Plan 10)**
Transect 2	20.8	79.2			

Average	**18.4**	**81.6**			

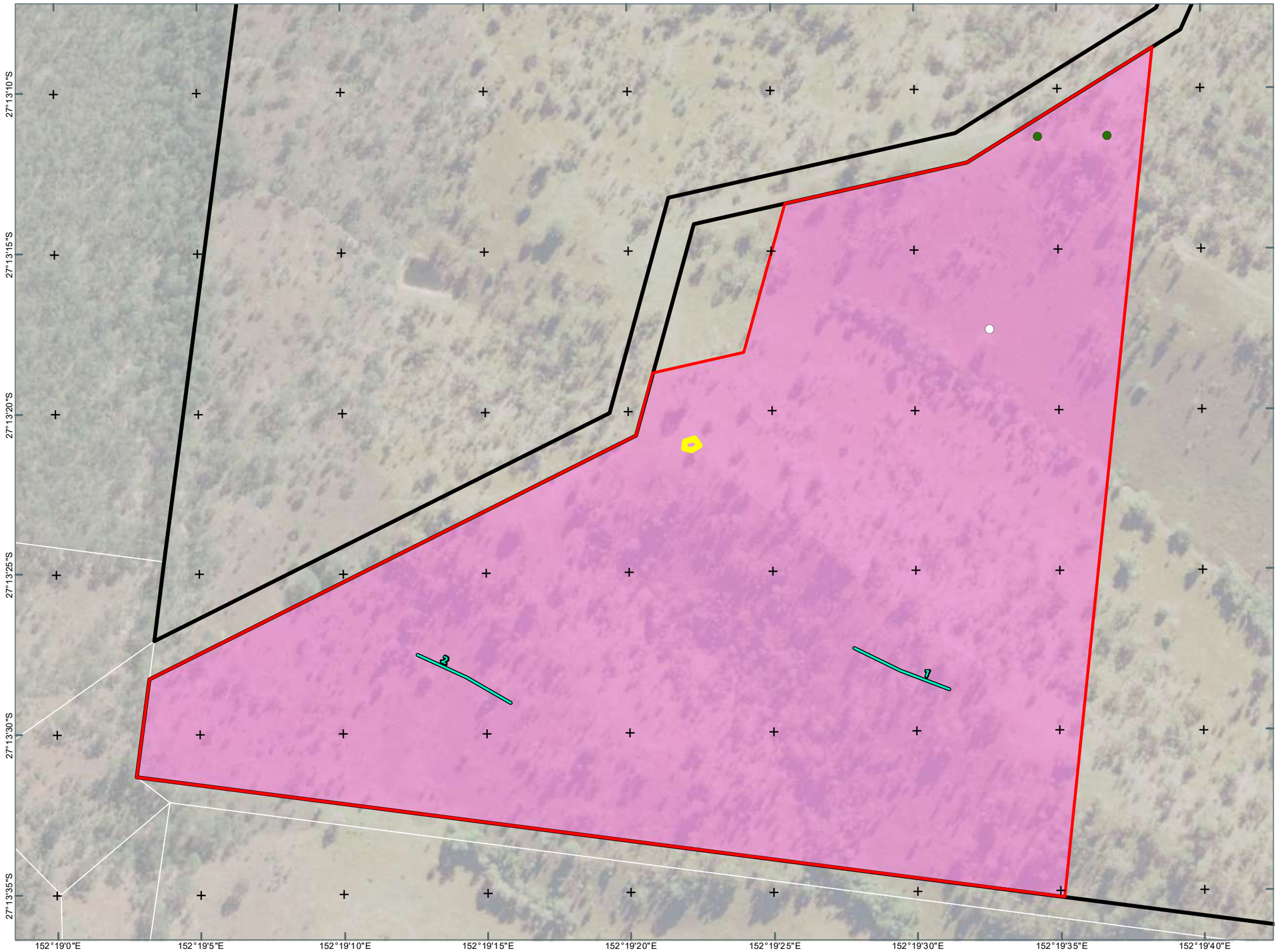


Photo set 5: Predominantly native grass across the entire offset site.



Photo set 4: *Oputina sp*. (Velvet Tree Pear) in scattered patches across the offset area.

PLAN 10. OFFSET BASELINE WEED MAPPING



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LEGEND

- Qld DCDB
- Offset Site Boundary
- Proposed Offset Area [40.0 ha]
- 10–25% non-native pasture grasses [40.0 ha]
- Opuntia sp. and Lantana Dominated [107m^2]
- Weed Transect
- Opuntia sp. Observation
- Sporadic Balloon Cotton



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Lots 14-16 on RP151378

5/11/2025

11390 E 10 Baseline Weeds D_SHG

6.2.4 Koala Modified Habitat Quality Assessment – results and discussion

Utilising the same methodologies detailed in **Section 3.3** and implemented at the impact site, the following sections discuss the results of the baseline MHQA for Koala.

The habitat quality scores for each AU were determined using a combination of Site Condition, Site Context and Species Stocking Rate technical data and scoring. The scores for Site Condition are derived directly from the MHQA tool data. These scores are then used to determine the scores for Quality and Availability of Food and Foraging Habitat, and Quality and Availability of Shelter.

Site condition (30%)

The site condition scoring for the proposed offset area is summarised in **Table 34**. Refer to **Appendix B** for detailed baseline Koala MHQA scoring and the raw data.

Table 34: Site condition scores for offset area assessment units

	AU1
Pre-clear Regional Ecosystem	12.9-10.2
Remnant/Non-remnant/Regrowth	Non-remnant
Recruitment of woody perennial species in EDL	5
Native plant species richness - trees	2.5
Native plant species richness -	2.5
Native plant species richness - grasses	5
Native plant species richness - forbs	0
Average tree canopy height*	3
Average tree canopy cover*	2
Shrub canopy cover	0
Native grass cover	5
Organic litter	3
Large trees	5
Coarse woody debris	2
Non-native plant cover	5
Quality and availability of food and foraging habitat	5
Quality and availability of shelter	5
Total (Out of 100)	**50**
Score out of 3	**1.50**

Quality and availability of food and foraging habitat/Quality and availability of shelter

In developing the MHQA to better incorporate MNES, two (2) species habitat index characteristics, being, quality and availability of food and foraging habitat, and quality and availability of shelter, have been added to the site condition indicator. **Table 35** to **Table 40** detail these baseline scores for the offset site as **5 out of 10** for both quality and availability of food and foraging habitat, and quality and availability of shelter.

Quality and availability of food and foraging resources

As detailed in **Section 3.3.1,** canopy cover is drawn from the bio condition benchmarks while stem densities are taken from the RE technical descriptions (Ryan 2001). Notably, RE12.9-10.2 does not reference a stem density as part of the technical description. The Queensland Herbarium have provided a draft technical description of RE12.9-10.2 which does include stem densities and has been utilised during this assessment (refer **Appendix D**).

Table 35: Koala Food Tree Abundance – Offset Site

Impact Assessment Unit	RE	Benchmark (trees/ha)	Site Count (trees/ha)	Benchmark Percentile	Score
AU1	12.9-10.2	240	95	39.58%	4/8

Table 36: Canopy Cover – Offset Site

Impact Assessment Unit	RE	Benchmark (% cover)	Site (% cover)	Benchmark Percentile	Score
AU1	12.9-10.2	64	7.2	11.25%	0.5/2

Table 37: Final score for *Quality and availability of food and foraging resources*

Assessment unit	Total score	MHQA score
AU1	4.5/10	5/10

Quality and availability of shelter

Table 38: Shelter Tree Abundance – Offset Site

Impact Assessment Unit	RE	Benchmark (trees/ha)	Site Count (trees/ha)	Benchmark Percentile	Score
AU1	12.9-10.2	240	95	39.58%	3/6

Table 39: Large Trees abundance – Offset Site

Impact Assessment Unit	RE	Benchmark (trees/ha)	Site (trees/ha)	Benchmark Percentile	Score
AU1	12.9-10.2	38	6	15.79%	1/4

Table 40: Final score for *Quality and availability of shelter*

Assessment unit	Total score	MHQA score
AU1	4/10	5/10

Site Context (30%)
The site context characteristics for Koala are shown on with scores summarised in **Table 41**.

Table 41: Koala site context scores for offset area

	AU1 (non-remnant pre-clear 12.9-10.2)
Size of patch	10
Connectedness	4
Context	5
Ecological corridors	0
Role of the site location to species overall population in the state	5
Threats to species	7
Species mobility capacity	10
Total (out of 56)	**38**
Score out of 3	**2.04**

Site Context

Size of patch

This attribute is a measure of the size of the patch of vegetation in which the assessment unit is located. The scoring reflects the importance of large patches in the landscape and is based on the size of the patch of critical Koala habitat connected to the site in this instance. This attribute is scored such that is reflects the fact that larger patches are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller patches. The size of patch attribute was calculated using GIS and determined the proposed offset area to be part of a patch size of larger than 500 ha. The proposed offset area is connected to a patch >500 ha and therefore achieves a score of **10 out of 10** (refer **Plan 11**)

Connectedness

As a landscape level attribute, connectedness aims to assess the degree to which the assessment unit is connected to adjacent native vegetation. Connectedness relates to the capacity of the species to disperse through the landscape between sustainable patches of habitat, and therefore has important implications for species persistence. Connectedness was calculated using GIS, with the percentage of the proposed offset area boundary length supporting a Koala critical habitat connection off and on-site was calculated at 58% and therefore achieves a score of **4 out of 5** (refer **Plan 11**)

Context

The context attribute refers to the amount of critical koala habitat that is retained within a 1 km buffer of the site being assessed and is calculated using GIS. Each assessment unit achieved the same scores for Site context. Existing critical koala habitat within a 1 km buffer of the site was calculated at 76% and

therefore achieves a score of **5 out of 5** as per the Queensland BioCondition Assessment methodology (refer **Plan 11**).

Ecological corridors

The proposed offset area is not located within a Statewide corridor of regional significance (refer **Plan 6**) therefore achieves a score of **0 out of 6**.

Role of site location to species overall population in the State

This attribute aims to quantify the importance of the site for state Koala populations through a combined approach that considers the activity and usage across the site and the importance of habitat for fulfilling the Koala's life cycle (i.e., foraging and breeding) and thus the effect that removal of habitat would have on a local population and the species as a whole. This attribute achieved a score of **5 out of 5** as it was determined that the referral area contains habitat critical to the survival of the species. While habitat within the referral area is highly disturbed and site-specific surveys found low Koala activity, any habitat that meets the definition of critical koala habitat under the EPBC Act is also considered potential breeding habitat.

Threats to species

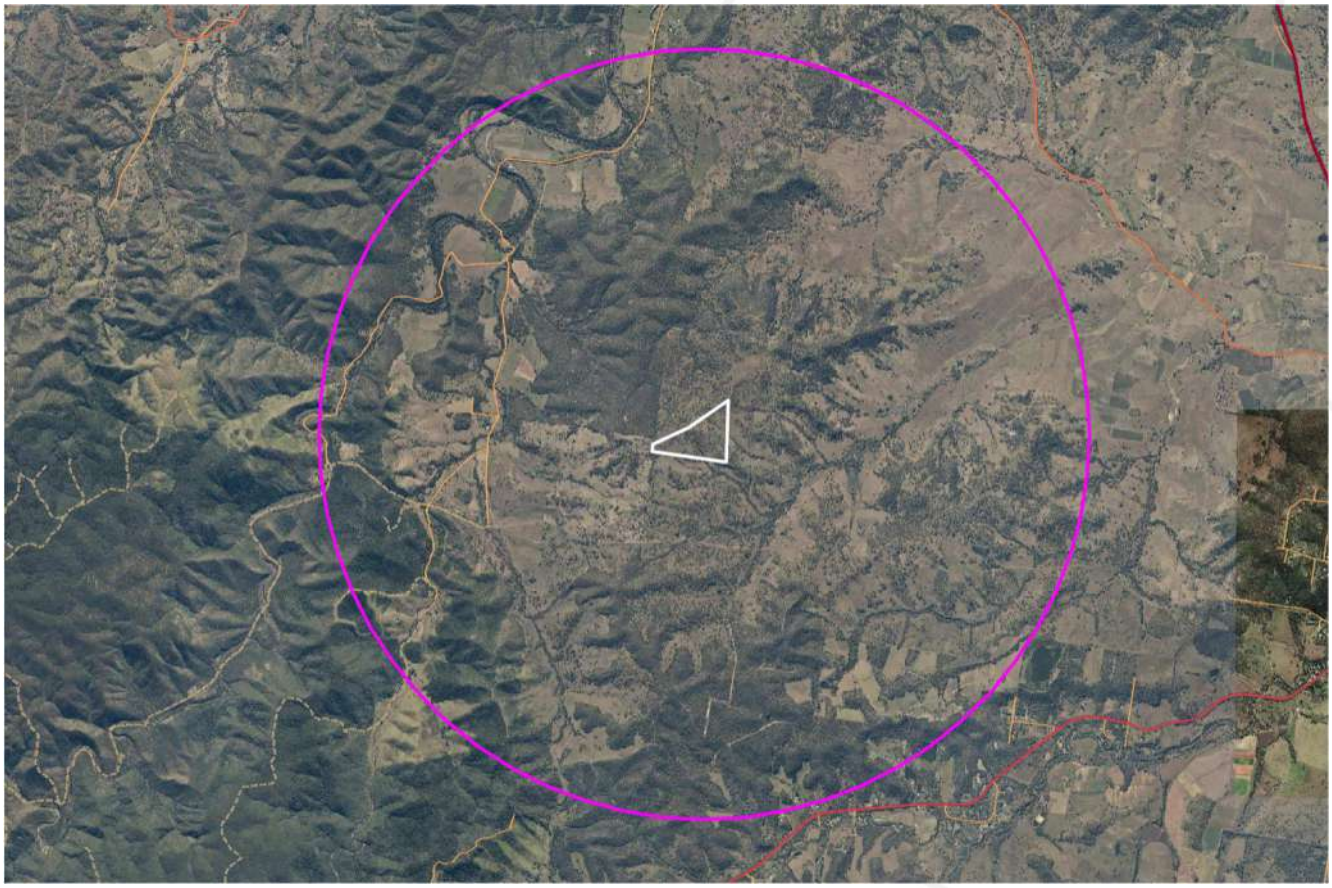
- Clearing and degradation of habitat – the offset area is zoned as rural under the SRC plan as is the majority of surrounding land. Approximately 50-70% of the surrounding land is degraded as is consisted with rural farmland in the broader locality **Insert 2**. There is currently no protective mechanisms in place for the offset area. The offset area would continue to be grazed and slashed to promote rural uses if not utilised as an offset. Therefore, a weighted score of **2.8** or 'moderate risk' is appropriate.
- Inappropriate fire regimes – SRC identifies at least part of the offset property as bushfire risk. A non-Koala specific Bushfire Management Plan is not in place for the offset area which is considered to have low fuel load as a result of sparse canopy and promotion of paddocks. Therefore, a weighted score of **2.8** or 'moderate risk' is appropriate.
- Vehicle strike – There are limited roads proximal to the offset area with most roads unsealed access tracks. The offset area is located approximately 2 km east of Kipper Creek Road, therefore the risk of vehicle strike is considered low. A weighted score of **1.5** or 'low risk' is appropriate.
- Dog attack – Several Wild Dogs have been recorded within the offset area. Canopy cover providing refuge for Koala is limited to only 11.25% of the benchmark for canopy and 45.25% of the benchmark for sub-canopy. Therefore, a weighted score of **0.1** or 'high risk' is appropriate.
- A total score for threats based on these attributes was assigned as **7 out of 15** or 'moderate.'

Table 42: Koala Threat Scoring Matrix (green shading indicates applicable scores for the site)

Metric	Low	Moderate	High
Threat Thresholds			

Metric	Low	Moderate	High
Clearing and Degradation of Habitat	Apply one of the following options in order of priority: 1. Apply a current legal protective mechanism. 2. The site is zoned for conservation purposes or clearing is not permitted. 3. If ≤30% of the area within a 5 km buffer of the site is cleared or disturbed land.	In the absence of justification for scoring as high or low and if: >30% and <70% of the area within a 5km buffer of the site is cleared or disturbed land.	Apply one of the following options in order of priority: 1. The site is zoned for development. 2. If ≥ 70% of the area within a 5 km buffer of the site is cleared or disturbed land.
Score Weighting	**6**	**2.8**	**0.4**
Inappropriate Fire Regimes Very High Risk	Current Government endorsed Bushfire Management Plan (BMP) to protect the Koala is in effect.	Non-Koala specific BMP in effect. or; Low fuel load and low fire risk.	Site has a high fuel load and/or high fire risk.
Score Weighting	**6**	**2.8**	**0.4**
Vehicle Strike Moderate Risk	Low volume of cars, unsealed, no Koala accessibility, fencing, and mitigation measures in place, negligible Koala mortality.	Site-specific and evidence-based qualitative assessment of these considerations	High volume of cars, sealed, accessibility for Koala, no fencing, and no mitigation measures in place, high Koala mortality
Score Weighting	**1.5**	**0.7**	**0.1**
Dog Attack Moderate Risk	<10% the Relative Abundance Index	Dogs recorded on site and adequate refuge for Koalas (>70% canopy cover).	Dogs recorded on site and limited refuge for Koalas (<70% canopy cover)
Score Weighting	**1.5**	**0.7**	**0.1**
Threats to Species			
Threshold Analysis	≥13.5	>5 and <13.5	≤5
Score	**15**	**7**	**1**





Insert 2: High level assessment of degraded land within 5 km of the offset area (between 50 and 60%)

Species mobility capacity

Species mobility capacity is used to quantify the ability of the species to move from the site and through the surrounding landscape to meet survival needs. Species mobility capacity is considered particularly important in response to rapid changes to the surrounding environment, such as the commencement of land clearing. Assessment has been carried out in accordance with method provided in **Section 3.3** with outcomes provided below (refer **Table 43**). The site is considered, minor restriction giving it a score of **10 out of 10**.

Table 43: Species mobility capacity assessment – Offset site

Direction	Description of restriction	Restriction score
North	To the north of the Offset Site exists similarly managed cleared rural land.	No restriction
South	To the south of the Offset Site exists similarly managed cleared rural land.	No restriction
East	To the east of the Offset Site exists similarly managed cleared rural land.	No restriction

Direction	Description of restriction	Restriction score
West	To the west of the Offset Site exists similarly managed cleared rural land.	No restriction
Total restriction score		0% (minor restriction)

Species stocking rate (40%)
The species stocking rate for Koala scored has been scored at **40 out of 70** for AU1 (refer to **Table 44**).

Further details on the assessment are provided below:

- Presence detected on or adjacent to site (neighbouring property with connecting habitat) – a single Koala scat was recorded within the offset area. Recorded evidence of usage (directly or indirectly) within the offset area results in a score of **10 out of 10.**
- Species usage of the site (habitat type and evidenced usage) – This attribute relies on habitat type and evidence of usage. While the offset area does contain large areas of open paddock, Koala habitat trees are present. Koala usage was recorded indirectly (scats) therefore the offset site is considered to provide dispersal, foraging and breeding habitat for the Koala and has been assigned a score of **15 out of 15**.
- Approximate density – This attribute utilises evidence of usage compared with the Phillips *et al.* 2011 'Koala use (East Coast med-high)' category. Two (2) SAT assessments completed within the offset area recorded 'low use' at SAT 1 and 'no use' at SAT2. The approximate density for the offset site has therefore been considered as 'low' and scores **10 out of 30**.
- Role/importance of species population on site – The low evidence of usage and no evidence of breeding recorded within the offset area indicates that it is highly unlikely that the offset site contains a key source population for breeding (0 out of 5). It is not clear if the offset site provides a key population for dispersal however given the dispersal capacity of the Koala and utilising the precautionary principle it is considered possible (5 out of 5). The low evidence of usage indicates it is unlikely that the offset site contains a population necessary for maintaining genetic diversity (0 out of 15). The location of the offset site is not near the limit of the species range (0 out of 15). Utilising the SSR Supplementary Table – Total supplementary score results in a **5 out of 15** for this attribute

Table 44: Koala species stocking rate scores within offset area assessment units

Species Stocking Rate Table	
	AU1
Presence detected on or adjacent to site (neighbouring property with connecting habitat) (/10)	10
Species usage of the site (habitat type and evidenced usage) (/15)	15
Approximate density (per ha) (/30)	10
Role/importance of species population on site* (/15)	5
Total Species Stocking Rate Score (/70)	**40**
Species Stocking Rate Score – out of 4	**2.29**
***SSR Supplementary Table – Total supplementary score 0 = 0, 5-15 = 5, 20-35 = 10, 40-45 = 15**	

	AU1
Key source population for breeding (/5)	0
Key source population for dispersal (/5)	5
Necessary for maintaining genetic diversity (/15)	0
Near the limit of the species range (/15)	0

Two (2) SATs were completed at MHQA transects 1 and 2. A single scat was recorded at SAT 1 (refer **Photo set 6**).



Photo set 6: Single scat recorded within the offset area

A summary of the SAT survey results completed at each MHQA transect are provided in **Table 45,** with raw data provided at **Appendix E**.

Table 45: Baseline SAT survey results

SAT ID (MHQA transect)	Number of scats	Evidence of Koala activity (%)	Koala use (East Coast med-high)
AU1			
SAT 1 (MHQA 1)	1	3.33	Low
SAT 2 (MHQA 2)	0	0	No use

The SAT surveys demonstrate that contemporary Koala utilisation of the proposed offset area is not present, as expected, given the current state of the vegetation on site, but has the capacity to support ecological gain for the Koala with rehabilitation efforts. Koala are known to occur in the locality, having been recorded previously across the adjoining offset areas, and it is assumed that utilisation of the site will increase over the lifespan of the offset as site condition and context improve.

PLAN 11. OFFSET SITE KOALA CONTEXT ASSESSMENT



Notes:
The information on this plan is not suitable for any purpose other than the expressed use of the Client. Property dimensions, areas, numbers of lots and contours and other physical features may need verification if the development application is approved and development proceeds, and may change when a full survey is undertaken or in order to comply with development approval conditions. No reliance should be placed on the information on this plan for detailed design or for any financial dealings involving the land. Saunders Havill therefore disclaims any liability for any loss or damage whatsoever or howsoever incurred, arising from any party using or relying upon this plan for any purpose other than as a document prepared for the sole purpose of accompanying a development application and which may be subject to alteration beyond the control of Saunders Havill.Unless a development approval states otherwise, this is not an approved plan.

Layer Sources
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
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Updated data available at
http://qldspatial.information.qld.gov.au/catalogue/
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LEGEND

- Qld DCDB
- Offset Site Boundary
- Proposed Offset Area [40.0 ha]
- 1km Offset Site Buffer
- Percentage of Koala critical habitat within 1km of Offset Site [76%]
- Size of Koala critical habitat patch >200m corridor connectivity [>500ha]
- Percentage of Offset Site boundary length supporting a Koala critical habitat connection off and on site [58%]



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BLUE ROCK QUARRY, CEDAR CREEK

0 100 200 300 m
Transverse Mercator
GDA 2020 | Zone 56

N
1:12,000
@ A3

Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024
Lots 14-16 on RP151378

5/11/2025

11390 E 11 Offset Koala Context D_SHG

6.2.5 Summary of baseline scores for offset area

The overall habitat quality scores for Koala at the proposed offset area are presented in **Table 46**.

Table 46: Offset area MHQA score summary – Koala

	AU1
Site Condition (/3)	1.50
Site Context (/3)	2.20
Species Stocking Rate (/4)	2.29
MHQA Score	**5.98 (rounded to 6)**

7. Environmental Outcomes

This OMP identifies outcomes focused management actions pursuant the EPBC Act for the provision of Koala habitat offset. The management objectives for the proposed offset area, in alignment with the Environmental Offsets Policy (EOP) will:

- Deliver an overall conservation outcome that improves the viability of habitat for the Koala.
- Provide a direct offset that is in proportion to the level of statutory protection that applies to Koala habitat.
- Be of a size and scale proportionate to the residual impacts on Koala habitat.
- Effectively account for and manage the risks of the offset not being successful within the required management timeframe.
- Provide a conservation gain additional to what is already required by a duty of care or to any environmental planning laws at any level of Government.
- Be efficient, effective, timely, transparent, scientifically robust and reasonable with appropriate transparent governance arrangements in place for measuring, monitoring, auditing and enforcing the management of the proposed offset area.

7.1. Koala

A summary of the baseline and improvement scoring for each assessment unit within the proposed offset area is outlined in **Table 47**. Detailed environmental outcomes showing the specific attributes which will be improved by the offset actions including interim milestones are provided at **Table 50** and **Table 51**.

Table 47: Koala baseline MHQA and offset improvement scores

MHQA Final Scores	AU1 – Baseline	AU1 – Uplift
Site condition (/3)	1.50	2.70
Site context (/3)	2.20	2.63
Species stocking rate (/4)	2.29	2.29
AU score	**5.98**	**7.61**
Rounded	**6**	**8**
Assessment Unit Area (ha)	40	

7.2. Offset Assessment Guide – Calculator

Table 48 and **Table 49** outlines a summary of the MNES offset compensation associated with the 5.9 ha of impacts, being 151.32% for Koala. The offset compensation for the impacts on MNES is derived from the EPBC Offset Assessment Guide (OAG) calculator and habitat quality gains achieved from the successful implementation of the management actions.

Refer to **Appendix F** for the detailed EPBC offset calculator sheets.

Table 48: Offset Assessment Guide Parameters – Koala

Parameter	Rationale
Impact (Area)	5.9 ha for Koala
Quantum of Impact (Quality)	A score of 6 for Koala
Quantum Impact (Area)	3.54 ha
Risk Related Time Horizon	The proposed offset area will be legally secured in perpetuity; hence, the maximum score of 20 years.
Time Until Ecological Benefit	Measures prescribed in this Offset Area Management Plan are expected to achieve the predicted increase in habitat quality over a period of 20 years. This timeframe is broadly recognised for regrowth vegetation to meet remnant status (50% canopy cover and 70% canopy height (Neldner et al. 2023)
Start Area	40 ha
Start Quality	6 out of 10 - Refer **Table *49***
Risk of Loss without Offset	It is understood risk of loss is to be set at 0% without any comprehensive evidence to the contrary.
Risk of Loss with Offset	It is understood risk of loss is to be set at 0% without any comprehensive evidence to the contrary.
Confidence in Result (Risk of Loss)	As risk of loss is set at 0%, a high score of 90% is used for confidence in result.
Future Quality without Offset	Existing habitat quality is expected to be maintained if the current land use / management regime is continued. Under management for exclusively grazing over 20 years and without the offset, current habitat quality for Koala is unlikely to improve, and some attributes may deteriorate where regrowth is subject to periodic clearing for cattle grazing and/or maintenance/fire regimes that are not compatible with ecosystem improvement are employed.
Future Quality with Offset	Though the direct implementation of management actions detailed in this OMP the future quality of the offset will improve. Refer **Table 49.**



Parameter	Rationale
Confidence in Result (Future Quality)	Confidence in the success of the offset is typical of non-remnant vegetation with some existing vegetation (≥85%). Given the detail and intensity of the management actions outlined within this OMP and the proposed uplift of two points, this confidence is considered appropriate. The confidence is supported by the offset area selection, design of management actions, and clear monitoring and reporting procedures. The offset area contains well-maintained access tracks that will facilitate access to weed treatment areas and planting areas. This offset area is the northern extent of a much larger offset property with several approved offset areas. Therefore, a level of increased confidence would come with the aggregation of offset approvals within the one offset property which is undertaking identical management actions and outcomes across all offset approvals with identical baseline conditions.

Table 49: Summary of Koala offset compensation

Impact Area			Offset Area		
Impact Area	**Impact Score**	**Quantum Impact (QI) Area**	**Habitat Quality Gain**	**Offset Area (ha)**	**% of Impact Offset**
			AU1	**AU1**	**AU1**
5.9 ha	6/10	3.54 QI ha	6/10 to 8/10	40	151.32

7.2.1 Completion criteria

The management framework designed to achieve the proposed environmental outcomes summarised above are detailed in **Section 9** of this OMP.

A summary of the management actions and their completion criteria required to achieve the environmental outcomes are provided in **Table 50.** The management actions will result in a net gain of the overall habitat quality for Koala over the period of effect of the offset through active management, maintenance, monitoring and reporting.

This OMP includes completion criteria and performance targets that evidence protection or improvement of Koala habitat. For the purpose of the plan:

a) **completion criteria** are longer term time-bound values, specified for measurable parameters, that if attained and maintained ensure the plan's environmental outcomes are achieved; and

b) **performance targets** are time-bound short- and medium-term targets guided by prescribed management measures, for management interventions and environmental condition, that are used to monitor, evaluate, review and improve the effectiveness of the plan to offset impacts.

Tracking of progress against the environmental outcomes will be measured at milestone monitoring years using the baseline survey methodologies detailed in **Section 6**. A schedule of monitoring and reporting is provided in **Section 8**.



Table 50: Completion criteria and performance targets

Management Action	OMP Section	Performance Targets	Completion criteria
Management Action 1 – Legally Secure Offset Area	9.3	Not applicable	• The offset area is legally secured for conservation via a suitable method. It is anticipated that this will be via a Voluntary Declaration (VDEC) process administered under the Queensland *Vegetation Management Action 1999* in the interim, prior to the impacts occurring, followed by a covenant under the *Land Act 1994* or *Land Titles Act 1994* • The Department is notified of the legal securement within 5 business days of commencing the implementation of the OMP *i.e.,* the date from which the offset area is legally secured. • The offset area is not used for other purposes – site access is restricted.
Management Action 2 – Non-native Vertebrate Pest Management	9.4	• Development and implementation of a property-wide feral animal management program specifying techniques (trapping, baiting, shooting) and ongoing monitoring methods (including datasheets) to be utilised will be completed within Year 1 of the offset. • A suitably qualified pest management contractor will be engaged to manage feral animals within the offset area for the life of the offset.	• Feral animals suppressed within the offset area to <10% of the baseline Relative Abundance Index (RAI). Priority wild dogs

Management Action	OMP Section	Performance Targets	Completion criteria
Management Action 3 – Management of Weeds of National Significance (WONS)	9.5	• Establish photo monitoring locations in Year 1 of the offset to monitor increases in WONS extent • All WONS will receive on-going treatment • Follow-up treatment of WONS will occur annually or as needed, determined by the suitably qualified regeneration contractor.	• The management actions must maintain the extent of WONS cover <5% of the offset area for the life of the offset (20 years).
Management Action 4 – Bushfire Management Plan	9.6	• A Bushfire Management Plan (BMP) will be developed and implemented in accordance with relevant Queensland guidelines and endorsed by an experienced bushfire practitioner to reduce potential threats from fires to Koala.	• Implement BMP • Monitor and maintain fire breaks and fuel loads within the offset area • Minimise risk of high intensity fires • Minimise risk of vegetation composition and restoration regime being negatively affected by prescribed burns
Management Action 5 – Habitat Creation and Regeneration	9.7	• Initial infill planting (primarily trees) within low vegetation cover areas to be completed by the end of Year 2 of the offset • Establish photo monitoring locations in Year 1 of the offset to monitoring natural regeneration prior to Year 5 milestone event. • By the end of Year 5, Site condition metrics for Koala have improved in accordance with environmental outcomes (refer **Table 51**).	• Rehabilitated areas are established, regenerated and mapped as remnant vegetation under Queensland's *Vegetation Management Act 1999* (VMA) successor legislation by Year 20 which requires 70% of canopy height and 50% of expected cover according to the relevant Regional Ecosystem benchmark to be reached.

Management Action	OMP Section	Performance Targets	Completion criteria
			• Site condition metrics for Koala improves in accordance with environmental outcomes (refer **Table 51**).
Management Action 6 – Fencing and Signage	9.8	• Fencing and signage is installed and retrofitted by the end of Year 1 of the offset and maintained for the life of the offset (20 years).	• All fencing and signage has been installed, retrofitted and maintained for the life of the offset • Fencing enables Koala to move through the offset area and into surrounding land. • If stock breaches or unauthorised access is observed, fencing is rectified within 2 weeks.

Table 51: Koala environmental outcomes – AU1

Attribute	Current Score	Year 5 score	Year 10 score	Year 15 score	Year 20 score	Time Until Measured Benefit	Justifications / Management Actions	Monitoring	KPIs and Adaptive Management
Recruitment of woody perennial species	5	5	5	5	5	Immediate	Recruitment of EDL species will be maintained at >75% of the benchmark as a result of management actions 1, 3, 4 & 5 outlined in **Table 50**. These management actions are all proposed to reduce land degradation and promote habitat regeneration. Current rural uses include intensive unmanaged slashing, grazing and inappropriate burning to promote pasture grasses reducing the likelihood of recruitment of native shrubs and trees.	Baseline Site Condition attributes are established. Establish photo monitoring points where remedial tree planting occurs at commencement of offset. Habitat quality transects and photo monitoring to be completed by suitably qualified professionals at annually for the first three years and then year 5, 10, 15, and 20 years.	It is anticipated that recruitment of woody perennial species will be maintained at >75% of the benchmark. Remedial actions are not anticipated.
Native plant species richness – Trees	2.5	2.5	5	5	5	10 Years	All of the expected tree species will be present as a result of specific management actions 1, 3, 4 & 5 outlined in **Table 50**. These management actions are all proposed to reduce land degradation and promote habitat regeneration. Current rural uses include intensive unmanaged slashing, grazing and inappropriate burning to promote pasture grasses reducing the likelihood of recruitment of native shrubs and trees. Infill plantings in line with management action 5 will directly improve this attribute.	Baseline Site Condition attributes are established. Habitat quality transects to be completed by suitably qualified professionals at 5, 10, 15, and 20 years.	Tree species richness is currently at 66.67% of the benchmark. If the tree species richness has not improved to greater than 75% at 10 years then remedial actions to improve the prospect of achieving >90% in 20 years will be applied. These include remedial plantings.
Native plant species richness - Shrubs	2.5	5	5	5	5	5 years	All of the expected shrub species to be present as a result of specific management actions 1, 3, 4 & 5 outlined in **Table 50**. These management actions are all proposed to reduce land degradation and promote habitat regeneration. Current rural uses include intensive unmanaged slashing, grazing and inappropriate burning to promote pasture grasses reducing the likelihood of recruitment of	Baseline Site Condition attributes are established. Habitat quality transects to be completed by suitably qualified professionals at 5, 10, 15, and 20 years.	Shrub species richness is currently at 42.86% of the benchmark. If the shrub species richness has not improved to greater than 75% at 15 years then remedial actions to improve the prospect of achieving 90% in 20 years will be applied. These include remedial plantings.

Attribute	Current Score	Year 5 score	Year 10 score	Year 15 score	Year 20 score	Time Until Measured Benefit	Justifications / Management Actions	Monitoring	KPIs and Adaptive Management
							native shrubs and trees. Infill plantings in line with management action 5 will directly improve this attribute.		
Native plant species richness - Grasses	5	5	5	5	5	Immediate	All of the expected grass species to be present as a result of specific management actions 1, 3, 4 & 5 outlined in **Table 50**. These management actions are all proposed to reduce land degradation and promote habitat regeneration. Current rural uses include intensive unmanaged slashing, grazing and inappropriate burning to promote pasture grasses. Native grasses are present across the offset area which will be maintained.	Baseline Site Condition attributes are established. Habitat quality transects to be completed by suitably qualified professionals at 5, 10, 15, and 20 years.	Grass species richness is currently at 92.86% of the benchmark. If the grass species richness has not been maintained above 90% at 15 years then remedial actions to improve the prospect of achieving 90% in 20 years will be applied. These include remedial plantings.
Native plant species richness - Forbs	0	2.5	2.5	5	5	10 years	All of the expected forb species to be present as a result of specific management actions 1, 3, 4 & 5 outlined in **Table 50**. These management actions are all proposed to reduce land degradation and promote habitat regeneration. Current rural uses include intensive unmanaged slashing, grazing and inappropriate burning to promote pasture grasses reducing the likelihood of recruitment of particularly groundcovers.	Baseline Site Condition attributes are established. Habitat quality transects to be completed by suitably qualified professionals at 5, 10, 15, and 20 years.	Forb species richness is currently at 23.08% of the benchmark. If monitoring indicates that forb species richness is not transitioning to over 25% at Year 5 and over 90% at Year 15 then remedial actions will be applied. These include remedial plantings.
Tree canopy height	3	3	3	3	5	20 years	Tree canopy height greater than 70% of the benchmark will be achieved as a result of management actions 1, 3, 4 & 5 outlined in **Table 50**. These management actions are all proposed to reduce land degradation and promote habitat regeneration. Existing trees will continue to mature with a reduced risk of being impacted by rural land-uses. Direct plantings will have reached the required height in 20 years.	Baseline Site Condition attributes are established. Habitat quality transects to be completed by suitably qualified professionals at 5, 10, 15, and 20 years.	Median tree canopy height is currently 52.38% (EDL) and 50% (sub-canopy), average 51.19%. It is anticipated that the tree canopy height will increase to greater than 70% of the benchmark by the end of Year 20.

Attribute	Current Score	Year 5 score	Year 10 score	Year 15 score	Year 20 score	Time Until Measured Benefit	Justifications / Management Actions	Monitoring	KPIs and Adaptive Management
Tree canopy cover	2	2	2	2	5	20 years	Tree canopy cover between 50% and 200% of the benchmark will be achieved as a result of management actions 1, 3, 4 & 5 outlined in **Table 50**. These management actions are all proposed to reduce land degradation and promote habitat regeneration. Existing trees will continue to mature with a reduced risk of being impacted by rural land-uses.	Baseline Site Condition attributes are established. Habitat quality transects to be completed by suitably qualified professionals at 5, 10, 15, and 20 years.	Tree canopy cover is currently 11.25% (EDL) and 45.25% (sub-canopy), average 28.25%. It is anticipated that the tree canopy cover will increase to between 50% and 200% of the benchmark by the end of Year 15. If the tree canopy cover has not improved to greater than 35% at 10 years then remedial actions to improve the prospect of achieving between 50% and 200% in 20 years will be applied. These include remedial plantings.
Shrub canopy cover	0	3	5	5	5	10 years	Shrub canopy cover to be between 50% and 200% of the benchmark as a result of specific management actions 1, 3, 4 & 5 outlined in **Table 50**. These management actions are all proposed to reduce land degradation and promote habitat regeneration. Current rural uses include intensive unmanaged slashing, grazing and inappropriate burning to promote pasture grasses reducing the likelihood of recruitment of native shrubs and trees. These management actions will promote shrub cover.	Baseline Site Condition attributes are established. Habitat quality transects to be completed by suitably qualified professionals at 5, 10, 15, and 20 years.	Shrub canopy cover is currently at 9.17% of the benchmark. If monitoring indicates that shrub canopy cover is not transitioning to between 50 and 200% by Year 15 then remedial actions will be applied. These include remedial plantings.
Native perennial grass cover	5	5	5	5	5	Immediate	Native perennial grass cover greater than 90% of the benchmark will be maintained as a result of management actions 1, 3, 4 & 5 outlined in **Table 50**. Native grass cover is currently high as has been promoted for cattle grazing. The management of the land in line with proposed management actions and promotion of natural regeneration will maintain native grass cover.	Baseline Site Condition attributes are established. Habitat quality transects to be completed by suitably qualified professionals at 5, 10, 15, and 20 years.	Native grass cover is currently at 338.10% of the benchmark. It is anticipated the grass cover will reduce once active regeneration has taken place. However, if monitoring indicates that native grass cover has not been maintained >90% in Year 5 then remedial actions will be applied. These include remedial plantings.

Attribute	Current Score	Year 5 score	Year 10 score	Year 15 score	Year 20 score	Time Until Measured Benefit	Justifications / Management Actions	Monitoring	KPIs and Adaptive Management
Organic litter	3	3	3	3	5	20 years	Organic litter between 50% and 200% of the benchmark will be achieved as a result of management actions 1, 3, 4 & 5 outlined in **Table 50**. These management actions are all proposed to reduce land degradation and promote habitat regeneration. Organic litter is directly linked to the presence of vegetation at multiple strata. The increase in these attributes will lead to an increase in organic litter.	Baseline Site Condition attributes are established. Habitat quality transects to be completed by suitably qualified professionals at 5, 10, 15, and 20 years.	Organic litter is currently at 15.63% of the benchmark. If monitoring indicates that organic litter is not at >40% by Year 15 then remedial actions will be applied. These include remedial plantings.
Large trees	5	5	5	5	5	Immediate	The number of large trees will not increase in the 20-year timeframe. No management actions can be utilised to increase the number of larger trees. However, existing large trees will be protected though management actions 1, 3 and 4.	Baseline Site Condition attributes are established. Habitat quality transects to be completed by suitably qualified professionals at 5, 10, 15, and 20 years.	It is anticipated that the number of large trees will not increase to between >50% of the benchmark. Remedial actions not warranted
Coarse woody debris	2	2	2	5	5	15 years	Course woody debris greater than 50% and less than 200% of the benchmark will be achieved by specific management actions 1, 3, 4 & 5 outlined in **Table 50**. Woody debris is directly linked to the presence of vegetation. The increase in these attributes will lead to an increase in woody debris which will then be retain through appropriate bushfire management.	Baseline Site Condition attributes are established. Habitat quality transects to be completed by suitably qualified professionals at 5, 10, 15, and 20 years.	Coarse woody debris is currently 38.29% of the benchmark due to current and historical land uses. If monitoring by Year 15 indicates that coarse woody debris is not transitioning to between 50 and 200% then remedial actions will be applied. These include a review of actions that impact on coarse woody debris such as fire regimes and importing native tree debris if necessary.
Weed cover	5	5	10	10	10	10 years	Weed coverage will reduce to less than 5% of the site over the course of 10 years by specific management actions 3 & 5 outlined in **Table 50**. On-going weed management is necessary to promote native regeneration.	Baseline Site Condition attributes are established. Habitat quality transects to be completed by suitably qualified professionals at 5, 10, 15, and 20 years. An additional survey is recommended at Year 8 to track progress to the Year 10 milestone objective.	Weed cover is currently 15% of the site. If improvement to below 5% of the site has not been achieved by the end of Year 10 then then remedial actions to reduce weed cover will be applied. These include refining weed control methods.
Quality and availability of food and foraging habitat	5	5	10	10	10	10 years	Quality and availability of food and foraging habitat will be improved to high by specific management actions 1, 3, 4 & 5 outlined	Baseline attributes are established. Establish strategic photo monitoring points at commencement of offset. Habitat quality	Quality and availability of food and foraging habitat is currently moderate scoring 5 out of 10. An increase in key attributes, recruitment,

Attribute	Current Score	Year 5 score	Year 10 score	Year 15 score	Year 20 score	Time Until Measured Benefit	Justifications / Management Actions	Monitoring	KPIs and Adaptive Management
							in **Table 50**. This metric is driven by recruitment, tree species richness canopy and subcanopy heigh and cover and shrub cover. An increase in these attributes will increase the quality and availability of food and foraging habitat.	transects and photo monitoring to be completed by suitably qualified professionals annually for the first three years and then year 5, 10, 15, and 20 years.	tree species richness canopy and subcanopy heigh and cover and shrub cover will increase this score
Quality and availability of shelter	5	5	10	10	10	10 years	Quality and availability of shelter will be improved to high by specific management actions 1, 3, 4 & 5 outlined in **Table 50**. This metric is driven by recruitment, tree species richness canopy and subcanopy heigh and cover and shrub cover. An increase in these attributes will increase the quality and availability of shelter.	Baseline attributes are established. Establish strategic photo monitoring points at commencement of offset. Habitat quality transects and photo monitoring to be completed by suitably qualified professionals annually for the first three years and then year 5, 10, 15, and 20 years.	Quality and availability of shelter is currently moderate scoring 5 out of 10. An increase in key attributes, recruitment, tree species richness canopy and subcanopy heigh and cover and shrub cover will increase this score
Site Condition Score	**50**	**58**	**67.5**	**83**	**90**				
Overall Site Condition Score out of 3	**1.50**	**1.74**	**2.03**	**2.49**	**2.70**				
Size of patch	10	10	10	10	10	No change	N/A	N/A	N/A
Connectedness	4	4	4	4	4	No change	N/A	N/A	N/A
Context	5	5	5	5	5	No change	N/A	N/A	N/A
Ecological Corridors	0	0	0	0	0	No Change	N/A	N/A	N/A
Role of site location to species overall population in the state	5	5	5	5	5	No Change	N/A	N/A	N/A
Threats to the species	7	7	15	15	15	10 years	Threats to species will be reduced by specific management actions 1, 2, & 4 outlined in **Table 50.** As per the threats matrix detailed in Section 6.2.4, Land degradation will be reduced to 'low risk' following the legal securement of the offset area. Inappropriate fire regimes will be managed by a specific bushfire management plan to protect Koala 'low risk.' This risk of dog attack will be reduced through measurable reduction targets and increase in refuge habitat within the offset area 'low risk.' All these actions will	Baseline attributes are established. This criterium is reliant upon the protection of land against degradation and the suppression and control of pest species. Pest monitoring will be evaluated as per the pest management program.	Legal securement of the offset area will immediately reduce the risk of land degradation. The control of pest species will provide a reduction in threats. If monitoring as per the pest management program indicates pest species are not reduced then the management plan will require amendment and improved control demonstrated.

Attribute	Current Score	Year 5 score	Year 10 score	Year 15 score	Year 20 score	Time Until Measured Benefit	Justifications / Management Actions	Monitoring	KPIs and Adaptive Management
							reduce existing threats at the offset area.		
Species mobility capacity	10	10	10	10	10	No change	Baseline species mobility score of 10 out of 10 has been assigned to the offset area.	Baseline attributes are established. Milestone monitoring to be completed at year 5, 10, 15, and 20 years.	Site remedial actions not required as species mobility capacity remains unchanged
Site Context Score	**41**	**41**	**49**	**49**	**49**				
Overall Site Context Score (out of 3)	**2.20**	**2.20**	**2.63**	**2.63**	**2.63**				
Presence	10	10	10	10	10	No change	Field surveys recorded evidence of Koala within the offset area. Through Management actions detailed in **Table 50** it's expected that Koala will continue to utilise the offset area	Koala SAT surveys will be completed by suitably qualified professionals at 5, 10, 15, and 20 years.	Site remedial actions will improving the condition, context, and other stocking rate factors of the offset area. It is anticipated that the evidence of Koala on-site will continue.
Usage	15	15	15	15	15	No change	Field surveys recorded evidence of Koala within the offset area with Koala habitat present. Through Management actions detailed in **Table 50** it's expected that habitat type and evidence of usage will remain at 'breeding.'	Baseline SAT attributes are established. Koala SAT surveys will be completed by suitably qualified professionals at 5, 10, 15, and 20 years.	The offset area is currently considered breeding habitat which will only increase through natural regeneration occurring across the site
Approximate Density	10	10	10	10	10	No change	Field surveys recorded evidence of Koala within the offset area. Through Management actions detailed in **Table 50** it's expected that at least low-level Koala activity (non-zero scats recorded using the East Coast med-high population category) will be maintained.	Baseline SAT attributes are established. Koala SAT surveys will be completed by suitably qualified professionals at 5, 10, 15, and 20 years.	If density levels are not maintained at least low level at the 15-year mark, then broader Koala population surveys will be undertaken to ascertain potential external causes and the management actions re-visited accordingly.
Role of the population	5	5	5	5	5	No change	NA - Not anticipated to change	NA - Not anticipated to change	NA - Not anticipated to change
SSR Score out of 70	**40**	**40**	**40**	**40**	**40**				
SSR Score out of 4	**2.29**	**2.29**	**2.29**	**2.29**	**2.29**				
Total Habitat Quality Scores	**5.98**	**6.22**	**6.94**	**7.40**	**7.61**				

8. Monitoring and Reporting Schedule

The timing and frequency of monitoring and reporting actions, corrective actions and responsibilities for the proposed offset area are provided in **Table 52**. The monitoring schedule is considered appropriate to allow the Proponent, Offset Provider and appointed suitably qualified person to assess the quality of the proposed offset area and success of management actions. In addition, if any non-compliances or ineffectiveness of management action are identified, adaptive management strategies can be implemented to ensure the proposed offset area will increase in quality for the Koala.

Table 52: Timeline for monitoring and reporting actions

Management Action	Monitoring action(s)	Reporting Action and Timing	Responsible person(s) for activity/reporting
1. Legally secure offset area	The offset area will be secured via a suitable method. This will be completed via a Voluntary Declaration administered under the Queensland *Vegetation Management Act 1999* in the interim, prior to impacts occurring, followed by a covenant under the *Land Act 1994* or *Land Titles Act 1994*	The Department will be notified that the offset area has been secured. Evidence in the form of the shapefiles and confirmation of declaration from the Queensland Department of Resources will be provided with the notification. Details will be included in the Annual Compliance Report (ACR).	Suitably qualified person as appointed by the Proponent
2. Pest management	Monitoring will occur before the end of Years 5, 10, 15, and 20 and will include a repeat of baseline survey methodologies (i.e., motion triggered detection camera deployment) and sightings (direct and indirect) with evidence of non-native predators GPS recorded. Evidence of feral animal presence within the offset area and feral animal management implementation will be extracted from the	An OAAR will be completed annually within one (1) month of the end of each offset year detailing feral animal management implementation. Milestone Reports will be prepared three (3) months after the completion of milestone surveys at Years 5, 10, 15, and 20 of the offset and included in the ACR.	Offset Provider and Suitably qualified pest management contractor as appointed by the Offset Provider. Suitably qualified person as appointed by the Proponent.



Management Action	Monitoring action(s)	Reporting Action and Timing	Responsible person(s) for activity/reporting
	Offset Area Annual Report (OAAR) and will be used in assessments of the relative success of the management of threats and progress towards the environmental outcomes and milestone criteria.		
3. WONS management	Weed cover surveys and mapping, and MHQA surveys will be conducted before the end of Years 5, 10, 15, and 20 of the offset in accordance with baseline survey methodologies to track progress against interim milestone targets and completion criteria and identify any issues for rectification. Annual photo monitoring will be implemented in Year 1 to Year 3 to monitor weed treatment areas prior to the first milestone monitoring period at Year 5. Milestone monitoring will be undertaken during the same time of year at every monitoring event, to ensure that the timing is consistent and aligns with the baseline assessment.	An OAAR will be completed within one (1) month of the end of each offset year detailing WONS management implementation, where required, and progress against the performance targets. OAARs will be included in the ACR. Photo monitoring details will be included in OAAR. Milestone Reports will be prepared three (3) months after the completion of milestone surveys at Years 5, 10, 15, and 20 of the offset and included in the ACR.	Offset Provider and suitably qualified weed management contractor as appointed by the Offset Provider. Suitably qualified person as appointed by the Proponent.
4. Bushfire Management Plan	Annual monitoring requirements to review access tracks, fire breaks, seasonal fuel loads and outcomes of controlled burns or other management in accordance with the associated Bushfire Management Plan.	An OAAR will be completed within one (1) month of the end of each offset year which documents bushfire management actions undertaken under the direction of the local authority or recommended in consultation with the Queensland Rural	Offset Provider and suitably qualified bushfire management contractor as appointed by the Offset Provider.

Management Action	Monitoring action(s)	Reporting Action and Timing	Responsible person(s) for activity/reporting
		Fire Brigade. OAARs will be included in the ACR.	
5. Habitat creation and regeneration	Photo monitoring will be completed annually during the first three (3) years of the offset and documented in the OAAR. Photo monitoring will encompass areas of assisted natural regeneration and reconstruction to document on-ground progress. Photo monitoring coordinates are to be recorded and occur in the same location each survey period. Direct infill planting areas will be monitored quarterly for first year then bi-annually to Year 5 or until establishment is reached. The monitoring timing is dependent on the planting cycle of the engaged bush regeneration contractor. MHQA surveys will be conducted before the end of Years 5, 10, 15, and 20 of the offset in accordance with baseline survey methodologies to track progress against interim milestone targets and completion	An OAAR will be completed within one (1) month of the end of each offset year with input from the suitably qualified bush regeneration contractor to document: • Planting/seedling events • Watering schedule • Implemented corrective actions • Success/failure rates within initial maintenance period/watering period until establishment • Certificate of practical completion of planting works; and • Certificate/sign off that establishment has been reached. OAARs will be included in the ACR. Milestone Reports prepared three (3) months after the completion of milestone surveys at Years 5, 10, 15, and 20 of the offset and will be included in the ACR.	Offset Provider and suitably qualified bush regeneration contractor as appointed by the Offset Provider. Suitably qualified person as appointed by the Proponent.

Management Action	Monitoring action(s)	Reporting Action and Timing	Responsible person(s) for activity/reporting
	criteria and identify any issues for rectification.		
6. Fencing and signage	Status of fencing and signage and any issues requiring rectification will be identified through regular site inspections (approximately quarterly) to be determined by the Offset Provider.	Installation and maintenance of fencing will be reported in the Year 1 OAAR. Ongoing status of fencing/signage and any rectification works will be reported in OAARs for the relevant offset year and subsequently in the ACR for the project period.	Offset Provider

Table 53: Monitoring Summary Table

Monitoring Summary								
Monitoring Action	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 15	Year 20
Pest Monitoring	×	×	×	×	✓	✓	✓	✓
Rehabilitation photo monitoring	✓	✓	✓	×	×	×	×	×
Weed mapping	×	×	×	×	✓	✓	✓	✓
MHQA assessments	×	×	×	×	✓	✓	✓	✓
Planting	Following any plantings - quarterly for first year then bi-annually to Year 5 or until plants have become established							
Bushfire Monitoring	Annually for the life of the offset							
Fencing and signage	Monitoring of fence lines is expected to occur quarterly (approximately), as determined by the offset provider, for the life of the offset							

9. Management Framework

This section outlines the management framework to be implemented for the life of the offset (20 years) including management measures to be implemented by the Offset Provider or appointed contractor, annual monitoring requirements, and interim milestone monitoring of environmental outcomes for relevant management actions to be completed by a suitably qualified person at Years 5, 10, 15, and 20 of the offset. These management actions are designed to minimise the risks associated with key threatening processes to the Koala and enhance the quality of the habitat within the proposed offset area. The proposed monitoring actions are summarised in a monitoring and reporting schedule in **Section 6.**

9.1. Management Approach

The measures outlined in the following subsections are considered effective for the listed status of the Koala in addition to the size and scale of the offset and the focus on priority management actions, which are efficient, timely and transparent (*i.e.,* able to be monitored and are auditable). Additionally, a number of these measures correspond to Priority Management Actions outlined in the following documents:

- *Approved Conservation Advice for Phascolarctos cinereus (combined populations of Queensland, New South Wales and the Australian Capital Territory) (Koala Northern Designable Unit*) (DAWE 2022)
- *National Recovery Plan for the Koala Phascolarctos cinereus* (DAWE 2022b)

Although the measures have been developed to achieve the required offset environmental outcomes as a priority, they will deliver an overall improvement in the condition and quality of a wide range of native species present within the proposed offset area.

9.2. Operational Management Units

For the purpose of the management framework, the Assessment Units are termed Operational Management Units (OMUs). The consistent vegetation type and single assessment unit across the referral area results in a single OMU, details for the proposed offset area is provided in **Table 54**.

Table 54: Offset area operational management units

OMU	Assessment Unit	VMA Status	Regional Ecosystem	Area (ha)
OMU1	AU1	Category X	Non-remnant RE12.9-10.2	40

9.3. Management Action 1 – Legally Secure Offset Area

The proposed offset area must be protected and managed against known and potential threats for the Koala in perpetuity to attain a conservation gain. As such, the proposed offset area will be legally secured for conservation prior to impacts occurring via a suitable method such as a covenant and VDEC process administered under the Queensland VMA. Notification of declaration will be supplied to DCCEEW.

The declared area will be recognised as making significant contribution to the conservation of biodiversity. KFF, as the offset provider, will continue to manage the proposed offset area for the life of the offset, whilst reporting required milestones and data to the proponent annually. Legally securing the proposed offset area is listed in the Conservation Advice as a Priority Management Action, under “Habitat Loss, Disturbance and Modification”. Demonstration of this management action will be provided in the Annual Compliance Report.

9.4. Management Action 2 – Non-native Vertebrate Pest Management

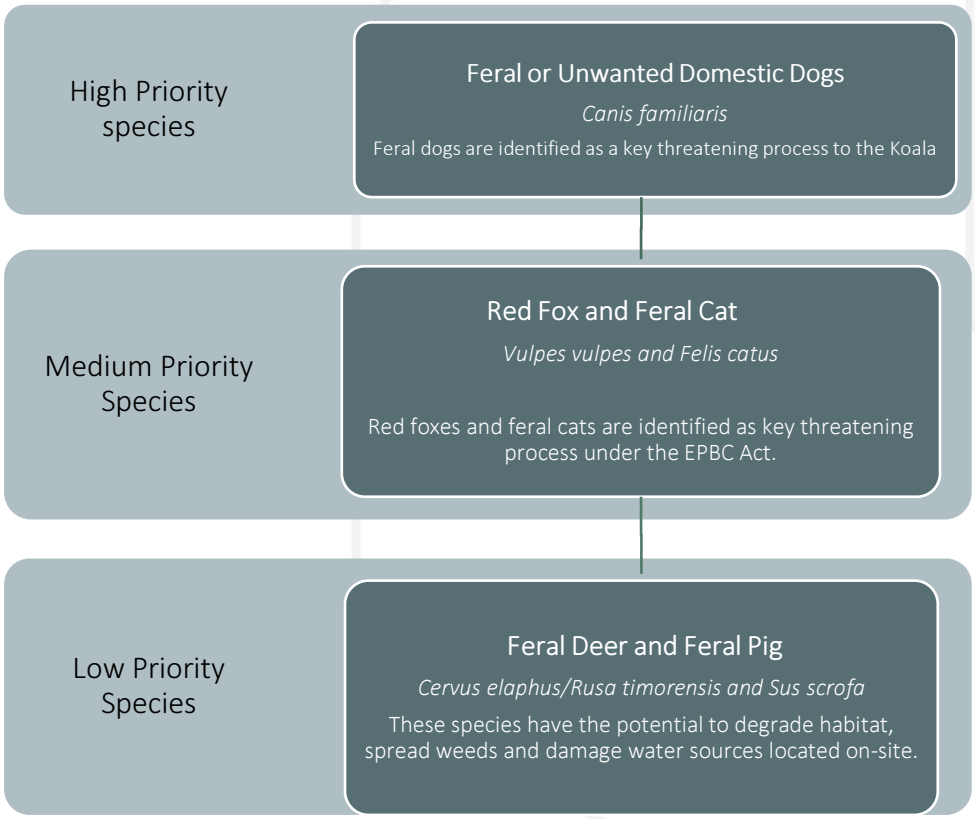
9.4.1 Justification

Wild dogs have been identified as a key threatening process under the EPBC Act and are confirmed as a direct predation risk to Koalas. Managing animal predation is listed as a Priority Management Action under the Koala Conservation Advice.

Additionally, the presence of other non-native predators which may pose a lower level of threat, such as *Felis catus* (feral cat) and *Vulpes vulpes* (European red fox), have the potential to attack and indirectly stress Koalas making them more susceptible to disease. Predation rates by wild dogs are difficult to quantify because attack often occurs in areas infrequently visited by people, and the carcasses of killed animals are buried, eaten, or may go undetected (Beyer *et al*. 2018). Wild dog attack is routinely cited as one of the main causes of mortality of Koalas (Rhodes *et al*. 2011; Gonzalez-Astudillo *et al.* 2017; Beyer *et al.* 2018). Wild dogs are also identified as regional pest species by Somerset Regional Council.

Removal of the wild dog threat produced significant gains in the survival of Koalas in a study where the causes of mortality of 291 Koalas were tracked over four years (Beyer *et al.* 2018). Wild dogs were confirmed as the cause of death for 117 (40.2% of total) deaths during the study. In addition, wild dogs were attributed to another 38 (13.1% of the total) deaths but were not confirmed. Population growth rates of Koala in the study increased from 0.659 in the first year to 1.20 in the fourth year of the project through a combination of reduction in predation and disease treatment. Modelling indicated that the population would increase in size by 21% within a decade with continued management (Beyer *et al.* 2018).

Feral animal species are detailed below in order of prioritisation relative the direct threat to Koala.



Wild Dogs

The Department of Agriculture and Fisheries (DAF) lists feral dogs as abundant and widespread throughout the Somerset region. Wild dogs (*Canis lupus dingo and Canis lupus familiaris*) are listed as declared pest animals by Somerset Regional Council, (refer Somerset Regional Council Biosecurity Plan – Invasive Plants and Animals 2020 – 2025).

Targeted baseline surveys specific to the Offset Area identified six (6) sperate dogs during the survey period. A total of four (4) cameras were deployed throughout this period which equates to a total of fifty-six (56) camera nights. The total RAI of wild dogs within the property is calculated as **10.71**. No other feral species were recording during this survey however are still considered relevant due to their known occurrence in the broader landscape.

European Fox

While the European Fox is not considered a threat under the Koala Conservation Advice, existing literature indicates European Fox to pose at least some risk to the species (Mella et al 2018). DAF lists foxes as being widespread across Australia due to being highly adaptable and opportunistic feeders. The Australian Government's 2022-2023 Threatened Species Action Plan includes targets to manage foxes in important habitats for threatened species. The Queensland Government sites several control methods for this species, including shooting, trapping, fencing, baiting, and livestock guardian dogs, combined with land management (Business Queensland, 2021) (refer **Table 28**). While evidence of European Fox was not recorded within the Offset Area, they are knwin to be present across the broader offset property. Continued pest management of Foxes is still considered relevant to Koala as a lower priority.

Feral Cats

The DCCEEW state that feral cats pose a significant threat to many nationally listed threatened species. This species is known to predate on native species, spread diseases and reduce viable habitat for species most at risk. While not listed as a recognised threat to Koala under the Conservation Advice, Feral Cats have been included as a lower risk predator. While evidence of Feral Cat was not recorded within the Offset Area, continued pest management of Feral Cats is still considered relevant.

Feral Pig

Feral pigs (*Sus scrofa*) are opportunistic omnivores and will consume a wide range of animals including small mammals and birds. Feral Pigs are also widely known to cause significant environmental destruction to soil and vegetation via digging, spreading weeds and consuming vegetation. Feral pigs were not recorded suring targeted surveys however are considered a relevant threat through large scale land degradation.

Feral Deer

Feral deer such as Red deer (*Cervus elaphus*) and Rusa deer (*Rusa timorensis*) pose significant threats to ecological restoration through their browsing of seedlings and under-storey plants, ring-barking and bark-stripping of young trees, trampling of regenerating vegetation and disturbance of soil through wallowing or hard-hoofed movement. These behaviours reduce vegetation recruitment, alter species composition and degrade habitat structure; moreover, the soil disturbance they cause can create bare patches that facilitate invasive weeds, undermining restoration efforts. Ecological restoration therefore faces a heightened risk of failure if deer populations are unmanaged, particularly in planting or natural regeneration areas where plant establishment is critical.

While specific site-based case studies for red deer or rusa deer within the region are limited in public documentation, national research and regional control programs in SEQ indicate that rusa deer can maintain home-ranges of a few hundred hectares in peri-urban and bushland fringe settings (making them locally manageable) and hence pose a realistic threat to restoration success within the Offset Area.

Current Biosecurity Obligations

Presently, under the *Biosecurity Act 2014*, there is the General Biodiversity Obligation (GBO) for landholders to manage biosecurity risks that are under their control and take reasonable and practical steps in doing so. To determine the extent of management and to determine if it is necessary to take reasonable and practical steps in managing the biosecurity risk, the landholder is required to assess the risk and its potential harm (i.e., extensive productivity loss). IF not utilised as an environmental offset, the landowner would not undertake feral animal control as it is assessed under the 'general biosecurity obligation' of the Biosecurity Act 2014, that feral animal threat to productivity does not have a positive cost benefit to the current land use (i.e., the expenditure to undertake feral animal control would not result in enough economic gain in productivity to warrant implementation).

The implementation of a targeted Pest Management Program for the offset site will provide certain, detailed, and active reduction of pest species in the local area.

9.4.2 Proposed action

The control and prevention of invasive animal incursions will be undertaken in accordance with the relevant legislation (such as the Commonwealth *Biosecurity (Consequential Amendments and Transitional Provisions) Act 2015* and the *Queensland Biosecurity Act 2014*) and include the control of non-native

predators by legal methods by suitably qualified pest management contractor(s). Any required hazardous materials must be handled and stored in accordance with the material's safety data sheets and the *Approved Code of Practice for the Storage and Handling of Dangerous Goods*. Non-native predator control will be undertaken in a humane manner.

Management measures will be implemented by the Offset Provider for the life of the offset (20 years) for the control of the feral animal species identified in across the proposed offset area include:

- Development and implementation of a property wide feral animal management program specifying techniques (trapping, baiting, shooting) and ongoing monitoring methods (including datasheets) will be utilised, completed within Year 1 of the offset.
- Adjacent land holders will be consulted for the potential of collaboration in a localised landscape-wide pest management effort if considered appropriate by the suitably qualified pest management contractor/offset provider. As feral animal management is best achieved on a property-wide scale, this will occur across adjacent offset holdings at a minimum.
- if considered appropriate by the suitably qualified pest management contractor/offset provider, cooperative participation in feral animal management planning and implementation with local land managers (government departments, local governments and utility providers) will occur to ensure effective management in the locality of the offset area, being Somerset Regional Council.
- Signage installation informing that feral animal control being undertaken within the offset area.

The proposed action to be implementation at the discretion of the suitably qualified pest contractor for feral animal species is provided in **Table 55.** These have been adapted from the *National Wild Dog Action Plan: Promoting and supporting community-driven action for landscape scale wild dog management* (WoolProducers Australia 2014), refer **Table 56** Any control methods will be used in consultation with local residents and authorities.

Table 55: Feral animal control Actions

Timeframe	Details
Year 1	• Development of a property wide feral animal management program specifying techniques (trapping, baiting, shooting) and ongoing monitoring methods (including datasheets) will be utilised. • Incorporates baseline RAI of feral animals completed as part of this OMP and detailed in Section 6.2.2 • The feal animal management program will use the baseline data to build a calendar of annual activities based around varying control methods, seasons and species recorded.
Years 2-20	• Implement property wide feral animal management program Best practice management measures will be implemented and will include for: a. Dogs – biannual control (Mar-May breeding and Sep-Nov weening)

Timeframe	Details
	i. Shooting – dawn ii. Cage trap – set evening, clear morning iii. Foothold / padded-jaw / offset laminated jaw traps – set evening, clear morning iv. Leg hold trap – set evening, clear morning v. Collarum® neck restraint – set evening, clear morning vi. Baiting with / without infra-red sensing cameras – set as required b. Foxes – biannual control (winter/spring breeding and autumn migration) i. Shooting – dawn ii. Cage trap – set evening, clear morning iii. Padded-jaw / offset laminated jaw traps – set evening, clear morning iv. Leg hold trap – set evening, clear morning v. Baiting with / without infra-red sensing cameras – set as required c. Cats – biannual control i. Shooting – nocturnal more productive ii. Wire 'treadle-type' box traps – baited and set evening, clear morning iii. Rubber-jawed leg-hold traps - baited iv. Baiting with / without infra-red sensing cameras – set as required d. Pigs – annual control targeting ≥ 70% of population i. Shooting – outside of trapping and baiting ii. Fenced trapping - set evening, clear morning – pre-feeding and then triggered iii. Baiting with / without infra-red sensing cameras – set as required – can pre-feed to attract e. Deer – manage in response to an incursion i. Shooting – diurnal v. Self-mustering trap - set evening, clear morning and euthanise Year 5: Compile findings in a Milestone Report of five years of the Feral Animal Management Program (as outlined below). Year 10: Compile findings in a Milestone Report of five years of the Feral Animal Management Program (as outlined below). Year 15: Compile findings in a Milestone Report of five years of the Feral Animal Management Program (as outlined below). Year 20: Compile findings in a Milestone Report of five years of the Feral Animal Management Program (as outlined below).



Table 56: Feral animal (predator) species control methods - adapted from WoolProducers Australia 2014

Method	Efficacy	Cost effectiveness	Target specificity	Humaneness acceptability	Comment
Ground baiting with 1080	Effective	Cost-effective	High	Conditionally acceptable	Currently the most cost-effective technique available. Poison baits are made from raw animal meat or offal or manufactured baits are used. Average and minimum weights vary between states. Sodium fluoroacetate (1080) is the main toxin used for control of wild dogs – reference to relevant State directions for use will be required.
Shooting to euthanise trapped dogs / fox / cats	Effective	Cost-effective	High	Acceptable	Effective technique although will require to be completed in accordance with existing State laws and guidelines.
Ground shooting	Can be effective to target individual dogs / foxes – largely opportunistic	Moderately expensive and time consuming	Moderate to high	Conditionally acceptable, dependent on skillset of shooter. Welfare issues arise if animal is not shot humanely	Limited effectiveness for broadscale population reduction, however, can achieve sustained control within a local area.
Exclusion fencing	Effective in suitable areas	Expensive	Can be effective in	Acceptable	Requires substantial resource input both initially, during installation, and in an ongoing capacity due to high maintenance requirements. Electric fencing can

Method	Efficacy	Cost effectiveness	Target specificity	Humaneness acceptability	Comment
			specific situations		be an effective barrier when used appropriately and in conjunction with supplementary management techniques. Often adequate defense against reinvasion of controlled areas. Due to high levels of maintenance and upkeep required, fencing can be difficult to effectively maintain.
Aversion techniques	Not known	Not known	Not certain – possible short-term until target species become familiar with technique	Acceptable	Suggested aversion methods include flashing lights, sounding alarms, objects flapping in the wind and chemicals.

Adaptive management for feral animal species

Given the extended management timeline, it is not possible or intended that this Offset Management Framework will provide a detailed prescription of management actions. This framework has been based on the current state of knowledge of species ecology and best practice habitat management approaches for Koala habitat. It is anticipated that new techniques will become available over the course of the management period to monitor environmental values through indicators including vegetation composition, Koala absence, presence and abundance, and weed presence or density (including level of infestation). In addition, given the variable nature of pest management, an adaptive management approach has been adopted to ensure the Pest Management Plan works effectively for any species over the area, as well as integrating future research and insights into management and monitoring actions. This will ensure best practice techniques can be adopted as new information becomes available over time via an adaptive management approach, ensuring the anticipated delivery and measurement of offset outcomes.

Adaptive management refers to a way of managing natural resources where management actions are reviewed and, if necessary, modified, based on observed changes in environmental condition and/or updates in knowledge which underpins the original management approach.
Adaptive management will be used to incorporate changes into management processes across the proposed offset area, and will include the following:

- Assimilation of new data or information – such as updates to conservation advice or new threat abatement plans relevant to the Koala.
- Annual review of risks – to reassess existing risks/threats to the offset area and ensure best practice methodology is implemented to achieve effective management of target species.
- Annual review of management measure effectiveness – to reassess management actions where monitoring performance criteria are not met.

9.4.3 Monitoring

The effectiveness of pest management actions will be measured and monitored through a structured process which includes annual surveys by a qualified pest management contractor and 5 yearly milestone monitoring by a suitably qualified person before the end of Years 5, 10, 15, and 20 of the offset.

Baseline surveys (completed)

- Detailed Offset Area-specific Baseline Survey (Year 1) – Establishes initial feral animal population data and report.

Years 2 – 20

- Annual scheduled Feral Animal Surveys and Control completed by suitably qualified pest contractor

Years 5, 10, 15 and 20

- Targeted feral animal surveys completed by suitably qualified Ecologists replicating baseline surveys detailed in **Section 6.1** and summarised below.

The following non-native predator monitoring methodology will be implemented by a suitably qualified person:

- Desktop Assessment



- Review previous survey mapping and camera locations, field datasheets, photos and notes.

- Field Survey
  - Grid-based motion detection camera deployment for minimum of 14 nights in the same locations at 5 yearly monitoring schedule for the life of the offset. Motion detection camera locations are to be recorded with hand-held GPS. GPS coordinates and photos to be recorded.
  - Field datasheet will detail the time of year of the monitoring event, record observed scats or tracks, photo location and notes of any evidence of positive and/or negative changes in feral animal occurrence.
  - A GPS will be used to locate the presence of feral animal species, with a focus on species identified during baseline field surveys via notable tracks or scats.
  - Transfer GPS data to spatial data programs to generate feral animal occurrences and collate all data in excel spreadsheets and save all digital photos to file for ongoing monitoring and reporting purposes.
  - Where feral animal presence is detected, targeted trapping and baiting programs, will be implemented on completion of the monitoring program.

9.4.4 Reporting

- Milestone feral animal monitoring survey results will be reported by the suitably qualified person in the 5, 10, 15 and 20 Year Milestone Report. This will provide detail on survey methodologies and detected predator abundance with reference to the baseline survey data.
- Implementation of the Feral Animal Management Program and results of feral animal management program will be detailed annually by the Offset Provider in Offset Area Annual Reports.
- OAARs and/or Milestone Reports will be included in the relevant Annual Compliance Report.
- In the event that the completion criteria has been met (<10% of RAI) monitoring will continue for the life of the offset to ensure continued environmental outcome for the Koala.

9.4.5 Completion Criteria

Timing	Completion Criteria
Year 1	Development of a property wide feral animal management program
Year 2 – 20	Implement property wide feral animal management program to reduce feral animal abundance
Years 5, 10, 15	Review feral animal management program based on available data and endorsed guidelines and including a review of management techniques and adaptive management strategies where appropriate.
Year 15	Feral animals suppressed within the offset area to <10% of the Relative Abundance Index (RAI). Priority wild dogs.



9.5. Management Action 3 – Management of Weeds of National Significance

9.5.1 Justification

The listing and prioritisation of WONS is a joint initiative of the States, Territories and Australian Government and their long-term control is of national interest. *L. camara* and its impact on Koala movement is listed as a key threatening process, prolonging time spent on the ground and therefore increasing susceptibility to predators (Paull *et al.* 2019, The Honourable Leeanne Enoch 2019). The Queensland Koala Strategy 2019-2024 lists Koala habitat restoration, including removal of weeds, as a key priority, and these recommendations were developed at the advice of the Koala expert panel (Queensland Government 2019).

As well as limiting movement for Koalas and other fauna, *L. camara* also changes the structure and health of the ecosystem, which can lead to a decline in the health and quality of Koala food and habitat. *L. camara* is a transformer weed, altering wildfire behaviour, potentially resulting in destruction of native trees on a larger scale (Berry et al 2011, DAF 2016). *L. camara* also supresses eucalypt recruitment, both through its allelopathic properties and its capacity to shade out other species. Without management intervention this leads to an overall decline in habitat health (Threatened Species Scientific Committee, 2010). If eucalypt species cannot recruit the succession of vegetation is interrupted, threatening the future health of the ecosystem.

Weed control is fundamental to improving biodiversity and the ecological condition of the habitat within the offset area. Historical land uses across the proposed offset area have resulted in the introduction and spread of a variety of environmental weeds. Weeds recorded on-site are generally confined to ground cover species such as pasture grasses which dominate the area. *Lantana camara* (Lantana), a WONS, is a persistent weed in SEQ and is widespread across the broader Little Kiper Creek Offset Property. However, *Lantana camara* (Lantana) was recorded in only very low abundance within the proposed offset area, likely a result of continued cattle grazing and dominance of pasture grasses. Nevertheless, the ongoing maintenance of <5% WONS is considered relevant, particularly given the potential for *Lantana camara* (Lantana) to seed from adjacent dense patches and quickly spread. Germination can occur rapidly after wet weather or when a parent plan is removed. Therefore, on-going repeat visits to the offset area following are required to maintain low abundance of *Lantana camara* (lantana).

9.5.2 Proposed action

The majority of weeds recorded on-site are ground cover species indicative of cattle grazing country. As such, the suppression of weeds will likely occur following the reinstatement of native vegetation and canopy cover. Direct weed control will be implemented where necessary to achieve the scoring as proposed in **Table 22**. Given the potential for *Lantana camara* (Lantana) infestation to occur, future works will be adaptive and any new infestations of *Lantana camara* (Lantana), or any other WONS, will be prioritised. Weed management strategies for Lantana specifically are listed in **Table 57** and other WONS in **Table 58**.

The management actions must maintain WONS weed cover below 5% over the entire offset site by Year 15 of the offset, as detailed in the environmental outcomes (**Section 7** and **Table 24**). The timing for the implementation of management measures includes:

- Establish photo monitoring locations
- Treatment of WONS will occur annually and where needed.

Table 57: Lantana management methods

Type of infestation	Physical	Mechanical	Chemical	Fire	Biological
Small (few plants, small area)	Hand grubbing only suitable for seedlings. Wear gloves for protection from thorns.	Not suitable.	Spot spray plants less than 2 m in height between summer and autumn with a registered herbicide.	Not suitable.	There are four useful biological control agents. They are already distributed throughout their potential range.
Medium (medium density, medium total area)		Bulldoze, plough, stick-rake or slash infestations. Soil disturbance will lead to mass seed germination, so follow up with further controls. Do not use mechanical control in areas susceptible to erosion. A permit may be required.	Spraying is uneconomical for medium or large infestations. Helicopter spraying is used when there is no access for mechanical control, eg very steep slopes.	Under permit, burn in summer with good fuel load of grass and/or mechanically cleared lantana. Also use as follow-up. Do not burn in rainforests.	
Large (many plants, many ha)					

Note: table extracted from CRC for Australian Weed Management, 2003, Weed Management Guide, Lantana – Lantana camara, Commonwealth Department of the Environment and Heritage.

Table 58: Weed treatment and removal methods

No.	Family	Scientific name	Common name	Non-chemical control	Chemical control
1	Amaranthaceae	*Alternanthera philoxeroides*	Alligator Weed	Refer to Business Queensland: Invasive Plants at https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/landmanagement/health-pests-weeds-diseases/weeds-diseases/invasive-plants for additional guidance. Or WONS weed management guides available at https://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html	Herbicides must be applied by appropriately qualified / supervised persons in accordance with the Agricultural Chemicals and Distribution Control Act 1966 at rates identified on registered product labels, or on an Australian Pesticides and Veterinary Medicines Authority issued off-label permit where applicable. Also refer to: Business Queensland: Invasive Plants at https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/landmanagement/health-pests-weeds-diseases/weeds-diseases/invasive-plants for additional guidance.
2	Gramineae	*Andropogon gayanus*	Gamba Grass		
3	Annonaceae	*Annona glabra*	Pond Apple		
4	Basellaceae	*Anredera cordifolia*	Madeira Vine		
5	Asparagaceae	*Asparagus aethiopicus cv. Sprengeri*	Asparagus Ground Fern		
6	Asparagaceae	*Asparagus africanus*	Ornamental Asparagus, Asparagus Fern		
7	Asparagaceae	*Asparagus asparagoides*	Bridal Creeper		
8	Asparagaceae	*Asparagus declinatus*	Bridal Veil, South African Creeper		
9	Asparagaceae	*Asparagus plumosus*	Asparagus Fern		
10	Asparagaceae	*Asparagus scandens*	Climbing Asparagus Fern		
11	Cactaceae	*Austrocylindropuntia spp.*	Prickly Pears		
12	Cabombaceae	*Cabomba caroliniana*	Cabomba		
13	Asteraceae	*Chrysanthemoides monilifera subsp. Monilifera*	Boneseed		
14	Asteraceae	*Chrysanthemoides monilifera subsp. rotundata*	Bitou Bush		
15	Asclepiadaceae	*Cryptostegia grandiflora*	Rubber Vine		
16	Cactaceae	*Cylindropuntia spp.*	Prickly Pears		
17	Fabaceae	*Cytisus scoparius*	Common Broom		
18	Bignoniaceae	*Dolichandra (Macfadyena) unguis-cati*	Cat's Claw Creeper		

No.	Family	Scientific name	Common name	Non-chemical control	Chemical control
19	Pontederiaceae	*Eichhornia crassipes*	Water Hyacinth		Southeast Queensland Ecological Restoration Framework WONS weed management guides available at https://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html
20	Fabaceae	*Genista linifolia*	Flax-leaved Broom, Mediterranean Broom		
21	Fabaceae	*Genista monspessulana*	Montpellier Broom, Cape Broom, Canary Broom		
22	Poaceae	*Hymenachne amplexicaulis*	Hymenachne		
23	Euphorbiaceae	*Jatropha gossypifolia*	Bellyache Bush		
24	Verbenaceae	*Lantana camara var. camara*	Lantana		
25	Solanaceae	*Lycium ferocissimum*	African Boxthorn		
26	Mimosaceae	*Mimosa pigra*	Giant Mimosa		
27	Gramineae	*Nassella neesiana*	Chilean Needle Grass		
28	Gramineae	*Nassella trichotoma*	Serrated Tussock		
29	Cactaceae	*Opuntia spp.*	Prickly Pears		
30	Cactaceae	*Parkinsonia aculeata*	Parkinsonia		
31	Asteraceae	*Parthenium hysterophorus*	Parthenium Weed		
32	Mimosaceae	*Prosopis pallida*	Algaroba		
33	Rosaceae	*Rubus fruticosus aggregate*	Blackberry		
34	Alismataceae	*Sagittaria platyphylla*	Delta Arrowhead, Arrowhead, Slender Arrowhead		
35	Salicaceae	*Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii*	Willows (except Weeping Willow, Pussy Willow and Sterile Pussy Willow)		
36	Salviniaceae	*Salvinia molesta*	Salvinia		
37	Asteraceae	*Senecio madagascariensis*	Fireweed		

No.	Family	Scientific name	Common name	Non-chemical control	Chemical control
38	Solanaceae	*Solanum elaeagnifolium*	Silver Nightshade		
39	Tamaricaceae	*Tamarix aphylla*	Athel Pine		
40	Fabaceae	*Ulex europaeus*	Gorse, Furze		

Weed notes

Weed management typically comprises a major part of rehabilitation site works. Weed management provides the basis of aiding natural regeneration and assisted natural regeneration.

Weed Management will be undertaken in accordance with the SEQERF Primary, Follow-up and Maintenance works notes above targeting WONS.

Critical skills for Weed Management include:

- Knowledge of relevant legislation.
- Plant Identification skills.
- Knowledge of different weed management techniques.

Knowledge of different weed management techniques

A range of weed management techniques are available to combat varying weed species and scenarios. Refer to the following **Table 59** for a summary of contemporary weed management techniques extracted from the SEQERF.

Table 59: Weed treatment schedules (source: SEQERF)

Method	Description
Herbicide	The herbicide weed control techniques described below provide a range of proven methods that can be used on a restoration site
Cut- scrape - paint	Cut the stem of the plant close to the ground (approximately 1-2cm) ensuring that soil does not come in contact with the cut surface. The cut can be made at a slight angle in order to increase the surface area that is exposed to the chemical. Apply herbicide immediately to the cut stump using poison pot and brush or dripper bottle. Using a knife, scrape the sides of the stump thoroughly to expose the green tissue. Apply herbicide to the scraped stump. The chemical must be applied within 10 seconds of the cut or scrape being made in order for it to be fully effective.
Cut– paint	Cut the stem of the plant close to ground level. Apply herbicide to the cut stump using poison pot and brush or dripper bottle. This method is best suited to easy-to-treat weeds such as small-leaved privet (*Ligustrum sinense*), provided that the diameter of the stem at ground level is less than approximately three centimetres. If a glyphosate-/ metsulfuron methyl herbicide mix is being used in the poison pot, a greater range of weeds can be controlled using this method e.g., Easter cassia.
Scrape - paint	Scrape as much of the stem as possible (one side of the stem) using a knife and apply herbicide to the scrape. Leave a small section of the vine unscraped, and then twist the vine so that the next scrape is made on the opposite side of the stem to the preceding scrape. Continue along the length of the vine, scraping and painting as much of the stem as possible, with scraping to be concentrated along the thicker stems close to the root of the plant. This is the best method to use for madeira vine, as it allows the chemical to translocate to the underground storage organs and aerial tubers which may be hanging in large clusters above head height. This avoids the potential problem of tubers from cut stems left hanging in the trees from dropping to the ground and sprouting. When scraping madeira vine stems a deep scrape is advisable - scrape right through to the fibrous, stringy section of the stem, taking care not to sever the vine. This method is also suitable for treatment of ochna.
Over-spraying	Over-spraying involves the use of knapsacks or power sprayers to treat large expanses of weed such as lantana thickets. The foliage must be covered with



Method	Description
	herbicide but not to the point of running off the plant. The dead plants remain in place and can be cut down at a later stage. Prior to over-spraying, any weeds that are growing closely around established native plants must be hand removed or treated by cut-scrape-paint.
Oil-hang	Vines such as mile-a-minute (*Ipomoea cairica*) which produce long stolons extending many metres along the surface of the ground, are suited to the oil-hang method. Locate the base of the plant and carefully pull up the runners and roll them up. The resulting roll of vine is then hung in the fork of a tree to dry out as if it is left on the ground it is likely to re-shoot. Where runners are climbing up into a tree they are cut off at head height prior to the runner being rolled up - there is no need to pull cut vines down from trees as this action is likely to damage the tree. The base of the vine is treated using the cut scrape- paint method.
Gouge-paint	This method applies to plant species that have a fleshy underground storage organ, such as the large tuber that is often found at the base of madeira vine. It is also particularly appropriate for the treatment of climbing asparagus (*Protasparagus plumosus*). If using this technique on climbing asparagus, first cut the stems that are growing into the canopy at head height and also at the base. The fleshy rhizome can then be gouged, or alternatively in the case of climbing asparagus, it may be struck several times firmly with the head of a pair of loppers, allowing the brown outer covering of the crown to peel away exposing the white fleshy inner section of the rhizome for application of herbicide. Gouge out sections of the fleshy base with a knife and apply herbicide using a paint pot and brush or dripper bottle within 10 seconds
Basal Barking	This method involves mixing an oil soluble herbicide in diesel/kerosene and painting or spraying the full circumference of the trunk or stem of the plant from ground level to a height of approximately 45cm. Basal bark application is suitable for thin-barked woody weeds including saplings, regrowth and multi- stemmed shrubs. The method will usually result in the mortality of difficult-to- control woody weeds at any time of the year, provided the bark is not wet or too thick to enable the herbicide to penetrate. The method should not be used in wet weather, adjacent to waterways or in areas where native trees and shrubs are located. The use should be restricted to situations where a weed is particularly difficult to control e.g., cherry guava and where other methods have been unsuccessful.
Splatter Gun	This small gas-powered injector kit is fitted into a knapsack for easy carrying and delivers large droplets in a stream over the weed. The gun is used to deliver a concentrated herbicide (glyphosate or metsulfuron methyl) across large dense expanses of weed. This method is used for species such as lantana (ratio of 1:9 of glyphosate water). Splatter gun involves spraying strips at one to two meter intervals over the thicket. The herbicide is then translocated throughout the entire plant. The method does not require the whole plant to be covered as in over-spray
Spot-spraying	A knapsack filled with an appropriate herbicide mix is used by the operator to selectively control environmental weeds. A keen eye and an ability to distinguish between the native and weed species likely to be present, especially at seedling stage, is essential. Marker dye is added to the chemical mix to allow the operator to see what has already been sprayed, thus covering the ground weeds comprehensively and thoroughly Glyphosate and metsulfuron methyl are the main herbicides used for spot-spraying in ecological restoration, together with the addition of a penetrant and/or surfactant and marker dye

Method	Description
Stem Injection	Large woody weeds such as camphor laurel, coral trees (*Erythrina spp.*, *Privet Ligustrum spp.*) and umbrella trees are generally treated by stem-injection. Holes are drilled at regular intervals around the base of the tree and exposed roots using a drill. A tree injection syringe attached to a small capacity knapsack is used to fill the holes with herbicide. Stem-injection of trees can also be undertaken using a hatchet to create cuts in a brickwork pattern in trunks of trees for the application of herbicide (known as tree filling). Frilling is more labour intensive than drilling. The greatest benefit of stem injection is that the trees can be left standing in situ as they die, provided there is no risk to humans or infrastructure from falling limbs. This creates convenient roosts for birds and other animals, and prevents the formation of large amounts of debris on the ground and damage to understorey plants which would result if the trees were to be cut down using a chainsaw.
Wick Wiping	Wick wipers can be manually used with a sponge or wick applicator, attached to a container filled with herbicide or as an attachment towed by a tractor. The manual method can be used to selectively apply herbicide to the leaves of weeds growing in sensitive situations. The hand held container can leak and generally spot spraying would be recommended. The use of a tractor drawn wick wiper is used to control taller growing species such as introduced grasses and to encourage the growth of lower growing species. This method could be used in preparation for planting.
Mechanical	Mechanical weed control involves the use of powered and non-powered equipment such as brushcutters, chainsaws, slashers, shovels, pruners, saws, etc. These methods are best used in situations where there is a large, uninterrupted stand of weeds.
Dig and Bag	Dig and remove tuberous/ rhizomatous root systems. Remove roots or whole plant in hard/ compacted soils. Place in suitable container and remove from site, dispose of by deep burial, burn or burial at a land fill, must not place declared weed species in recycling (mulch).
Hand-pull	Remove totally from ground by hand (human). Perform when soil is moist. Applicable to small infestations or areas of environmental sensitivity (including sensitive watercourses, when frogs are breeding, or presence of threatened species).
General Mechanical	May involve use of machinery (e.g., brushcutter, chainsaw, slasher, dozer, excavator). Suitable for large infestations and weed trees. Initially cost-effective, but requires immediate revegetation of site or matting/ mulch application and extensive maintenance periods, Generates excessive soil and vegetation disturbance

9.5.4 Monitoring

A suitably qualified person will complete monitoring for WONS before the end of Years 5, 10, 15, and 20 of the offset to track against the interim milestone and completion criteria in the environmental outcomes as outlined in **Table 51**. Detailed surveys are also recommended at Year 8 to ensure WONS cover remain below 5% over the whole offset area.

The methodology for non-native plant survey will be repeated by the suitably qualified person in accordance with the monitoring and reporting schedule in **Section 6**. Surveys include the search and recording of infestations and MHQA transects to record weed cover. The following procedures will be implemented to ensure that the monitoring events align with the baseline survey methodology:

Baseline surveys (completed)

- Detailed Offset Area-specific weed mapping – Establishes baseline WONS cover

Years 1 - 3

- Photo monitoring across offset area

Years 5, 10, 15 and 20

- Detailed WONS mapping completed by suitably qualified Ecologists replicating baseline surveys detailed in **Section 6.1** and summarised below.
- Desktop Assessment
    - Reviewing previous survey mapping, field datasheets, photos and notes including WONS priority areas where applicable.
    - Reviewing weed and bush regeneration records for the last year.
- Field Survey
    - MHQA transects are carried out at baseline survey locations,
    - Utilising the weed cover assessment methodology discussed in **Section 6.1**, inspect previously identified weeds infestations. Mapping of any new WONS infestation areas using GPS unit and quantify using weed cover transects.
    - Record WONS and all non-native flora species.
    - Provide photo monitoring at established locations to be set up in Year 1 of the offset with photo location and direction, and
    - Notes of any notable positive and/or negative changes in weed density and coverage.

9.5.5 Reporting

Details of any WONS treatment and photo monitoring will be detiloed in the OAAR.

Milestone monitoring survey results will be reported by the suitably qualified person in the Year 5, 10, 15, and 20 Milestone Report and included in the ACR. This will provide detail on survey methodologies and detected predator abundance with reference to the baseline survey data.

9.5.6 Completion Criteria

Timing	Completion Criteria
Year 1	Initial treatment of existing WONS
Year 2 - 9	Continued treatment of existing WONS
Year 10 – 20	• Maintain WONS at <5% of the offset area for the life of the offset • Reduce all weeds to <5% of the site

9.6. Management Action 4 – Bushfire Management Plan

9.6.1 Justification

Fire management of the offset area is critical to achieving the intended outcomes and conservation gains over the management period. Managing the vegetation to promote natural regeneration and reduce the impacts of uncontrolled wildfire within the offset area will ensure management objectives are achieved. Uncontrolled wildfire is considered a key threat to Koala populations, with impacts inclusive of mortality, injury, and loss of or altered habitat resulting in a reduction in food source and potentially increased exposure to predators.

The management measures contained in this OMP will be used to assess baseline fuel loads and indicate management techniques and planning, specific to the offset area in the context of the surrounding landscape. The overall objective is to prevent fire-induced Koala mortality via targeted fuel hazard reduction and prescribed fire management. Managing the vegetation to promote natural regeneration and reduce the impacts of uncontrolled wildfire within the offset area will ensure management objectives are achieved.

Under current Queensland legislation, landowners are required to prepare and plan for bushfire hazards by being aware of fire management issues in the area, trimming trees, mowing grass, removing flammable material around the home, and clearing vegetation, particularly if land boundaries are shared with bushland. It is important to balance undertaking these activities and preventing harm to the natural environment and areas of cultural heritage. This can be achieved through property planning or preparing and implementing a land and water management system. Specific actions as directed by the local authorities must be implemented which may include prescribed burning or other techniques undertaken in consultation with the Queensland Rural Fire Brigade to manage fuel loads if required.

9.6.2 Proposed action

A specific BMP will be developed in accordance with relevant Queensland guidelines and endorsed by an experienced bushfire practitioner to reduce potential threats from fires to Koala. The BMP will assess baseline fuel loads and minimise risk of bushfires to Koalas or habitat. The BMP will expand points on wider fire management concepts.

The BMP will combine information from a variety of sources including land manager discussions, industry best practice, This OMP, as well as the following technical documents:

- Queensland Fire and Emergency Services. (2020). Queensland Bushfire Plan.
- Queensland Parks and Wildlife Services (QPWS) Bioregional Planned Burn Guidelines
  - Queensland Parks and Wildlife Service. (2022). Planned Burn Guidelines: Introductory Volume.
  - Queensland Parks and Wildlife Service. (2022). Planned Burn Guidelines: Southeast Queensland Bioregion of Queensland.
  - Queensland Parks and Wildlife Service. (2012). Planned Burn Guidelines - How to Assess if Your Burn is Ready to Go. www.bom.gov.au
  - Queensland Parks and Wildlife Service. (2012). QPWS Planned Burn Fire Behaviour Tables.
- Queensland Fire and Emergency Services. (2019). Bushfire Resilient Communities (BRC) Technical Reference Guide for the State Planning Policy State Interest “Natural Hazards, Risk and Resilience Bushfire.
- Australasian Fire Authorities Council (AFAC) National Burning Project.

- Queensland Fire and Biodiversity Consortium (2022). Burnett Mary Fire Management Guidelines

The BMP will include the following components, with further initial detail on some of these components in the below sections:

- Fire management for MNES: Description of fire management considerations for koala, including threats from inappropriate fire regimes.
- Bushfire hazards: A comprehensive landscape-scale assessment and historical review of the key factors characterising the area's bushfire risk, including fire weather, topography and fire history. Site fuel load assessment. A brief description of hazards on the Offset Property is provided in **Section 9.6.3** below.
- Operation fire management units (FMUs): outlining site fire management activities including but not limited to weed management, stock grazing and planned burning for fuel reduction and ecological management, access and fire break maintenance and habitat protection measures (further detailed in Section 9.6.3 below).
- Fire management plan: Provides a land management plan which outlines Fuel Management Units, including land management zones (including operational and site information).
- Monitoring and maintenance schedule: Describing an approach for adaptive management and monitoring to evaluate the effectiveness of fire management regimes and land management activities (monitoring methods outlined in **Section 9.6.5**).

Planned burns

Planned burns have been included as a bushfire management technique however it is not possible to provide a detailed plan of frequency of these events as they are driven by fuel hazard monitoring as detailed in the BMP and **Section 9.6.5**.

As a guide to burn frequency, the Queensland Department of Environment, Tourism, Science and Innovation (DETSI) provide fire management guidelines for RE12.9-10.2 which is the sole vegetation community across the Offset Site. A burn interval of 4 – 25 years is referenced with an aim for 40-60% mosaic burn. This high variability of burn frequency of RE12.9-10.2 highlights the challenges with providing a detailed burn regime. Planned burns will not occur at frequency intervals of less than 4 years as detailed in the fire management guidelines and dependent on outcomes of fuel hazard monitoring.

If results of the fuel load monitoring determine that a planned burn is required, then a plan will be put in place detailing the location/extent of the planned burn, the methods to be utilised and a photo log of pre/post burn conditions which will feed into the monitoring regime discussed in **Section 9.6.5**.

9.6.3 Bushfire risk areas and potential ignition sources

External bushfire risk areas

The Offset Property is bordered on all sides by rural pastoral land. These surrounding land uses present potential pathways for bushfire to originate outside the Offset Property and enter the site, particularly under elevated fire weather conditions.

Higher external bushfire risk is associated with:

- North-western boundaries, where more continuous native vegetation connects to the Offset Property, increasing the potential for large landscape scale fires to enter the site.
- Boundaries with rural pastural land where fire may originate from due to pasture management activities, machinery use or escaped planned burns; and

- Roadside corridors and access tracks adjoining or entering the Offset Property, which may act as ignition sources during periods of high fire danger.

Internal bushfire ignition sources

Potential sources of bushfire ignition within the Offset Property include:

- Escaped planned fire management activities, including ecological or hazard reduction burning.
- Operational activities, such as use of farm machinery and vehicle movements along internal tracks.
- Natural ignition sources, including lightning strikes, particularly along ridgelines and elevated areas; and
- Accumulated fine fuels, including grasslands, regrowth areas and edge interfaces between cleared land and remnant vegetation.

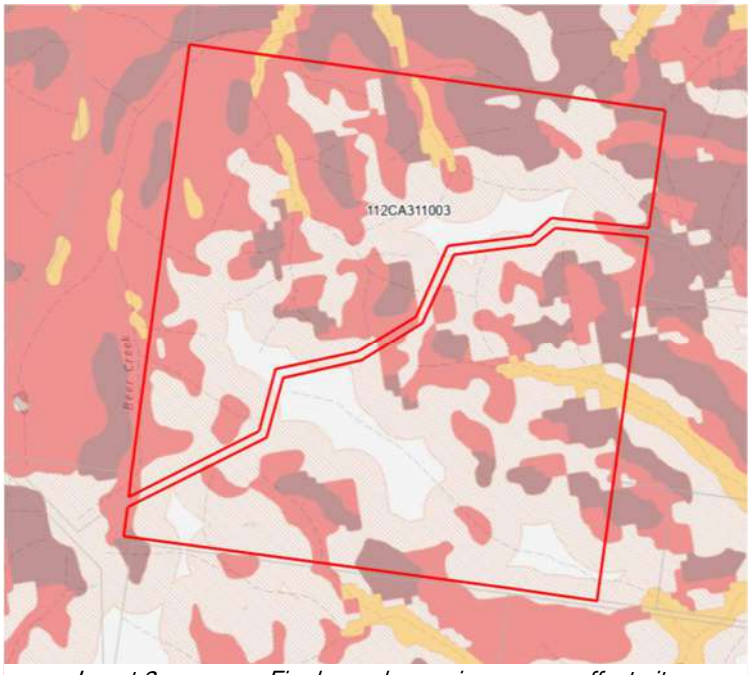
Bushfire hazard characteristics

Bushfire behaviour across the Offset Property is influenced by fuel, weather and topography. Fuel loads vary spatially and include heavily grazed areas, ungrazed grasslands, regenerating vegetation and wooded area. Areas of steeper terrain and woody vegetation, particularly along ridgelines and vegetated creek lines, present a higher potential bushfire intensity.

Much of the Offset Property is mapped as a Bushfire Prone Area under the State Planning Policy. Mapping indicates patches of Very High and High Potential Bushfire Intensity associated with woody vegetation on, with Medium Potential Bushfire Intensity generally occurring along vegetated drainage lines. Cleared areas with scattered regrowth are mapped as Potential Impact Buffers (**Insert 3**).

Existing access tracks and cleared areas provide opportunities for fire containment and suppression, subject to prevailing fire weather conditions and fire behaviour.

Fire management across the Offset Property will prioritise asset protection and prevention, with the offset values and restoration areas treated as critical assets requiring protection from high-intensity or unplanned fire.



Insert 3: Fire hazard mapping across offset site

9.6.4 Fire access, breaks and water resources

Site access and fire management lines

The Offset Property contains an established network of internal access tracks and entry points that provide access for land managers and emergency services (**Plan 12**). These tracks also function as fire management lines, enabling fire suppression access and assisting in fire containment during bushfire events.

Existing 10 m wide fire breaks have already been established across the whole of the Kipper property as depicted in **Plan 12**. No further clearing for fire breaks is required. These fire breaks will be maintained for the life of the offset. Currently there are three water bores and three water storage tanks across the Offset Property.

Water resources and fire management infrastructure

The offset site currently has numerous water bores, dams and water storage tanks for use during firefighting and revegetation activities (Plan 12). These water sources may provide suitable access points for fire management vehicles and emergency services during bushfire suppression activities.

The approximate locations of existing water resources are identified to support fire response planning. Locations for temporary or permanent fire management infrastructure, including additional water tanks or equipment storage areas, will be further assessed and refined through the development of the BMP.

Protection of revegetation and rehabilitation areas

Fire management will specifically address the heightened vulnerability of developing revegetation and rehabilitation areas, which are at increased risk of damage from unplanned or high intensity fire, particularly during early establishment phases. Fire regimes will be designed to minimise the likelihood of fire impacting these areas until vegetation communities have sufficiently matured.

Protection of restoration areas is critical to achieving offset objectives and will be a key consideration in fire management planning, prioritisation of suppression response and selection of fuel management techniques.

Fuel management

It is acknowledged that the primary aim of the Offset Area is to manage habitat and food resources for MNES, therefore fuel management should be implemented as part of an integrated land management approach that aims to appropriately manage the offset site values and risk profile.

Prescribed low intensity burning as a bushfire management technique is widely employed and generally agreed upon as an effective means of reducing widespread and severe bushfire risk particularly when implemented in line with Indigenous cultural burning practices. The National Recovery Plan for Koala acknowledges the scope of impacts of prescribed burning on Koala population dynamics is not well understood. While the risk of wildfire can be reduced through prescribed burning regimes, it is acknowledged that the effectiveness of this is determined by the scale and severity of the bushfire, as exemplified by the 2019-2020 summer bushfires which affected areas that were considered low risk to bushfire.

Instead of conducting a full ecological burn through a larger area of the offset, low intensity hazard reduction burns can be undertaken to reduce the locally abundant fire fuel loads and in turn reducing the risk of a high intensity wildfire spreading throughout the offset. A hazard reduction action will be used around fire exclusion zones (i.e., revegetation zones) to reduce the risk of any fire spread into these areas.



While new research is emerging which supports the benefits of low intensity temporary grazing for the management of bushfire fuel loads and the broader benefits in avoiding the impacts of wildfire on conservation values. At the time of drafting this OMP the Department does not support even the temporary use of light grazing as a preferred bushfire load management tool when compared to traditional controlled burns. Therefore, cattle grazing will not occur within the offset area as detailed in this OMP. The offset provider is pursuing a property wide grazing plan separate to this OMP as a potential management action. Under no circumstances will cattle grazing occur within the offset area until such a time that a grazing plan is approved by the department.

9.6.5 Monitoring

Monitoring of the Offset Area will be undertaken by the Offset Provider annually and as required to review access tracks, fire breaks, fuel loads and outcomes of controlled burns or other management techniques such as use of livestock. Fuel loads and bushfire breaks will be monitored annually by the Offset Provider as required depending on seasonal variation in fuel loads.

Monitoring and adaptive site management will be incorporated into the management of bushfire risk within the Offset Property to assess the effectiveness of management activities. Specifically, monitoring will occur prior to and after implementing planned burns. The adaptive management program may pose simple questions such as those provided below, or more complexed assessment. For example:

- Was the fuel hazard reduced to the targeted level for the FMU?
- Did the management activity contribute to a fire regime that is maintaining offset targets and environmental values?
- Did target regrowth or planted canopy species of a specific size survive the management activity?

If the answer to these questions is no, then adjustments to the land management actions or schedule may need to be made. The fuel hazard, vegetation condition and fire management tracks will be comprehensively assessed annually, as well as periodically as part of regular property activity, and especially before the start of the bushfire season (August – November).

Fuel hazard monitoring

Fuel hazard monitoring within each FMU (or between FMUs with similar condition) will be used to identify triggers for implementing proposed fuel reduction measures including any rotational grazing and planned burns and evaluate the effectiveness of these measures. The Overall Fuel Hazard Assessment Guide (Hines et al., 2010) provides a quick and representative estimate of fuel hazard on site that will be used for ongoing fuel hazard monitoring to inform management intervention. The OFHAG methodology is based on the structure and availability of fuels within various strata categories (bark, elevated, near surface and surface) and is widely used by land managers across southeast Queensland.

Target fuel layer attributes for each FMU will be detailed in the BMP which will be based on the contribution to fire behaviour and the risk to recruiting Eucalypt trees. Fuel hazard monitoring will be undertaken annually, which will encompass pre and post bushfire management activities. These will be completed at the same location which will be GPS located.

Bushfire Audit

If a bushfire affects the offset site, a post-fire site audit will be undertaken once emergency response activities (if applicable) have concluded and it is safe to access the area. The purpose of the audit is to



confirm site safety, identify environmental and asset risks, and determine the actions required to stabilise and recover the habitat values within the site.

The bushfire audit will address the following at a minimum:

- Confirm site safety prior to works recommencing, including identification of unsafe areas, exclusion zones, and access restrictions.
- Inspect for fire-related hazards, such as unstable or fire-damaged trees, ash pits, weakened ground surfaces, damaged structures, and compromised services or utilities.
- Assess the extent and severity of fire impacts, including source of the fire, the distribution of burnt areas, loss of vegetation and ground cover, and evidence of soil exposure or heat damage.
- Review soil condition and erosion risk, with particular attention to slopes, areas of bare ground, and locations where ash or sediment could be mobilised during rainfall.
- Inspect waterways and drainage features, where present, to identify ash, debris, or sediment accumulation and potential impacts to water quality or drainage performance.
- Check for contamination or hazardous materials, including damaged fuel or chemical storage areas, burnt infrastructure materials, asbestos-containing debris, or other potential sources of pollution.
- Assess impacts to vegetation and habitat, including plant survival, natural regeneration potential, loss of fauna shelter, and increased weed or pest risk.
- Inspect site infrastructure and assets, such as access tracks, fences, culverts, erosion controls, signage, buildings, and hardstand areas, to identify damage and restoration needs.
- Identify and prioritise risks, distinguishing between immediate safety or environmental risks, short-term stabilisation requirements, and longer-term rehabilitation actions.
- Document findings and recommended actions, including photographs and summary notes, to support decision-making, recovery planning, and regulatory compliance.

The bushfire audit will provide recommendations for stabilisation and rehabilitation of the offset area including actions to reduce the risk of future bushfire events. Recommendations from the audit will be used to update the BMP and develop an offset area recovery plan to guide re-instatement of the offset area.

9.6.6 Reporting

Implementation of the BMP will be reported annually by the Offset Provider in the MVOA Annual Report and will provide detail on maintenance and monitoring activities undertaken under the BMP such as maintenance of access tracks and fire breaks, records of seasonal fuel loads and outcomes of controlled burns or other management techniques such as use of livestock. Notes of any evidence of positive and/or negative changes will be recorded and documented. Annual monitoring and reporting is important to ensure any possible negative impacts are identified early and management processes are appropriately adapted to ensure conservation outcomes are achieved. Monitoring to occur 3-6 months post fire event or after the next wet weather event (whichever is sooner).

Bushfire audits will be completed once emergency response activities (if applicable) have concluded and it is safe to access the area. The audit, including recommended updates to the BMP, and a offset area recovery plan will be issued to DCCEEW within 3 months of the date of the audit.



9.6.7 Management Action Completion Criteria

Timing	Completion Criteria
Year 1	• Develop BMP • Complete consultation with SRC and QRFS
Year 2 – 20	• Implement BMP • Monitor and maintain fire breaks and fuel loads within the offset area • Minimise risk of high intensity fires • Minimise risk of vegetation composition and restoration regime being negatively affected by prescribed burns

9.6.8 Management Action Adaptive Management

Management actions to reduce the risk of bushfire impacts within the offset area include:

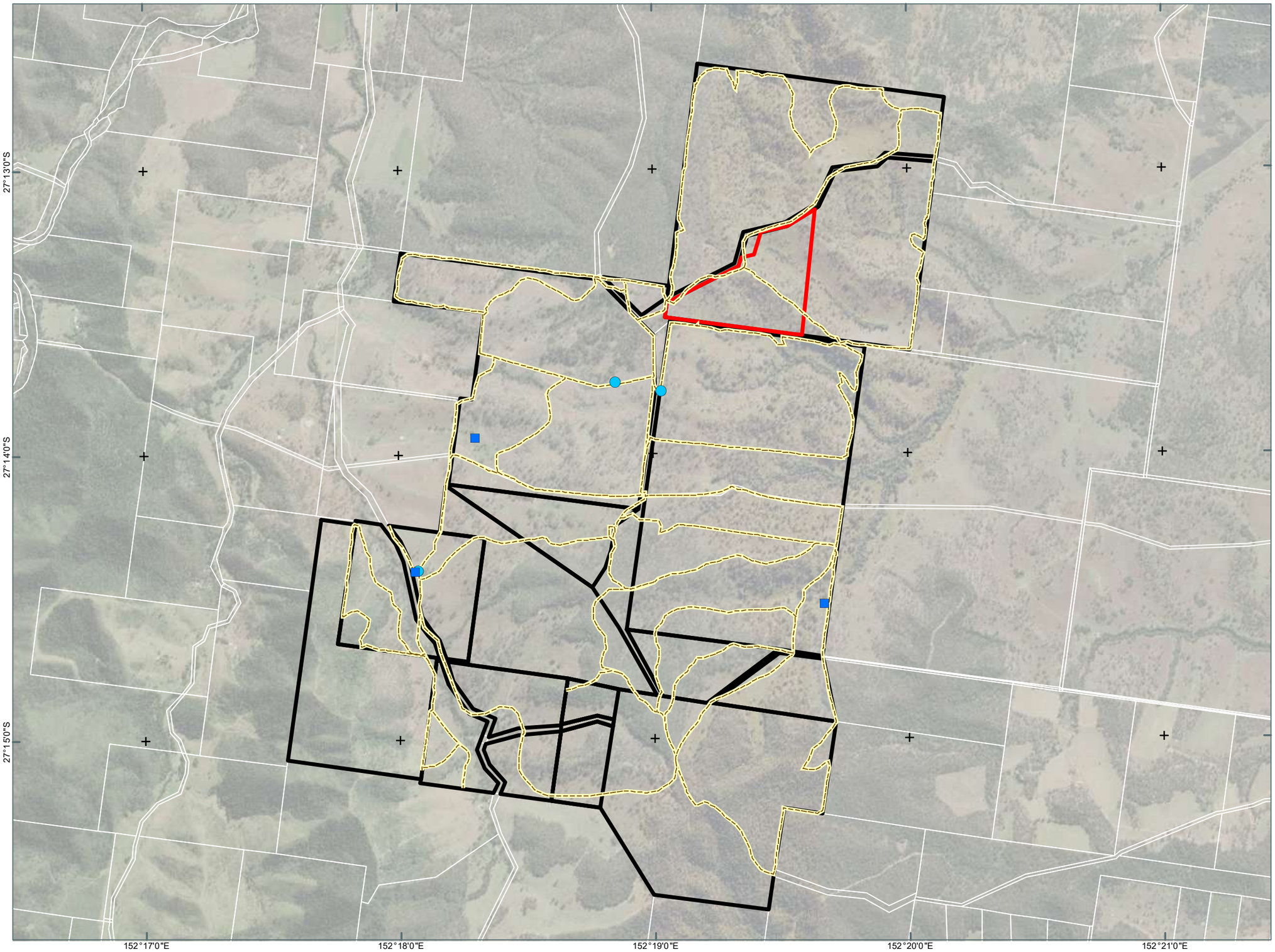
- Maintaining existing bushfire breaks between adjacent landholders in particular along the boundaries where the State Planning Policy bushfire hazard mapping indicates there is a 'high' or 'very high' risk of bushfire occurring (refer to **Insert 3**).
- Cooperating with the local QRFS, SRRC and adjoining landholders to minimise bushfire risk at a regional scale.
- Undertaking a feasibility assessment on insurance for plant stock replacement.

The overall assessment of bushfire risk is that their occurrence is unlikely within the life of the offset and consequences of such an event would be moderate. With intervention and management, bushfire is evaluated as a moderate risk to this offset project. Refer to **Appendix G** for more details.

In the event a bushfire does occur within the offset area, adaptive management will involve:

- The provision of additional rehabilitation works where bushfire has occurred and damage or losses to plantings has resulted.
- Review of the adequacy of risk management measures to determine factors that may have resulted in the bushfire occurring and an assessment of any other management measures that could be implemented to reduce the risk further.

PLAN 12. BUSHFIRE MANAGEMENT



Notes:
The information on this plan is not suitable for any purpose other than the expressed use of the Client. Property dimensions, areas, numbers of lots and contours and other physical features may need verification if the development application is approved and development proceeds, and may change when a full survey is undertaken or in order to comply with development approval conditions. No reliance should be placed on the information on this plan for detailed design or for any financial dealings involving the land. Saunders Havill therefore disclaims any liability for any loss or damage whatsoever or howsoever incurred, arising from any party using or relying upon this plan for any purpose other than as a document prepared for the sole purpose of accompanying a development application and which may be subject to alteration beyond the control of Saunders HavillUnless a development approval states otherwise, this is not an approved plan.

Layer Sources
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
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Updated data available at
http://qldspatial.information.qld.gov.au/catalogue/
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LEGEND

- Qld DCDB
- Offset Property
- Proposed Offset Area [40.0 ha]
- Water Bores
- Water Tanks
- Access Tracks



Saunders Havill
BOWENHILLS | SPRINGFIELD
1300 123 744 | mail@saundershavill.com

Fulton Hogan

BLUE ROCK QUARRY, CEDAR CREEK

0 200 400 600 m
N
Transverse Mercator
GDA 2020 | Zone 56
1:25,000
@ A3

Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024
Lots 14-16 on RP151378

17/11/2025

11390 E 12 Offset Bushfire D_SHG

9.7. Management Action 5 – Habitat creation and regeneration

9.7.1 Justification

Habitat creation and regeneration is a key management action that will improve existing habitat values within the proposed offset area and expand habitat values in areas that have been subject to weed infestation. In addition, regeneration is a Priority Management Action listed under "Habitat Loss, Disturbance and Modification" of the Conservation Advice for the Koala. Rehabilitation aims to enhance degraded areas through assisted natural regeneration and Management Action 3 which will continue to manage WONS. Assisted natural regeneration applies to areas where the native plant community is largely healthy and functioning or where native plant seed is still stored in the soil, can easily disperse from nearby natural areas, or be readily dispersed by animals. It is applied when limited human intervention, such as weed control, minor soil amelioration, fencing works or cessation of slashing etc., is enough to trigger the recovery process and natural regeneration. Planting occurs where necessary and does not interfere with natural process.

Management Actions 3 to 5 will work together to improve habitat quality through WONS management, bushfire management and native species establishment.

9.7.2 Locations

The entire offset area is considered as a single OMU as per **Section 9.2**. Key management actions across the proposed offset area will be relatively consistent based on existing values. Actions will include assisted natural regeneration practices to expand patches of regrowth and direct planting where cleared areas are present to assist in vegetation coverage and composition. **Table 60** summaries the management methods required at the proposed offset site. Indicative planting locations are provided in Plan 12 where existing vegetation cover is lacking.

Table 60: Operational management unit rehabilitation method summary

OMU	Description	Rehabilitation Method
Non-remnant vegetation area (OMU 1)	Discontinuous canopy vegetation	• Assisted natural regeneration • Infill planting • Weed removal/control • Bushfire management

On-ground works proposed within the OMU include are detailed below.

Non-remnant vegetation area (OMU 1)

- Implementation of rehabilitation techniques that aim to promote the regeneration of native vegetation and improve habitat values:
    - Infill planting of trees will occur by the end of Year 2 in areas show in **Plan 13** and where deemed necessary following primary site works. Follow up planting of shrubs, grasses and ground coves will be completed as required to meet environmental outcomes and interim targets.
    - Where natural regeneration is ineffective (i.e photo monitoring and milestone monitoring demonstrates limited evidence of growth compared with baseline results), seeding with

native endemic seeds will occur utilising species necessary to achieve the proposed MHQA uplifts.

- Assisted natural regeneration practices were weed treatment results in open areas – replanting with locally endemic species (infill planting as necessary).
- Removal of impediments to Koala movement such as old, unused fences (where present).
- Introduction of management practices which support and favour habitat increase (e.g. bushfire management)
- Maintain and manage the land for the life of the offset (20 years from the legal securement/implementation of the offset area), including direct monitoring of Koala usage.

9.7.3 Rehabilitation methodology

Following the resolution of site analysis and management areas as part of rehabilitation design, prioritising site works should be considered. Prior to site works commencing, the site should be secured from degrading impacts such as grazing by stock, unauthorised access and rubbish. Some factors that may require immediate attention include:

- The presence of highly invasive weed species which may disperse further prior to substantial site works commencing.
- The presence of weed species which may have a long-term impact on ecological communities such as exotic and weed varieties of vines.
- Flammable materials (including weed thickets, grasses and vines).
- Damaging and easy access by 4WD, motorbikes, and pedestrians into core retained vegetation and ecological restoration areas. This may require installation of temporary fencing if deemed appropriate.

Site works can be typically broken down into the following categories depending on the condition of the site prior to works commencing:

1. Primary Works
2. Follow-up Works
3. Maintenance Works

1. Primary works

Primary works, or initial works, within the site or a section of the site will commonly involve a sequence of activities such as the control of groundcover weeds, woody weeds in the understorey and exotic vines prior to the control of weed trees. Primary work has the effect of creating a large degree of disturbance which will stimulate the germination of native and exotic species. Therefore, continuing works should be scheduled shortly after the initial visit to allow for timely control of the newly regenerating weeds. Where present, highly invasive weeds should be treated as a priority during primary work in order to avoid invasion of newly disturbed areas. Some weeds will need to be treated in steps e.g., where weeded areas are being used by nesting birds or where the staged removal of canopy weed trees is required. Techniques used during primary work commonly involve spot spray, cut-scrape paint, cut-paint, scrape-paint, roll-hang and over spraying (source: SEQERF).

Following completion of weed management, rehabilitation such as assisted natural regeneration, construction, and fabrication planting can occur in areas unaffected by weed management activities or



areas where primary weed management activities have concluded. Direct planting will occur within areas with very little vegetation cover to assist in further promoting natural regeneration processes. At the end of primary work, the zone will have been comprehensively and systematically worked, ready for follow-up works.

2. Follow-up works

At intervals, which will vary according to the type of weed impacting the site and growing conditions, follow-up work will be necessary. This generally involves the spot-spraying of newly germinating weeds and re-sprouting sections of woody weeds and vines. It is at this stage that observational visits should be made to the site to assess the progress of vegetation regeneration and determine whether follow-up work is necessary. A site that receives poorly-timed, too frequent, or too little follow-up will rapidly experience setbacks, as weed propagules will quickly become established in the newly disturbed areas. Regular visual assessments are to occur approximately quarterly as determined by the offset provider.

Germinating native seedlings may be outcompeted by weeds or damaged by inexperienced operators thereby exhausting the seed bank. Unless adequate follow-up can be ensured when planning restoration works, there is little point in commencing primary work, as time and resources are consumed with no substantial gain achieved (source: SEQERF).

3. Maintenance works

By the maintenance stage, the vegetation community supports germination and establishment of native plant species and canopy formation. Weed density decreases as the native plants, which have been supported through restoration works, are able to out-compete the weed species. One of the fundamental principles of ecological restoration involves creating or re-establishing a self-sustaining ecosystem. Therefore, the underlying goal is that maintenance will progressively decrease. While this goal is not always possible due to factors such as the continual reintroduction of weed propagules to the site from adjoining properties, unfavourable seasons or significant weather events, persistent weed species, or global influences such as the enhanced greenhouse effect, it should always be strived for (source: SEQERF).

Maintenance works including minor, ongoing weed management and infill planting will be determined by on-going visual assessments of the offset area and results of milestone monitoring. All rehabilitation works are to be carried out by a suitably qualified bush regeneration contractor.

Plant identification skills

Both native and weed species should be identified prior to primary weed removal works and ongoing throughout the follow-up and maintenance periods. This will maximise natural regeneration by reducing the likelihood of accidental weed spraying to native vegetation. Regenerating species are to be treated and maintained in a similar manner to planted tube stock. Where a contractor is unsure of species, advice should be sought from a botanist, specialist contractor, or confirmed with Queensland Herbarium. Refer to indicative Weed Treatment schedules derived from the *South East Queensland Ecological Restoration Framework: Manual* (2012) for an indication of weed species and treatments (refer **Table 59**).



Planting notes

Areas subjected to weed removal and control may require infill planting (assisted natural regeneration) where lack of natural regeneration is evident. Prior to installation, the following items should be considered:

- Species selection;
- Sourcing plant material;
- Timing of planting;
- Site preparation;
- Planting density; and
- Planting installation.

Sourcing plant material

There are several options for sourcing plant material for infill planting purposes. Propagation from site seed is a good outcome but is often limited by the required timing of works. Sourcing plants from local nurseries is the more commonly chosen option and has the following benefits:

- Awareness of genetic considerations when collecting seed;
- Experience with breaking dormancy mechanisms in hard to germinate seeds;
- Highly successful propagation techniques;
- Ability to provide high quality stock to order; and
- Draw on industry resources.

Timing of planting

The timing of planting should ideally be aligned with the wet season in SEQ (Summer and Autumn). This minimises the need for intensive watering to establishment planting. Planting between February - May is the most beneficial as it generally avoids intense heat periods of summer. However, it is understood planting may occur at various times within rehabilitation areas due to development timing needs.

Site preparation

Site or planting preparation includes:

- Fencing to exclude grazing animals and people (if required);
- Pre-spraying of exotic grasses and other weeds to planting areas;
- Consideration of source of water for new planting (access tracks, temporary irrigation);
- Arranging delivery of mulch, jute netting and tree guards (if required);
- Treatment of heavily compacted soils by ripping and or application of gypsum; and
- Soil amelioration as required.

Planting installation

The following outlines the preferred installation methodology for revegetation works within the rehabilitation areas. It has been designed to maximise plant establishment success rates and minimise plant mortality. Revegetation works shall be either undertaken or directly supervised by an experienced



and qualified contractor. All works shall be in accordance with the provisions of this Offset Management Framework, and local government policies and Australian Standards.

Plant installation methods shall include:

- Plants are to be vigorous, well established, hardened off, consistent with species or variety, free from disease and insect pests, with large root systems and no evidence of having been restricted or damaged. The landscape coordinator has the right to inspect and reject stock prior to planting.
- Plants are to be planted immediately after delivery to the planting site.
- Excavate planting medium to a depth suitable for the installation of tube or pot specimens. In areas where planting substrate is deemed to be very poor (compacted, nutrient deficient, hydrophobic etc.) and above areas of potential frequent inundation and waterflow, topsoil may be used.
- Pre-water plant hole if soil is dry to decrease root stress upon planting and assess the infiltration of water through the soil.
- Place plant into hole and backfill ensuring that the plant is upright and the stem is not covered in any less than 10 millimetres (mm) or any more than 20 mm of planting medium.
- Planting should only occur when the ground is wet. If planting occurs in dry conditions, plants are to be watered thoroughly immediately after planting (ensure deep irrigation) and thereafter as guided by the suitable qualified bush regenerator. Creation of a concave hollow around the base of each plant will aid water infiltration to the plant roots.
- A complete, long-term slow-release fertiliser such as Nutricote or similar is recommended and will be administered appropriately during planting as guided by the bush regenerator. Topdressing with slow-release fertiliser is preferred to avoid toxic levels of fertiliser accumulating in the plant hole around the plant roots.
- Where considered suitable by the bush regenerator planting surfaces will be covered in:
    - a 100 mm layer of high-quality weed-free composted chip mulch (site mulch)- Note: to avoid possible stem rot in some 'drier' species ensure mulch is 'dished' and not covering plant stem by more than 20 mm. Where available, mulch material to be sourced from cleared vegetation material if adequately seasoned, or
    - Suitable individual anchored natural fibre weed mat (jute netting).
- A minimum 80% survival rate should be achieved. Noting that the requirements of species density and diversity is driven by the MHQA scoring metrics as defined in the environmental outcomes and interim targets.
- The offset site currently has numerous water bores, dams and water storage tanks for use during revegetation activities (**Plan 12**). Currently there are three water bores and three water storage tanks across the Offset Property.

Indicative planting pallet

An indicative planting pallet has been provided as **Table 61** listing potential species utilised throughout the offset area where infill planting is required. This species list is referenced directly from the Bio-condition technical description of RE12.9-10.2. Not all species in **Table 61** will be utilised where planting occurs. Direct planting of trees will focus on species that are lacking from the offset area. For example, the offset area is dominated by *Corymbia citriodora* (Spotted Gum) with Ironbarks, *Eucalyptus crebra* (Narrow-

leaved Ironbark), *Eucalyptus siderophloia (*Grey Ironbark) *and Eucalyptus melanophloia* (Silver-leaved Ironbark) having been historically cleared for logging. The promotion of a diversity of species is required to achieve the proposed environmental outcomes.

Plantings will primarily include trees to allow time for establishment. Infill planting of shrubs and ground covers will occur as required to meet the interim targets and environmental outcomes specified in **Table *51***.

All trees in the T1 canopy layer will reflect Non-juvenile Koala Habitat Trees (NJKHTs). Primary food trees, preferred by Koala, have been designated with a (P)*, whilst secondary food trees, still important food and shelter trees, are designated with a (S*).

Table 61: Indicative planting palette for RE12.9-10.2

Scientific Name	Common Name	Plant Form	RE
Trees			**12.9-10.2**
Corymbia citriodora subsp. Variegata* (S)	Spotted Gum	T1/T2	✓
Eucalyptus tereticornis* (P)	Forest Red Gum	T1/T2	✓
Eucalyptus crebra* (P)	Narrow-leaved Iron Bark	T1/T2	✓
Eucalyptus siderophloia* (P)	Grey Ironbark	T1/T2	✓
Eucalyptus moluccana* (S)	Gum-topped Box	T1/T2	✓
Eucalyptus major* (P)	Grey Gum	T2	
Angophora leiocarpa* (S)	Smooth-barked Apple	T1/T2	✓
Eucalyptus melanophloia* (S)	Silver-leaved Ironbark	T2	✓
Corymbia intermedia* (S)	Pink Bloodwood	T2	✓
Corymbia tessellaris* (S)	Moreton Bay Ash	T1/T2	✓
Allocasuarina torulosa	Forest Sheoak	T2	✓
Alphitonia excelsa	Soap Tree	T2 / S1	✓
Acacia disparrima	Hickory Wattle	T2 / S1	✓
Shrubs			
Pittosporum angustifolium	Bitter Bush	S1	✓
Acacia leiocalyx	Early Flowering Wattle	S1	✓
Acacia fimbriata	Brisbane Wattle	S1	✓
Denhamia cunninghamii	Yellowberry Bush	S1	✓
Acacia salicina	Sally Wattle	S1	✓
Jacksonia scoparia	Dogwood	S1	✓

Scientific Name	Common Name	Plant Form	RE
Hovea lorata	Purple Pea Bush	S1	✓
Persoonia sericea	Silky Geebung	S1	✓
Ground			
Cymbopogon refractus	Barbed-wire Grass	G	✓
Entolasia stricta	Wiry Panic	G	✓
Themeda triandra	Kangaroo Grass	G	✓
Imperata cylindrica	Blady Grass	G	✓
Heteropogon contortus	Black-spear Grass	G	✓
Eragrostis brownii	Browns Love Grass	G	✓
Dianella revoluta	Blue-flax Lily	G	✓
Eremophila debilis	Winter Apple	G	✓
Hardenbergia violacea	Native Sarsaparilla	G	✓
Desmodium rhytidophyllum	Hairy Trefoil	G	✓
Dichondra repens	Kidney Weed	G	✓
Hardenbergia violacea	Native Sarsaparilla	G	✓
Glycine tabacina	Variable Glycine	G	✓
Lomandra multiflora subsp. multiflora	Multi-flowered Matrush	G	✓
Lomandra longifolia	Spiky-headed Mat-rush	G	✓

9.7.4 Monitoring

Baseline surveys (completed)

- Detailed Offset Area-specific habitat quality assessment (Year 0) – Establishes baseline MHQA results

Years 1 - 3

- Annual photo point monitoring
- Quarterly (approximately) visual assessments and data sheets

Years 1 – 5 (infill planting)

- Quarterly monitoring for first year
- Bi-annual monitoring until year 5 or until plants have become established

Years 5, 10, 15 and 20

- Milestone monitoring (MHQA and weed mapping)

- Detailed habitat quality assessments (MHQA) and weed mapping completed by suitably qualified Ecologists replicating baseline surveys detailed in **Section 6.1** and summarised below.

Annual photo point monitoring

To monitor Management Action 5, photo point monitoring and GPS locational and extent survey will be utilised. The coordinates of the initial photo monitoring will be recorded using the handheld GPS. Photo point monitoring will be undertaken annually at the same location and time of the year, before and after regeneration activities. Photo points will be the same directions (i.e North, South, East and West) to provide an assessment of regeneration values.

Photo monitoring for the first 3 years is considered suitable as the early stages of the offset is when significant works will occur including weed removal and direct plantings. The photos provide the baseline imagery to compare future photo point monitoring. A record of the photos will be maintained which includes:

- GPS coordinates of the photo point.
- Date, time and number of each photo.
- Direction in which the photo was taken (north, south, east and west).

Rehabilitation and regeneration monitoring – visual assessments

The following elements will be noted on a field datasheet:

- Evidence of natural regeneration of native species.
- The presence of weeds within the rehabilitation extent.
- The average health of rehabilitation areas
- The average height of rehabilitation areas

Milestone monitoring

The suitably qualified person as appointed by the Proponent will complete MHQA surveys before the end of Years 5, 10, 15, and 20 of the offset to assess against the interim milestones and environmental outcomes (see **Section 3** and **Table 51**). Milestone monitoring will replicate all surveys utlising the same methodologies as completed as part of the baseline survey and detailed in Section 6.

Milestone monitoring surveys will included:

- MHQA transects at baseline sampling locations and
- Detailed weed mapping.

Direct planting monitoring

Where direct infill planting has occurred, the suitably qualified regeneration contractor will complete quarterly monitoring of planted stock for the first year and then bi-annually until Year 5 or until plants are established. The following data will be recorded during these periods:

- Photos of planting progress
- The success of planted stock (a physical count of alive plants in the ground, >80% survival rate required).
- The average health of planted stock.



- The average height of planted stock.
- Any additional remedial actions required

If photo monitoring, visual assessment and MHQA data indicates that natural regeneration is not occurring in line with interim targets (refer **Table 51**). Then infill planting will be utilised where specific attributes area lacking (i.e shrub species richness, forb species richness, etc). Additional infill planting can occur at any point during the life of the offset in response to interim targets.

9.7.5 Reporting

- The Offset Provider is responsible for preparing and issuing Offset Area Annual Reports to the proponent within contracted timeframes for inclusion in the Approved Project Annual Compliance Report.
- Photo monitoring details and rehabilitation works progress reports will be prepared by the suitably qualified regeneration contractor and included in the OAAR.
- Milestone weed monitoring and MHQA survey results will be reported by the suitably qualified person in the 5, 10, 15 and 20 Year Milestone Report. This will provide detail on interim habitat quality targets (MHQA) and detected WONS and other weed presence with reference to the baseline survey data.
- Reporting, or a sample of, will be included in the relevant Annual Compliance Report.

9.7.6 Completion Criteria

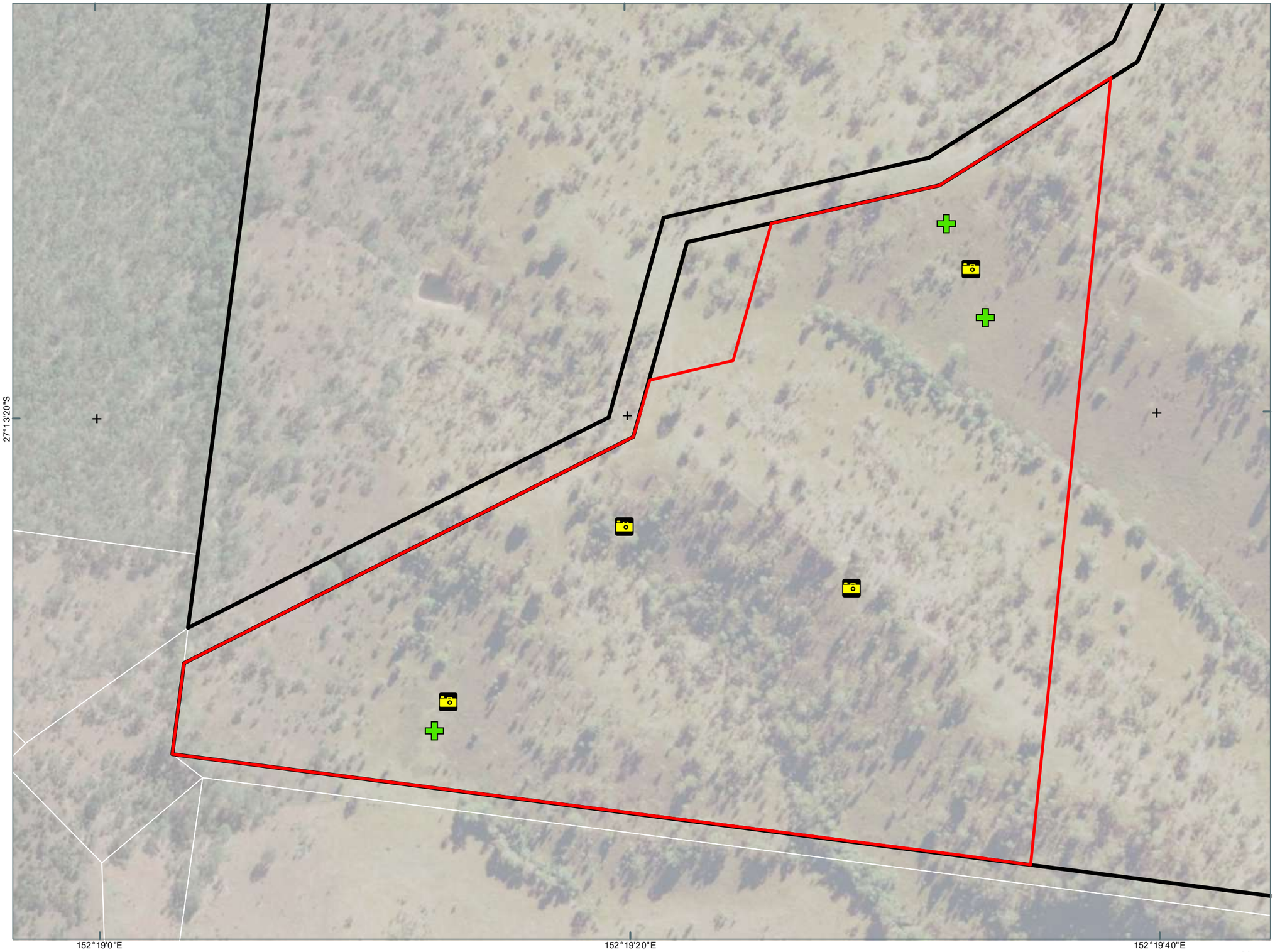
Table 62: Management Action 5 completion criteria

Timing	Completion Criteria
Year 1 - 3	• Initial weed treatment and site preparation (excluding cattle) • Establish photo monitoring locations to monitor natural regeneration progress
Year 2	• Complete infill planting in areas of the offset area where existing vegetation cover is low in accordance with planting palette.
Years 3 - 20	• Infill planting proposed if interim targets not being met by milestone monitoring (Year 5, Year 10, Year 15, Year 20) or if natural regeneration not progressing though photo monitoring • Ensure 80% survival rate of any planting implemented (focusing on trees).
Years 5, 10, 15 and 20	• Vegetation meets interim targets and environmental outcomes detailed in **Table 51**. • Rehabilitated areas are established, regenerated and mapped as remnant vegetation under Queensland's *Vegetation*



Management Act 1999 (VMA) successor legislation by Year 20 which requires 70% of canopy height and 50% of expected cover according to the relevant Regional Ecosystem benchmark to be reached.

PLAN 13. PROPOSED PLANTING AREAS AND INDICATIVE PHOTO MONITORING LOCATION



Notes:
The information on this plan is not suitable for any purpose other than the expressed use of the Client. Property dimensions, areas, numbers of lots and contours and other physical features may need verification if the development application is approved and development proceeds, and may change when a full survey is undertaken or in order to comply with development approval conditions. No reliance should be placed on the information on this plan for detailed design or for any financial dealings involving the land. Saunders Havill therefore disclaims any liability for any loss or damage whatsoever or howsoever incurred, arising from any party using or relying upon this plan for any purpose other than as a document prepared for the sole purpose of accompanying a development application and which may be subject to alteration beyond the control of Saunders HavillUnless a development approval states otherwise, this is not an approved plan.

Layer Sources
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Updated data available at
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LEGEND

- Qld DCDB
- Offset Site Boundary
- Proposed Offset Area [40.0 ha]
- Indicative photo monitoring locations
- Indicative supplementary planting areas where existing vegetation cover is low

**Note: Potential for infill planting to occur across the entire offset area if interim targets are not being met through natural regeneration.*



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Lots 14-16 on RP151378

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9.8. Management Action 6 – Fencing and Signage

The proposed offset area will be suitably fenced and marked with signage to discourage trespassing and keep out cattle. Gates leading to the subject proposed offset area will have signage installed for added protection. Any internal fences that include barbed wire will also be retrofitted to further reduce threats to MNES.

The external boundary of Lot 112 on CA311003, where the offset area is located, will be fenced with fauna friendly fencing (refer to **Plan 14** for proposed offset area fencing and signage). The entirety of Lot 112 is planned as a future environmental offset area and therefore internal fencing is not proposed. Fauna friendly fencing are based on the following specifications:

- Top strand plain wire, and
- Bottom strand plain wire at a minimum 300 mm above ground.

A minimum gap of 300 mm from the ground to the bottom strand is considered suitable for Koala movement as detailed in Department of Environment and Science (Queensland) 2020, Koala-sensitive design guideline.

9.8.1 Monitoring and establishment

Fencing and signage will be installed in Year 1. Any internal fencing requiring retrofitting will be completed within Year 1. All fencing management and implementation works are the responsibility of the offset provider.

As part of general site management protocols, fencing is inspected on a quarterly basis (approximate) as a result of regular site monitoring by the offset provider. Increased frequency to occur following significant weather events or correspondence from neighbouring landowners at the discretion of the offset provider. Damaged fences will be rectified with 2 weeks of being identified.

9.8.2 Reporting

- The Offset Provider is responsible for preparing and issuing Offset Area Annual Reports to the proponent within contracted timeframes for inclusion in the Approved Project Annual Compliance Report.
- Details of installed/retrofitted fencies will be detailed in the OAAR.

Reporting, or a sample of, will be included in the relevant Annual Compliance Report.

9.8.3 Completion criteria

Timing	Completion Criteria
Year 1	Fencing and signage will be installed in Year 1
Year 2 – 20	• All fencing and signage has been installed, retrofitted and maintained for the life of the offset • Fencing enables Koala to move through he offset area and into surrounding land.

Timing	Completion Criteria
	• If stock breaches or unauthorised access is observed, fencing is rectified within 2 weeks.

9.9. Reporting requirements

An OAAR will be prepared by the Offset Provider for each year of the offset detailing management activities undertaken in accordance with the Management Framework and providing clear details on how performance targets specified in **Table 50** are being addressed and any adaptive management measures implemented. The OAAR will be provided to the Proponent and suitably qualified person preparing the **Annual Compliance Report** (ACR) one (1) month after each annual anniversary of the date of legal securement of the offset area (i.e. if the site is legally secured on 1 July 2025, year one ACR will be due before 1 Augst 2026, year two before 1 August 2027, etc.).

A **Milestone Report** is proposed to be completed by a suitably qualified person appointed by the Proponent 3 months after the completion of milestone surveys of Years 5, 10, 15, and 20 of the offset detailing how the offset is progressing against the interim milestones, key performance indicators and environmental outcomes specified in **Section 7** and **Table 24**. This will include an assessment of whether each environmental outcome has been or is likely to be achieved and advise of any circumstance/s which they consider is/are affecting the achievement of each outcome. The findings of each assessment will be documented and published within 3 months of the end of the relevant year of the offset in which the assessment is undertaken.

An ACR will be prepared in line with any conditions associated with EPBC approval. The OAAR and Milestone Reports will be included as part of the Annual Compliance Reports. The reporting period for the action will be the year following the commencement of the action.

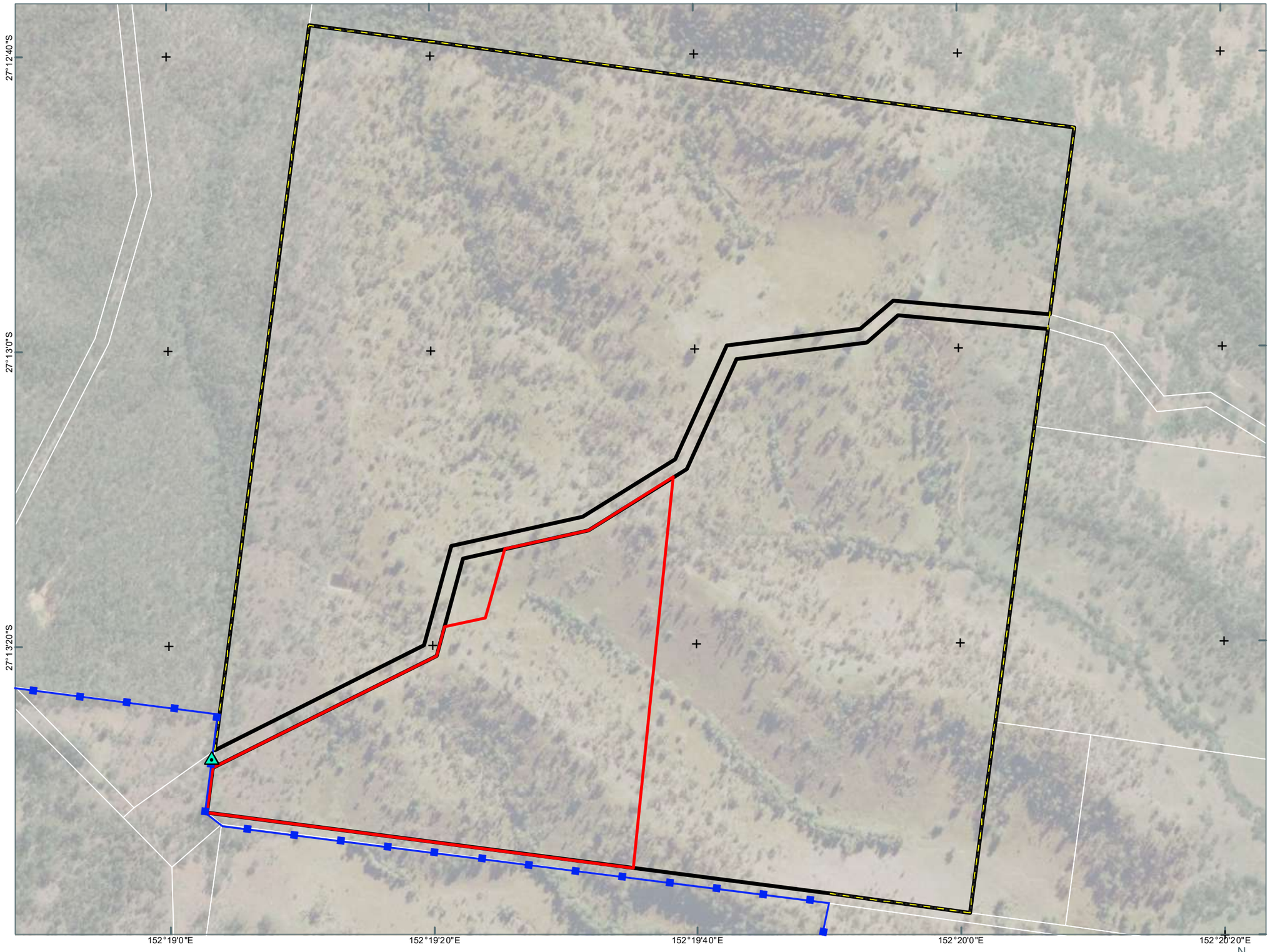
The ACR will be prepared by a qualified environmental person as directed by the Proponent and published on the project website each year by the conditioned date. The report will address the compliance with each of the conditions of approval, including any incident reports of undesirable impacts upon Koalas (i.e where corrective actions have been triggered as detailed in **Table 63**) and any monitoring and management milestones achieved during the previous 12 months, including progress on key management measures, attainment of performance targets and completion criteria, and adaptive implementation outcomes. The compliance report will also address the effectiveness of the management measures and how the proposed offset area is progressing against performance and completion criteria.

Documentary evidence providing proof of the date of publication of the ACR and non-compliance with any of the conditions of the approval will be provided to DCCEEW at the time of publishing the compliance report if the action is approved.

Section 6 provides a monitoring and reporting schedule for the OMP. This includes the management action, monitoring actions, corrective action trigger, corrective action, reporting action and responsible person/party.



PLAN 14. OFFSET AREA FENCING



Notes:
The information on this plan is not suitable for any purpose other than the expressed use of the Client. Property dimensions, areas, numbers of lots and contours and other physical features may need verification if the development application is approved and development proceeds, and may change when a full survey is undertaken or in order to comply with development approval conditions. No reliance should be placed on the information on this plan for detailed design or for any financial dealings involving the land. Saunders Havill therefore disclaims any liability for any loss or damage whatsoever or howsoever incurred, arising from any party using or relying upon this plan for any purpose other than as a document prepared for the sole purpose of accompanying a development application and which may be subject to alteration beyond the control of Saunders Havill.Unless a development approval states otherwise, this is not an approved plan.

Layer Sources
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
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Updated data available at
http://qldspatial.information.qld.gov.au/catalogue/
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LEGEND

- Qld DCDB
- Offset Site Boundary
- Proposed Offset Area [40.0 ha]
- Installed Fauna Friendly Fencing
- Future Fauna Friendly Fencing
- Future Gates and Offset Area Signage



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9.10. Data Management

The Proponent, Offset Provider and engaged suitably qualified person appointed by the Proponent and/or Offset Provider will be responsible for the management of data, including interpretation, reporting and presentation. The Proponent will be responsible for the ownership, distribution and availability of data to the Department.

10. Adaptive Management

An adaptive implementation program will be used to ensure uncertainty is reduced over time, and that completion criteria are attained and maintained for the life of the offset. As more information becomes available following ongoing performance monitoring, the management and monitoring regime will be reviewed and revised to maximise the likelihood of attaining and maintaining the outcomes to be achieved by implementing the OMP. Any updates to the OMP which do not result in a material change to the environmental outcomes, performance and completion criteria will be made by the Offset Provider **KFF1 and/or The Proponent** without the requirement of approval from DCCEEW (however a copy of OMP changes will be sent to DCCEEW for record keeping). If material amendments likely to alter the environmental outcomes, or performance and completion criteria are proposed to the OMP, the amendments and justification for the contingency measures will be provided to DCCEEW in writing.

Adaptive management will be used to incorporate changes in any of the following areas:

1. Assimilation of new data or information - such as, updates to conservation advice or new threat abatement plans relevant to the Koala.
2. Project coordination and scheduling – to manage unforeseen disruptions to schedule such as inclement weather on contractor works for management actions and environmental consultant monitoring events.
3. Annual review of risks – to refresh the mitigation measures should new threats be identified or stochastic events such as unplanned fires or floods occur.
4. Annual review of management measure effectiveness – to increase the frequency or change the method of management actions where monitoring performance criteria are not met.
5. Contingency for unplanned incidents – such as stochastic events including unplanned fires or floods.

An audit of OMP completed every five (5) years with consideration to the areas identified above and will be directed by the Offset Provider and an appointed suitably qualified person by the proponent.

Changes to the management plan resulting from the adaptive management process will be reported to DCCEEW differently depending on whether they are minor, major or urgent. These are defined as:

- **Minor Change** – has no potential to alter any of the environmental outcomes or completion criteria specified in the management plan. A notification will be provided to DCCEEW at least 10 business days prior to the change occurring.
- **Major Change** – has potential to alter the environmental outcomes or completion criteria specified in the management plan. A notification requesting approval for the change will be provided to DCCEEW prior to the change occurring.
- **Urgent Change** – actions that are required to be taken to address an urgent matter. Changes will be implemented immediately at the direction of a suitably qualified expert with notification sent to DCCEEW as soon as practical but no more than 10 business days after the change occurs. An example of an urgent change could be an increase in buffers or removal of understorey vegetation in response to an intense bushfire.

The notification for any change will be accompanied by documentation addressing at a minimum:



- A description of the proposed change including identification of specific management measures to be altered and how the changes will be implemented.
- Target outcomes of the proposed change including alterations to environmental outcomes or completion criteria if applicable.
- Proposed monitoring regime to demonstrate the outcomes of the change.
- Future reporting requirements with monitoring outcomes to be provided to DCCEEW no more than 6 months after the commencement of the change.
- If the target outcomes have not been achieved reporting must include response actions and ongoing monitoring requirements.

Once the target outcomes have been achieved notification will be provided to DCCEEW stating that the change will be permanently included in the management plan. The changed management measure will continue to be monitored as part of general compliance reporting unless otherwise specified.

In the case of an urgent change notification and documentation may be provided retrospectively.

10.1. Uncertainty

The plan identifies and manages uncertainty. To this end the plan specifies:

a) key data/information used to formulate the plan;

b) the limitations and/or uncertainty associated with the use of that data/information;

c) the risks that limitation and/or uncertainty represents for plan failure; and

d) how limitations and/or uncertainty, and associated risks, are mitigated during plan implementation. For example, where a margin of safety is applied to management measures until uncertainty is reduced to an acceptable level or performance targets/completion criteria are attained/maintained.

To identify and manage uncertainty, the OMP used regulatory and policy context to formulate the plan, listed below.

10.1.1 Regulatory and policy context

This document has been prepared taking into account the following technical guidelines and legislation:

- National Recovery Plan for the Koala *Phascolarctos cinereus* (combined populations of Queensland, New South Wales and the Australian Capital Territory) (DAWE 2022)
- EPBC Act environmental offsets policy (Department of Sustainability, Environment, Water, Population and Communities, 2012);
- EPBC Act Environmental Management Plan Guidelines (DoEE, 2014)
- Policy Statement: Advanced environmental offsets under the *Environment Protection and Biodiversity Conservation Act 1999*;
- *Vegetation Management Act 1999* (legally securing the offset through a Voluntary Declaration under Section 19F);
- Queensland *Environmental Offsets Act 2014*; and
- Queensland *Environmental Offsets Regulation 2014*.

10.2. Risk of Failure

The plan assesses the risk of failure to achieve the plan's performance targets and/or completion criteria. To this end the plan:

a) states the plan's performance targets and/or completion criteria;

b) identifies events or circumstances that prejudice attainment/maintenance of performance targets and/or completion criteria. The events or circumstances must address scientific/ecological uncertainty, stochastic events and legal/land use planning factors that may represent risks;

c) includes a qualitative assessment of the likelihood and consequence of those events or circumstances, and the residual risk of failure to achieve those criteria due to identified events or circumstances (*assuming management measures will be implemented*);

d) characterises risk as low, medium, high or severe, and derived from likelihood (highly likely, likely, possible, unlikely, rare) and consequence (minor, moderate, high, major and critical); and

e) outlines how consequence, likelihood and risk level for each risk have been determined.

To identify the risk of failure, **Table 63** states the management action, completion criteria, corrective action triggers and corrective actions. In addition, a risk assessment has been completed in **Appendix G.**



Table 63: Risk of failure table and corrective actions

Action	Completion Criteria	Corrective Action Trigger	Corrective Action
Legally secure the offset area	• The offset area is legally secured for conservation via a suitable method such as a VDEC process administered under the Queensland VMA or a covenant under the *Land Act 1994* or *Land Titles Act 1994* prior to the impacts occurring • The Department is notified of the legal securement within 5 business days of commencing the implementation of the OMP *i.e.*, the date from which the offset area is legally secured. • The offset area is not used for other purposes – site access is restricted.	Offset area is not legally secured.	The offset area is legally secured prior to any impacts occurring.
Non-Native Vertebrate Pest Management	• Feral animals suppressed within the offset area to <10% of the Relative Abundance Index (RAI). Priority wild dogs.	Feral animal management is not implemented and/or evidence of predation on Koalas is observed. Monitoring actions and OAARs identify ongoing presence of predator pest species. Monitoring actions and OAARs show no decrease in non-native	Implement supplementary control measures, increase frequency of control events or other management actions as recommended by suitably qualified pest contractor within 3 months of a monitoring event where non-native predator detection has not decreased from baseline.



Action	Completion Criteria	Corrective Action Trigger	Corrective Action
		predators from the previous survey (or <10% of the RAI) Monitoring actions and OAARs detect an increase in non-native predators from the previous survey or relative to the baseline.	Where there is evidence of non-native predator activity, a trapping or baiting program by a suitably qualified contractor will be conducted within 3 months of detection. Risk management, corrective actions and adaptive management are to be integrated as required throughout the offset management period in response to changes or natural events. If performance criteria are not achieved by the timeframes outlined, the corrective actions will continue until achieved, extending the management period.
WONS management	• WONS weed cover is currently at <5% of the offset area. The management actions must maintain WONS weed cover at <5% of the offset area for the life of the offset (20 years).	Weed cover has increased to >5% of the offset area. The extent of WONS has not been maintained as required to reach the environmental outcome as identified in the OAARs and Milestone Reports.	Weed control program to be expanded/adapted to improve outcomes within 6 months following a monitoring event where the WONS extent has not been maintained<5% of the offset area. Risk management, corrective actions and adaptive management are to be integrated as required throughout the offset management

Action	Completion Criteria	Corrective Action Trigger	Corrective Action
			period in response to changes or natural events. If key milestones and performance criteria are not achieved by the timeframes outlined in **Table 4** and **Table 51**, the corrective actions will continue until achieved, extending the management period.
Bushfire management	• Implement BMP • Monitor and maintain fire breaks and fuel loads within the offset area • Minimise risk of high intensity fires • Minimise risk of vegetation composition and restoration regime being negatively affected by prescribed burns	Bushfire management measures not implemented and/or a high intensity bushfire impacts the offset area. Unexpected bushfire event and resurgence of weeds/decreased habitat.	Undertake audit to inspect impacts within 2 weeks or within 2 weeks from when the site is deemed safe. Following annual monitoring of fuel loads, implement actions as directed by the local authority which may include prescribed burning or other techniques undertaken in consultation with the Queensland Rural Fire Brigade to manage fuel loads within 6 months or as soon as appropriate (*i.e.*, consider weather conditions). If required, recovery actions including weed control and management and/or infill planting may be undertaken to ensure the habitat quality performance criteria are achieved within the management period within 6

Action	Completion Criteria	Corrective Action Trigger	Corrective Action
			months following an audit if weather conditions are favourable. Risk management, corrective actions and adaptive management are to be integrated as required throughout the offset management period in response to changes or natural events.
Habitat creation and regeneration management	• Rehabilitated areas are established, regenerated and mapped as remnant vegetation under Queensland's VMA successor legislation by Year 20, which requires 70% of canopy height and 50% of expected cover according to the relevant Regional Ecosystem benchmark to be reached. • Site condition metrics for Koala improves in accordance with environmental outcomes (see **Section 3** and **Table 51**.	Regeneration measures not implemented as proposed; site condition metrics do not improve according to proposed environmental outcomes. OAARs indicate that the rate of plant stock failure is greater than 10%. Habitat does not achieve performance criteria as identified in Milestone Reports within the management period, implement corrective actions.	Infill planting will be implemented if required within 12 months following MHQA survey intervals. Monitoring of infill planting to occur quarterly for first year and then bi-annually until establishment. Requirements for watering schedules (depending on rainfall), weed control, fertilizer, amelioration or other management actions will be implemented as required to enhance success rate and stimulate tree growth and establishment. Risk management, corrective actions and adaptive management are to be integrated as required throughout the offset management

Action	Completion Criteria	Corrective Action Trigger	Corrective Action
			period in response to changes or natural events. The management period may be extended to ensure environmental outcomes are able to be achieved.
Fencing and Signage	▪ All fencing and signage has been installed, retrofitted and maintained for the life of the offset ▪ Fencing enables Koala to move through he offset area and into surrounding land. • If stock breaches or unauthorised access is observed, fencing is rectified within 2 weeks.	fencing or signage not installed or retrofitted or monitoring by offset provider (approximately quarterly) identifies fencing causing Koala injury, stock breaches, or other unauthorised access.	Fencing is rectified within 2 weeks of corrective action being recorded. Fencing is repaired and alternative signage and fencing solutions are considered if needed.

10.3. Limitations

Although an adaptive management plan will be implemented across the offset area for life of the offset (20 years), potential limitations to achieving these include:

- Associated risks and uncertainty in predicting the occurrence and extent of natural disasters or extreme weather events, including drought and flooding.
- Uncertainty of the rate at which vegetation will re-establish.
- The ability of native fauna (*i.e.,* Koala) to recognise and utilise the site.
- Uncertainty of future predator occurrence and the effectiveness of the pest management measures.
- Coordinated approaches between local governments and the offset area holder to ensure effective implementation of management plans.

The implementation of adaptive management measures will ensure that identified limitations are avoided and/or the subsequent impacts are mitigated where possible. The promotion of suitable habitat on-site through implementing the various management actions, along with the continuous monitoring of abundance, will assist in species utilisation of the site.

Further, the review of this OMP, inclusive of the management actions and monitoring methodologies detailed within it, will assist in identifying areas requiring improvement, as well as identify methodology that has been successful. The success or required amendments to the management plans or works on-site will be assessed during the completion of the ACR as required under the EPBC Approval.

To ensure progress towards environmental outcomes and completion criteria is assessed correctly the baseline surveys have been developed to be repeatable and provide the data required for comparison against the completion criteria. Surveys are to be repeated in the same manner and location as practicable throughout the management period to ensure a consistent approach and accurate representation of the conservation values within the proposed offset area.

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12. Appendices

Appendix A

Impact Area – MHQA (Koala) results

Appendix B

Offset Area – MHQA (Koala) baseline results and raw data

Appendix C

Offset Area – Raw Weed Mapping data

Appendix D

RE12.9-10.2 technical description (Ryan 2001)

Appendix E

Offset Area – Baseline Raw SAT Data

Appendix F

Offset Assessment Guide Calculator Results and Justification

Appendix G

Risk Assessment



Appendix A

Impact Area – MHQA (Koala) results

Assessment Unit - Regional Ecosystem	AU 1 - Remnant (RE12.11.3)					
	RE12.11.3 Benchmark	Transect 1	Transect 2	Average of Transect(s)	% Benchmark	Score
SITE CONDITION						
Recruitment of woody perennial species in EDL	100	100	100	100.00	100.00	5
Native plant species richness - trees	6	12	11	11.50	191.67	5
Native plant species richness - shrubs	12	6	4	5.00	41.67	2.5
Native plant species richness - grasses	4	3	2	2.50	62.50	2.5
Native plant species richness - forbs	21	13	9	11.00	52.38	2.5
Tree canopy height (Canopy)*	25	19	22	20.50	82.00	5
Tree canopy height (Sub-canopy)*	10	8	11	9.50	95.00	5
					*Average tree canopy height	5
Tree canopy cover (Canopy)**	72	77.5	74.1	75.8	105.28	5
Tree canopy cover (Sub-canopy)**	17	35.6	26.8	31.2	183.53	5
					**Average tree canopy cover	5
Shrub canopy cover	21	11.6	4.9	8.25	39.29	3
Native grass cover*	16	13	23	18.00	112.50	5
Organic litter*	76	57	65	61.00	80.26	5
Large trees (euc plus non-euc) (per ha)	45	14	6	10.00	22.22	5
Coarse woody debris (per ha)	370	11.4	22.4	16.90	4.57	0
Non-native plant cover	0	70	60	65.00	65.00	0
Quality and availability of food and foraging habitat	NA	10	10	10.00	-	10
Quality and availability of shelter	NA	10	10	10.00	-	5
					Site Condition Score (/100)	60.5
					Overall Site Condition Score - out of 3	1.82
SITE CONTEXT						
Size of patch	10					10
Connectedness	5					2
Context	5					5
Ecological Corridors	6					6
Role of site location to species overall population in the state	5					5
Threats to the species	15					7
Species mobility capacity	10					7
					Site Context Score (/56)	42
					Overall Site Context Score - out of 3	2.25
SPECIES STOCKING RATE						
Koala Stocking Rate (utilising SSR & SSR Supplementary Table(s)	70	55	55	55		40
					Species Stocking Rate Score (/70)	40.00
					Overall Species Stocking Rate Score - out of 4	2.29
					Overall Assessment Unit Score	6.35

Impact area Koala species stocking rate results – Assessment Unit 1

Species Stocking Rate attributes	
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	10/10
Species usage of the site (habitat type and evidenced usage)	15/15
Approximate density (per ha)	10/30
Role/importance of the species population on site*	5/30
Total Species Stocking Rate Score	**40/70**
Species Stocking Rate Score – out of 4	**2.29**

***Species Stocking Rate supplementary table attributes**	
Key source population for breeding	0/10
Key source population for dispersal	5/5
Necessary for maintaining genetic diversity	0/15
Near the limit of the species range	0/15

Assessment Unit - Regional Ecosystem	AU 2 - Regrowth (RE12.11.10)				
	RE12.11.10 Benchmark	Transect 3	Average of Transect(s)	% Benchmark	Score
SITE CONDITION					
Recruitment of woody perennial species in EDL	100	100	100.00	100.00	5
Native plant species richness - trees	25	6	6.00	24.00	0
Native plant species richness - shrubs	23	8	8.00	34.78	2.5
Native plant species richness - grasses	1	1	1.00	100.00	5
Native plant species richness - forbs	35	7	7.00	20.00	0
Tree canopy height (Canopy)*	22	0	0.00	0.00	0
Tree canopy height (Sub-canopy)*	8	9	9.00	112.50	5
				*Average tree canopy height	2.5
Tree canopy cover (Canopy)**	64	0	0	0.00	0
Tree canopy cover (Sub-canopy)**	47	70	70	148.94	5
				**Average tree canopy cover	2.5
Shrub canopy cover	29	2.4	2.40	8.28	0
Native grass cover*	15	0	0.00	0.00	0
Organic litter*	54	34	34.00	62.96	5
Large trees (euc plus non-euc) (per ha)	88	4	4.00	4.55	5
Coarse woody debris (per ha)	705	820	820.00	116.31	5
Non-native plant cover	0	70	70.00	70.00	0
Quality and availability of food and foraging habitat	NA	1	1.00	-	1
Quality and availability of shelter	NA	5	5.00	-	1
				Site Condition Score (/100)	34.5
				Overall Site Condition Score - out of 3	1.04
SITE CONTEXT					
Size of patch	10	10	10		10
Connectedness	5	4	4		2
Context	5	4	4		5
Ecological Corridors	6	6	6		6
Role of site location to species overall population in the state	5	5	5		5
Threats to the species	15	7	7		7
Species mobility capacity	10	7	7		7
				Site Context Score (/56)	42
				Overall Site Context Score - out of 3	2.25
SPECIES STOCKING RATE					
Koala Stocking Rate (utilising SSR & SSR Supplementary Table(s)	70				30
				Species Stocking Rate Score (/70)	30.00
				Overall Species Stocking Rate Score - out of 4	1.71
				Overall Assessment Unit Score	5.00

Impact area Koala species stocking rate results – Assessment Unit 2

Species Stocking Rate attributes	
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	10/10
Species usage of the site (habitat type and evidenced usage)	5/15
Approximate density (per ha)	10/30
Role/importance of the species population on site*	5/30
Total Species Stocking Rate Score	**30/70**
Species Stocking Rate Score – out of 4	**1.71**

***Species Stocking Rate supplementary table attributes**	
Key source population for breeding	0/10
Key source population for dispersal	5/5
Necessary for maintaining genetic diversity	0/15
Near the limit of the species range	0/15

Assessment Unit - Regional Ecosystem	AU 3 - Non-remnant (RE12.11.3)				
	RE12.11.3 Benchmark	Transect 4	Average of Transect(s)	% Benchmark	Score
SITE CONDITION					
Recruitment of woody perennial species in EDL	100	100	100.00	100.00	5
Native plant species richness - trees	6	6	6.00	100.00	5
Native plant species richness - shrubs	12	3	3.00	25.00	2.5
Native plant species richness - grasses	4	1	1.00	25.00	2.5
Native plant species richness - forbs	21	4	4.00	19.05	0
Tree canopy height (Canopy)*	25	0	0.00	0.00	0
Tree canopy height (Sub-canopy)*	10	7	7.00	70.00	3
				*Average tree canopy height	1.5
Tree canopy cover (Canopy)**	72	0	0	0.00	0
Tree canopy cover (Sub-canopy)**	17	18.2	18.2	107.06	5
				**Average tree canopy cover	2.5
Shrub canopy cover	21	5.4	5.40	25.71	3
Native grass cover*	16	1	1.00	6.25	0
Organic litter*	76	0	0.00	0.00	0
Large trees (euc plus non-euc) (per ha)	45	0	0.00	0.00	0
Coarse woody debris (per ha)	370	0	0.00	0.00	0
Non-native plant cover	0	90	90.00	90.00	0
Quality and availability of food and foraging habitat	NA	1	1.00	-	1
Quality and availability of shelter	NA	1	1.00	-	1
				Site Condition Score (/100)	24
				Overall Site Condition Score - out of 3	0.72
SITE CONTEXT					
Size of patch	10	10	10		10
Connectedness	5	4	4		2
Context	5	4	4		5
Ecological Corridors	6	6	6		6
Role of site location to species overall population in the state	5	5	5		5
Threats to the species	15	7	7		7
Species mobility capacity	10				7
				Site Context Score (/56)	42
				Overall Site Context Score - out of 3	2.25
SPECIES STOCKING RATE					
Koala Stocking Rate (utilising SSR & SSR Supplementary Table(s)	70	55	55		30
				Species Stocking Rate Score (/70)	30.00
				Overall Species Stocking Rate Score - out of 4	1.71
				Overall Assessment Unit Score	4.68

Impact area Koala species stocking rate results – Assessment Unit 3

Species Stocking Rate attributes	
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	10/10
Species usage of the site (habitat type and evidenced usage)	5/15
Approximate density (per ha)	10/30
Role/importance of the species population on site*	5/30
Total Species Stocking Rate Score	**30/70**
Species Stocking Rate Score – out of 4	**1.71**

***Species Stocking Rate supplementary table attributes**	
Key source population for breeding	0/10
Key source population for dispersal	5/5
Necessary for maintaining genetic diversity	0/15
Near the limit of the species range	0/15

Appendix B

Offset Area – MHQA (Koala) baseline results and raw data

Assessment Unit - Regional Ecosystem	AU 1 - 12.9-10.2 (non-remnant)					
	RE12.9-10.2 Benchmark	Transect 1	Transect 2	Average of Transect(s)	% Benchmark	Score
SITE CONDITION						
Recruitment of woody perennial species in EDL	100	100	100	100	100	5
Native plant species richness - trees	6	4	4	4	66.67	2.5
Native plant species richness - shrubs	7	3	3	3	42.86	2.5
Native plant species richness - grasses	7	5	8	6.5	92.86	5
Native plant species richness - forbs	13	2	4	3	23.08	0
Tree canopy height (Canopy)*	21	8	14	11	52.38	3
Tree canopy height (Sub-canopy)*	12	6	6	6	50.00	3
					*Average tree canopy height	3
Tree canopy cover (Canopy)**	64	2.6	11.8	7.2	11.25	2
Tree canopy cover (Sub-canopy)**	20	6.4	11.7	9.1	45.25	2
					**Average tree canopy cover	2
Shrub canopy cover	6	0	1.1	0.6	9.17	0
Native grass cover*	21	67	75	71.0	338.10	5
Organic litter*	48	6	9	7.5	15.63	3
Large trees (euc plus non-euc) (per ha)	38	2	10	6.0	15.79	5
Coarse woody debris (per ha)	506	105	282.5	193.8	38.29	2
Non-native plant cover	0	20	10	15.0	15.00	5
Quality and availability of food and foraging habitat	NA				-	5
Quality and availability of shelter	NA				-	5
					Site Condition Score (/100)	50
					Overall Site Condition Score - out of 3	1.50
SITE CONTEXT						
Size of patch	10			10		10
Connectedness	5			4		4
Context	5			5		5
Ecological Corridors	6			0		0
Role of site location to species overall population in the state	5			5		5
Threats to the species	15			7		7
Species mobility capacity	10			7		10
					Site Context Score (/56)	41
					Overall Site Context Score - out of 3	2.20
SPECIES STOCKING RATE						
Koala Stocking Rate (utilising SSR & SSR Supplementary Table(s)	70					40
					Species Stocking Rate Score (/70)	40.00
					Overall Species Stocking Rate Score - out of 4	2.29
Overall Assessment Unit Score						5.98

Species Stocking Rate attributes	
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	10/10
Species usage of the site (habitat type and evidenced usage)	15/15
Approximate density (per ha)	10/30
Role/importance of the species population on site*	5/30
Total Species Stocking Rate Score	**40/70**
Species Stocking Rate Score – out of 4	**2.29**

*Species Stocking Rate supplementary table attributes	
Key source population for breeding	0/10
Key source population for dispersal	5/5
Necessary for maintaining genetic diversity	0/15
Near the limit of the species range	0/15

Appendix C

Offset Area – Raw Weed Mapping data

Transect 1 – Weed Cover

Distance (m)			
Start	**End**	**Interval (m)**	**Dominant Species Coverage**
0	3.5	3.5	*Sporobolus sp.* (Giant Rat's Tails Grass)
3.5	22.2	18.7	Native Grasses*
22.2	23.4	1.2	*Melinis repens* (Red Natal Grass)
23.4	40.9	17.5	Native Grasses*
40.9	48.6	7.7	*Melinis repens* (Red Natal Grass)
48.6	55.6	7	Native Grasses*
55.6	58.9	3.3	*Melinis repens* (Red Natal Grass)
58.9	61	2.1	Native Grasses*
61	63.5	2.5	Leaf Litter
63.5	65.2	1.7	Native Grasses*
65.2	67.3	2.1	*Chrysocephalum apiculatum* (Yellow Buttons)
67.3	71	3.7	Native Grasses*
71	72.1	1.1	*Melinis repens* (Red Natal Grass)
72.1	79.1	7	Native Grasses*
79.1	80.3	1.2	Leaf Litter
80.3	86.4	6.1	Native Grasses*
86.4	89	2.6	*Melinis repens* (Red Natal Grass)
89	90.2	1.2	Bare Ground
90.2	95.8	5.6	*Melinis repens (Red Natal Grass)*
95.8	100	4.2	Native Grasses*
Total	**100**		
Native species	**75.0**		
Non-native species	**25.0**		

*The site is dominated by a mixture of native and exotic pasture grasses. Native species are referred to as *Heteropogon contortus* (Black Spear Grass), *Capillipedium parviflorum* (Scented Top Grass), *Imperata cylindrica* (Blady Grass), *Cymbopogon refractus* (Barbed-wire Grass), *Panicum decompositum* (Native Millet), *Eragrostis brownii* (Brown's lovegrass) and *Aristida vagans* (Three awn Aristida).

Transect 2 – Weed Cover

Distance (m)			
Start	**End**	**Interval (m)**	**Dominant Species Coverage**
0	1.2	1.2	*Imperata cylindrica* (Blady Grass)
1.2	4.1	2.9	*Melinis repens* (Red Natal Grass)
4.1	19.2	15.1	Native Grasses*
19.2	21.2	2	*Melinis repens* (Red Natal Grass)
21.2	26.3	5.1	*Gomphocarpus physocarpus* (Balloon Cotton Bush)
26.3	32	5.7	*Imperata cylindrica* (Blady Grass)
32	37.5	5.5	Exotic Forb
37.5	43	5.5	Native Grasses*
43	45.1	2.1	*Chrysocephalum apiculatum* (Yellow Buttons)
45.1	45.7	0.6	*Melinis repens* (Red Natal Grass)
45.7	48.6	2.9	*Chrysocephalum apiculatum* (Yellow Buttons)
48.6	56.4	7.8	*Imperata cylindrica* (Blady Grass)
56.4	63.7	7.3	Native Grasses
63.7	67.6	3.9	*Melinis repens* (Red Natal Grass)
67.6	72.5	4.9	Native Grasses
72.5	73.1	0.6	*Melinis repens* (Red Natal Grass)
73.1	97.4	24.3	Native Grasses*
97.4	100	2.6	*Imperata cylindrica* (Blady Grass)
Total	**100**		
Native species	**79.4**		
Non-native species	**20.6**		
*The site is dominated by a mixture of native and exotic pasture grasses. Native species are referred to as *Heteropogon contortus* (Black Spear Grass), *Capillipedium parviflorum* (Scented Top Grass), *Imperata cylindrica* (Blady Grass), *Cymbopogon refractus* (Barbed-wire Grass), *Panicum decompositum* (Native Millet), *Eragrostis brownii* (Brown's lovegrass) and *Aristida vagans* (Three awn Aristida).			

Appendix D

RE12.9-10.2 technical description (Ryan 2001)

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Regional Ecosystem Technical Descriptions

Technical descriptions provide a detailed description of the full range in structure and floristic composition of regional ecosystems (e.g. 12.3.5) and their component vegetation communities (e.g. 12.3.5a).

The descriptions are compiled using site survey data from the Queensland Herbarium's CORVEG database. Distribution maps, representative images (if available) and the pre-clearing and remnant area (hectares) of each vegetation community derived from the regional ecosystem mapping (spatial) data are included. The technical descriptions should be used in conjunction with the fields from the regional ecosystem description database (REDD) for a full description of the regional ecosystem. Quantitative site data from relatively undisturbed sites are extracted from CORVEG and summarized to provide information specific to each vegetation community.

Technical descriptions include the attributes: tree canopy height and cover and native plant species composition of the predominant layer, which are used to assess the remnant status of vegetation under the *Vegetation Management Act 1999*. However, as technical descriptions reflect the full range in structure and floristic composition across the climatic, natural disturbance and geographic range of the regional ecosystem, local reference sites should be used where possible (Neldner *et al*. 2005 section 3.3.3).

The technical descriptions are subject to review and are updated as additional data becomes available.

When conducting a BioCondition assessment, these technical descriptions should be used in conjunction with BioCondition benchmarks for the specific regional ecosystem, or component vegetation community.

Field definitions

Description	Description of the species, structural formation and habitat of the vegetation community (this is not the Regulation description)
Area of pre-clearing regional ecosystem	The area of the regional ecosystem vegetation community before clearing in hectares
Area of remnant RE and percentage remaining	The area of the remnant regional ecosystem vegetation community in hectares and as a percentage of pre-clearing extent
Species recorded	Total number; number of woody species; number in the ground layer (some species can be both woody and occur in the ground layer); average number of species per site (using only sites where a completed species list was recorded); standard deviation; number of sites used to calculate the average species number.
Basal area	Site average, range and standard deviation (m^2/hectare)
Structural Formation	Percentage of sites by structural formation. For example: Woodland: 39%; open-forest: 39%; open-woodland: 22%, 23 site(s)
Representative CORVEG sites	Site (id) numbers used in the description
For each stratum present: • Emergent (E) • Canopy (T1), Sub-canopy (T2) and Low tree layers (T3) • Shrub (S1) and Sub-shrub layers (S2) • Ground (G)	• *Height* - average canopy height in metres, range in metres and number of sites values are based on. • *Cover* - Average percentage canopy cover of the layer, range and number of sites values are based on. • *Average stem density* (stems per hectare), range and number of sites values are based on.
Dominant species (relative cover, frequency):	Relative cover (mean of cover of species / total cover of all species in that stratum for all values > zero) and frequency (percent of total sites) ordered by decreasing relative abundance. Up to five most dominant species with frequency > 20% listed for each stratum. For example: *Abutilon albescens* (78, 46%), means this species occurs in 46% of all sites and when it occurs comprises 78% of total cover (of the stratum)
Frequent species (cover, frequency):	Frequent species: Cover (mean of all values > zero) and frequency (percent of total sites) of all species occurring in more than 5% of sites ordered by decreasing frequency. For example: *Abutilon albescens (10, 46%)*, means this species occurs in 46% of all sites and when it occurs has a mean cover of 10% Ground layer species are listed as either graminoid or forbs. Naturalised species have an asterisk (*) after the scientific name. *indet.* after listed name = indeterminate species or genus

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Conditions of use

Technical descriptions have been developed from information published by the State of Queensland (acting through the Department) and remain the property of the State of Queensland. Technical descriptions are not to be included on internet sites other than the Queensland Government website.

Users should reference information contained in the technical descriptions as: Ryan, T.S. (ed.) (year*) Technical Descriptions of Regional Ecosystems of Southeast Queensland, (month, year*) (Queensland Herbarium, Department of Science, Information Technology, Innovation and the Arts: Brisbane). * Date shown in footnote of individual descriptions.

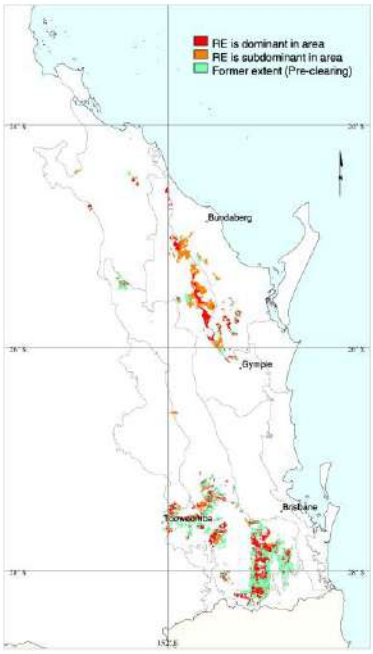
While every effort has been made to ensure the information presented is as reliable as possible, the State of Queensland accepts no liability and gives no assurance in respect of its accuracy and shall not be liable for any loss or damage arising from its use.

Technical descriptions are based on a combination of quantitative and qualitative information and should be used as a guide only. Technical descriptions are not to be used as a substitute for reference sites. Descriptions are subject to review and are updated as additional data becomes available.

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Corymbia citriodora subsp. variegata +/- Eucalyptus crebra open-forest on sedimentary rocks



Pre-clearing area (ha), remnant area (ha) and per cent remaining:	227,046	88,197	39%

Species recorded: Total: 175; woody: 59; ground: 125; Avg. spp./site: 28.2; std dev.: 7.7, 15 site(s)

Basal area: Avg./site: 16.0 m²/ha, range: 8.0 - 30 m²/ha, std. deviation: 5 m²/ha, 15 site(s)

Structural formation: Open-forest: 73%; woodland: 27%, 15 site(s)

Representative sites: 14276, 14283, 15472, 15476, 15477, 15480, 15481, 15482, 15483, 15518, 15525, 15528, 15786, 15795, 40825.

Stratum: **T1**

Height avg. = 21.2m, range 18-25m, 15 sites

Crown cover avg. = 53.5%, range 25.0-71.0%, 15 sites

Dominant species (relative cover, frequency): Corymbia citriodora subsp. variegata (65, 100%), Angophora leiocarpa (28, 27%), Eucalyptus crebra (25, 80%)

Frequent species (cover, frequency): Corymbia citriodora subsp. variegata (34, 100%), Eucalyptus crebra (14, 80%), Angophora leiocarpa (16, 27%), Eucalyptus tereticornis (3, 20%), Corymbia tessellaris (13%), Eucalyptus moluccana (16, 13%), Eucalyptus siderophloia (9, 13%), Allocasuarina torulosa (7%), Alphitonia excelsa (7%), Alstonia constricta (7%), Brachychiton populneus (7%), Eucalyptus melanophloia (3, 7%)

Stratum: **T2**

Height avg. = 12.9m, range 9-17m, 14 sites

Crown cover avg. = 19.9%, range 2.0-40.0%, 14 sites

Dominant species (relative cover, frequency): Corymbia citriodora subsp. variegata (42, 73%), Eucalyptus crebra (36, 67%), Angophora leiocarpa (18, 27%)

Frequent species (cover, frequency): Corymbia citriodora subsp. variegata (10, 73%), Eucalyptus crebra (6, 67%), Angophora leiocarpa (3, 27%), Alphitonia excelsa (1, 20%), Acacia disparrima subsp. disparrima (14, 13%), Corymbia intermedia (4, 13%), Corymbia tessellaris (4, 13%), Eucalyptus major (7, 13%), Lophostemon confertus (14, 13%), Acacia maidenii (7%), Allocasuarina torulosa (7%), Eucalyptus melanophloia (4, 7%), Eucalyptus moluccana (4, 7%), Eucalyptus siderophloia (2, 7%), Eucalyptus tereticornis (3, 7%), Notelaea longifolia (7%)

Stratum: **T3**

Height avg. = 7.2m, range 5-10m, 6 sites

Crown cover avg. = 13.0%, range 8.0-20.0%, 6 sites

Dominant species (relative cover, frequency): Eucalyptus crebra (57, 27%), Corymbia citriodora subsp. variegata (34, 33%)

Frequent species (cover, frequency): Corymbia citriodora subsp. variegata (6, 33%), Eucalyptus crebra (5, 27%), Angophora leiocarpa (3, 13%), Acacia glaucocarpa (8, 7%), Allocasuarina luehmannii (13, 7%), Alphitonia excelsa (7%), Celastrus subspicata (7%), Corymbia tessellaris (1, 7%), Eucalyptus major (7, 7%)

Stratum: **S1**

Height avg. = 2.5m, range 1.5-5m, 15 sites

Crown cover avg. = 21.6%, range 2.0-50.0%, 15 sites

Dominant species (relative cover, frequency): Acacia disparrima subsp. disparrima (48, 40%), Alphitonia excelsa (24, 53%), Acacia leiocalyx (20, 40%), Eucalyptus crebra (16, 27%), Lantana camara (12, 40%)*

Frequent species (cover, frequency): Alphitonia excelsa (4, 53%), Corymbia citriodora subsp. variegata (1, 47%), Acacia disparrima subsp. disparrima (7, 40%), Acacia leiocalyx (4, 40%), Lantana camara (4, 40%), Eucalyptus crebra (2, 27%), Jacksonia scoparia (1, 27%), Alstonia constricta (4, 20%), Angophora leiocarpa (1, 20%), Acacia falcata (9, 13%), Acacia fimbriata (15, 13%), Acacia glaucocarpa (4, 13%), Acacia maidenii (2, 13%), Choretrum candollei (13%), Corymbia tessellaris (13%), Eremophila debilis (13%), Maytenus cunninghamii (13%), Myoporum montanum (1, 13%), Pittosporum angustifolium (1, 13%), Acacia amblygona (8, 7%), Acacia concurrens (7%), Acacia decora (7%), Acacia implexa (7%), Acacia irrorata (8, 7%), Acacia loroloba (1, 7%), Acacia neriifolia (7%), Alectryon diversifolius (5, 7%), Allocasuarina littoralis (18, 7%), Allocasuarina torulosa (2, 7%), Astrotricha latifolia (5, 7%), Brachychiton populneus (1, 7%), Brachychiton rupestris (7, 7%), Breynia oblongifolia (2, 7%), Citrus australis (5, 7%), Corymbia intermedia (7%), Cupaniopsis parvifolia (7%), Daviesia ulicifolia (7%), Eucalyptus major (2, 7%), Eucalyptus moluccana (4, 7%), Eucalyptus tereticornis (7%), Flindersia australis (7%), Gomphocarpus physocarpus* (7%), Hovea lorata (2, 7%), Indigofera australis (8, 7%), Lophostemon confertus (20, 7%), Persoonia sericea (7%), Psydrax odorata (4, 7%), Psydrax odorata forma buxifolia (7%), Pultenaea euchila (2, 7%), Solanum ellipticum (7%), Solanum seaforthianum* (7%), Swainsona galegifolia (7%), Wikstroemia indica (7%), Xanthorrhoea johnsonii (8, 7%)*

Stratum: **G**

Height avg. = 0.6m, range 0.15-1m, 15 sites

PFC avg. = 47.2%, range 10-90%, 15 sites

Dominant species (relative cover, frequency): Entolasia stricta (33, 27%), Cymbopogon refractus (28, 67%), Themeda triandra (24, 67%), Eremochloa bimaculata (20, 33%), Imperata cylindrica (17, 27%)

Frequent species (cover, frequency): GRAMINOIDS: Cymbopogon refractus (14, 67%), Themeda triandra (14, 67%), Panicum effusum (1, 60%), Heteropogon contortus (8, 47%), Aristida vagans (1, 40%), Eragrostis brownii (33%), Eremochloa bimaculata (5, 33%), Entolasia stricta (9, 27%), Imperata cylindrica (6, 27%), Cyperus gracilis (20%), Eragrostis spartinoides (2, 20%), Bothriochloa decipiens (1, 13%), Capillipedium spicigerum (13%), Chloris divaricata (20, 13%), Digitaria breviglumis (2, 13%), Gahnia aspera (1, 13%), Melinis repens (5, 13%), Scleria mackaviensis (13%), Aristida calycina (36, 7%), Aristida gracilipes (16, 7%), Aristida indet. (7%), Aristida personata (4, 7%), Aristida queenslandica var. queenslandica (7%), Bothriochloa bladhii (7%), Cleistochloa rigida (7%), Cyperus aggregatus* (7%), Dichanthium sericeum (7%), Digitaria didactyla* (7%), Digitaria parviflora (7%), Eriachne glabrata (7%), Fimbristylis dichotoma (7%), Lepidosperma laterale (2, 7%), Megathyrsus maximus var. pubiglumis* (1, 7%), Oplismenus aemulus (7%), Panicum decompositum (5, 7%), Paspalidium caespitosum (7%), Paspalidium distans (7%), Sarga leiocladum (7%), Scleria sphacelata (7%), Sporobolus elongatus (1, 7%), Urochloa foliosa (1, 7%)*
FORBS: Cyanthillium cinereum (47%), Dianella revoluta (1, 47%), Eustrephus latifolius (47%), Lantana camara (5, 40%), Glycine tabacina (33%), Peripleura hispidula var. hispidula (33%), Desmodium rhytidophyllum (27%), Eremophila debilis (27%), Lantana montevidensis* (3, 27%), Brunoniella australis (20%), Chrysocephalum apiculatum (20%), Galactia tenuiflora (20%), Hardenbergia violacea (20%), Opuntia stricta* (20%), Sida hackettiana (3, 20%), Achyranthes aspera (2, 13%), Bidens pilosa* (13%), Desmodium gunnii (13%), Dianella caerulea (13%), Dianella indet. (13%), Gomphocarpus physocarpus* (13%), Laxmannia gracilis (13%), Lobelia purpurascens (13%), Lomandra longifolia (1, 13%), Lomandra multiflora (1, 13%), Mentha diemenica (1, 13%), Opuntia tomentosa* (13%), Passiflora subpeltata* (15, 13%), Abutilon oxycarpum forma oxycarpum (7%), Acacia leiocalyx (1, 7%), Alphitonia excelsa (7%), Alstonia constricta (1, 7%), Asparagus africanus* (7%), Breynia oblongifolia (2, 7%), Brunonia australis (7%), Cassytha pubescens (7%), Cheilanthes sieberi (7%), Cheilanthes tenuifolia (7%), Clematicissus opaca (7%), Conyza bonariensis* (7%), Crotalaria montana (7%), Cynanchum bowmanii (1, 7%), Desmodium brachypodum (7%), Desmodium uncinatum* (7%), Desmodium varians (7%), Dianella brevipedunculata (1, 7%), Dianella caerulea var. vannata (7%), Einadia hastata (7%), Glycine indet. (7%), Goodenia hederacea (1, 7%), Goodenia rotundifolia (7%), Grewia latifolia (1, 7%), Gymnostachys anceps (7%), Hibiscus sturtii (1, 7%), Hovea acutifolia (7%), Jasminum didymum (7%), Jasminum didymum subsp. lineare (7%), Jasminum suavissimum (1, 7%), Leucopogon juniperinus (7%), Lissanthe strigosa (2, 7%), Lomandra confertifolia subsp. pallida (25, 7%), Lomandra filiformis (7%), Monotoca scoparia (7%), Myoporum montanum (7%), Opuntia indet. (7%), Ozothamnus diosmifolius (7%), Passiflora suberosa* (7%), Picris angustifolia subsp. carolorum-henricorum (7%), Plectranthus parviflorus (7%), Podolepis neglecta (7%), Pomax umbellata (7%), Pterocaulon redolens (7%), Pycnosorus chrysanthes (7%), Rhodanthe anthemoides (7%), Secamone elliptica (1, 7%), Sida cordifolia* (7%), Sida rhombifolia* (7%), Solanum nemophilum (1, 7%), Solanum stelligerum (7%), Stephania japonica (7%), Velleia paradoxa (7%), Velleia spathulata (7%), Wahlenbergia gracilis (7%), Wedelia spilanthoides (7%)*

12.9-10.2 draft technical description

Tree 1 (Ht avg=24.46m, 18-33m, 44 sites; Cover avg=55.96%, 14-90%, 44 sites; SD/ha avg=110, 40-180, 2 sites)

Dominant species (cover)

Corymbia citriodora subsp. variegata (32, 100%), *Eucalyptus moluccana* (17, 9%), *Eucalyptus crebra* (15, 75%), *Angophora leiocarpa* (13, 14%), *Eucalyptus acmenoides* (11, 23%)

Species (frequency, cover)

Corymbia citriodora subsp. variegata (100%, 32), *Eucalyptus crebra* (75%, 15), *Eucalyptus acmenoides* (23%, 11), *Eucalyptus siderophloia* (20%, 10), *Eucalyptus tereticornis* (18%, 5), *Angophora leiocarpa* (14%, 13), *Corymbia tessellaris* (11%, 4), *Eucalyptus moluccana* (9%, 17), *Corymbia intermedia* (7%, 4), *Eucalyptus exserta* (7%, 8), *Allocasuarina torulosa* (5%), *Eucalyptus melanophloia* (5%, 2), *Eucalyptus propinqua* (5%), *Alphitonia excelsa* (2%), *Brachychiton populneus* (2%), *Corymbia trachyphloia subsp. trachyphloia* (2%, 8), *Eucalyptus longirostrata* (2%, 3), *Eucalyptus major* (2%)

Tree 2 (Ht avg=13m, 9-17m, 38 sites; Cover avg=20.05%, 1-60%, 38 sites; SD/ha avg=130, 40-220, 2 sites)

Dominant species (cover)

Allocasuarina littoralis (14, 2%), *Lophostemon confertus* (11, 7%), *Eucalyptus acmenoides* (10, 14%), *Acacia disparrima subsp. disparrima* (10, 14%), *Corymbia citriodora subsp. variegata* (9, 73%)

Species (frequency, cover)

Corymbia citriodora subsp. variegata (73%, 9), *Eucalyptus crebra* (48%, 7), *Acacia disparrima subsp. disparrima* (14%, 10), *Angophora leiocarpa* (14%, 4), *Eucalyptus acmenoides* (14%, 10), *Alphitonia excelsa* (11%, 1), *Corymbia tessellaris* (9%, 6), *Eucalyptus exserta* (9%, 4), *Eucalyptus siderophloia* (9%, 3), *Eucalyptus tereticornis* (9%, 4), *Allocasuarina torulosa* (7%, 5), *Corymbia intermedia* (7%, 3), *Eucalyptus major* (7%, 4), *Eucalyptus moluccana* (7%, 3), *Lophostemon confertus* (7%, 11), *Acacia maidenii* (2%), *Allocasuarina littoralis* (2%, 14), *Eucalyptus melanophloia* (2%, 4), *Notelaea longifolia* (2%), *Petalostigma pubescens* (2%, 4)

Tree 3 (Ht avg=7.5m, 5-10m, 15 sites; Cover avg=11.58%, 1-35%, 15 sites; SD/ha avg=40, 40-40, 1 sites)

Dominant species (cover)

Allocasuarina luehmannii (13, 2%), *Allocasuarina torulosa* (10, 2%),

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Acacia glaucocarpa (8, 2%), *Eucalyptus major* (7, 2%), *Eucalyptus crebra* (5, 16%)

Species (frequency, cover)
Corymbia citriodora subsp. variegata (30%, 5), *Eucalyptus crebra* (16%, 5), *Eucalyptus acmenoides* (9%, 4), *Eucalyptus siderophloia* (7%, 5), *Angophora leiocarpa* (5%, 3), *Acacia glaucocarpa* (2%, 8), *Allocasuarina luehmannii* (2%, 13), *Allocasuarina torulosa* (2%, 10), *Alphitonia excelsa* (2%), *Celastrus subspicata* (2%), *Corymbia tessellaris* (2%, 1), *Corymbia trachyphloia subsp. trachyphloia* (2%, 3), *Eucalyptus major* (2%, 7), *Eucalyptus tereticornis* (2%)

Shrub 1 (Ht avg=2.61m, 1-5m, 38 sites; Cover avg=21.77%, 1-65%, 38 sites; SD/ha avg=170, 120-220, 2 sites)

Dominant species (cover)
Daviesia filipes (15, 2%), *Lophostemon confertus* (13, 5%), *Acacia complanata* (12, 2%), *Acacia fimbriata* (11, 7%), *Allocasuarina littoralis* (11, 5%)

Species (frequency, cover)
Acacia leiocalyx subsp. leiocalyx (36%, 4), *Acacia disparrima subsp. disparrima* (34%, 5), *Corymbia citriodora subsp. variegata* (34%, 2), *Alphitonia excelsa* (32%, 8), *Lantana camara* (27%, 8), *Eucalyptus crebra* (18%, 3), *Jacksonia scoparia* (14%, 1), *Breynia oblongifolia* (11%, 1), *Acacia maidenii* (9%, 2), *Pultenaea euchila* (9%, 1), *Acacia falcata* (7%, 6), *Acacia fimbriata* (7%, 11), *Acacia glaucocarpa* (7%, 3), *Allocasuarina torulosa* (7%, 3), *Alstonia constricta* (7%, 4), *Angophora leiocarpa* (7%, 3), *Choretrum candollei* (7%), *Corymbia tessellaris* (7%, 1), *Eremophila debilis* (7%), *Eucalyptus tereticornis* (7%), *Myoporum acuminatum* (7%, 1), *Acacia melanoxylon* (5%, 3), *Allocasuarina littoralis* (5%, 11), *Denhamia cunninghamii* (5%), *Eucalyptus exserta* (5%, 2), *Eucalyptus siderophloia* (5%, 1), *Exocarpos cupressiformis* (5%, 2), *Lophostemon confertus* (5%, 13), *Lophostemon suaveolens* (5%, 5), *Psydrax odorata forma buxifolia* (5%, 2), *Acacia amblygona* (2%, 8), *Acacia complanata* (2%, 12), *Acacia concurrens* (2%), *Acacia decora* (2%), *Acacia implexa* (2%), *Acacia irrorata subsp. irrorata* (2%, 8), *Acacia loroloba* (2%, 1), *Acacia neriifolia* (2%), *Acrotriche aggregata* (2%), *Alectryon diversifolius* (2%, 5), *Astrotricha latifolia* (2%, 5), *Brachychiton populneus* (2%, 1), *Brachychiton rupestris* (2%, 7), *Citrus australis* (2%, 5), *Corymbia intermedia* (2%), *Cupaniopsis parvifolia* (2%), *Daviesia filipes* (2%, 15), *Daviesia ulicifolia* (2%), *Daviesia ulicifolia subsp. stenophylla* (2%), *Erythrina vespertilio* (2%, 1), *Eucalyptus major* (2%, 2), *Eucalyptus moluccana* (2%, 4), *Flindersia australis* (2%), *Gomphocarpus physocarpus*

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(2%), *Hovea lorata* (2%, 2), *Indigofera australis* (2%, 8), *Indigofera australis subsp. australis* (2%), *Persoonia sericea* (2%), *Phyllota* (2%, 1), *Pittosporum angustifolium* (2%, 2), *Psydrax odorata* (2%), *Pultenaea villosa* (2%, 1), *Solanum ellipticum* (2%), *Solanum seaforthianum* (2%), *Swainsona galegifolia* (2%), *Trema tomentosa* (2%), *Wikstroemia indica* (2%), *Xanthorrhoea johnsonii* (2%, 8)

Shrub 2 (Ht avg=1.2m, 1.2-1.2m, 1 sites; Cover avg=3%, 3-3%, 1 sites)

Dominant species (cover)
Macrozamia mountperriensis (3, 2%)

Species (frequency, cover)
Macrozamia mountperriensis (2%, 3)

Ground (Ht avg=0.53m, 0.15-0.85m, 44 sites; PFC avg=45.75%, 6-90%, 44 sites)

Dominant species (cover)
Cymbopogon queenslandicus (50, 2%), *Aristida caput-medusae* (28, 2%), *Aristida calycina* (26, 5%), *Chloris divaricata* (20, 5%), *Themeda triandra* (18, 68%)

Species (frequency, cover)
Themeda triandra (68%, 18), *Cymbopogon refractus* (59%, 10), *Desmodium rhytidophyllum* (36%, 1), *Eremochloa bimaculata* (36%, 11), *Cyanthillium cinereum* (32%), *Panicum effusum* (30%, 1), *Entolasia stricta* (27%, 6), *Eustrephus latifolius* (27%), *Heteropogon contortus* (27%, 9), *Dianella revoluta* (25%, 1), *Imperata cylindrica* (25%, 10), *Aristida vagans* (23%, 3), *Brunoniella australis* (23%), *Eragrostis brownii* (23%, 1), *Glycine tabacina* (20%, 1), *Lobelia purpurascens* (20%), *Aristida queenslandica var. queenslandica* (16%, 11), *Lantana camara* (16%), *Lantana montevidensis* (16%, 4), *Lomandra multiflora subsp. multiflora* (16%, 1), *Chrysocephalum apiculatum* (14%), *Digitaria parviflora* (14%, 1), *Eragrostis spartinoides* (14%, 2), *Hardenbergia violacea* (14%), *Laxmannia gracilis* (14%), *Cheilanthes sieberi* (11%), *Cyperus gracilis* (11%, 1), *Eremophila debilis* (11%), *Peripleura hispidula var. hispidula* (11%), *Achyranthes aspera* (9%, 1), *Bidens pilosa* (9%), *Desmodium varians* (9%, 1), *Fimbristylis dichotoma* (9%), *Galactia tenuiflora* (9%), *Grewia latifolia* (9%, 1), *Lomandra longifolia* (9%, 2), *Parsonsia straminea* (9%), *Scleria mackaviensis* (9%), *Acacia leiocalyx subsp. leiocalyx* (7%, 1), *Aristida gracilipes* (7%, 10), *Aristida personata* (7%, 5), *Chrysopogon sylvaticus* (7%, 10), *Crotalaria montana* (7%), *Desmodium brachypodum* (7%), *Desmodium gunnii* (7%, 2), *Dianella caerulea* (7%, 1), *Digitaria*

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didactyla (7%, 5), *Gahnia aspera* (7%, 1), *Melinis repens* (7%, 11), *Murdannia graminea* (7%), *Opuntia stricta* (7%), *Opuntia tomentosa* (7%), *Passiflora subpeltata* (7%, 10), *Sarga leiocladum* (7%, 4), *Sida hackettiana* (7%, 3), *Alloteropsis semialata* (5%, 1), *Alphitonia excelsa* (5%), *Apowollastonia spilanthoides* (5%), *Aristida* (5%), *Aristida benthamii var. benthamii* (5%, 4), *Aristida calycina* (5%, 26), *Aristida calycina var. calycina* (5%, 5), *Arundinella nepalensis* (5%, 15), *Bothriochloa decipiens* (5%, 1), *Bothriochloa decipiens var. decipiens* (5%, 2), *Capillipedium spicigerum* (5%), *Cheilanthes* (5%), *Chloris divaricata* (5%, 20), *Chrysopogon fallax* (5%, 5), *Cymbidium canaliculatum* (5%), *Cyperus aggregatus* (5%), *Dianella* (5%), *Digitaria breviglumis* (5%, 2), *Glycine* (5%), *Glycine tomentella* (5%, 1), *Gomphocarpus physocarpus* (5%), *Goodenia rotundifolia* (5%), *Jacksonia scoparia* (5%, 2), *Lomandra confertifolia subsp. pallida* (5%, 13), *Mentha satureioides* (5%, 1), *Opuntia* (5%), *Panicum decompositum* (5%, 3), *Paspalidium distans* (5%), *Passiflora suberosa* (5%, 1), *Phyllanthus virgatus* (5%), *Plectranthus parviflorus* (5%, 1), *Pterocaulon redolens* (5%), *Pycnosorus chrysanthes* (5%), *Sida cordifolia* (5%), *Sigesbeckia* (5%), *Sigesbeckia orientalis* (5%), *Sporobolus creber* (5%), *Xanthorrhoea latifolia subsp. latifolia* (5%, 7), *Zornia dyctiocarpa var. dyctiocarpa* (5%), *Abutilon oxycarpum var. oxycarpum* (2%), *Acacia disparrima subsp. disparrima* (2%, 3), *Afrohybanthus enneaspermus* (2%), *Alstonia constricta* (2%, 1), *Aristida caput-medusae* (2%, 28), *Aristida muricata* (2%), *Aristida queenslandica var. dissimilis* (2%), *Aristida ramosa* (2%), *Asparagus africanus* (2%), *Bothriochloa bladhii* (2%), *Breynia oblongifolia* (2%, 2), *Brunonia australis* (2%), *Bryophyllum delagoense* (2%), *Calotis dentex* (2%), *Capillipedium parviflorum* (2%, 5), *Carex breviculmis* (2%), *Cassytha filiformis* (2%), *Cassytha pubescens* (2%), *Cenchrus caliculatus* (2%, 1), *Chamaecrista mimosoides* (2%), *Cheilanthes sieberi subsp. sieberi* (2%), *Cheilanthes tenuifolia* (2%), *Chloris gayana* (2%), *Chloris ventricosa* (2%), *Chorizema parviflorum* (2%), *Clematicissus opaca* (2%), *Crotalaria montana var. angustifolia* (2%), *Cymbopogon queenslandicus* (2%, 50), *Cyperus javanicus* (2%), *Desmodium uncinatum* (2%), *Dianella brevipedunculata* (2%, 1), *Dianella caerulea var. vannata* (2%), *Dianella rara* (2%), *Dichanthium sericeum* (2%), *Dichondra repens* (2%, 2), *Digitaria diffusa* (2%, 3), *Dimorphochloa rigida* (2%), *Dodonaea triquetra* (2%), *Echium* (2%), *Einadia hastata* (2%), *Eragrostis lacunaria* (2%), *Eragrostis leptostachya* (2%), *Eragrostis tenuifolia* (2%), *Eriachne glabrata* (2%), *Erigeron bonariensis* (2%), *Erigeron pusillus* (2%), *Exocarpos cupressiformis* (2%, 2), *Flemingia parviflora* (2%, 1), *Galactia tenuiflora var. lucida* (2%), *Glycine clandestina var. clandestina* (2%), *Glycine cyrtoloba* (2%), *Goodenia delicata* (2%), *Goodenia hederacea* (2%,

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1), *Gymnostachys anceps* (2%), *Hibbertia linearis* (2%), *Hibiscus sturtii* (2%, 1), *Hovea acutifolia* (2%), *Iphigenia indica* (2%), *Jasminum dianthifolium* (2%, 1), *Jasminum didymum* (2%), *Jasminum didymum subsp. lineare* (2%), *Lepidosperma laterale* (2%, 2), *Lepidosperma laterale var. laterale* (2%), *Leucopogon juniperinus* (2%), *Liliaceae* (2%), *Lissanthe strigosa subsp. subulata* (2%, 2), *Lomandra filiformis* (2%), *Lomandra laxa* (2%, 2), *Macrozamia mountperriensis* (2%, 10), *Malvastrum americanum var. americanum* (2%), *Marsdenia* (2%), *Marsdenia rostrata* (2%), *Megathyrsus maximus* (2%, 16), *Megathyrsus maximus var. maximus* (2%), *Megathyrsus maximus var. pubiglumis* (2%, 1), *Monotoca scoparia* (2%), *Myoporum acuminatum* (2%), *Oplismenus aemulus* (2%), *Oxalis* (2%), *Oxalis corniculata* (2%), *Ozothamnus diosmifolius* (2%), *Panicum simile* (2%), *Parsonsia eucalyptophylla* (2%), *Paspalidium* (2%), *Paspalidium caespitosum* (2%), *Paspalidium constrictum* (2%), *Paspalidium criniforme* (2%), *Paspalidium disjunctum* (2%), *Passiflora foetida* (2%), *Petalostigma pubescens* (2%), *Phyllanthus* (2%), *Picris angustifolia subsp. carolorum-henricorum* (2%), *Plantago debilis* (2%), *Podolepis neglecta* (2%), *Polygala triflora* (2%), *Pomax umbellata* (2%), *Pterocaulon* (2%), *Pultenaea villosa* (2%, 1), *Rhodanthe anthemoides* (2%), *Rhynchosia minima* (2%), *Rostellularia adscendens subsp. adscendens* (2%), *Scleria sphacelata* (2%), *Secamone elliptica* (2%, 1), *Sida rhombifolia* (2%), *Solanum nemophilum* (2%, 1), *Solanum stelligerum* (2%), *Sporobolus elongatus* (2%, 1), *Stephania japonica* (2%), *Tephrosia filipes* (2%), *Urochloa foliosa* (2%, 1), *Velleia spathulata* (2%), *Vincetoxicum ovatum* (2%, 1), *Wahlenbergia gracilis* (2%), *Xanthorrhoea johnsonii* (2%), *Xanthorrhoea latifolia* (2%, 5)

Summary

Species recorded	Total: 272; Woody: 78; Ground: 209; Avg spp/site: 23.95; StDev: 12.28
Basal Area	Avg BA/site: 15.05 m²/ha; Range: 6 - 30 m²/ha; StDev: 5.03 m²/ha
Structural Form range	Open-Forest: 61.36%; Woodland: 34.09%; Tall Closed-Forest: 2.27%; Closed-Forest: 2.27%
Representative sites	(40825, 15644, 15392, 15986, 15989, 15407, 15690, 15696, 15518, 15476, 15477, 40826, 48714, 15969, 15652, 15648, 15865, 15283, 15979, 15999, 15140, 14276, 15409, 15174, 15182, 14283, 15022, 15525, 15472, 15795, 15480, 15481, 15483, 15482, 15489, 15491, 15492, 54874, 54934, 55018, 55354, 15528, 15786, 15504)

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Appendix E

Offset Area – Baseline Raw SAT Data

Spot Assessment Technique (SAT) Survey				
Date: 18.02.2024	**SAT ID:** 1, *adjoining MHQA 1*			
Tree No.	**Scientific Name**	**Common Name**	**DBH**	**Scat present?**
1	*Corymbia intermedia*	Pink Bloodwood	140	No
2	*Angophora subvelutina*	Broad-leaved Apple	210	No
3	*Angophora subvelutina*	Broad-leaved Apple	280	No
4	*Corymbia intermedia*	Pink Bloodwood	230	No
5	*Angophora subvelutina*	Broad-leaved Apple	300	No
6	*Eucalyptus crebra*	Narrow-leaved Ironbark	170	No
7	*Corymbia intermedia*	Pink Bloodwood	230	No
8	*Corymbia intermedia*	Pink Bloodwood	120	No
9	*Corymbia intermedia*	Pink Bloodwood	140	No
10	*Corymbia intermedia*	Pink Bloodwood	160	No
11	*Corymbia intermedia*	Pink Bloodwood	170	No
12	*Eucalyptus tereticornis*	Fores Red Gum	280	No
13	*Corymbia intermedia*	Pink Bloodwood	160	No
14	*Corymbia intermedia*	Pink Bloodwood	100	No
15	*Corymbia intermedia*	Pink Bloodwood	130	No
16	*Corymbia citriodora*	Spotted Gum	290	Yes
17	*Corymbia citriodora*	Spotted Gum	270	No
18	*Corymbia citriodora*	Spotted Gum	220	No
19	*Corymbia citriodora*	Spotted Gum	160	No
20	*Eucalyptus crebra*	Narrow-leaved Ironbark	250	No
21	*Corymbia intermedia*	Pink Bloodwood	280	No
22	*Corymbia intermedia*	Pink Bloodwood	180	No
23	*Corymbia citriodora*	Spotted Gum	190	No
24	*Corymbia citriodora*	Spotted Gum	440	No
25	*Corymbia citriodora*	Spotted Gum	160	No
26	*Corymbia intermedia*	Pink Bloodwood	100	No
27	*Corymbia intermedia*	Pink Bloodwood	160	No
28	*Corymbia intermedia*	Pink Bloodwood	120	No
29	*Corymbia intermedia*	Pink Bloodwood	110	No
30	*Corymbia intermedia*	Pink Bloodwood	180	No
Total scats (/30)				1
Percentage				3.33
East Coast (med-high) Activity Category				Low

Spot Assessment Technique (SAT) Survey				
Date: 19.02.2024	**SAT ID:** 2, *adjoining MHQA 2*			
Tree No.	**Scientific Name**	**Common Name**	**DBH**	**Scat present?**
1	*Corymbia citriodora*	Spotted Gum	160	No
2	*Corymbia citriodora*	Spotted Gum	170	No
3	*Corymbia citriodora*	Spotted Gum	180	No
4	*Corymbia citriodora*	Spotted Gum	170	No
5	*Corymbia citriodora*	Spotted Gum	140	No
6	*Corymbia citriodora*	Spotted Gum	150	No
7	*Corymbia citriodora*	Spotted Gum	400	No
8	*Corymbia citriodora*	Spotted Gum	340	No
9	*Corymbia citriodora*	Spotted Gum	370	No
10	*Corymbia citriodora*	Spotted Gum	210	No
11	*Corymbia citriodora*	Spotted Gum	100	No
12	*Corymbia citriodora*	Spotted Gum	130	No
13	*Corymbia citriodora*	Spotted Gum	280	No
14	*Corymbia citriodora*	Spotted Gum	160	No
15	*Corymbia citriodora*	Spotted Gum	100	No
16	*Corymbia citriodora*	Spotted Gum	160	No
17	*Corymbia citriodora*	Spotted Gum	170	No
18	*Corymbia citriodora*	Spotted Gum	150	No
19	*Corymbia citriodora*	Spotted Gum	120	No
20	*Corymbia citriodora*	Spotted Gum	250	No
21	*Corymbia citriodora*	Spotted Gum	130	No
22	*Corymbia citriodora*	Spotted Gum	200	No
23	*Corymbia citriodora*	Spotted Gum	190	No
24	*Corymbia citriodora*	Spotted Gum	170	No
25	*Corymbia citriodora*	Spotted Gum	110	No
26	*Corymbia citriodora*	Spotted Gum	390	No
27	*Corymbia citriodora*	Spotted Gum	160	No
28	*Corymbia citriodora*	Spotted Gum	160	No
29	*Corymbia citriodora*	Spotted Gum	180	No
30	*Corymbia citriodora*	Spotted Gum	200	No
Total scats (/30)				0
Percentage				0
East Coast (med-high) Activity Category				No usage

Appendix F

Offset Assessment Guide Calculator Results and Justification

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Koala
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Koala habitat patches	**Area**	5.9	Hectares	
			Quality	**6**	Scale 0-10	
			Total quantum of impact	3.54	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	3.54	Adjusted hectares	30	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	40	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	5.36	151.32%	Yes	
									Future area without offset (adjusted hectares)	40.0	**Future area with offset (adjusted hectares)**	40.0								
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**8**	2.00	85%	1.70	1.34				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	3.54	5.36	151.32%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Appendix G

Risk Assessment

Risk assessment for offset area

A qualitative risk assessment which considers the risks of achieving the objectives and outcomes for the offset area is presented in the table below. The risk assessment is completed in accordance with the EPBC Act Environmental Management Plan Guidelines (2014) and characterises risk as low, medium, high or severe, as derived from the likelihood (highly likely, likely, possible, unlikely, rare) and consequence (minor, moderate, high, major and critical) risk matrix.

The risk analysis assesses the risk of failure to achieve the OMP management objectives. It is necessary to re-evaluate and modify the risk analysis and contingency measures throughout the period of EPBC Act approval, particularly if any unforeseen risks emerge or any negative outcomes identified are greater than expected.

During the first five (5) years of monitoring and Annual Compliance Reporting, Offset Provider **KFF1 and/or The Proponent** will review management commitments in this Offset Management Framework, and if the review results in the need to revise the framework it will be revised and submitted for approval. It is noted that events are only addressed once in the risk assessment under the most relevant management objective, however, some events are likely to impact on multiple management objectives.

Note, potential impacts from the occurrence of cyclones have been included within the risk analysis table. Cyclones, if to occur proximal to the offset area, are likely to result in indirect impacts only, including increased rainfall and wind events. Whilst the pathway of and occurrence of cyclones can change easily, becoming difficult to determine, an assessment of the potential associated risks has been completed. According to BoM (2019), cyclones have rarely traversed inland SEQ for at least the last 20 years, with the exception of Cyclone Debbie in 2017 and Cyclone Alfred in 2025. While the risk of cyclones occurring south of 25°S has increased in more recent years, it is unlikely a formed cyclone would occur at or proximal to the offset area location. This is due to a range of factors, including surrounding changes in topography, modified urban environment and lack of warm open water to provide continued energy generation[1].

[1] Bureau of Meteorology 2019, *Past Tropical Cyclones*, BoM, Australian Government, accessed at http://www.bom.gov.au/cyclone/tropical-cyclone-knowledge-centre/history/past-tropical-cyclones/

Risk framework

		Consequence				
Likelihood		Minor	Moderate	High	Major	Critical
	Highly Likely	Medium	High	High	Severe	Severe
	Likely	Low	Medium	High	High	Severe
	Possible	Low	Medium	Medium	High	Severe
	Unlikely	Low	Low	Medium	High	High
	Rare	Low	Low	Low	Medium	High

Likelihood and consequence

Qualitative measure of likelihood (how likely is it that this event/circumstances will occur after management actions have been put in place/are being implemented)	
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances
Qualitative measure of consequences (what will be the consequence/result if the issue does occur)	
Minor	Minor risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing low cost, well characterised corrective actions.
Moderate	Moderate risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing well characterised, high cost/effort corrective actions.
High	High risk of failure to achieve the plan's objectives. Results in medium-long term delays to achieving plan objectives, implementing uncertain, high cost/effort corrective actions.
Major	The plan's objectives are unlikely to be achieved, with significant legislative, technical, ecological and/or administrative barriers to attainment that have no evidenced mitigation strategies.

• Critical	• The plan's objectives are unable to be achieved, with no evidenced mitigation strategies.

Risk assessment and management

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity/ies	Feasible/effective corrective actions
			L	C	RL		
To legally secure approved offset properties for conservation.	Failure to legally secure approved offset area. Legislative reform prejudices proposed tenure arrangements for offset properties.	Management action 1: • Legally secure the offset area via a suitable method such as a voluntary declaration under the *Vegetation Management Act 1999* or a covenant under the *Land Act 1994* or *Land Titles Act 1994*.	R	Mod	Low	Clearing of the 5.9 ha impact area cannot occur without legally securing the offset area.	N/A
Pest management	Failure to reduce the threat of feral animals	Management Action 2: • Conduct baseline surveys and determine relative abundance index. • Implement predator control program. • Conduct follow-up monitoring and implement further control.	U	Mod	Low	Monitoring of the presence of introduced predators through the use of remote motion-activated cameras; Survey the site to record the presence / absence of signs of introduced predator (sightings, killings and/or scats and tracks).	• Should the initial and ongoing introduced predator control measures not result in a reduction of introduced predator numbers (compared to baseline survey), introduced predator program to be expanded/adapted to improve outcomes. • Any incidence of injury/mortality resulting from introduced predator attack will initiate supplementary

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity/ies	Feasible/effective corrective actions
			L	C	RL		monitoring and control measures. In the event that an offset species is found injured, transport immediately to a local vet, or suitably qualified and experienced wildlife carer.
WONS management	Failure to control WONS.	Management Action 3: • Develop and implement a weed strategy, to maintain weeds listed with particularly ability to impact on movement and structural vegetation composition (predominantly *Lantana camara*), and under the *Biosecurity Act 2014*, to reduce weed cover to target thresholds. • Undertake weed management in accordance with the OMP.	U	Mod	Low	Annual photo monitoring for the first three years and then year 5, 10, 15, and 20 years and mapping of weed infestations, and 5-year targeted transects and MHQA surveys of non-native plant cover to ensure low weed abundance across offset area. Surveys in-line with weed management strategy. Repeated surveys of baseline data including 5 yearly habitat monitoring data as part of the framework.	If weed survey indicates WONS cover has increased since previous survey, the weed control program will be expanded/ adapted to improve outcomes.
High intensity fire	A high intensity uncontrolled fire occurs within the offset area/s which	Management Action 4: Actions as directed by the local authority which may include prescribed burning or other techniques	P	M	Med	Annual monitoring requirements to review access tracks, fire breaks, fuel loads and outcomes of controlled	If a wildfire occurs in the offset area, the following actions will be undertaken:

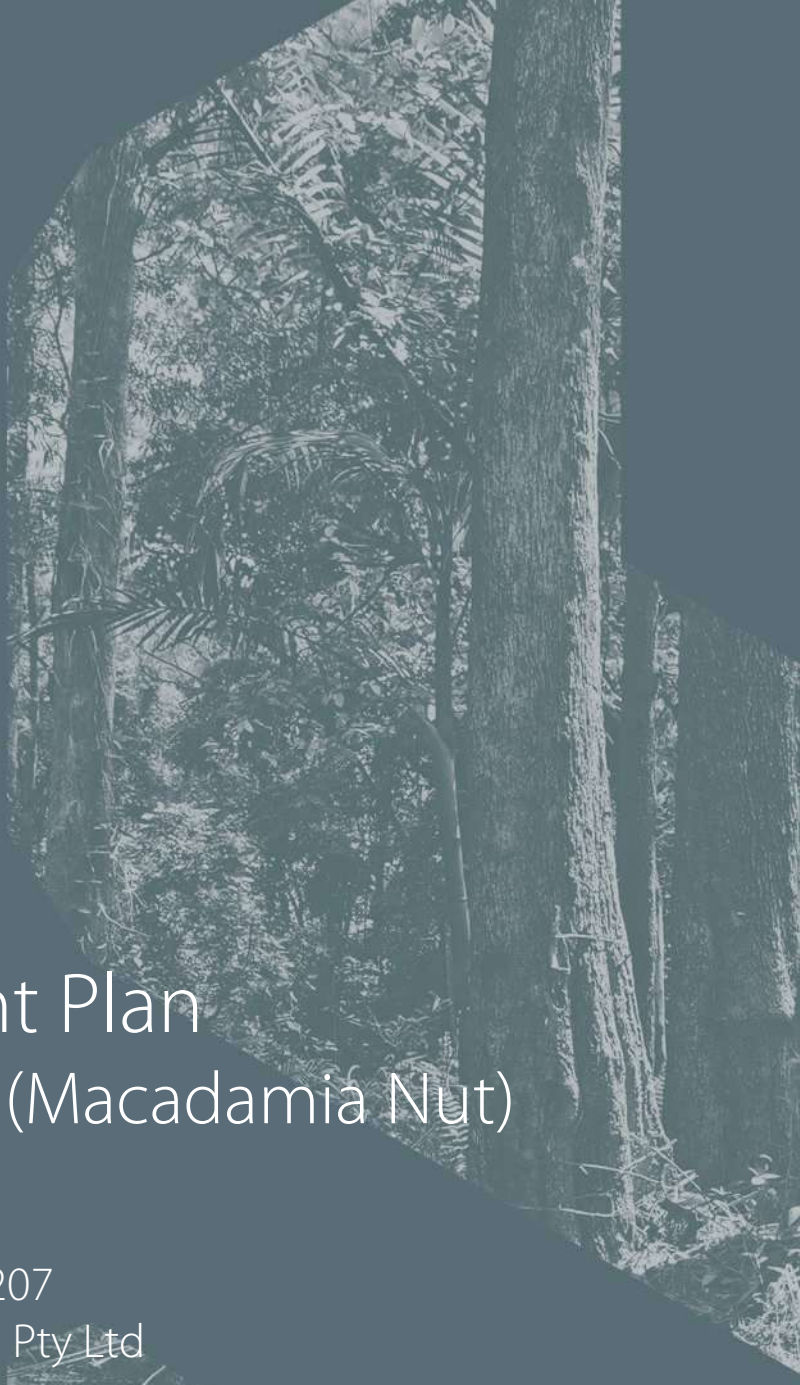
Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity/ies	Feasible/effective corrective actions
			L	C	RL		
	causes loss of habitat.	undertaken in consultation with the Queensland Rural Fire Brigade and controlled grazing to manage fuel loads.				burns or other management techniques such as use of livestock.	• Implement fire control • Repair any fire breaks and access tracks. • Stay informed through the Rural Fire Service. • Assess damage caused by the wildfire and monitor for natural regeneration. • Monitoring to occur 3-6 months post event or after the next wet weather event (whichever is sooner).
Achieve performance targets and completion criteria for habitat	Landowner-approval holder agreements fail to adequately address management commitments in the offset plan.	Management Action 1-5: • The offset area has been legally secured for conservation purposes. The development of this framework outlines specific management actions to achieve performance criteria.	U	Mod	Low	Scheduled monitoring/surveys and Annual Compliance Reports	• Review Offset Management Framework • Implement adaptive management and corrective actions

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity/ies	Feasible/effective corrective actions
			L	C	RL		
	The offset area fails to naturally regenerate.	Management Action 3: • Remove incompatible land uses. • WONS management (refer Management Action 3). • Sufficient rest period.	U	Mod	Low	After a sufficient rest period the repeat MHQA will indicate progress towards performance criteria.	• Where natural regeneration is failing to thrive, assist natural regeneration through direct seeding and planting • infill planting/ revegetation to be implemented after sufficient rest period.
	Failure to increase habitat for offset species.	Management Action 1: • legally secure offset area and remove incompatible land uses. Management Action 3: • Reduce the extent of weed as per criteria; and • Implement infill planting if required.	U	Mod	Low	Annual surveys (photo monitoring & audit of revegetation works) of revegetation area to ensure plant survival. Repeated surveys of baseline data including 5-yearly MHQA habitat monitoring data and annual observational data as part of the OMP.	If MHQA transects indicate habitat less than performance indicators, implement infill planting in weed control areas. Should plant stock fail supplementary planting, direct seeding, weed control, fertiliser, amelioration or other management actions necessary to stimulate tree growth.

Management objective/desired outcome	Event or circumstance	Relevant management actions/measures	Residual risk			Trigger detection and monitoring activity/ies	Feasible/effective corrective actions
			L	C	RL		
	Where infill planting is required and there is high plant stock failure.	Management Action 3: • Adhere to planting method and watering schedule.				Annual plant stock audit (first 5 years). Planting and monitoring event schedules by the qualified bush regenerator.	If there is a high rate of plant stock failure adaptive management and corrective actions will be implemented and may include, additional supplementary planting, direct seeding, weed control, fertiliser, water spike, mulching, tree guards, etc.

Attachment A8

Macadamia integrifolia Impact Management Plan



Impact Management Plan
Macadamia integrifolia (Macadamia Nut)

Blue Rock Quarry
Tamaree Road, Cedar Creek, QLD 4207
Prepared for Fulton Hogan Quarries Pty Ltd

11 March 2026



Saunders Havill

PATHWAYS TO SUCCESS

Document Control

Document: Impact Management Plan (*Macadamia integrifolia*) for Blue Rock Quarry, Tamaree Road, Cedar Creek, QLD 4207, prepared by Saunders Havill Group for Fulton Hogan Quarries Pty Ltd.

Document Issue

Issue	Date	Prepared By	Checked By
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B	11.03.2026	LB	SM

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Acronyms and Abbreviations

DCCEEW	Department of Climate Change, Energy, the Environment and Water (Cth)
DETSI	Department of Environment, Tourism, Science and Innovation (Queensland [Qld]) (formerly Department of Environment and Science)
EPBC	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth [Cth])
CEEVNT	Critically Endangered, Endangered, Vulnerable and Near Threatened (as listed in the *Nature Conservation [Plants] Regulation 2020*)
MSES	Matters of State Environmental Significance
NCA	*Nature Conservation Act 1992* (Qld)
NCPR	*Nature Conservation (Plants) Regulation 2020* (Qld)
PMAV	Property Map of Assessable Vegetation
SH	Saunders Havill
SRI	Significant Residual Impact
VMA	*Vegetation Management Act 1999* (Qld)

Expansion Area	Refers to the 5.9 ha direct clearing area
Clearing Impact Area	Refers to the 5.9 ha direct clearing area and 100m buffer
POA	Refers to the Planting Offset Area where the Macadamia integrifolia will be offset

1. Introduction

Saunders Havill (SH) was engaged by **Fulton Hogan Quarries Pty Ltd** to complete a flora survey for the Blue Rock Quarry expansion area. The quarry expansion area is located within a mapped 'High Risk' area under the *Nature Conservation Act 1992* (NCA) which indicated there may be flora protected under the *Nature Conservation* (Plants) *Regulation 2020* (NCPR) present at this location and triggered the need for a flora survey and report as per the protected plant survey guidelines.

The expansion area is in the southern extent of the existing Blue Rock Quarry, Cedar Creek. The quarry is accessed from near the intersection of Tamaree Road and Beaudesert Beenleigh Road and is located approximately 9 km north from Tamborine Village or 12 km from the M1 Highway near Yatala. Blue Rock Quarry has been in operation since the 1970's and is surrounded by a combination of remnant and regrowth vegetation with a mixture of rural land uses and retained vegetation. Refer to **Figure 1** for site context and **Figure 2** for site aerial. The protected plants 'high risk' area Flora Survey Trigger Map across the Blue Rock Quarry site, is generally aligned with existing vegetation including Category B (remnant), Category C (high-value regrowth) and Category X (non-remnant) vegetation (refer **Figure 3**). Key site details are provided in **Table 1**.

Under the NCA, the 'clearing impact area' includes both the area to be cleared and 100 m buffer area. During protected plant surveys of the clearing impact area and associated buffer, specimens of *Macadamia integrifolia* (Macadamia Nut) were recorded within the eastern extent of the clearing impact area. *Macadamia integrifolia* specimens recorded are considered a threatened plant under the NCA. As they meet the classification of "in the wild", the presence of these specimens within the clearing impact area triggers the requirement for an Impact Management Plan (IMP).

This IMP is intended to support a *Clearing Permit (Protected Plants)* application to support a protected plants clearing application to Department of Environment, Tourism, Science and Innovation (DETSI) to request clearing to occur where known NCA threatened plants are present within the clearing impact area. This IMP has been prepared in accordance with **Section 3.2** of the *Nature Conservation (Plants) Regulation 2020 – Protected Plants Assessment Guidelines*.

> *An impact management plan must include the following sections:*
>
> - *attempts to avoid and minimise impact;*
> - *nature of impact;*
> - *management of impact;*
> - *justification of impact management; and*
> - *survival of plant in the wild.*

Specific management and mitigations measures are included in this IMP which will be implemented prior to and during quarry operations to mitigate and/or minimise the potential impacts on *Macadamia integrifolia* specimens within and adjacent to the expansion area.

Macadamia integrifolia is listed as 'vulnerable' under both the state *NCA 1992* and the federal *EPBC Act 1999*. Therefore, this IMP has been developed to satisfy management and offset requirements of the future state approval and current federal approval process (EPBC 2024-09844).

Table 1: Property summary

Address	Blue Rock Quarry, Tamaree Road, Cedar Creek, Queensland
RPD	Part of Lot 89 on WD739
LGA	City of Gold Coast
Planning Scheme / Local Plan	City Plan Version 10 (Commenced 4th July, 2023)
Existing Land Use	Extraction Industry (Blue Rock Quarry)
Direct Impact Area	5.9 ha
NCA Clearing Impact Area (CIA) – inclusive of 100m buffer	12.5 ha

1.1. Nature Conservation Act 1992

The NCA classifies and protects significant areas (protected areas) and protects threatened plant and animal species. The *Nature Conservation (Plants) Regulation 2020* (NCPR) lists plant and animal species presumed extinct, endangered, vulnerable, near threatened, least concern, international or prohibited. The schedules of this regulation were considered in this IMP using DETSI's Wildlife Online database search for a 5 km radius of the site.

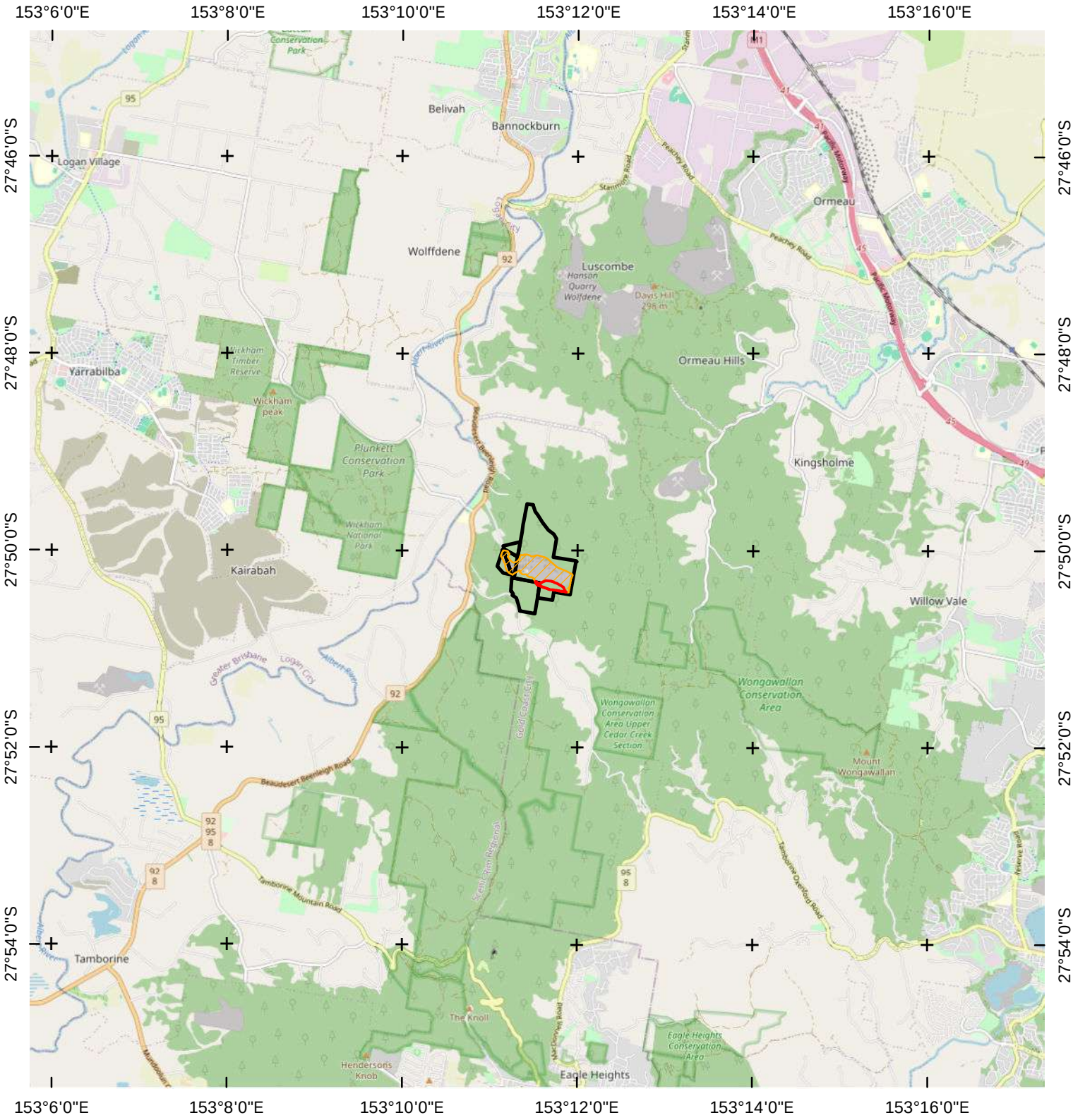
Flora species listed under the NCPR with the potential to occur around the subject site are shown in **Table 2**. The complete results of this search are included **Appendix A**.

Vegetation surrounding the current quarry footprint is within the 'High Risk' Area of the Protected Plants Flora Survey Trigger Map (refer **Figure 3**).

Table 2: NCA Wildlife Online Search Results (flora)

Scientific Name	Common Name	NCA Status
Leichhardtia coronata		Vulnerable
Pararistolochia praevenosa		Near Threatened
Picris conyzoides		Vulnerable
Corytnocarpus rupestris subsp. arborescens	Southern Corynocarpus	Vulnerable
Styphelia recurvisepala		Endangered
Baloghia marmorata	Jointed Baloghia	Vulnerable
Fontainea venosa		Vulnerable
Coleus habrophyllus		Endangered

Scientific Name	Common Name	NCA Status
Cryptocarya foetida	Stinking Cryptocarya	Vulnerable
Endiandra wongawallanensis		Endangered
Sophora fraseri	Brush Sophora	Vulnerable
Eucalyptus curtisii	Plunkett Mallee	Near Threatened
Gossia gonoclada		Critically Endangered
Gossia hillii		Critically Endangered
Melaleuca irbyana		Endangered
Rhodamnia dumicola	Rib-fruited Malletwood	Endangered
Rhodamnia rubescens	Scrub Turpentine	Critically Endangered
Rhodomyrtus psidioides	Native Guava	Critically Endangered
Jasminum jenniae		Endnagered
Macadamia integrifolia	Macadamia Nut	Vulnerable
Macadamia tetraphylla		Vulnerable
Randia moorei	Spiny Gardenia	Endangered
Cupaniopsis newmanii	Long-leaved Tuckeroo	Near Threatened
Planchonella eerwah		Endangered
Corchorus cunninghamii		Endangered
Brachychiton sp. (Ormeau)	Ormeau Bottle Tree	Critically Endangered



LEGEND

- Site Boundary
- Referral Area [5.9 ha]
  Quarry Expansion Area
- Existing Quarry Area

FIGURE A1

SITE CONTEXT

CLIENT

Fulton Hogan

PROJECT
CEDAR CREEK, QLD

COORDINATE SYSTEM
GDA 2020 MGA Z56

SCALE (A4)
1:100,000

N

0 1,100 2,200 3,300 4,400 m

Saunders Havill

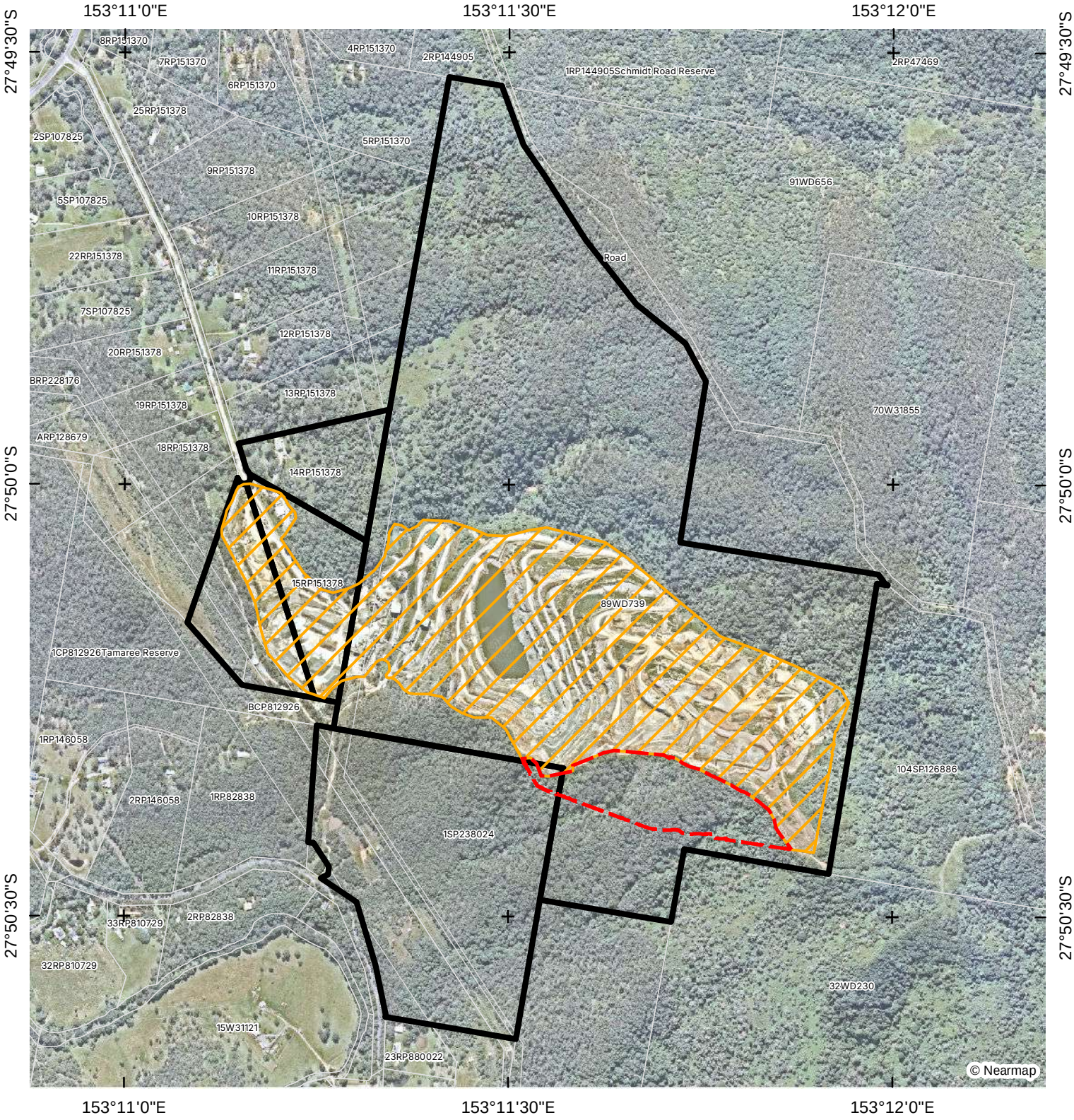
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FILE REFERENCE
11390 E MIMP Figure 1 Site Context A

DATE 7/10/2025



LEGEND

- Qld DCDB
- Site Boundary
- Referral Area [5.9 ha]
- *Quarry Expansion Area*
- Existing Quarry Area

FIGURE A2

SITE AERIAL

PROJECT
CEDAR CREEK, QLD

COORDINATE SYSTEM
GDA 2020 MGA Z56

SCALE (A4)
1:11,419

0 120 240 360 480 m

N

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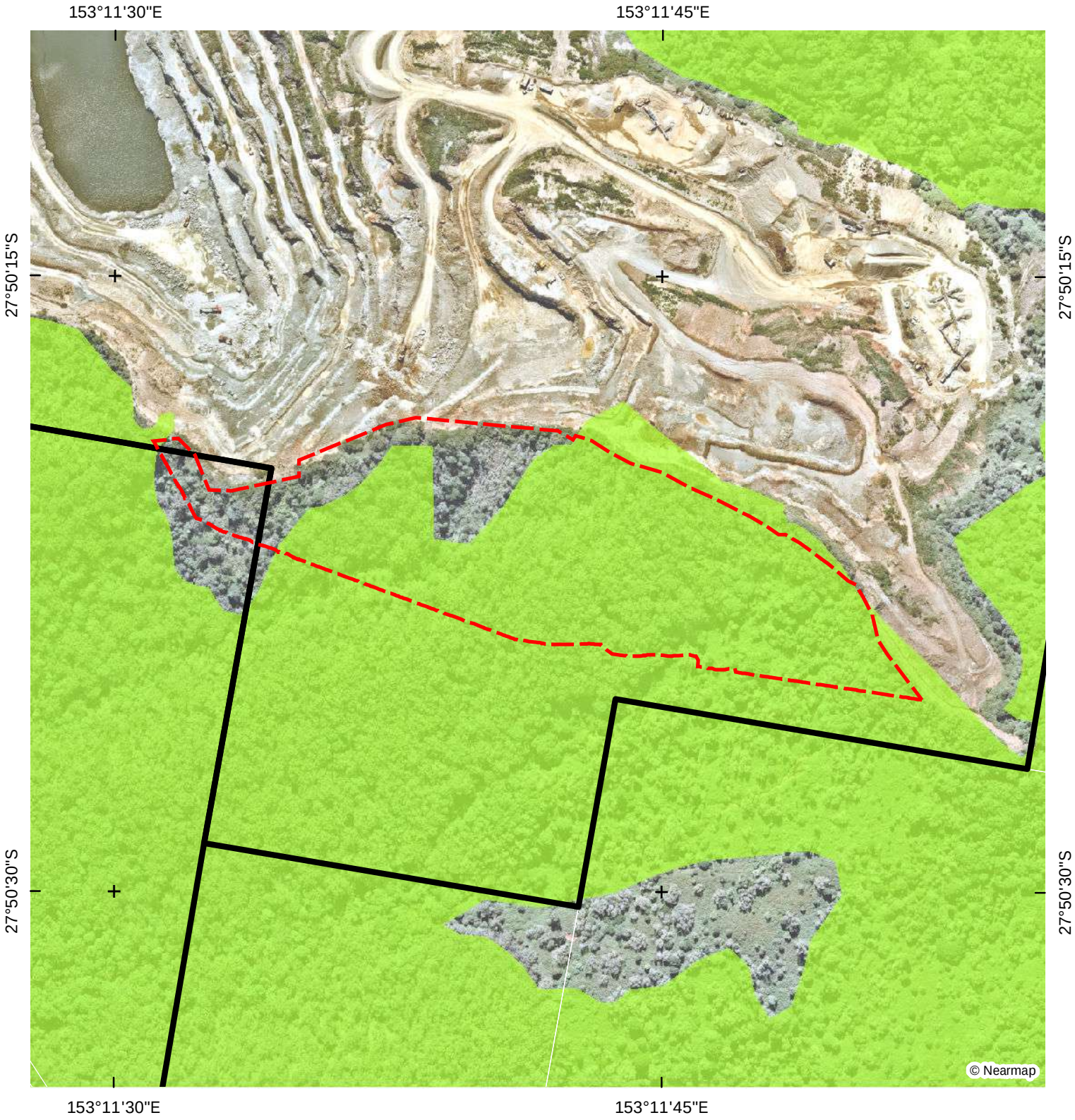
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FILE REFERENCE
11390 E MIMP Figure 2 Site Aerial A

DATE 7/10/2025



LEGEND

- Qld DCDB
- Site Boundary
- Referral Area [5.9 ha]
  Quarry Expansion Area
- NCA Protected Plants
- High risk area - flora survey trigger

FIGURE A3

NCA PROTECTED PLANTS MAPPING

PROJECT
CEDAR CREEK, QLD

COORDINATE SYSTEM
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SCALE (A4)
1:4,000

0 40 80 120 160 m

N

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FILE REFERENCE
11390 E MIMP Figure 3 NCA A

DATE 7/10/2025

2. Nature of Impact

2.1. Background

Blue Rock Quarry has been in operation since the 1970's, with the internal quarry footprint being cleared and maintained continuously through to the present day. The quarry expansion area associated with this report is a 5.9 ha area located south of the existing quarry footprint. The expansion area is partially mapped under a Property Map of Assessable Vegetation (PMAV), which contains Category X (non-remnant) vegetation and Category B (remnant) vegetation described as 'Least Concern' RE 12.11.3 (refer **Figure 4**). Areas of Category X (non-remnant) within the quarry expansion area reflect regrowth areas of 'Least Concern' RE 12.11.3 and 'Least Concern' RE12.11.10, however have not been mapped as Category C (high-value regrowth) due to the presence of a PMAV.

Presently vegetation extends to the south of the expansion area whilst the north is completely cleared to facilitate current quarry operations. Protected Plants Flora Survey Trigger Mapping (High Risk Area) is mapped across most of the expansion area, also extending south-west, south and south-east outside of the quarry expansion area. As a result of high-risk mapping being present within the clearing impact area, a flora survey in accordance with the methodology described in the *Flora Survey Guidelines – Protected Plants 2020* was undertaken.

The results of field survey identified seventeen (17) *Macadamia integrifolia* (Macadamia Nut) individuals (including juvenile and semi-mature specimens) within the protected plant survey area. Fifteen (15) of these specimens are proposed to be directly impacted and two (2) specimens are proposed to be retained within 100 m of the expansion area (refer **Plan 1** for locations and **Plan 2** for impact assessment). *Macadamia integrifolia* (Macadamia Nut) were the only Critically Endangered, Endangered, Vulnerable or Near Threatened (CEEVNT) protected plant found within the clearing impact area. The species profile for *Macadamia integrifolia* is detailed in **Section 2.2**. Further details of the *Macadamia integrifolia* (Macadamia Nut) specimens recorded on-site are provided in **Section 2.3**.

2.2. Protected plant profile

Macadamia integrifolia (Macadamia Nut) is a member of the Proteaceae family and listed as a Vulnerable threatened species under Schedule 2 of the NCPR. *Macadamia integrifolia* naturally occur within the northeast New South Wales-southeast Queensland coastal region. Within their distribution range, *Macadamia integrifolia* are endemic to rainforest and wet sclerophyll forest communities, including notophyll vine forest. The Queensland Herbarium Regional Ecosystem Description Database identifies *Macadamia integrifolia* as occurring in association with Regional Ecosystems (REs) 12.3.1, 12.8.3, 12.11.10 and 12.12.16. In addition, this species is genetically closely related to and often hybridises with *Macadamia tetraphylla* (Rough-Shelled Nut).

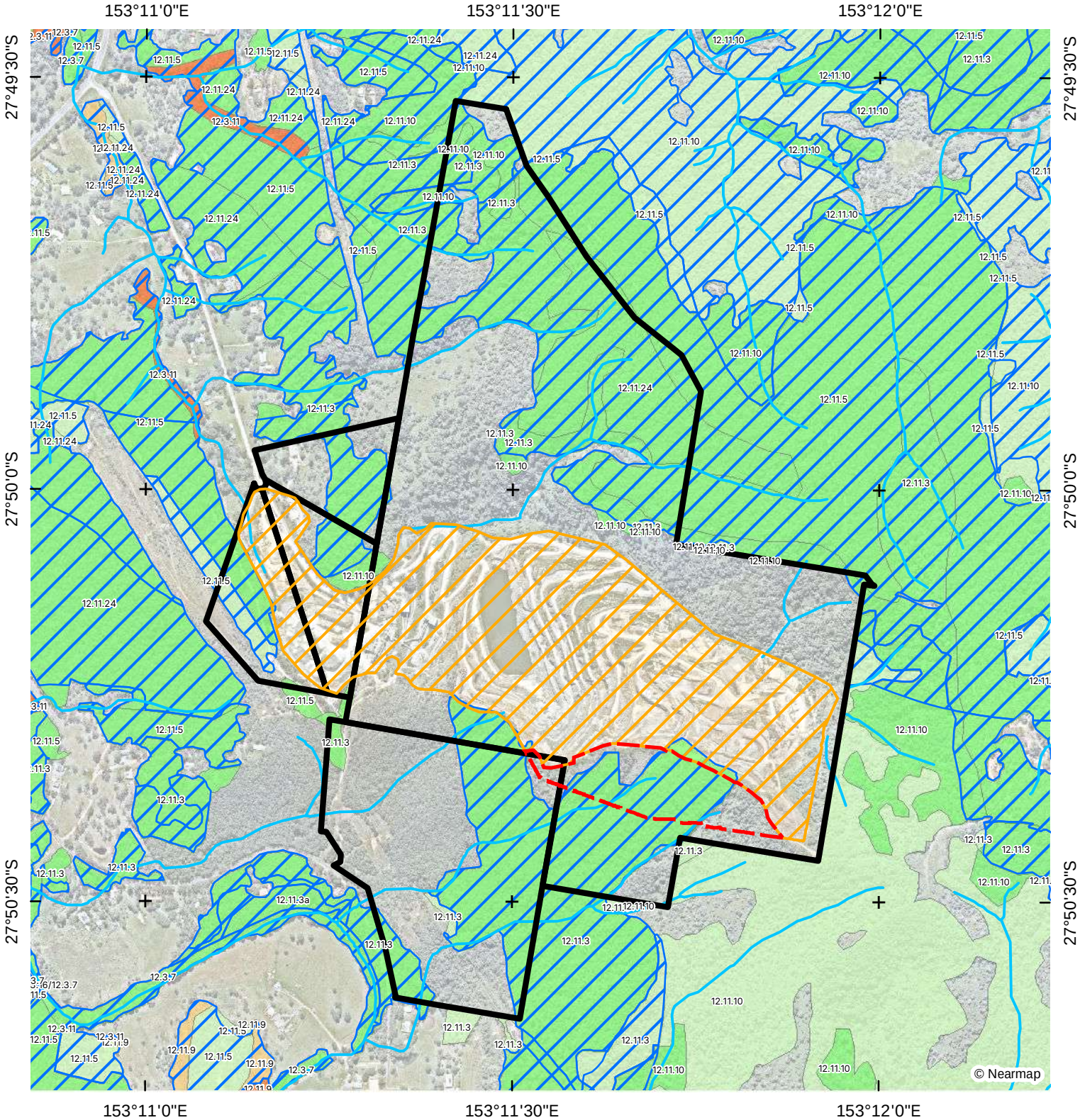
Macadamia integrifolia (Macadamia nut) is a long-lived perennial evergreen mid-storey subtropical rainforest tree to 20 m tall. Individuals are often multi stemmed with small crowns, with greyish branchlets dotted with raised lenticels. The simple obovate to narrowly oblong leaves are arranged in whorls of three or opposite and are generally 5.5 cm to 14 cm long by 2.5 cm to 6 cm wide. Blade tips are rounded and finish in a short sharp point; the base tapers to petioles 5 to 10 mm long. Axillary creamy-white flowers are arranged in brush-like hanging racemes 10 to 30 cm long.

2.3. *Macadamia integrifolia* site description

The Blue Rock Quarry clearing impact area includes three distinct mapped vegetation communities, however the majority is mapped as either remnant or non-remnant RE 12.11.3 (Eucalypt Woodland). The eastern and south-eastern extent of the clearing impact area is mapped as non-remnant vegetation containing regrowth RE 12.11.10 (notophyll vine forest) and RE 12.11.3 (Eucalypt Open Forest) (refer **Figure 4** and **Table 3**). Of the regional ecosystems mapped within Blue Rock Quarry, only RE 12.11.10 is recognised as containing potentially suitable habitat for *Macadamia integrifolia*. Notably, *Macadamia integrifolia* specimens recorded during surveys were only observed within the parts of the clearing impact area which reflect RE 12.11.10.

Table 3: Regional Ecosystem Vegetation Descriptions

Regional Ecosystem	VMA Status	Description
RE 12.11.3	*Least Concern*	*Eucalyptus siderophloia and E. propinqua open forest +/- E. microcorys, Lophostemon confertus, Corymbia intermedia, E. biturbinata, E. acmenoides, E. tereticornis, E. moluccana, Angophora leiocarpa, Syncarpia verecunda with vine forest species and E. grandis or E. saligna in gullies. Eucalyptus pilularis and E. tindaliae sometimes present e.g. mid D'Aguilar Range, Conondale Range. Occurs predominantly on hills and ranges of Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics. Not a Wetland. (BVG1M: 9a)*
RE 12.11.10	*Least Concern*	*Notophyll and notophyll/microphyll vine forest +/- Araucaria cunninghamii. Characteristic species include Argyrodendron trifoliolatum, Argyrodendron sp. (Kin Kin W.D.Francis AQ81198), Backhousia subargentea, Dissiliaria baloghioides, Brachychiton discolor, Beilschmiedia obtusifolia, Diospyros pentamera, Grevillea robusta, Gmelina leichhardtii and Ficus macrophylla forma macrophylla. Occurs on Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics. Not a Wetland. (BVG1M: 2a).*



LEGEND

- Site Boundary
- Referral Area [5.9 ha]
  Quarry Expansion Area
- Existing Quarry Area
- VM Watercourses
- VM Essential Habitat

VMRE Mapping

- Category A or B area containingof concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C area containingof concern regional ecosystems
- Category C area that is a least concern regional ecosystem

FIGURE A4

SUPPORTING VEGETATION MAP

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CEDAR CREEK, QLD

COORDINATE SYSTEM
GDA 2020 MGA Z56

SCALE (A4)
1:12,000

N

0 140 280 420 560 m

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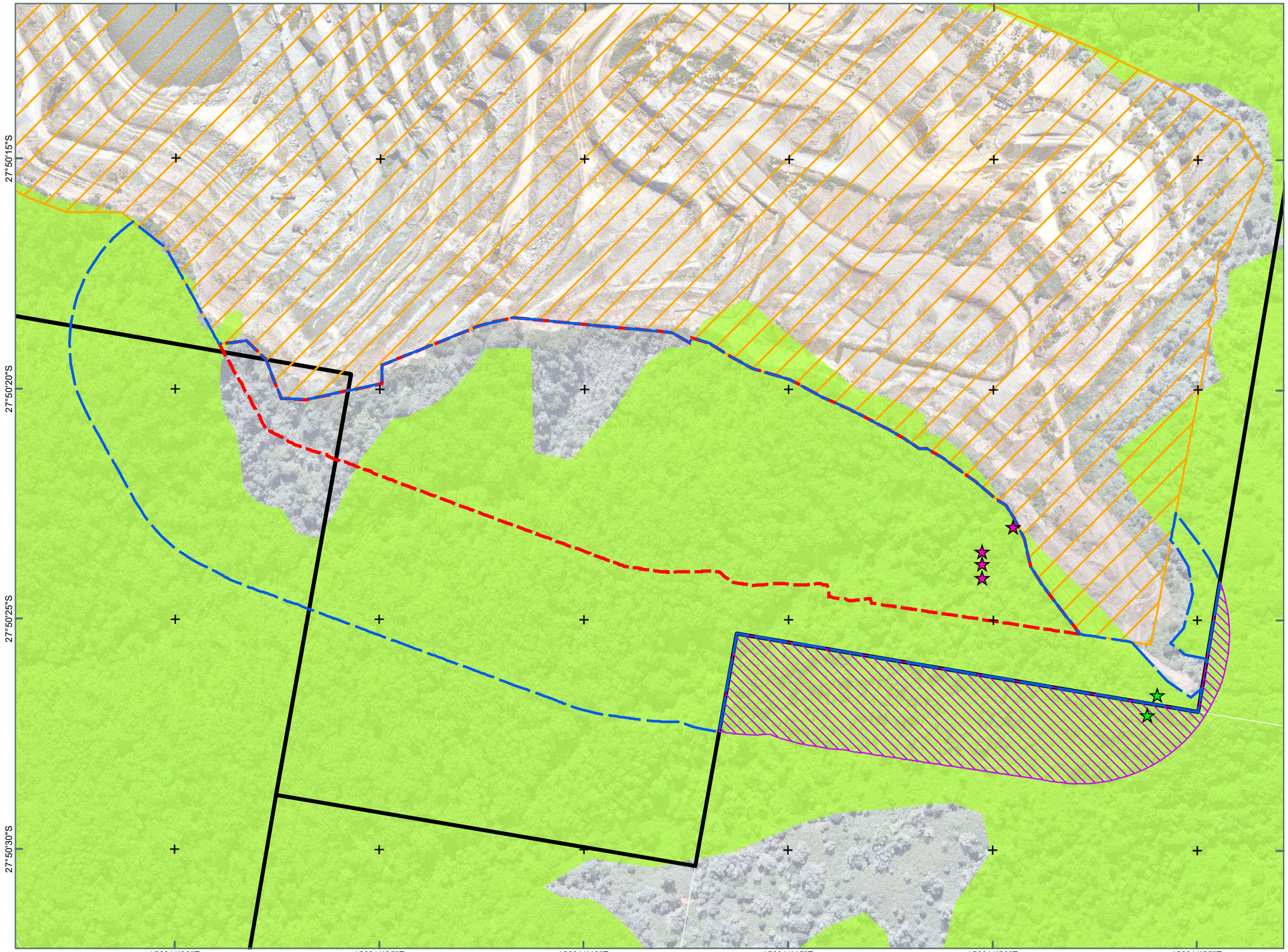
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FILE REFERENCE
11390 E MIMP Figure 4 SVM A

DATE 8/10/2025

PLAN A1. CLEARING IMPACT AREA AND SURVEY RESULTS



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LEGEND

- Qld DCDB
- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- Clearing Impact Area
- Access Not Possible On Neighbouring Properties

NCA Protected Plants

- High risk area - flora survey trigger
- Macadamia integrifolia specimen(s) located within referral area
  - *Specimen(s)* [15]
  - *Location(s)* [4]
- Macadamia integrifolia specimen(s) located outside referral area
  - *Specimen(s)* [1]
  - *Location(s)* [1]



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Fulton Hogan

BLUE ROCK QUARRY, CEDAR CREEK

0 20 40 60 m

N

Transverse Mercator
GDA 2020 | Zone 56

1:2,600
@ A3

Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024
Lots 14-16 on RP151378

6/03/2026

11390 E MIMP 01 Survey Area A

2.4. Avoidance and minimisation of impact

Blue Rock Quarry is located within the Gold Coast City Council (GCCC) local government area and is zoned 'Extractive Industry' under the *Gold Coast City Plan 2017*. In addition to local government zoning, the quarry area is also identified as Key Resource Area (KRA) 62. KRAs are identified in the *State Planning Policy*, with a total of 165 designations existing across Queensland. State intent of the designation is to protect land from development that could compromise the ability to access, extract and transport significant resources in the future.

The initial extraction approval was obtained in 1972 with quarry operations running through 5 decades to the present day. A range of other State and Local approvals have been obtained over the years including Environmental Authorities (EAs) that outline management requirements for the extraction activities, and operational works permits that allow vegetation clearing for approved extraction activities to occur. The current extent of the extraction area was reached in approximately 2005, with vegetation within the area being cleared and regrowing in cycles to support extraction activity. Regarding the expansion area, the following State and local Council approvals have been obtained:

- Environmental Authority P-EA-100268669 which includes extraction and screening activities for up to 1,600,000t per year on Lot 89 on WD739 and Lot 1 on SP238024.
- Clearing of remnant vegetation within the expansion area through DNRM permits RARP 2011/006373 and DPP 2005/101762
- MCU201400231 Material Change of Use Development Approval issued by Gold Coast City Council
- 306/3/248 (1977) Rezoning Approval for Extractive Industry issued by the then Albert Shire Council

As mentioned in previous sections, *Macadamia integrifolia* specimens were recorded within the clearing impact area, which includes both the 'area to be cleared' and the associated 100 m buffer. While it is not possible to avoid impacts to specimens within the clearing area, mitigation measures will be implemented for those specimens directly and potentially indirectly impacted as part of the quarry expansion. Proposed management and mitigation measures are discussed in **Section 3**.

3. Management of impact

This section contains justification for, and details on, the specific management strategies to be implemented prior to commencement of vegetation clearing works, during operational works, and post construction works on the subject site to ensure potential impacts on *Macadamia integrifolia* (Macadamia Nut) are mitigated and/or minimised.

3.1. Risk of impact

The Department of Climate Chance, Energy the Environment and Water (DCCEEW) Recovery Plan for *Macadamia integrifolia* (Macadamia Nut) was utilised to provide information on specific threats to the species with relevance to the site being addressed in this IMP.

The Recovery Plan Guideline details the following threats to the species

- Habitat loss and fragmentation
- Small Populations
- Weed species
- Fire
- Unmanaged Livestock
- Climate Change
- Genetic Pollution
- Disease

3.1.1 Habitat loss and fragmentation

The long-term impacts of land clearing and habitat fragmentation are underlying factors contributing to the threatened status of *Macadamia integrifolia*. This is exacerbated by ongoing clearing of remnant bushland throughout the species range for horticulture, agriculture, urban and industrial development, and associated infrastructure activities. The 'area to be cleared' consists of a mixture of remnant and non-remnant vegetation the latter of which contains regrowth vegetation reflective of pre-clear RE 12.11.10 and 12.11.3. Due to RE 12.11.3 being dominant, the majority of the area to be cleared does not contain suitable habitat for *Macadamia integrifolia*. However, the eastern extent of the expansion area contains 1.1 ha of regrowth reflecting RE 12.11.10, which is recognised as habitat for *Macadamia integrifolia*.

The extent of mapped remnant and high-value regrowth vegetation containing RE 12.11.10 within the broader landscape is vast, extending east and north from the Blue Rock Quarry's boundary. A significant portion of mapped RE 12.11.10 has been historically cleared throughout the region, resulting in a dominance of high-value regrowth vegetation with smaller pockets of remnant. As a result, areas of RE 12.11.10 within the clearing impact area contain significant disturbance and weeds dominating the understory. In addition, the vegetation lacks maturity and is dominated by regrowth specimens, further evidence of historical disturbance. Given the small size and disturbed nature of the vegetation, the proposed impact to regrowth RE 12.11.10 within the expansion area will not significantly reduce the extent of *Macadamia integrifolia* habitat, particularly given the extent of suitable habitat in the broader landscape.

3.1.2 Small population size

The *Macadamia integrifolia* Recovery Plan indicates that genetic drift, loss of genetic diversity, inbreeding depression, factors affecting reproductive success, and ability to sustain critical population size all affect the viability of the threatened species. When population size is reduced, genetic diversity can be reduced, and therefore population viability may be compromised.

The proposed clearing activities will retain some specimens that were recorded outside of the direct clearing area, retaining a population with some genetic diversity. Whereas the specimens that will be unavoidably removed as part of the quarry expansion will be offset in the local area within suitable habitat at a ratio of 4:1. The planted specimens will be propagated from those individuals to be impacted ensuring genetic diversity is maintained at the site. Mitigation measures will maintain genetic diversity of the local population and ultimately provide a net gain in overall population numbers within the region. Details on retaining genetic diversity through propagation efforts are discussed in **Section 5.1**.

3.1.3 Weeds

Invasive species can physically displace native flora, compete for resources (such as pollinators, light, nutrients and water), and create habitats that are conducive to other exotic species. Weed species that pose a direct and significant threat to *Macadamia* habitats are dense shrub Lantana (*Lantana camara*), and exotic vines Cat's Claw Creeper (*Dolichandra unguis-cati*) and Madeira Vine (*Anredera cordifolia*), which form a smothering habit through native canopy and shrub layers.

As a result of historical rural land-uses, the majority of the vegetation reflecting RE 12.11.10 within the clearing impact area is dominated by *Lantana camara* (Lantana). Where *Lantana camara* (Lantana) is abundant, it significantly reduces the recruitment of native species which was evident throughout the protected plant survey area. Notably, *Macadamia integrifolia* specimens were recorded in locations where *Lantana camara* (Lantana) infestations were lower, which reflects the highly suppressive nature of this invasive species. As the area is already significantly affected by invasive species, it is therefore considered highly unlikely that the clearing proposed will increase weeds that are not already abundant in the area. Furthermore, the site is managed under an existing Environmental Management Plan which details site protocols to minimise the spread of weeds.

3.1.4 Fire

The Recovery Plan indicates that *Macadamia integrifolia* and related species are particularly sensitive to fire. In general, due to their moist composition rainforest communities are normally less susceptible to wide spread bushfires, and do not facilitate the spread of fire. However, rainforest remnants containing edges infested with flammable weeds such as *Lantana camara* (Lantana) or exotic grasses are more susceptible to direct threat from bushfires, as is the case with the vegetation present on-site. In addition, extreme drought conditions exacerbated by Climate Change have increased the potential for and severity of rainforest fires (Thorley, J. *et al* 2023). As the majority of the clearing impact area is infested with *Lantana camara* (Lantana) the susceptibility of the area to high severity fires is considered significant. Subsequently, it is unlikely that the proposed clearing will increase the prevalence of weeds and therefore increase the risk of fires that are not already present.



3.1.5 Unmanaged Livestock

When access is given, livestock will utilise *Macadamia* habitat for shade, water (gallery and riparian rainforests) and grazing. Where unmanaged this has the potential to:

- modify the vegetation structure and floristic composition, cause loss of habitat diversity, initiate and exacerbate soil erosion (with consequent effects on water quality),
- facilitate the introduction and spread of invasive weeds
- particularly exotic pasture grasses and legumes
- and alter the amount and distribution of fuel throughout the landscape potentially increasing the incidence, intensity and extent of fires.

Cattle crazing is not permitted within the quarry nor are surrounding properties utilised for this; therefore, the proposed clearing will not increase the likelihood of livestock presence.

3.1.6 Climate Change

Not applicable to the scope of this project. It is unlikely that the proposed clearing will significantly increase the threat of climate change.

3.1.7 Genetic Pollution

Genetic pollution DNA marker studies have confirmed hybrid genotypes of *Macadamia integrifolia* and *M. ternifolia*, and *M. integrifolia* and *M. tetraphylla* occur within a 20 km overlap zone where both species co-occur within the same rainforest patch (Peace, 2005). This natural predisposition for hybridisation has been found to be causing genetic 'pollution' of wild populations. Both *M. integrifolia* and *M. tetraphylla* are known to occur in the broader locality of the Tamborine region and is identified as an area where hybridisation occurs. Therefore, the proposed clearing of highly disturbed regrowth vegetation is highly unlikely to increase genetic pollution that is not already present. Planting specimens will be propagated directly from those trees to be impacted reducing the risk of genetic pollution.

3.1.8 Disease

Phytophthora root rot is a major problem for the Australian *Macadamia* industry and is a serious threat to wild populations. Of the Phytophthora species impacting *Macadamia*, *Phytophthora cinnamomi* is most widespread, has frequent impact and is the most devastating. If left untreated, *P. cinnamomi* causes stem canker, root rot, tree decline, dieback and tree death.

With the implementation of standard vehicle washdown and hygiene procedures, proposed clearing is not considered likely to increase the risk of disease into the area. Furthermore, indirect impacts are to be mitigated through stormwater and dust management.

3.2. Prior to vegetation clearing

Prior to the commencement of vegetation clearing, the clearing area will be pegged out by surveyors and the boundary between the vegetation to be removed and to be retained is to be clearly delineated with tape, fencing or signage. No clearing is to occur outside nominated clearing zones and contractors shall not enter areas of retained vegetation.

The individual threatened plants (or area) to be retained will be identified and marked on construction plans prior to the commencement of site preparation works. Extraction will be staged to allow sufficient time for individual threatened plants located within the impact are to be retained long enough for propagation to occur as detailed in **Section 5.1.1**. (refer Plan 2 for indicative staging).

3.3. During operation works

This section contains specific management strategies for mitigating and/or minimising the potential impacts on *Macadamia integrifolia* (Macadamia Nut) and its associated habitat during construction works.

3.3.1 Vegetation protection guidelines

All vegetation clearing and operational works will be contained and limited to the expansion area (5.9 ha). Further, individual trees to be removed will be felled in a direction away from retained *Macadamia integrifolia* (Macadamia Nut) specimens.

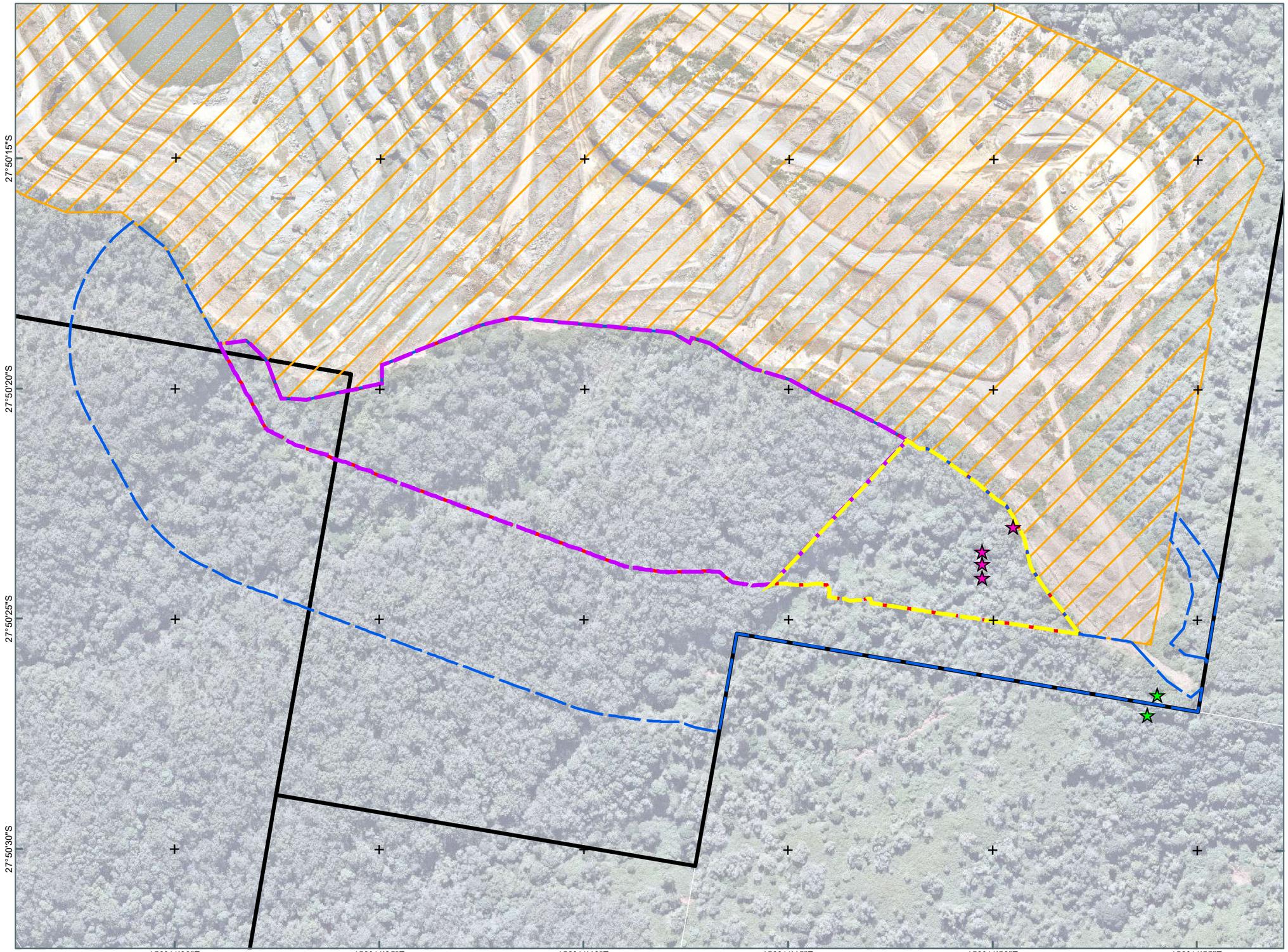
Outside of the approved clearing zone, the following activities shall not be permitted:

- Storage and mixing of materials;
- Storing machinery
- Liquid disposal;
- Combustion of any material;
- Stockpiling of soil, rubble or debris; and
- Unauthorised pesticide, herbicide or chemical applications.

3.3.2 Prevention of erosion

Stormwater within the quarry area will be managed in accordance with the Stormwater Management Plan in effect for existing operations, provided as **Appendix B** - Stormwater Management Plan. This management plan outlines principal objectives and how they are to be achieved including adequate control measures to manage runoff from site, preservation of water quality downstream and also provide a framework for surveillance, response and reporting. Further proposed stormwater runoff management controls will be designed in accordance with the Queensland Urban Drainage Manual (QUDM), as per industry standards.

PLAN A2. IMPACT PLAN



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LEGEND

- Qld DCDB
- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]

Indicative Exctractive Staging

- Stage 1 [4.6 ha]
- Stage 2 [1.3 ha]
- Clearing Impact Area
- Impacted Macadamia integrifolia specimen(s) located within referral area
  - *Specimen(s)* [15]
  - *Location(s)* [4]
- Retained Macadamia integrifolia specimen(s)
  - *Specimen(s)* [1]
  - *Location(s)* [1]



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Fulton Hogan

BLUE ROCK QUARRY, CEDAR CREEK

0 20 40 60 m
Transverse Mercator
GDA 2020 | Zone 56
1:2,600 @ A3

Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024
Lots 14-16 on RP151378

6/03/2026

11390 E MIMP 02 Impact A

4. Proposed Planting Area assessment

Over the extent of its natural distribution, *Macadamia integrifolia* is generally found within lowland warm *complex notophyll vine forest* and *Araucarian notophyll vine forest* that occur on metamorphosed sediments and interbedded volcanics or alluvia in higher rainfall areas. This species occupies all topographic positions including ridges, scree slopes, foot slopes, gullies, benches and riverine terraces. Soils are predominantly alluvial or volcanic, well drained, often with significant surface exposure of rock fragments, however slope and aspect vary. The currently recorded extent of occupied habitat is approximately 1,500ha and the modelled extent of Elevation range is 5–600m. Habitat critical to the survival of *Macadamia integrifolia* is identified to be in association with RE 12.3.1, RE 12.8.3, RE 12.11.10 and RE 12.12.16.

Vegetation mapped as RE 12.11.10 is abundant within the broader locality that could support the supplementary *Macadamia integrifolia* specimens. As such, an area in the north of the Fulton Hogan land holding has been identified as a suitable planting area for several reasons, which are discussed below.

1. **Habitat suitability**

Any proposed planting area needs to be of a suitable habitat type to ensure planted *Macadamia integrifolia* specimens have the best chance of survival. Vegetation within the northern extent of the Fulton Hogan land holding is mapped as RE 12.11.10, containing a mixture of remnant and high-value regrowth communities. Under the National Recovery Plan for Macadamia species (DCCEEW 2023), this regional ecosystem is a recognised habitat community for *Macadamia integrifolia* and aligns with the vegetation type where the specimens proposed for removal currently exist. The area of RE 12.11.10 within the land holding is also mapped as present to the north and east within neighbouring private properties, thus forming a large area of continuous suitable vegetation able to support *Macadamia integrifolia*.

While the Planting Offset Area (POA) was identified though desktop assessments and vegetation mapping as potential habitat to support *Macadamia integrifolia*, on-ground confirmation of habitat suitability was required. Subsequently, on 2 September, two (2) suitably qualified Ecologists from SH carried out a visual inspection of the area and identified *Mallotus philippensis* (Red Kamala), *Aphananthe philippinensis* (Rough-leafed Elm) and *Ficus watkinsiana* (Strangler Fig) to be present which are indicator species of RE 12.11.10 (refer **Photo Set 1**). Portions of this area observed to contain evidence of prior clearing and disturbance, likely a result of historic rural land-uses. These disturbed areas are reflected in the VMA mapping. The POA includes 1.77 ha of mapped RE12.11.10 to receive planted *Macadamia integrifolia* (refer **Plan 3**)



Photo set 1: Proposed planting area contains species indicative of RE12.11.10 with some areas having been historically cleared.

2. Context

This POA occurs within the northern extent of the Fulton Hogan landholding within a portion of the site not proposed for extraction activities. The location of this area several hundred meters from the current quarry pit and associated infrastructure limits potential edge effects and indirect impacts from extraction activities. Furthermore, where offsetting species, it is most beneficial for proposed offset planting sites to occur as close to the impact area as possible (i.e < 5 km). This contributes to maintaining the population as a whole and ensures conditions, such as climate, rainfall, and necessary pollinators, remain similar to where wild specimens occur to increase the chance of the planted specimen's survival.

The proposed planting area is approximately 1.5 km north-west of the clearing impact area and therefore planted specimens will have a net gain on the local population and occur in conditions alike to the impacted specimens.

3. Access

The topography of the POA is steep, which is typical for the region and reflects surrounding areas of vegetation containing RE 12.11.10. However, the POA is readily accessible from Schmidt Road which, from

an operational works perspective, allows for access during the establishment, monitoring and maintenance of the planted specimens.

4. Population and Records

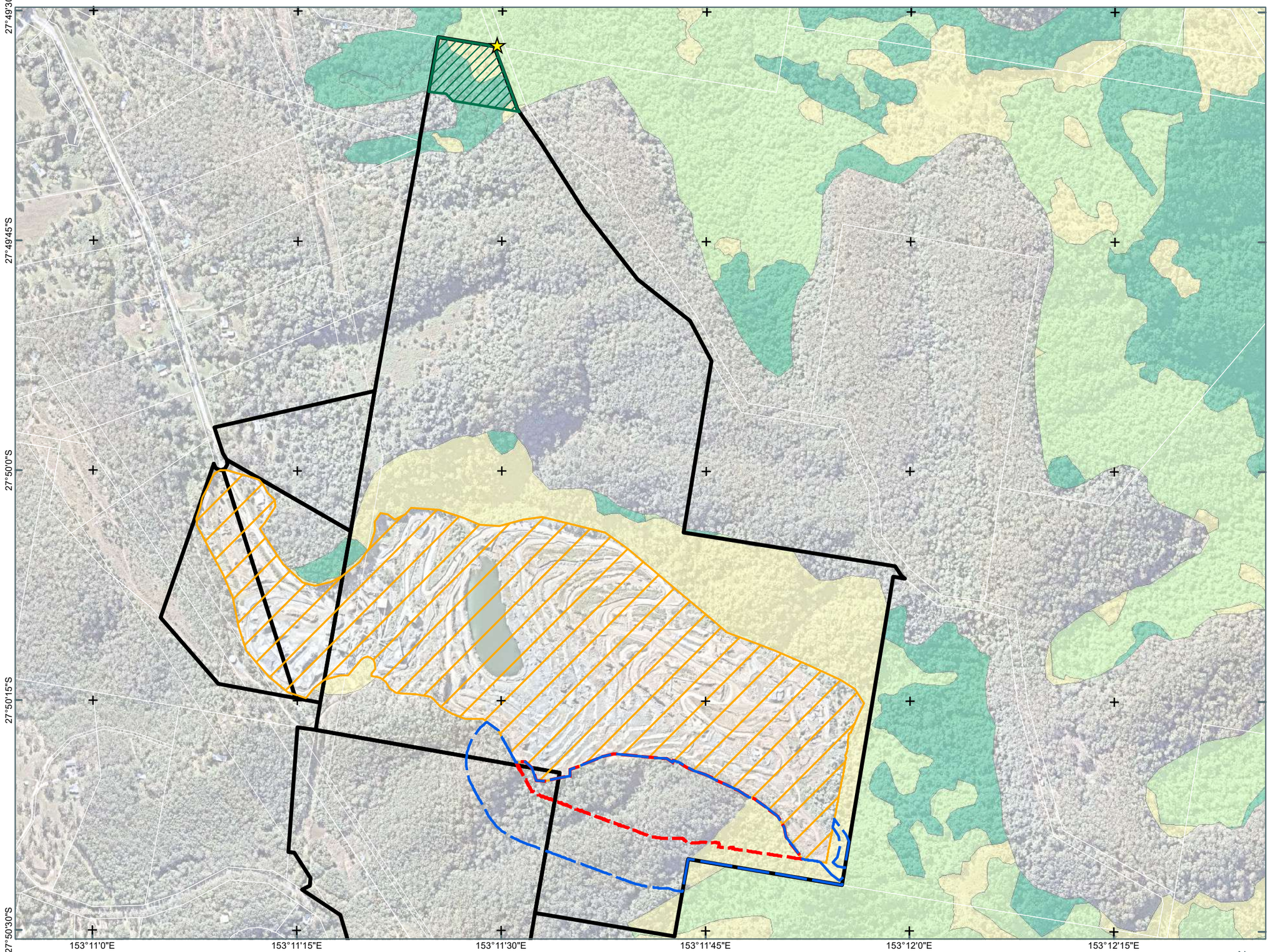
While the POA is within close proximity to the clearing impact area, the presence of local contemporary records of *Macadamia integrifolia* provides security that the POA is likely to be suitable to support the planted specimens. A desktop search of species records identifies several records of *Macadamia integrifolia* as occurring within 5 km of the POA, occurring within remnant and regrowth vegetation to the north and south of the land holding.

Furthermore, during an initial suitability assessment of the POA, several *Macadamia integrifolia* specimen was observed on the northern side of Schmidt Road where mapped high-value regrowth RE 12.11.10 is present (refer **Photo Set 2**). The presence of this specimen and confirmation of suitable vegetation community provides further confidence in the suitability of the POA.



Photo set 2: Existing *Macadamia integrifolia* north of Schmidt Road, adjacent to proposed planting area

PLAN A3. PROPOSED PLANTING AREA



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LEGEND

- Qld DCDB
- Site Boundary
- Existing Quarry Area
- Referral Area [5.9 ha]
- Clearing Impact Area

QLD VMA mapping

- VMA Category B - RE 12.11.10
- VMA Category C - RE 12.11.10
- VMA Category X - (preclear RE 12.11.10)
- Planting Offset Area (POA) [1.77 ha]
- ★ *Macadam integrifolia* Observation



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Fulton Hogan

BLUE ROCK QUARRY, CEDAR CREEK

0 100 200 m
N
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GDA 2020 | Zone 56
1:7,700
@ A3

Address / RPD: Lot 89 on WD739 and Lot 1 on SP238024
Lots 14-16 on RP151378

6/03/2026

11390 E MIMP 03 Planting A

5. Management Action 1 – Direct Planting

To ensure the survival of the *Macadamia integrifolia* species in the wild, direct supplementary planting will be undertaken to replace those individuals directly impacted. Impacted individuals will be replaced at a ratio of 4:1 to provide a net gain in specimens to the area, which will be planted in the POA in the north of the Fulton Hogan land holding (refer to Plan 2). The POA and planting procedure including timings and maintenance measures is described in detail in this section.

5.1. Propagation Measures

While *Macadamia integrifolia* specimens are readily available as a cultivar through nurseries, due to their use in horticulture, these specimens generally have less genetic diversity than wild specimens due to the widespread use of grafting, which results in genetically uniform cultivated plants. Cultivated specimens are less able to adapt to a range of environmental conditions and grafted specimens with limited genetic variability would be susceptible to being wiped out from a singular traumatic event such as disease and pests due to a limited potential for diverse beneficial traits to be present.

Furthermore, a study on wild and domesticated *Macadamia* genetic diversity by Southern Cross University found that the South-east Queensland populations of *Macadamia integrifolia* differ based on five main genetic clusters which generally correspond with geographic regions. The specimens proposed for impact occur within the genetic group designated as "South Brisbane to Gold Coast hinterland (Mt Cotton to Beechmont)". This study also found that most Australian cultivars are derived from the Mt Bauple and the Gympie region genetic groups of the *Macadamia integrifolia* and therefore may face different conditions and life history to those within the Gold Coast Hinterland Region (Nock, 2020). Further indicating the need to propagate specimens from individuals within this genetic region to bolster genetic diversity of the local population and survivability of planted specimens.

5.1.1 Propagation methodology

Fulton Hogan have engaged a third-party specialist (Adjunct Associate Professor Albano Mucci, University of Queensland) to provide guidance and coordinate works necessary to fulfill this offset requirement.

Albano Mucci is an experienced field Ecologist with over 20 years in conservation planning and management with an expertise in design and development of studies associated with threatened species (flora and fauna). The information provided in this document has been developed with guidance from Albano Mucci.

Several methods have been considered to achieve the required offset ratio for the project (4:1) including transplanting of individual specimens from the expansion area. While transplanting of *Macadamia sp*. has been successful on nearby projects including the Tugun Bypass Project (DTMR 2004) and Beechmont Road Project (Reynolds 2011), transplanting alone will not yield the net gain in specimens (i.e. 4:1 ratio).

A range of propagation methods have been investigated to achieve the required offsets ratio. These methods are described below:

- **Seed collection or cuttings**: Studies have found that propagating wild *Macadamia integrifolia* from seed can be difficult, as the species generally produces fewer mature nuts viable for propagation (McConachie 2010). Additionally, propagating *Macadamia integrifolia* from seed can take several years to establish a plant suitable for planting with commencement dependent on time of year. The specimens proposed to be impacted vary from juvenile to semi-mature specimens and as such seed collection is uncertain.

The collection of germplasm (i.e tissues) via 'air layering': The 'air layering' process is a vegetative propagation method used for the establishment of macadamia (*Macadamia integrifolia* and *Macadamia tetraphylla*) that produces clonal plants genetically identical to the parent material. The technique involves the selection of healthy branches, typically 10–20 mm in diameter, from mature/semi-mature trees. A section of bark from the branch is removed to disrupt phloem transport, and the exposed area is treated with a rooting hormone to promote root formation. The wound is then enclosed with a moist rooting medium, commonly sphagnum moss, and sealed to maintain humidity. Root development generally occurs within 3 months but can be up to 6 months. Once the air layered branch is considered to be sufficiently rooting as determined by the suitably qualified environmental person, the branch is detached and transplanted into a pot which is stored in nursery ready to be planted. Air layering is a successful method of cultivation (>70% success) if completed correctly by a suitable qualified environmental person (typically horticulturalists).

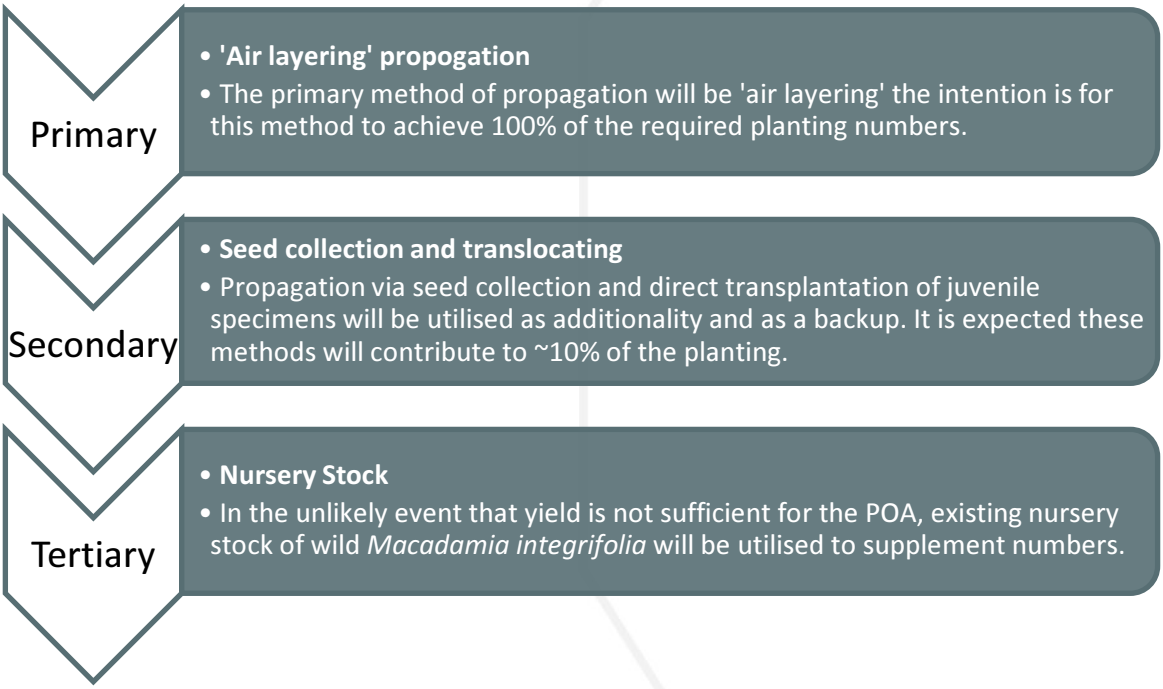
The main benefits of air layering over seed collection is the timeframe from propagating to an established sapling ready for planting is significantly reduced. Seed collection is reliant on several variables which cannot be controlled such as timing and seed yield. These variables are more easily controlled with the air layering technique which allows multiple specimens to be harvested from the same tree irrespective of whether seeding is occurring and provides greater confidence in the expected yield.

Propagation of *Macadamia integrifolia* for cultivation and horticulture is relatively common however fewer studies on the propagation of wild *Macadamia integrifolia* for conservation exist. The method of collection of germplasm (i.e tissues) via 'air layering' propagation for conservation has occurred with *Macadamia integrifolia* cuttings been successfully propagated during other projects in the Gold Coast area (Hinze Dam Alliance 2008). This method is also documented as suitable in *Wild Macadamia Conservation,* Rahman (2020), and Nagao and Hirae (1992).

A site inspection by SH and Albano Mucci was completed on 4 February 2026 to ascertain the quality of the existing *Macadamia integrifolia* specimens for 'air layering.' It was concluded during this assessment that there is sufficient numbers and quality at the impact site to achieve 100% of the required planting numbers by air layering. Suitable *Macadamia integrifolia* were flagged for future reference (refer **Photo set 5**)

While the intention is for all planting stock to be propagated by air layering several additional techniques may be utilised as a failsafe should yield not be adequate. The order of priority propagation methods is provided in **Insert 1**

A total of 60 specimens is required to meet the 4:1 ratio. To account for potential failure, 75 specimens will be sourced.



Insert 1: *Planting stock methods order of prioritisation*



Photo set 3: *Macadamia integrifolia* intended to be impacted flagged in preparation for propagation

5.2. Planting, Maintenance and Monitoring

To ensure the planted *Macadamia integrifolia* (Macadamia Nut) have the best chance of survival and ultimately provide a no net loss of *Macadamia integrifolia* in the area, a maintenance and monitoring program will be implemented that outlines requirements during planting, establishment, and maintenance phases through to completion.

5.2.1 Planting

Specimens will be planted within suitable areas of the POA site following the site preparation including weed removal and erosion control as determined by the suitably qualified environmental person as appointed by the approval holder. All planting stock will be advanced tube stock, well-formed and hardened off to suit final revegetation location and increase chances of survival. Specific planting locations are to be determined by a suitably qualified environmental person based on site conditions and access and will be designed to replicate a natural setting (i.e not planted in rows).

There is little documented evidence of wild *Macadamia integrifolia* density that is not highly variable. This is largely a result of varying site conditions associated with vine thicket vegetation and long history of disturbance and fragmentation of suitable habitat across SEQ. Pisanu et al (2009) concluded reproductive success of wild Macadamia requires neighbouring trees within 10–20 m, implying naturally close spacing amongst individuals. While this study was specifically detailed *Macadamia tetraphylla*, the species are genetically very similar and have overlapping habitat.

Planted stock will be planted in clusters of 5-10 individuals as directed by suitable qualified environmental person (Albano Mucci) to mimic natural composition and characteristics of the species in the wild as identified at the expansion area. Large mature wild *Macadamia integrifolia* were observed in clusters to the north of Schmidt Road near to the POA. Planted specimens will be clearly marked and GPS locations recorded and provided to all necessary contractors.

As detailed in **Table 4**, propagation will start prior to the commencement of the action and continue for approximately 12 months until such time that specimens are considered suitable for planting. The action will commence provided propagation has begun and the proposed planting area has been legally secured via a Voluntary Declaration (refer **Section 6**).

Table 4: Proposed propagation and planting timeframe

Timing	Detail
Prior to commencement of the action	• Air layering of suitable trees within the expansion area commences. • Completed by suitable qualified practitioner utilising the methodology detailed in Section 5.1
3-6 months	• The air layering is assessed for evidence of root formation. • If considered adequate, the branch is detached, removed from site and planted in a pot

	• If roots formation is inadequate, propagation is re-checked every month until considered suitable
6-12 months	• The harvested plants are grown in a nursery and monitored until they are considered suitable for planting • The Planting Offset Site is prepped. • Planting locations determined • Weed removal • Soil testing to highlight if plants need any supplementary feeding at time of planting.
Year 2	All plantings completed within 2 years from the commencement of the action

5.2.2 Establishment Phase

The establishment phase of planting occurs up to 12 weeks post planting. At this point, planted stock are under the most amount of stress as they adapt to the new area. As such, frequent care and monitoring is required to ensure survival. Planted specimens will be advanced tubestock reducing the risk of planting failure.

Sufficient watering, as determined by the suitably qualified environmental person, will be carried out at the time of planting when the tube stock is most susceptible to drying out. Following initial planting, the tubestock will be left to establish within the prevailing climatic conditions with regular monitoring (approximately every 2-4 weeks) of their progress during the establishment phase as considered necessary by the suitably qualified environmental person. If it is observed during this phase that the plant is under stress, then a subsequent watering event will be required as directed by the suitably qualified environmental person. Dense weed infestations within the specific planting locations will be treated prior to plantings and will continue to be monitored and suppressed where regrowth is observed. Best practice weed management techniques will be employed for weed removal amongst revegetation areas to ensure planted specimens are not impacted.

To retain the net gain expectation, an 80% success rate for planted *Macadamia integrifolia* is required by the end of the establishment period. Where die-off occurs at greater than 20% during the initial 12-week period, lost specimens will be replanted by the suitably qualified environmental person. All replacement plants shall be of the same quality and propagated from the same process as detailed in **Section 4.2.1**.

5.2.3 Maintenance Phase

The maintenance phase of the planting area occurs from 13 weeks to 2 years post planting. No specific watering regime is provided during the maintenance period. The intent is for the area to become self-sufficient in utilising natural rain patterns and run off and ensures specimens do not become reliant on artificial water regimes. However, the planting area will be monitored on a quarterly basis up to 2 years where implementation of adaptive management will be carried out as appropriate guided by the suitably qualified environmental person.

5.2.4 Maturity phase

The maturity phase is defined as from 2 years post planting up until plants are considered 'mature.' The National Recovery Plan for Macadamia Species (DCCEEW 2023) states that maturity of *Macadamia integrifolia* occurs at around 10 years. This timeframe is potentially variable depending on external factors and is measured as growth from seed. Planted specimens proposed as part of this project will be advanced tube stock and therefore are already progressed beyond the initial seedling phase.

Seeding of planted trees indicates that *Macadamia integrifolia* are progressing towards maturity. While they may not have reached full maturity by this stage signs of seeding gives a clear indication that plants are self-sustaining and maturing. For the purposes of providing clear definition of 'maturity' for this project maturity will be considered achieved if the majority (>50%) of planted specimens have been observed to be seeding or 10 years has passed since planting completion (whichever occurs first). Annual monitoring will occur during this phase. Utilising seeding as a metric for maturity allows assessment to be site specific as opposed to only a broad timeframe.

Maturity defined as:

- Majority (>50%) of planted specimens have started seeding, or
- 10 years has passed since planting was complete

5.2.5 Completion Phase

Once planted specimens are considered mature as detailed in **Section 5.2.4** annual monitoring for 2 years will occur signifying completion criteria have been achieved.

5.2.6 Monitoring

A summary of monitoring schedule and frequency is provided in **Table *5***.

Table 5: Monitoring schedule

Monitoring Action	**Timing**			
	Establishment Phase (first 3 months following planting)	Maintenance Phase (From 13 weeks to 2 years following planting)	Maturity Phase (from 2 years until plants are consider mature)	Completion Phase (from when plants are considered mature for 2 years)
Direct planting	Every 2-4 weeks (approximately)	Every 3 months	Annually	Annually

5.2.7 Reporting

A Planting Offset Area Report (POAR) will be developed by the suitable qualified environmental person as appointed by the Proponent following each monitoring period. This POAR will include but is not limited to the following:

- Status of clearing area
- Status of planting area
- Physical count of planted specimens (>80% success rate)
- Status of planted specimens
    - Size/maturity/evidence of seeding
- Where and if any remedial actions had taken place
- Issues affecting the rehabilitation area and any rectification works undertaken
    - Supplementary watering, tree guards, weed removal
- Recommendations

Annual Compliance Report (ACR)

An ACR will be prepared in line with any conditions associated with EPBC approval. The POAR will be included as part of the ACRs. The reporting period for the action will be the year following the commencement of the action.

The ACR will be prepared by a suitable qualified environmental person as directed by the Proponent and published on the project website each year by the conditioned date. The report will address the compliance with each of the conditions of approval for the project. Documentary evidence providing proof of the date of publication of the ACR and non-compliance with any of the conditions of the approval will be provided to DCCEEW at the time of publishing the compliance report if the action is approved.

5.2.8 Management Action Completion Criteria

Timing	Completion Criteria
Year 10 post planting	Planted stock reach the definition of mature being 50% of the stock are seeding or 10 years has passed since planting.

6. Management Action 2 – Legal securement

The POA must be protected for *Macadamia integrifolia* offsets to attain a conservation gain. The POA will be legally secured prior to commencement of the action via a Voluntary Declaration (VDec) administered under the VMA. Notification of declaration will be supplied to DCCEEW.

A covenant under either Chapter 6 Part 4 Division 8A of the *Land Act 1994* (Qld) or Part 6 Division 4A of the *Land Titles Act 1994* (Qld) will be registered within 12 months of commencing the action. If a covenant is not possible an alternative legally binding mechanism will be implemented in consultation with DCCEEW.

The declared area will be recognised as making significant contribution to the conservation of *Macadamia integrifolia*. Demonstration of this management action will be provided in the ACRs.

6.1.1 Management Action Completion Criteria

Timing	Completion Criteria
Prior to commencing the Action	Legally secure the proposed planting area via a Voluntary Declaration (VDec) administered under the VMA and notify DCCEEW.
Year 1	Register a covenant under the Land Act 1994 (Qld) and notify DCCEEW within 20 business days. If a covenant is not possible an alternative legally binding mechanism will be implemented in consultation with DCCEEW.



7. Adaptive Management

An adaptive implementation program will be used to ensure uncertainty is reduced over time, and that completion criteria are attained and maintained for the life of the offset. As more information becomes available following ongoing monitoring, the management and monitoring regime will be reviewed and revised to maximise the likelihood of attaining and maintaining the outcomes to be achieved by implementing the IMP.

Adaptive management will be used to incorporate changes in any of the following areas:

1. Assimilation of new data or information – such as, updates to conservation advice or new threat abatement plans relevant to *Macadamia integrifolia*.
2. Project coordination and scheduling – to manage unforeseen disruptions to schedule such as inclement weather on contractor works for management actions and environmental consultant monitoring events.
3. Annual review of risks – to refresh the mitigation measures should new threats be identified or stochastic events such as unplanned fires or floods occur.
4. Annual review of management measure effectiveness – to increase the frequency or change the method of management actions where completion criteria is not being met.
5. Contingency for unplanned incidents – such as stochastic events including unplanned fires or floods.

Changes to the management plan resulting from the adaptive management process will be reported to DCCEEW differently depending on whether they are minor, major or urgent. These are defined as:

- **Minor Change** – has no potential to alter any of the environmental outcomes or completion criteria specified in the management plan. A notification will be provided to DCCEEW at least 10 bd prior to the change occurring.
- **Major Change** – has potential to alter the environmental outcomes or completion criteria specified in the management plan. A notification requesting approval for the change will be provided to DCCEEW prior to the change occurring.
- **Urgent Change** – actions that are required to be taken to address an urgent matter. Changes will be implemented immediately at the direction of a suitably qualified expert with notification sent to DCCEEW as soon as practical but no more than 10 business days after the change occurs. An example of an urgent change could be an increase in buffers or removal of understorey vegetation in response to an intense bushfire.

The notification for any change will be accompanied by documentation addressing at a minimum:

- A description of the proposed change including identification of specific management measures to be altered and how the changes will be implemented.
- Target outcomes of the proposed change including alterations to environmental outcomes or completion criteria if applicable.
- Proposed monitoring regime to demonstrate the outcomes of the change.
- Future reporting requirements with monitoring outcomes to be provided to DCCEEW no more than 6 months after the commencement of the change.

- If the target outcomes have not been achieved reporting must include response actions and ongoing monitoring requirements.

Once the target outcomes have been achieved notification will be provided to DCCEEW stating that the change will be permanently included in the management plan. The changed management measure will continue to be monitored as part of general compliance reporting unless otherwise specified.

In the case of an urgent change notification and documentation may be provided retrospectively.

7.1.1 Risk of Failure

The plan assesses the risk of failure to achieve the plan's environmental outcomes and completion criteria. A review of the identified risks to Macadamia integrifolia (refer Section 3.1) has been revisited for the POA with reference to the proposed management actions detailed in **Section 5** and **Section 6**

To identify the risk of failure, **Table 6** states the management action, completion criteria, risk of failure, monitoring and correcting actions.

Habitat Loss and Fragmentation

One of the primary threats to *Macadamia integrifolia* is habitat loss and fragmentation. The POA will be legally secured via a Voluntary Declaration (VDec) administered under the VMA. To ensure legal protection of the POA in perpetuity the POA will be registered as a covenant under the Land Act 1994 (Qld). If a covenant is not possible an alternative legally binding mechanism will be implemented in consultation with DCCEEW.

Small population size

The proposed clearing activities will retain some specimens that were recorded outside of the direct clearing area, retaining a population with some genetic diversity. Whereas the specimens that will be unavoidably removed as part of the quarry expansion will be offset in the local area within suitable habitat at a ratio of 4:1. This mitigation measure will maintain genetic diversity of the local population and ultimately provide a net gain in overall population numbers within the region.

Weeds

As identified at the impact site, dense weeds (primarily *Lantana camara*) were observed which plays a significant role in supressing native regeneration. The planting of macadamia integrifolia at the POA will include site preparation works including weed management. The planted stock will be monitored as detailed in Section 5.2 until they reach maturity. Once plants have reached maturity as defined in Section 5.2 the threats of weeds negatively impacting growth is significantly reduced.

Fire

While no specific Bushfire management plan is in effect at the site, bushfire will be managed in accordance with current procedures for the extraction site including maintenance of access roads to provide buffers and provide access for watering or other measures as necessary.

Unmanaged livestock

The POA will not be utilised for livestock and will be legally protected for conservation under a Voluntary Declaration and covenant



Climate Change

Not applicable to the scope of this project.

Genetic Pollutions

Genetic pollution DNA marker studies have confirmed hybrid genotypes of *Macadamia integrifolia* and *M. ternifolia*, and *M. integrifolia* and *M. tetraphylla* occur within a 20 km overlap zone where both species co-occur within the same rainforest patch (Peace, 2005). This natural predisposition for hybridisation has been found to be causing genetic 'pollution' of wild populations. Both *M. integrifolia* and *M. tetraphylla* are known to occur in the broader locality of the Tamborine region and is identified as an area where hybridisation occurs. The proposed planting specimens will be propagated directly from existing *Macadamia integrifolia* that are proposed to be impacted. Therefore, the offset will mitigate risk of genetic pollution on the area.

Disease

Phytophthora root rot is a major problem for the Australian *Macadamia* industry and is a serious threat to wild populations. Of the Phytophthora species impacting *Macadamia*, *Phytophthora cinnamomi* is most widespread, has frequent impact and is the most devastating. If left untreated, *P. cinnamomi* causes stem canker, root rot, tree decline, dieback and tree death.

With the implementation of standard vehicle washdown and hygiene procedures the risk of disease within the POA is considered minimal.

Table 6: Risk of Failure and Corrective Actions

Action	Completion Criteria	Corrective Action Trigger	Corrective Action
1 – Direct planting	• A total of 75 plants are sourced via techniques detailed in **Section 5.1.** • Plants specimens achieve >80% survival rate	The suitable qualified environmental person indicates planting stock not sufficient to meet required numbers. POAR indicates less than 80% survival rate observed through monitoring period detailed in **Section 5.2** POAR identify negative impacts to planted specimens.	Readily available stock of wild *Macadamia integrifolia* specimens sourced from local nursery. Supplementary planting will be implemented if required within 12 months following corrective action being triggered. Monitoring of infill planting to occur regularly after planting in accordance with watering schedules determined by the suitable qualified environmental person as detailed in **Section 5.2.2**. Additionally, management actions will be implemented were necessary as determined by the suitably qualified environmental person which includes weed control, erosion control, tree guards, etc. Risk management, corrective actions and adaptive management are to be integrated as required throughout the offset management period in response to changes or natural events. Depending on the above corrective actions, the management period may be extended to ensure environmental outcomes are able to be achieved.

Action	Completion Criteria	Corrective Action Trigger	Corrective Action
2 – Legally secure the offset area	• The Planting Offset Area is legally secured for conservation via a Voluntary Declaration (VDEC) process administered under the Queensland *Vegetation Management Action 1999* prior to the commencement of the action. • Subsequently, the offset area is legally secured in perpetuity within 12 months of the implementation of the IMP via a covenant under the *Land Act 1994* or *Land Titles Act 1994* or suitable legal mechanism • The Department is notified of the legal securement via VDEC within 5 business days of commencing the implementation of the IMP *i.e.,* the date from which the Planting Offset Area is legally secured. • The Department is notified within 5 business days of being legally secured via covenant or similar legal protection mechanism. • The Planting Offset Area is not used for other purposes – site access is restricted.	Planting Offset Area is not legally secured.	The Planting Offset Area is legally secured prior to any vegetation clearing impacts occur.

7.1.2 Limitations

Although an adaptive management plan will be implemented across the Planting Offset Area there remains a number of potential limitations that may arise. These include the following:

- Associated risks and uncertainty in predicting the occurrence and extent of natural disasters or extreme weather events, including drought and flooding.
- Uncertainty of the rate at which planted stock will establish.

To ensure progress towards the environmental outcome and completion criteria, monitoring has been designed to be repeatable and frequent enough to monitor outcomes inline with the completion criteria.

8. Conclusion

Saunders Havill has been engaged by Fulton Hogan Quarries Pty Ltd to complete an Impact Management Plan for specimens of *Macadamia integrifolia* (Macadamia Nut) located within the 5.9 ha quarry expansion impact area at Blue Rock Quarry. This IMP is intended to satisfy the EPBC offset requirements (EPBC 2024-09844) and support a *Clearing Permit (protected plants)* to the Department of Environment, Tourism, Science, and Innovation (DETSI) in accordance with the *Nature Conservation (Plants) Regulation 2020 - Protected Plants Assessment Guidelines*.

A total of fifteen (15) *Macadamia integrifolia* (Macadamia Nut) individuals (including juvenile and semi-mature specimens) are proposed to be directly impacted as part of the project. These specimens will be offset in the local area within a 1.77 ha area (POA) of suitable habitat in the north extent of the Fulton Hogan Land holding at a ratio of 4:1. The proposed mitigation planting area and planting procedure including timings and maintenance measures are provided in **Section 5** and **Section 6** of this report.

Under the EPBC act Offset Assessment Guide (OAG) the proposed offset will acquit 300% of the impacted *Macadamia integrifolia* (refer **Appendix C**).

All detailed management measures promote the continued survival of *Macadamia integrifolia* in the local region, both during vegetation clearing and continued operation of the quarry.

9. References

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10. Appendices

Appendix A

Wildlife Online Search

Appendix B

Blue Rock Quarry Stormwater Management Plan

Appendix C

EPBC Offset Assessment Guide (OAG) – *Macadamia integrifolia*

Appendix A

Nature Conservation Act 1992
Wildlife Online Search Results

Queensland Government

WildNet species list

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Queensland status: Rare and threatened species
Records: Confirmed
Date: Since 1980
Latitude: -27.8308
Longitude: 153.1947
Distance: 5
Email: liambrzezinski@saundershavill.com
Date submitted: Tuesday 20 Aug 2024 13:17:20
Date extracted: Tuesday 20 Aug 2024 13:20:01

The number of records retrieved = 28

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Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Limnodynastidae	*Adelotus brevis*	tusked frog		V		10
animals	birds	Apodidae	*Hirundapus caudacutus*	white-throated needletail		V	V	1
animals	birds	Cacatuidae	*Calyptorhynchus lathami*	glossy black-cockatoo		V		1
animals	birds	Cacatuidae	*Calyptorhynchus lathami lathami*	glossy black-cockatoo (eastern)		V	V	2
animals	birds	Menuridae	*Menura alberti*	Albert's lyrebird		NT		1
animals	birds	Strigidae	*Ninox strenua*	powerful owl		V		1
animals	insects	Papilionidae	*Ornithoptera richmondia*	Richmond birdwing		V		1
animals	mammals	Phascolarctidae	*Phascolarctos cinereus*	koala		E	E	172
plants	land plants	Apocynaceae	*Leichhardtia coronata*			V		8/6
plants	land plants	Aristolochiaceae	*Pararistolochia praevenosa*			NT		2/2
plants	land plants	Asteraceae	*Picris conyzoides*			V		1/1
plants	land plants	Corynocarpaceae	*Corynocarpus rupestris subsp. arborescens*	southern corynocarpus		V		3/3
plants	land plants	Ericaceae	*Styphelia recurvisepala*			E		5/5
plants	land plants	Euphorbiaceae	*Baloghia marmorata*	jointed baloghia		V	V	2/2
plants	land plants	Euphorbiaceae	*Fontainea venosa*			V	V	2/2
plants	land plants	Lamiaceae	*Coleus habrophyllus*			E	E	4/4
plants	land plants	Lauraceae	*Cryptocarya foetida*	stinking cryptocarya		V	V	2/2
plants	land plants	Lauraceae	*Endiandra wongawallanensis*			E		8/6
plants	land plants	Leguminosae	*Sophora fraseri*	brush sophora		V	V	1/1
plants	land plants	Myrtaceae	*Gossia hillii*			CR		2/2
plants	land plants	Myrtaceae	*Rhodamnia dumicola*	rib-fruited malletwood		E		2/2
plants	land plants	Oleaceae	*Jasminum jenniae*			E		1/1
plants	land plants	Proteaceae	*Macadamia integrifolia*	macadamia nut		V	V	105/10
plants	land plants	Rubiaceae	*Randia moorei*	spiny gardenia		E	E	13/12
plants	land plants	Sapindaceae	*Cupaniopsis newmanii*	long-leaved tuckeroo		NT		9
plants	land plants	Sapotaceae	*Planchonella eerwah*			E	E	3/3
plants	land plants	Sparrmanniaceae	*Corchorus cunninghamii*			E	E	11/7
plants	land plants	Sterculiaceae	*Brachychiton sp. (Ormeau L.H.Bird AQ435851)*	Ormeau bottle tree		CR	CE	40/26

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.*
The codes are Extinct (EX), Extinct in the Wild (PE), Critically Endangered (CR), Endangered (E), Vulnerable (V), Near Threatened (NT), Special Least Concern (SL) and Least Concern (C).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.*
The values of EPBC are Extinct (EX), Extinct in the Wild (XW), Critically Endangered (CE), Endangered (E), Vulnerable (V) and Conservation Dependent (CD).

Records - The first number indicates the total number of records of the taxon (wildlife records and species listings for selected areas).
This number is output as 99999 if it equals or exceeds this value. A second number located after a / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

Appendix B

Blue Rock Quarry Stormwater Management Plan

GROUNDWORK plus
Resources, Environment, Land Use Planning

BLUE ROCK QUARRY, CEDAR CREEK

STORMWATER MANAGEMENT PLAN

Prepared for:
Fulton Hogan Construction Pty Ltd

Date:
6 November 2012

File Ref:
documents / 982_611_001_SMP

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APPENDICES

Appendix A Standard Specification Drawings of Stormwater Management Controls and Devices

1. Introduction

1.1 General

Groundwork Plus has been commissioned by Fulton Hogan Construction Pty Ltd (Fulton Hogan) to prepare a Stormwater Management Plan (SMP) for their extractive industry operations at Blue Rock Quarry on Tamaree Road, Cedar Creek (the subject 'Site'). See Figure 1 – Site Location Plan for the location of the quarry.

This report has been prepared to respond to Item 13 of the Department of Environment and Heritage Protection (EHP) Information Request (dated 8 November 2011) issued in relation to a Material Change of Use (MCU) application (Reference No. MCU201100490). This report will replace the previous SMPs prepared for the quarry which are listed below:

- Stormwater Management Plan, AECOM, 2012;
- Hydrological and Hydraulic Assessment, Golder Associates, 2009; and
- Stormwater Management Plan, Ecoroc Pty Ltd, 2009.

The aim of this SMP is to develop stormwater management strategies that ensure statutory requirements and leading industry practices are achieved.

1.2 Scope

It is our understanding that Fulton Hogan is preparing a submission to EHP to demonstrate reporting and approval compliance with the MCU condition requirements. One of the key requirements of the EHP conditions of approval is that the SMP is to achieve one of the following:

- Capture and retain a 24 hour storm event with an average recurrence interval of 1 in 5 years; or
- Achieve a 90% hydraulic efficiency.

The scope of works includes the following processes:

- Review background information including existing site layout plans, stormwater management plans, hydraulic modelling and erosion and sediment control (ESC) plans;
- Review conditions of approval and previous EHP correspondence;
- Attend site inspections and detailed briefing session with Fulton Hogan;
- Prepare a preliminary assessment, concept designs (options) and preliminary recommendations to meet the 1 in 5 year design condition;
- Attend a workshop with Fulton Hogan to determine most feasible option for the SMP including ESC measures;
- Liaise with EHP to ascertain realistic water quality criteria and discuss other key requirements;
- Develop the detailed SMP based on the outcomes of the workshop; and
- Documentation and lodgement of SMP with EHP.

This report provides strategies to control stormwater runoff from disturbed areas of the quarry and prevent or mitigate contamination of stormwater with pollutants such as silts and chemical residues (oils, greases and fuels). The measures proposed are broad-ranging and include processes, procedures and structural controls.

This report sets out to:

- describe the Site and identify possible impacts on the surrounding environment;
- identify legislation, impacts and issues associated with operations;
- set practical and environmentally sound strategies and methods for the design, construction and management of stormwater runoff and erosion and sediment controls;
- describe audit and review processes;
- identify means of assessing whether failures occur; and
- detail actions to be taken if objectives are not met.

Specifically, the SMP details the following:

- Catchment delineation and segregation of disturbed areas of the quarry from the undisturbed areas surrounding the quarry;
- Catchment hydrology and stormwater conveyance;
- Estimation of sediment transport from the disturbed areas of the quarry;
- Operational phase stormwater management and erosion and sediment control measures for the disturbed areas of the quarry;
- Water quality objectives of the receiving waters; and
- Maintenance and Monitoring Program.

To minimise the impact of the development on the external environment, the proponent shall implement this SMP. To avoid significant and/or sustained deterioration in downstream water quality, this SMP shall be amended as required, in response to the Monitoring and Maintenance Program described herein.

1.3 Objective

The principal objectives of the SMP are:

- to segregate stormwater catchments with similar uses, levels of disturbance and risk of pollution as undisturbed and disturbed catchments;
- to ensure adequate control measures are implemented to manage runoff from disturbed areas of the existing quarry;
- to implement appropriate measures to eliminate or reduce pollutant and sediment loading in stormwater discharges from disturbed areas of the existing quarry;
- to preserve downstream water quality and ensure water leaving disturbed areas of the existing quarry is not degraded to a significant extent;
- to reduce the potential for erosion on Site and subsequent sedimentation of natural waterways downstream of the quarry;
- to prevent the release of untreated contaminated stormwater from disturbed areas of the existing quarry;
- to provide a framework for the surveillance, response and reporting of incidents which may impact on stormwater quality; and
- to provide a basis for the training of quarry personnel in the management of stormwater and minimise the potential for stormwater contamination.

These objectives will be achieved through the implementation of the following measures:

- Management strategies designed to minimise water pollution from the development;
- Specific operational phase controls to minimise sediment and nutrient export from the subject Site;
- Optimising the volume of stormwater discharged from the quarry having regard to the mass and concentration of contaminants expected to reach the receiving waters;
- Specific operational phase runoff management and diversion controls that can be converted to water harvesting structures with minimal redesign;
- Segregating stormwater by quality or source;
- Reducing contaminant concentrations by the use of appropriate treatment methods; and
- Applying appropriate risk assessment methods in the sizing and design of sediment ponds/dams.

Proposed stormwater runoff management controls for the disturbed areas of the existing quarry will be designed in accordance with the *Queensland Urban Drainage Manual* (QUDM) (EHP, 2008). Proposed erosion and sediment control measures will be designed in accordance with *Book 2 and Book 4 of Best Practice Erosion and Sediment Control* (IECA, 2008).

1.4 Site Details

The quarry is situated on Tamaree Road in Cedar Creek, Queensland, approximately 13 km south of Beenleigh. The quarry comprises the following lots:

- Lot 14, 15 and 16 on RP151378;
- Lot 89 on W739; and
- Lot 1 on SP238024.

The quarry is located in a rural setting and has been used for quarrying since 1971. Historically, prior to quarrying, the Site has been used mainly for agricultural purposes, including cattle grazing. The Site is located in a Key Resource Area and is surrounded by rural residential developments. See Figure 1 – Site Location Plan for details.

The quarry is worked using conventional drill and blast open cut quarrying methods and consists of the following principal components or activities:

- Quarry workings;
- Overburden stockpiles;
- Internal haul roads;
- Crushing and screening plant:
- Aggregate and other finished product stockpiles;
- Pre-coat aggregate plant and product storage bays;
- Equipment workshops;
- Office and employee amenity buildings;
- Fuel storage; and
- Water supply dam and stormwater and sediment management controls.

See Figure 2 – Site Layout Plan for details.

1.5 Topography and Receiving Environment

The quarry is located in the upper reaches of the Albert River catchment. The receiving water for the Blue Rock Quarry Site is Michie Creek, an ephemeral watercourse which runs parallel to Tamaree Road and joins the Albert River approximately 1.5 km from the quarry entrance and 5 km upstream of the Luscombe Weir. Michie Creek has not been identified as a watercourse and has been designated as a drainage feature, as determined by EHP.

Current quarrying and related activities extend over 40 ha within the Site and have significantly altered over time, the topography, vegetation and drainage of the area. Steep upper slopes beyond the limit of quarry workings support regrowth vegetation and some woodland. Site levels vary from approximately RL 280 m AHD along the Site's north-eastern boundary to approximately RL 45 m AHD near the Site's entrance along the north-western boundary.

1.6 Environmental Values

In accordance with the Environmental Protection (Water) Policy 2009, EPP (Water), environmental values for the Lower Albert River (estuarine) including tributaries have been identified to include:

- Aquatic ecosystems wildlife habitat;
- Irrigation, stockwater and farm use;
- Primary, secondary and visual recreation;
- Cultural heritage;
- Industrial use; and
- Aquaculture.

The following Water Quality Objectives have been considered in the development of the SMP for the quarry:

- pH – 6.5 to 8.0;
- Dissolved Oxygen – 80% to 105% saturation;
- Turbidity – 50 NTU;
- Suspended Solids or correlated turbidity vs. suspended solids – 50 mg/L;
- Total Phosphorous – 0.07 mg/L;
- Total Nitrogen – 0.65 mg/L;
- Litter/gross pollutants – No man made material greater than 5 mm; and
- Oil/grease – no visible films or odours.

These Water Quality Objectives are based on the Queensland Water Quality Guidelines (EHP, 2009) and ANZECC Guidelines (NWQMS, 2000). The Queensland Water Quality Guidelines specify a water quality objective of 6 mg/L for suspended solids for Lowland Streams in South East Queensland (SEQ); however, the water quality objective of 50 mg/L has been specified for the site since this is considered to be typical of background values in the SEQ region.

2. Catchment Delineation and Hydrological Analysis

2.1 Catchment Delineation

Based on existing topography, the Site has been divided into thirteen (13) catchments. The Site catchment areas are presented in Table 1 – Site Catchment Areas.

Table 1 – Site Catchment Areas

Catchment	Catchment Type	Catchment Area (ha)
A	Disturbed	6.7
B	Disturbed	6.4
C	Disturbed	3.1
D	Disturbed	10.2
E	Disturbed	7.3
F	Undisturbed	4.7
G	Disturbed	1.9
H	Undisturbed	8.8
I	Undisturbed	23.9
J	Undisturbed	67.9
K	Undisturbed	25.1
L	Undisturbed	15.5
M	Undisturbed	11.1

Catchments A to E and G mainly comprise the working areas, haul roads, stockpile areas, processing, treatment, administrative and office areas of the quarry. These areas have been cleared of vegetation in the past and have been progressively developed, resulting in the generation of sediment laden runoff during storm events. As such, these areas have been classified to be disturbed areas.

Catchments F and H to M mainly comprise dense bushland and rehabilitated areas of the quarry. These have been classified as clean undisturbed areas.

Horton's 'n' value of 0.02 has been assumed for disturbed catchment areas (Catchments A to E and G), in accordance with QUDM. Horton's 'n' values ranging between 0.055 and 0.06 have been assumed for undisturbed catchments (Catchments F and H to M). These values have been used to calculate the Time of Concentration (t_c) and peak flow rates for all events up to and including the Q_{100} storm event, using the Rational Method in accordance with QUDM.

The times of concentration, peak flow rates and peak runoff volumes for each catchment are summarised in subsequent sections of this report.

Refer Figure 3 – Catchment Delineation Plan for the catchment areas.

2.2 Catchment Hydrology

2.2.1 Intensity – Frequency – Duration

Rainfall intensities for various storm durations are shown in Table 2 – Rainfall Intensities for Various Storm Durations, Blue Rock Quarry.

Table 2 – Rainfall Intensities for Various Storm Durations, Blue Rock Quarry

Duration of Rainfall	Average Recurrence Interval (1:n years)						
	1	2	5	10	20	50	100
5 mins	120	152	187	206	234	269	296
6 mins	113	143	175	194	220	253	278
10 mins	92.2	117	144	159	181	208	230
20 mins	67.6	85.9	106	118	134	154	170
30 mins	55.1	70.1	86.8	96.4	110	127	140
1 hour	37.2	47.5	59.1	65.8	75	87	96.2
2 hours	23.9	30.5	38.2	42.7	48.7	56.7	62.8
3 hours	18.2	23.2	29.1	32.6	37.3	43.4	48.2
6 hours	11.3	14.5	18.3	20.5	23.5	27.4	30.5
12 hours	7.18	9.23	11.7	13.2	15.2	17.8	19.9
24 hours	4.75	6.14	7.91	8.97	10.4	12.3	13.7
48 hours	3.17	4.12	5.41	6.18	7.21	8.59	9.67
72 hours	2.4	3.13	4.15	4.77	5.59	6.7	7.56

NB: All rainfall intensities in mm/hr.

2.2.2 Runoff Calculations

The peak runoff generated by the catchments of the quarry for various design storm events has been estimated using the following equation in accordance with *Book 2 – Appendices A-G*, *Best Practice Erosion and Sediment Control (International Erosion Control Association, 2008)*.

V = (Cv.R.A)/1000
where:
V = Runoff volume (m^3)
Cv = Volumetric runoff coefficient
A = Area (hectares)
R = Total rainfall (mm)

The 24 hour storm intensities and peak runoff volumes for storm events for Catchments A to M are summarised in Table 3 – Peak Runoff Volumes below. A volumetric runoff co-efficient of 0.83 has been assumed for the Site. This assumption has been made for the peak 24 hours 1 in 5 year design rainfall depth of 189.8 mm in accordance with Table B7 of Book 2 of the IECA Guidelines.

Table 3 – Peak Runoff Volumes

Catchment	Description	Catchment Area (ha)	24 hr Rainfall Intensity (mm/hr)	24 hr Rainfall Depth (mm)	Runoff Volume (m^3)
A	1 in 1, 24 hour	6.7	4.75	114.0	6,340
	1 in 2, 24 hour		6.14	147.4	8,195
	1 in 5, 24 hour		7.91	189.8	10,557
	1 in 10, 24 hour		8.97	215.3	11,972
	1 in 20, 24 hour		10.4	249.6	13,880
	1 in 50, 24 hour		12.3	295.2	16,416
	1 in 100, 24 hour		13.7	328.8	18,285
B	1 in 1, 24 hour	6.4	4.75	114.0	6,056
	1 in 2, 24 hour		6.14	147.4	7,828
	1 in 5, 24 hour		7.91	189.8	10,084
	1 in 10, 24 hour		8.97	215.3	11,436
	1 in 20, 24 hour		10.4	249.6	13,259
	1 in 50, 24 hour		12.3	295.2	15,681
	1 in 100, 24 hour		13.7	328.8	17,466

Catchment	Description	Catchment Area (ha)	24 hr Rainfall Intensity (mm/hr)	24 hr Rainfall Depth (mm)	Runoff Volume (m^3)
C	1 in 1, 24 hour	3.1	4.75	114.0	2,933
	1 in 2, 24 hour		6.14	147.4	3,792
	1 in 5, 24 hour		7.91	189.8	4,885
	1 in 10, 24 hour		8.97	215.3	5,539
	1 in 20, 24 hour		10.4	249.6	6,422
	1 in 50, 24 hour		12.3	295.2	7,595
	1 in 100, 24 hour		13.7	328.8	8,460
D	1 in 1, 24 hour	10.2	4.75	114.0	9,613
	1 in 2, 24 hour		6.14	147.4	12,427
	1 in 5, 24 hour		7.91	189.8	16,009
	1 in 10, 24 hour		8.97	215.3	18,154
	1 in 20, 24 hour		10.4	249.6	21,048
	1 in 50, 24 hour		12.3	295.2	24,894
	1 in 100, 24 hour		13.7	328.8	27,727
E	1 in 1, 24 hour	7.3	4.75	114.0	6,945
	1 in 2, 24 hour		6.14	147.4	8,977
	1 in 5, 24 hour		7.91	189.8	11,565
	1 in 10, 24 hour		8.97	215.3	13,115
	1 in 20, 24 hour		10.4	249.6	15,206
	1 in 50, 24 hour		12.3	295.2	17,984
	1 in 100, 24 hour		13.7	328.8	20,031
F	1 in 1, 24 hour	4.7	4.75	114.0	4,447
	1 in 2, 24 hour		6.14	147.4	5,749
	1 in 5, 24 hour		7.91	189.8	7,406
	1 in 10, 24 hour		8.97	215.3	8,398
	1 in 20, 24 hour		10.4	249.6	9,737
	1 in 50, 24 hour		12.3	295.2	11,516
	1 in 100, 24 hour		13.7	328.8	12,826
G	1 in 1, 24 hour	1.9	4.75	114.0	1,748
	1 in 2, 24 hour		6.14	147.4	2,259
	1 in 5, 24 hour		7.91	189.8	2,910
	1 in 10, 24 hour		8.97	215.3	3,300
	1 in 20, 24 hour		10.4	249.6	3,826
	1 in 50, 24 hour		12.3	295.2	4,525
	1 in 100, 24 hour		13.7	328.8	5,041
H	1 in 1, 24 hour	8.8	4.75	114.0	8,336
	1 in 2, 24 hour		6.14	147.4	10,775
	1 in 5, 24 hour		7.91	189.8	13,882
	1 in 10, 24 hour		8.97	215.3	15,742
	1 in 20, 24 hour		10.4	249.6	18,252
	1 in 50, 24 hour		12.3	295.2	21,586
	1 in 100, 24 hour		13.7	328.8	24,043
I	1 in 1, 24 hour	23.9	4.75	114.0	22,586
	1 in 2, 24 hour		6.14	147.4	29,195
	1 in 5, 24 hour		7.91	189.8	37,611
	1 in 10, 24 hour		8.97	215.3	42,651
	1 in 20, 24 hour		10.4	249.6	49,451
	1 in 50, 24 hour		12.3	295.2	58,485
	1 in 100, 24 hour		13.7	328.8	65,142
J	1 in 1, 24 hour	67.9	4.75	114.0	64,304

Catchment	Description	Catchment Area (ha)	24 hr Rainfall Intensity (mm/hr)	24 hr Rainfall Depth (mm)	Runoff Volume (m^3)
	1 in 2, 24 hour		6.14	147.4	83,121
	1 in 5, 24 hour		7.91	189.8	107,083
	1 in 10, 24 hour		8.97	215.3	121,433
	1 in 20, 24 hour		10.4	249.6	140,791
	1 in 50, 24 hour		12.3	295.2	166,513
	1 in 100, 24 hour		13.7	328.8	185,466
K	1 in 1, 24 hour	25.1	4.75	114.0	23,759
	1 in 2, 24 hour		6.14	147.4	30,712
	1 in 5, 24 hour		7.91	189.8	39,565
	1 in 10, 24 hour		8.97	215.3	44,867
	1 in 20, 24 hour		10.4	249.6	52,020
	1 in 50, 24 hour		12.3	295.2	61,524
	1 in 100, 24 hour		13.7	328.8	68,526
L	1 in 1, 24 hour	15.5	4.75	114.0	14,628
	1 in 2, 24 hour		6.14	147.4	18,909
	1 in 5, 24 hour		7.91	189.8	24,360
	1 in 10, 24 hour		8.97	215.3	27,624
	1 in 20, 24 hour		10.4	249.6	32,028
	1 in 50, 24 hour		12.3	295.2	37,879
	1 in 100, 24 hour		13.7	328.8	42,191
M	1 in 1, 24 hour	11.1	4.75	114.0	10,456
	1 in 2, 24 hour		6.14	147.4	13,515
	1 in 5, 24 hour		7.91	189.8	17,411
	1 in 10, 24 hour		8.97	215.3	19,744
	1 in 20, 24 hour		10.4	249.6	22,892
	1 in 50, 24 hour		12.3	295.2	27,074
	1 in 100, 24 hour		13.7	328.8	30,156

2.2.3 Time of Concentration and Rational Method Calculations

The natural hydrology of the quarry and its catchments has been assessed in accordance with QUDM and Gold Coast City Council Planning Scheme 2003 Policy 11 – Land Development Guidelines. The quarry catchments have been considered to be predominantly piped or channelized urban catchments less than 500 ha with the top of the catchment being bushland or grassed park.

The time of concentration for all catchments has been determined using Friend's Equation as per QUDM Table 4.06.3, combined with a channel time flow calculation. Friend's Equation is defined as follows:

Friend's Equation

$t_C = (107 \times n \times L^{0.333})/S^{0.2}$

where
t_C = overland sheet flow travel time (minutes)
L = overland sheet flow path length (m)
n = Horton's surface roughness factor (-)
S = slope of surface (%)

Table 4 – Time of Concentration presents a summary of catchment parameters used within Friend's Equation and the calculated time of concentration for the existing scenario.

Table 4 – Time of Concentration

Catchment	A	B	C	D	E	F	G	H	I	J	K	L	M
Overland Flow Component													
Estimated L length of sheet flow (m)	50	50	20	200	100	20	100	20	20	200	200	200	20
Horton's Roughness Value	0.02	0.02	0.02	0.02	0.02	0.055	0.02	0.05	0.05	0.06	0.06	0.06	0.06
Slope (%)	12.3	10.9	13.9	11	9	15.4	4.4	31.8	29	9	30.2	30.3	28.1
t_c (minutes)	4.77	4.88	3.43	7.73	6.39	9.24	7.37	7.26	7.40	20.13	18.96	18.94	8.93
Channel/Creek Flow Component													
Length of Channel Flow (m)	480	640	160	1070	472	370	125	420	563	1804	760	675	490
Velocity (m/s) – assume 1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
t_c (minutes)	5.33	7.11	1.78	11.89	5.24	4.11	1.39	4.67	6.26	20.04	8.44	7.50	5.44
TOTAL t_c	10.1	12.0	5.2	19.6	11.6	13.4	8.8	12.0	13.7	40.2	27.4	26.4	14.4

Design storm events across the catchments were derived using the Rational Method as per QUDM. This involved:

- Determination of a C_{10} value (derived in accordance with Table 3.5A of the GCCC Land Development Guidelines). A C_{10} value of 0.95 has been applied to Catchments A to E, while a C_{10} value of 0.75 has been applied to Catchments F to L;
- Derivation of design rainfall using BoM Intensity Frequency Duration (IFD) data for the Blue Rock Quarry; and
- Calculation of design flows through the catchments for the Q_{100}, Q_{50}, Q_{20}, Q_{10}, Q_5, Q_2 and Q_{3month} rainfall events where Q_{3month} is deemed to be 50% of the Q_1 rainfall event.

A summary of the hydrologic calculations are presented in Table 5 – Catchment Hydrology below.

Table 5 – Catchment Hydrology

Catchment ID	Area (ha)	t_c (min)	I_{100} (mm/hr)	C	Q_{100} (m^3/s)	I_{50} (mm/hr)	C	Q_{50} (m^3/s)	I_{20} (mm/hr)	C	Q_{20} (m^3/s)	I_{10} (mm/hr)	C	Q_{10} (m^3/s)	I_5 (mm/hr)	C	Q_5 (m^3/s)	I_2 (mm/hr)	C	Q_2 (m^3/s)	I_1 (mm/hr)	C	Q_{3month} (m^3/s)
A	6.7	10.10	229.40	1.00	4.27	207.46	1.00	3.86	180.53	1.00	3.35	158.59	0.95	2.80	143.62	0.90	2.41	116.69	0.81	1.75	91.95	0.76	0.65
B	6.4	11.99	218.00	1.00	3.88	197.20	1.00	3.51	171.60	1.00	3.04	150.80	0.95	2.55	136.40	0.90	2.19	110.78	0.81	1.59	87.28	0.76	0.59
C	3.1	5.21	210.20	1.00	1.81	265.80	1.00	2.29	231.20	1.00	1.99	203.60	0.95	1.67	184.60	0.90	1.43	150.20	0.81	1.04	118.60	0.76	0.39
D	10.2	19.62	172.40	1.00	4.87	156.16	1.00	4.41	135.88	1.00	3.83	119.64	0.95	3.21	107.52	0.90	2.74	87.14	0.81	1.99	68.58	0.76	0.74
E	7.3	11.64	220.40	1.00	4.49	199.36	1.00	4.06	173.48	1.00	3.53	152.44	0.95	2.95	137.92	0.90	2.54	112.02	0.81	1.84	88.26	0.76	0.68
F	4.7	13.35	210.20	0.90	2.47	190.18	0.86	2.14	165.49	0.79	1.70	145.47	0.75	1.42	131.46	0.71	1.22	106.74	0.64	0.89	84.08	0.60	0.33
G	1.9	8.76	244.40	1.00	1.25	221.50	1.00	1.14	192.70	1.00	0.99	169.50	0.95	0.83	153.30	0.90	0.71	124.80	0.81	0.52	98.44	0.76	0.19
H	8.8	11.93	218.60	0.90	4.81	197.74	0.86	4.17	172.07	0.79	3.32	151.21	0.75	2.78	136.78	0.71	2.38	111.09	0.64	1.73	87.53	0.60	0.64
I	23.9	13.65	207.80	0.90	12.40	188.02	0.86	10.75	163.61	0.79	8.54	143.83	0.75	7.15	129.94	0.71	6.14	105.49	0.64	4.46	83.10	0.60	1.65
J	67.9	40.17	125.11	0.90	21.26	113.40	0.86	18.46	98.10	0.79	14.58	86.00	0.75	12.18	77.38	0.71	10.41	62.42	0.64	7.51	49.01	0.60	2.78
K	25.1	27.40	147.80	0.90	9.28	134.02	0.86	8.06	116.24	0.79	6.38	102.02	0.75	5.34	91.79	0.71	4.56	74.21	0.64	3.30	58.35	0.60	1.22
L	15.5	26.44	150.80	0.90	5.83	136.72	0.86	5.06	118.64	0.79	4.01	104.18	0.75	3.36	93.71	0.71	2.87	75.79	0.64	2.07	59.60	0.60	0.77
M	11.1	14.38	203.60	0.90	5.62	184.24	0.86	4.88	160.32	0.79	3.88	140.96	0.75	3.25	127.28	0.71	2.78	103.32	0.64	2.02	81.38	0.60	0.75

The selection and assessment of appropriate best management practices required to address erosion and sediment runoff from the quarry catchments are presented in the following sections. All proposed stormwater conveyance structures on Site have been designed using the Q_{10} peak flow rate summarised in Table 5. Catch drains and drainage channels have been designed to convey the Q_{10} peak flow rate. Flows from upstream undisturbed areas are proposed to be diverted to Michie Creek through an appropriately sized stormwater pipe network to be located near the stockpile area and has been sized to convey the peak Q_{10} flow rate.

Catchments F and H to M have been designated as undisturbed areas and therefore, in accordance with best practice, no treatment has been proposed for these areas.

3. Stormwater Management Strategy

3.1 Principles of Stormwater Management

The following is a summary of the principles which are the basis of this SMP:

- The SMP will be reviewed periodically and will be updated as necessary to include revised quarry development layout, topographic plans and development plans, control device designs, specifications and design parameters;
- Drainage systems and flow control devices are designed to control stormwater for a design Average Recurrence Interval (ARI) of 10 years. Designs are based on calculated water discharge rates and velocities;
- Wherever practicable, clean water will be diverted around the site and into drainage structures and watercourses in a non-erosive manner;
- Existing catch drains, diversion drains and pipes are used to the maximum practicable extent;
- Land disturbance will be minimised to the maximum practicable extent;
- Ground cover will be maximised through agronomic soil testing, amelioration and the use of suitable plant selection;
- Sediment treatment structures will be sized according to the requirements and where this is not practicable, their performance will be improved through the use of chemical flocculation;
- Proposed stormwater drainage controls and structures (catch drains, check dams, diversion drains, diversion bunds, sediment basins, sumps etc.) will be installed as soon as practicable;
- Proposed diversion drains, drainage channels and catch drains will be riprapped and/or grass lined unless otherwise stated. Drains will be excavated to twice the design depth and backfilled with coarse rock materials to the design depth;
- Rock check dams will be constructed at regular intervals in accordance with the IECA Guidelines within all existing and proposed catch drains, including roadside drains along haul roads;
- Any mobile equipment used on Site will be restricted to designated roads or hardstand areas;
- A monitoring program will be undertaken to program maintenance and assess the effectiveness of erosion and sediment control methods and devices;
- Stormwater treatment systems comprising sediment ponds will be constructed to remove sediment. Monitoring and maintenance of the stormwater treatment systems will ensure that sediment trapping capacity remains effective; and
- Water collected in the sediment treatment and storage devices will be recycled to the maximum practicable extent. This water will be available for dust suppression, processing and/or the irrigation of rehabilitated areas.

3.2 Proposed Stormwater Management Strategies

Conceptual stormwater management strategies and controls for the quarry are shown on Figure 4 – Stormwater Management Controls while sectional details of these controls and structures have been presented on Figure 5 – Stormwater Management Details. These specific stormwater management measures and controls have been developed in accordance with QUDM and the IECA guidelines for Catchments A to E and Catchment G only as part of this assessment. Catchments F and H to M are undisturbed catchments and therefore have been excluded from this assessment.

Standard specification drawings of stormwater management controls and measures have been prepared in accordance with the IECA Guidelines and are included in Appendix A.

3.2.1 Sizing of Existing and Proposed Catch Drains

Existing and proposed catch drains have been sized using Channel Flow Equations 4.08 and 4.09 from QUDM Section 4.06.10. The catch drains are proposed to be rock lined/rip rapped to assist in the removal of sediment and reduce velocity of peak flow.

Rock check dams will be constructed within all existing and proposed catch drains on the quarry Site in accordance with the IECA Guidelines. The construction of these catch drains is expected to help reduce the velocity of flow within the catch drains and reduce scouring at the receiving end.

Details of catch drains are summarised in Table 6 below.

Table 6 – Catch Drain Sizing Calculations

Catch Drain ID	Lining Type	Manning's (n)	Grade (S)	Base Width (m)	Batter Slope	Depth (m)	Velocity (m/s)	Peak Flow Conveyance Capacity (m^3/s)	Depth and Velocity Product (D*V)
CD1	Rock lined/rip rap	0.02	0.02	1.0	1 in 4	0.25	2.1	1.1	0.5
CD2	Rock lined/rip rap	0.02	0.11	2.5	1 in 4	0.25	4.8	3.2	1.2
CD3	Rock lined/rip rap	0.02	0.13	2.5	1 in 4	0.2	5.2	3.4	1.0
CD4	Rock lined/rip rap	0.02	0.12	2.0	1 in 4	0.2	5.0	2.8	1.0
CD5	Rock lined/rip rap	0.02	0.03	0.5	1 in 4	0.25	2.2	0.8	0.5

Refer Figure 4 – Stormwater Management Controls for the location of catch drains CD1 to CD5.

3.2.2 Sizing of Proposed Sumps

The proposed sumps in Catchments A, B and C have been designed to capture and treat the 24 hour, 1 in 5 year rainfall runoff. The location of these sumps is shown on Figure 4 – Stormwater Management Controls.

Table 7 below summarises the volume and dimensions of the proposed sumps including batter requirements.

Table 7 – Sump Sizing Calculations

Sediment Basin ID	Catchment ID	Design Rainfall event	Volumetric Runoff Coefficient	Design Rainfall Depth (mm)	Sediment Settling Volume (m^3)	Sediment Storage Volume (m^3)	Total Volume (m^3)	Depth (m)	Batter Slope/Angle	Area (m^2)
A	A	24 hour, 1 in 5 years	0.83	189.8	10,557	5,278	15,835	7	80°	2,262
B	B				10,084	5,042	15,126	5	80°	3,025
C	C				4,884	2,442	7,326	5	80°	1,465

Due to the limited space available in the working area for establishing the proposed sumps, the volume of holding capacity of Sumps A, B and C have been restricted to 11 ML, 13 ML and 5 ML holding capacity respectively. The remainder of the runoff from the design storm event will be contained within the drop cut where Sump C is located. This will result in the flooding of the working area during the design rainfall periods. The extent of flooding within this drop cut is shown on Figure 4 – Stormwater Management Controls and the average depth of flooding has been calculated to be 1.54 m.

3.2.3 Sizing of Proposed Sediment Basins

Sediment basins are required on Site to treat dirty runoff from disturbed catchments D, E and G of the quarry. The proposed sediment basins have been designed as Type F basins in accordance with the IECA Guidelines. The following formula from the IECA Guidelines has been used to calculate the settling and sediment storage volumes of proposed sediment basins on Site. The sediment storage volume has been assumed to be 50% of the settling volume in accordance with the IECA Guidelines.

$V_{set} = 10.Cv.A.R_{y\%ile,\ x\text{-}days}$

where:

V_{set} = Settling Volume (m^3)

V_{stor} = Sediment storage Volume (m^3)

C_v = the volumetric runoff coefficient (dimensionless)

A = Area (hectares)

$R_{y\%ile,\ x\text{-}days}$ = Design rainfall event (mm)

The sediment basins have been designed to treat peak runoff generated by the 24 hour, 1 in 5 year storm event. The design rainfall depth from the 24 hour, 1 in 5 year storm event has been calculated to be 189.8 mm for the Blue Rock Quarry. The sediment basin calculations are summarised in Table 8 below.

Table 8 – Sediment Basin Sizing Calculations

Sediment Basin ID	Catchment ID	Design Rainfall event	Volumetric Runoff Coefficient	Design Rainfall Depth (mm)	Sediment Settling Volume (m^3)	Sediment Storage Volume (m^3)	Total Volume (m^3)	Depth (m)	Batter Slope/Angle	Area (m^2)
D	D	24 hour, 1 in 5 years	0.83	189.8	16,008	8,004	24,012	6	1:1/45°	4,830
E	E				11,565	5,782	17,347	6	1:1/45°	3,598
G	G				2,910	1,455	4,365	4	1:1/45°	1,381

Refer Figure 4 – Stormwater Management Controls for the location of the proposed sediment basins.

3.2.4 Emergency Spillway Calculations

Emergency spillways for the proposed sediment basins have been designed to convey any flows in excess of the Q5 flow rate to the downstream receiving environment. The location of the spillways is shown on Figure 4 – Stormwater Management Controls. The spillway calculations are summarised in Table 9 below.

Table 9 – Emergency Spillway Sizing Calculations

Sediment Basin/SUMP ID	Catchment	Design ARI	Time of concentration (minutes)	Intensity (mm)	Co-efficient of Runoff	Discharge Rate (m^3/s)	Bottom Width of Spillway (m)	Depth of water over weir (m)	Freeboard over water level to Crest (m)
Sump B	B	50	12.0	197.2	1.00	3.5	8	0.36	0.39
Sediment Basin D	D	50	19.6	156.16	1.00	4.5	10	0.37	0.38
Sediment Basin E	E	50	11.6	199.36	1.00	4.2	9	0.38	0.37
Sediment Basin G	G	50	8.8	221.5	1.00	1.4	3.5	0.34	0.41

3.2.5 Diversion of Clean Flows from Upstream Undisturbed Catchments to Michie Creek

The stormwater pipe infrastructure at the entrance to the Site will need to be upgraded to divert flows from upstream undisturbed catchments. The current infrastructure includes a 375 mm diameter pipe which is currently conveying flows from Catchment H (refer Figure 3 – Catchment Delineation Plan). A secondary 525 mm diameter pipe currently discharges flows from Catchment J (refer Figure 3 – Catchment Delineation Plan) to the existing ephemeral wetland area. The existing 375 mm diameter pipe and 525 mm diameter pipe have been found to be grossly undersized to convey the Q_{10} flow rate from the upstream catchments and hence will need to be upgraded to convey the peak Q_{10} flow rate. An overland flow path will be provided to convey flows in excess of Q_{10} to the Site's legal point of discharge.

Preliminary calculations have indicated that, in order to convey the peak Q_{10} flow rate from Catchment H, the existing 375 mm diameter pipe will need to be replaced with twin 525 mm diameter pipes with the construction of a head wall to prevent scouring and buoyancy during peak flow conditions. An end wall will be constructed at the downstream end of the twin 525 mm diameter pipes and outlet scour protection will be provided to aid in energy dissipation.

The existing 525 mm diameter pipe will be retained in its original location, in addition, twin 1,500 mm diameter pipes will be constructed upstream of the existing 525 mm diameter pipe to convey flows from Catchment J to the wetland area. In order to dissipate energy, a stormwater pit with a surface area of 130 m² and depth of 2.5 m will be constructed at the upstream end of the twin 1,500 mm diameter pipes. Baffles with low flow orifices will be constructed within the pit which will help dissipate energy and reduce velocity of flow within the proposed pipes and at the outlet. An end wall and scour protection will be provided at the downstream end of the pipes to further aid in energy dissipation and the reduction of velocity at the outlet. In addition, rock check dams may also be constructed within the diversion channel at regular intervals in accordance with the IECA Guidelines.

Refer Figure 4 – Stormwater Management Controls and Figure 5 – Stormwater Management Details for details of the proposed measures.

3.2.6 Rehabilitation/Revegetation of Exposed Areas of the Quarry

Certain areas of the upper reaches of the quarry are currently bare and exposed to the elements resulting in the transport of sediment laden runoff to the clean water diversion drain during periods of rainfall. These areas (refer Figure 4 – Stormwater Management Controls) will be progressively revegetated by grass seeding using a suitable grass species. Mulch berms/sediment fences will be installed along the edge of the proposed rehabilitation area and maintained with the aim of maximising ground cover through soil remediation and the use of suitable vegetation.

Stormwater runoff from these areas will be diverted to the existing clean water diversion channel by the construction of a catch drain and diversion bund along the edge of the rehabilitated areas. Refer Figure 4 – Stormwater Management Controls for the location of the diversion structures.

3.2.7 Stabilisation and Rehabilitation of Exposed Stockpile Embankments in the Upper Reaches of the Quarry

The steep embankments of the stockpile areas abutting the clean water diversion channel in the upper reaches of the quarry currently pose a high erodibility risk and subsequent contamination of the clean water diversion channel. In order to stabilise these stockpile embankments and prevent the runoff of sediment laden water into the clean water diversion channel, it is proposed that these slopes be stabilised via soil rendering with the use of suitable soil conditioning agents/chemicals. In addition, geofabric material will be installed over these slopes and sediment fencing erected at the base of these banks until the slopes have been stabilised and vegetative cover has been established.

Refer Figure 4 – Stormwater Management Controls for details.

3.2.8 Maintenance of the Existing Ephemeral Wetland Area

A man made ephemeral wetland area is present downstream of the existing sediment basin in the lower part of the quarry, adjacent to the existing stockpile area. This wetland area will need to be reconstructed in order to provide for the final treatment of stormwater discharged from the Site. Fine sediments and nutrients will be removed from the pre-treated stormwater in the wetland area via sedimentation, fine filtration and biological uptake. The vegetated wetland area, over time, will also provide habitat and improved landscape amenity.

Refer Figure 4 – Stormwater Management Controls for the location and footprint of the wetland area.

3.2.9 Treatment of Sediment Laden Stormwater and Feasibility of an Automatic Flocculation System

Water and soil sampling and analysis will be required to determine the soil characteristics and particle size distribution in order to select the most appropriate flocculating chemical/agent to be used on Site. The use of flocculants and/or coagulants is likely to significantly improve the quality of water discharging from the site. Flocculants/coagulants should be applied to the sediment basins immediately following a rain event in appropriate doses as recommended by the manufacturer.

The feasibility of using an automatic flocculation system on Site was investigated as part of this assessment. Preliminary investigations of a rainfall activated Desiltation Unit manufactured by LandLoch Pty Ltd has revealed that the use of such a system or similar on Site will help reduce the volume and footprint of the required sediment basins for the design storm event by approximately 50% while achieving water quality objectives at the same time. Further investigations including a comparative analysis will be required during the detailed design stage and formal discussions and approvals from EHP will be required before using such a system on Site.

4. Maintenance and Monitoring

4.1 Maintenance

Stormwater conveyance and treatment infrastructure such as catch drains, sediment basins and wetlands require inspection and maintenance to ensure they operate in accordance with the design intent. Maintenance of these systems will typically involve:

- Routine inspection to identify damage to vegetation, scouring or litter and sediment build up;
- Routine inspection of inlet and outlet points to identify any areas of scour, blockages and sediment build up;
- Removal and management of invasive weeds;
- Periodic desilting of sediment basins and conveyance structures including sediment fences; and
- Vegetation pest monitoring and control.

4.2 Monitoring

The following Water Quality Objectives have been considered in the development of the SMP for the quarry:

- pH – 6.5 to 8.0;
- Dissolved Oxygen – 80% to 105% saturation;
- Turbidity – 50 NTU;
- Suspended Solids or correlated turbidity vs. suspended solids – 50 mg/L;
- Total Phosphorous – 0.07 mg/L;
- Total Nitrogen – 0.65 mg/L;
- Litter/gross pollutants – No man made material greater than 5 mm; and
- Oil/grease – no visible films or odours.

Water quality monitoring will need to be undertaken to ensure that the proposed management controls are working. Fulton Hogan currently undertakes periodic water quality monitoring and the results of monitoring are reported annually to EHP.

Water quality monitoring undertaken on Site should meet the water quality objectives listed above in addition to the water quality objectives of receiving waters and/or any other requirements set by the conditions of approval by EHP. As a minimum, water quality monitoring should be undertaken immediately following a storm event and during events of discharge from Sediment Basins D, E and G at the legal points of discharge from the site as specified in the environmental authority.

5. Conclusion

This study has investigated potential impacts of the existing extractive industry activities of Blue Rock Quarry on downstream receiving watercourses. Based on this study, the following conclusions have been drawn:

- Stormwater and sediment management controls and measures have been developed for the disturbed areas of the quarry.
- The proposed sediment basins have been designed to capture and retain a 24 hour storm event with an average recurrence interval of 1 in 5 years in accordance with Item 13 of the Department of Environment and Heritage Protection (EHP) Information Request (dated 8 November 2011).
- Runoff from the upstream undisturbed areas is diverted to Michie Creek, around the disturbed areas of the quarry.
- The sediment basins have been designed to capture and treat the runoff from a 24 hour, 1 in 5 year storm event.
- Preliminary investigations have revealed that the use of such a rainfall activated desiltation unit or similar on Site will help reduce the volume and footprint of the required sediment basins for the design storm event by approximately 50% while achieving water quality objectives at the same time.

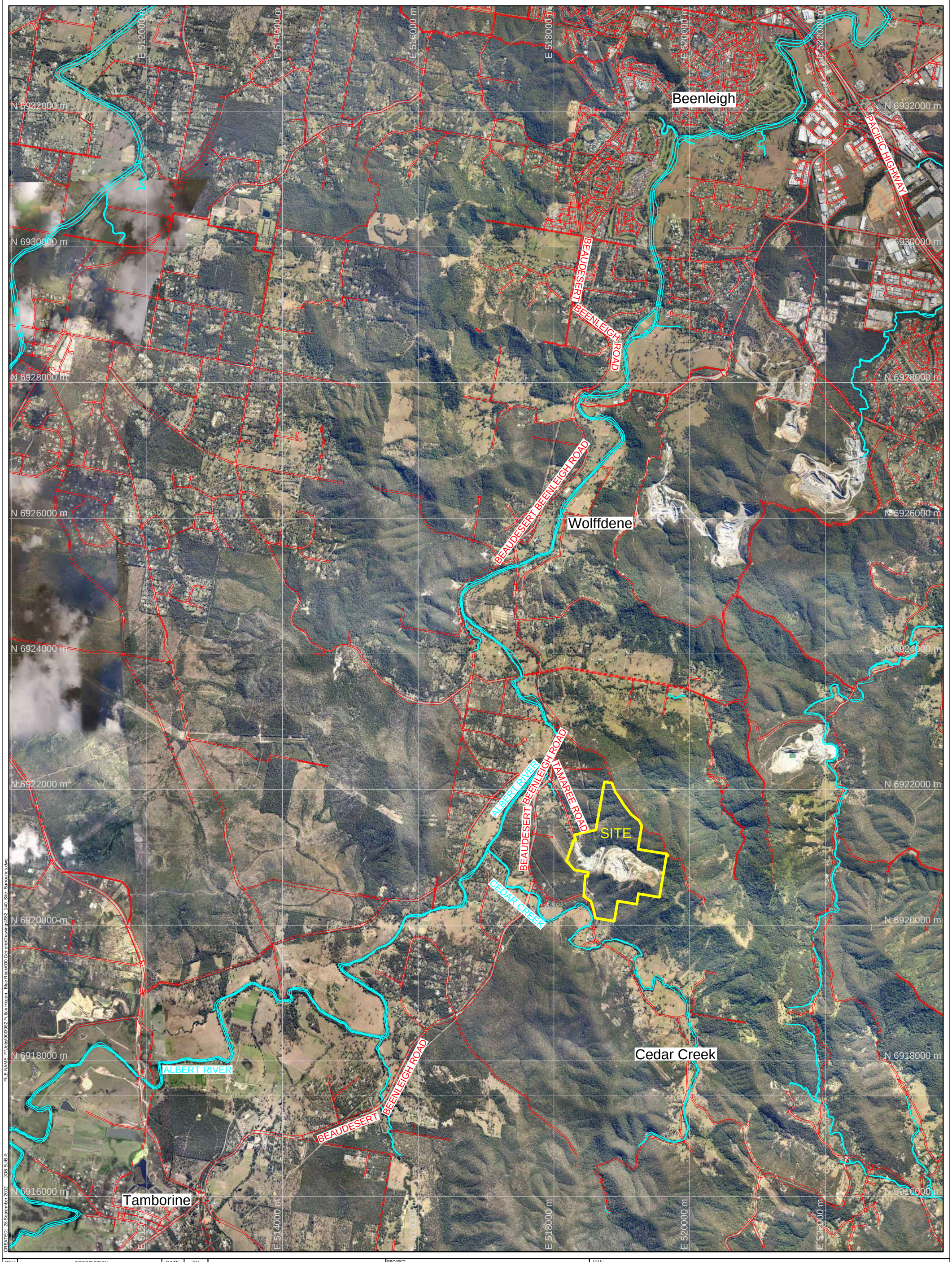
In summary, the integrity of receiving water bodies will not be adversely impacted as a result of the ongoing activities on Site provided the mitigation measures described herein are implemented and maintained.

6. Reference

The information presented herein has been prepared with reference to the following:

- Stormwater Management Plan, Ecoroc Pty Ltd, December 2009.
- Hydrological and Hydraulic Assessment, Golder Associates, November 2009.
- Queensland Urban Drainage Manual, Department of Environment and Heritage Protection, 2008.
- Stormwater Management Plan, AECOM, August 2012.
- Environmental Protection Policy (Water), Department of Environment and Heritage Protection, 2010.
- Urban Stormwater Quality Planning Guidelines 2010, Department of Environment and Heritage Protection, 2010.
- Monitoring and Sampling Manual, 2009. Department of Environment and Heritage Protection, 2009.

figures



FILE NAME: F:\Jobs\900\982 Fulton Hogan - Blue Rock\000 Generic\Drawings\982 - 140 Site Surrounds.dwg

CREATED: 28 September 2012 JOB SUB #

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Topography:
Cadastre:
Ecosystem:
Other:

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Legend:
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- Cadastral Boundary - Road
- Cadastral Boundary - Watercourse

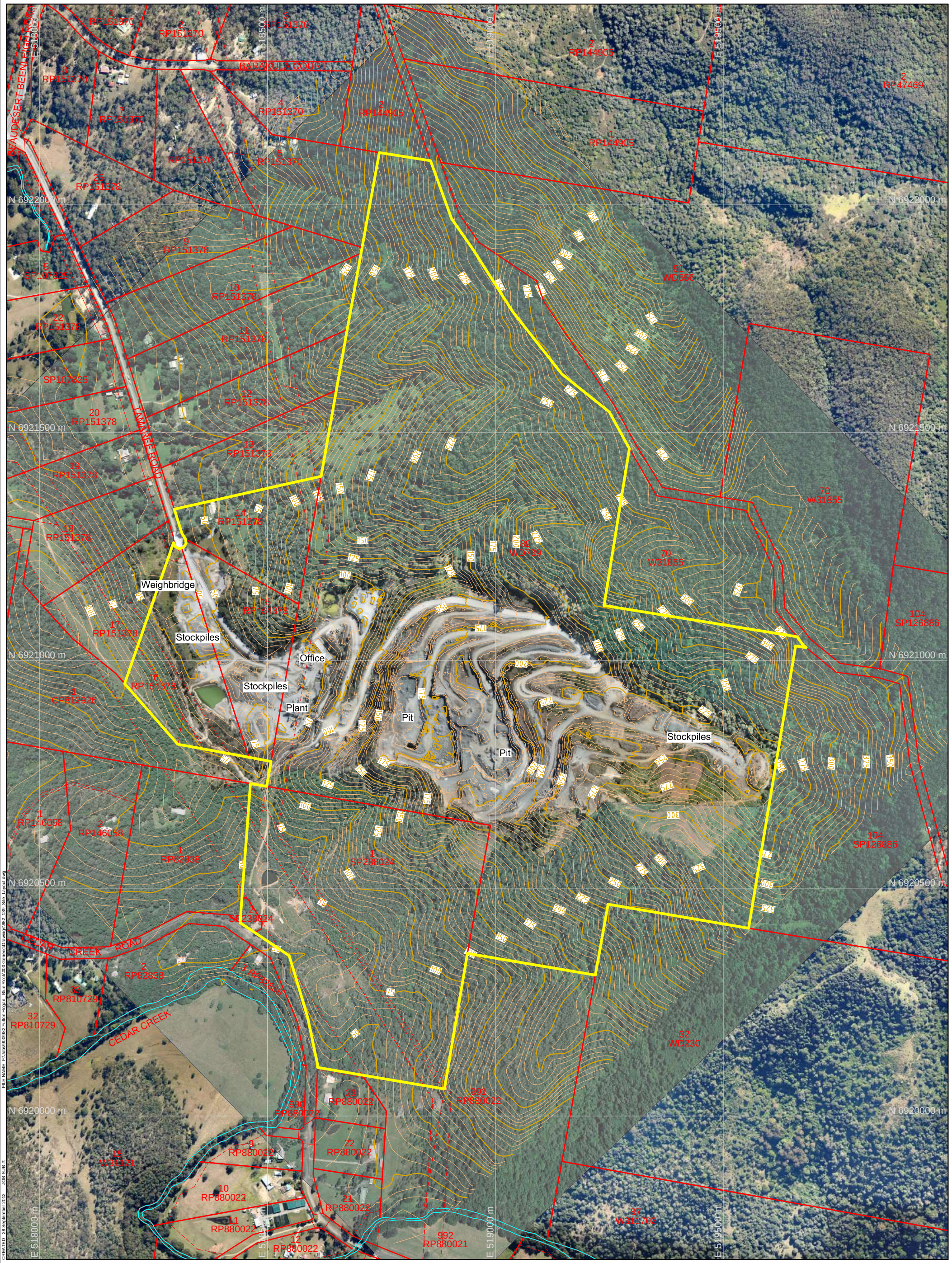
PROJECT: Blue Rock Quarry

CLIENT: Fulton Hogan

TITLE: Figure 1 - Site Location Plan

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REV	DESCRIPTION	DATE	BY

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Legend:
- Site Boundary
- Cadastral Boundary
- Easement Boundary

PROJECT: Blue Rock Quarry

CLIENT: Fulton Hogan

TITLE: Figure 2 - Site Layout Plan

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MGA / AHD / 56

CREATED: 28 September 2012 JOB SUB #: FILE NAME: F:\Jobs\900\982 Fulton Hogan Blue Rock\000 General\Drawings\982 - 139 Site Layout.dwg

Catchment	Area (ha)	24 Hour, 1 in 5 year Runoff Volume (ML)	Q5 Flow Rate (m^3/s)	Q100 Flow Rate (m^3/s)
A	6.7	10.6	2.41	4.27
B	6.4	10.1	2.19	3.88
C	3.1	4.9	1.43	1.81
D	10.2	16.1	2.74	4.87
E	7.3	11.6	2.54	4.49
F	4.7	7.4	1.22	2.47
G	1.8	2.9	0.71	1.25
H	8.8	13.9	2.38	4.81
I	23.9	37.6	6.14	12.40
J	67.9	107.1	10.41	21.26
K	25.1	39.6	4.56	9.28
L	15.5	24.4	2.87	5.83
M	11.1	17.4	2.78	5.62

Legend:
- Site Boundary
- Cadastral Boundary
- Easement Boundary
- Catchment Boundary
- Existing Concentrated clean runoff flowpath
- Existing Sediment Basin / Dam / Sump / Water Storage
- Release / Discharge Point

REV	DESCRIPTION	DATE	BY
1	Catchment Delineation Plan	27/9/12	LT
2	Amendments to Catchment Areas	30/10/12	LT/PR

Data Sources:
Photography: Fulton Hogan, 2012-09-03; Vekta 2011-03-23; Nearmap 2012-08-05
Topography: Fulton Hogan, 2012-09-03; Vekta 2011-03-23
Cadastre:
Ecosystem:
Other:

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PROJECT: Blue Rock Quarry

CLIENT: Fulton Hogan

TITLE: Figure 3 - Catchment Delineation Plan

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REVISION: 2
DATE: 5 November 2012
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PRINTED: 5 November 2012
CHECKED: PR
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FILE NAME: F:\Jobs\900\982 Fulton Hogan Blue Rock\000 General\Drawings\982_133_Catchment_Plan R2.dwg
JOB SUB #:
CREATED: 9 October 2012

Install end wall and provide scour protection at outlet

Construct headwall and upgrade existing 375mmØ to twin 525mmØ pipes

Install Stormwater Pit with baffle walls and twin 1500mmØ pipes

Upstream Clean Runoff Drainage Channel

Sediment Basin G (4.4ML)

Water Storage Dam

Install end wall and provide scour protection at outlet

Sediment Basin E (17.4ML)

Sump B (13ML)

Geofabric application to stabilise batter and to prevent the runoff of sediments into the clean water channel. Regular maintenance required.

Excess Flows (9.3ML) from Sumps A, B and C will be contained within the Box Cut

Sediment Basin D (24ML)

Sump C (5ML)

Sump A (11ML)

Construct mulch berm/sediment fence and maintain until satisfactory vegetative cover is established

LST

Legend:

- Site Boundary
- Cadastral Boundary
- Easement Boundary
- RF — RF — Rock Filter Bund
- Clean Surface Water Flow
- Dirty Surface Water Flow
- Clean Concentrated Water Flow
- DB — DB — Diversion Bund - Clean Water
- CD — CD — Catch Drain - Dirty Water
- DRC — DRC — Drainage Channel
- SD — SD — Spoon Drain
- PB — PB — Perimeter Bund
- RF — RF — Rock Filter Bund
- ES — ES — Emergency Spillway
- Mulch Berm
- Culvert
- Sediment Basin
- Stormwater Pit (4m x 4m x 2.5m)
- Rehabilitate / Revegetate by grass seeding
- Existing Ephemeral Wetland area
- Geofabric Application for Batter Stabilisation
- Q5 Flood Inundation Area (Depth =1.54m)
- A — A' Cross Section (refer Drg 982.137)
- Water storage and Sumps

Notes:

1. Sediment basins D, E and G have been designed as Type F basins in accordance with the IECA (2008) guidelines.
2. Sediment basins have been designed to treat the runoff generated by the 24 hours, 1 in 5 year storm event.
3. Construct rock check dams,in accordance with the IECA Guidelines, within all conveyance structures including catch drains. Rock check dams are to be constructed at 50m intervals except in steep sections where the maximum separation distance between rock check dams should be 25m.
4. Vegetate using a suitable grass species, the batters of all existing and proposed diversion structures including diversion bunds, perimeter bunds, and the batters of all sediment basins.
5. Refer Figure 5 - Stormwater Management Details for sectional details and dimensions of stormwater management structures.

REV	DESCRIPTION	DATE	BY
1	Updated design.	8/10/12	PR
2	Updated design and Q5 flood level	30/10/12	LT/PR
3	Text and presentation changes	05/11/12	MH

Data Sources:
Photography: Fulton Hogan, 2012-09-03; Vekta 2011-03-23
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PROJECT: Blue Rock Quarry

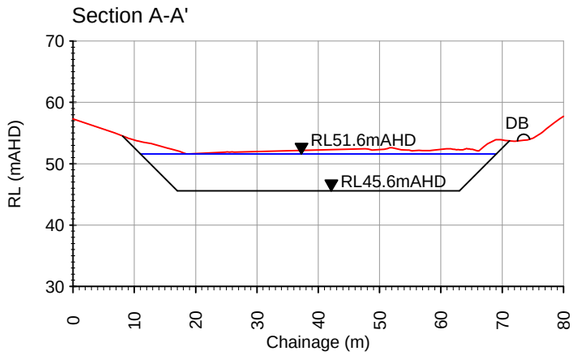
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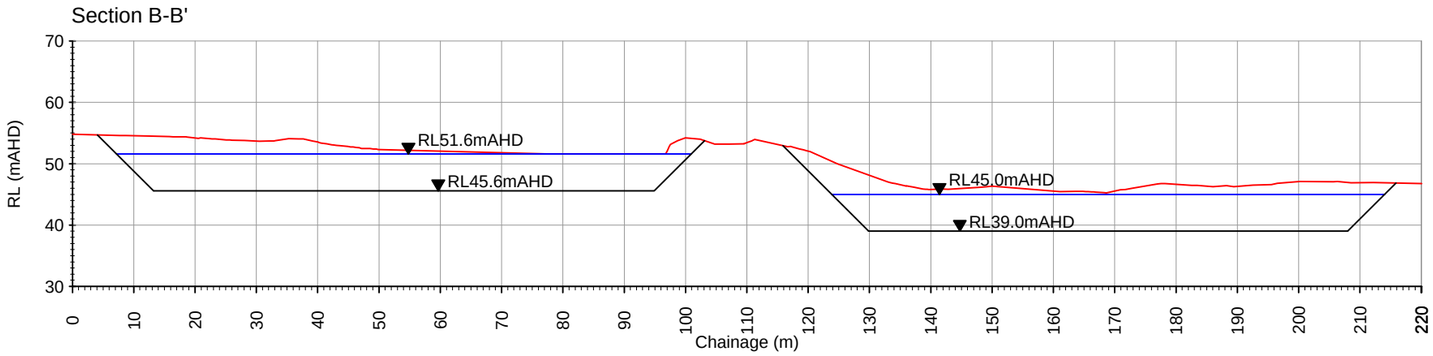
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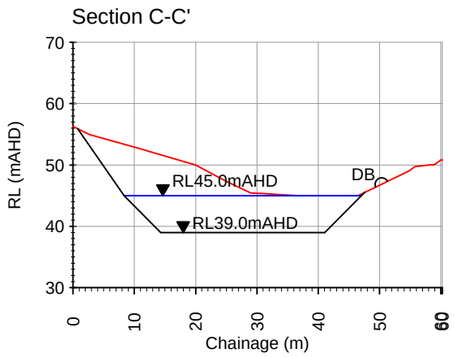
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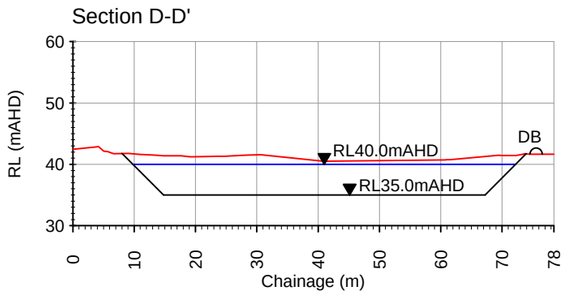
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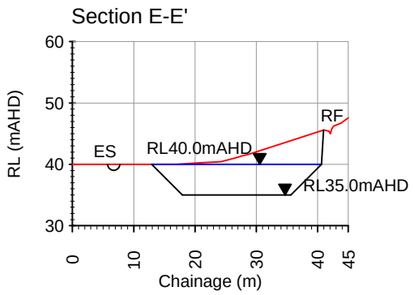
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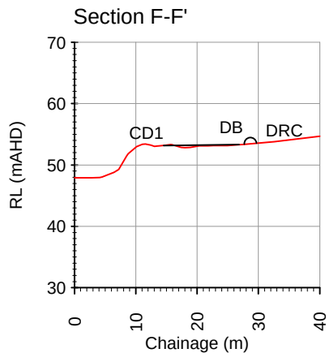


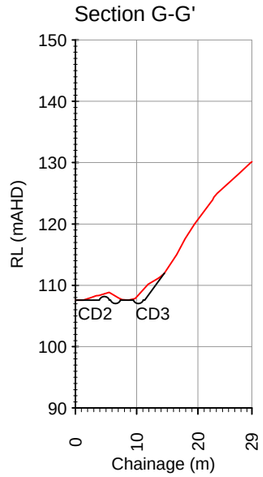


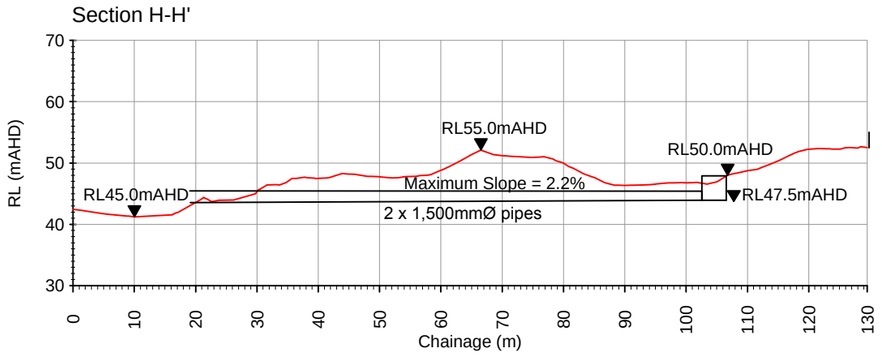












Sediment Basin Sizing				
Basin ID	Catchment	Surface Area (m^2)	Depth (m)	Volume (ML)
D	D	4,830	6	24.1
E	E	3,600	6	17.4
G	G	1,380	4	4.4

Emergency Spillway Calculations						
Sediment Basin / Sump ID	Sub-catchment	Design ARI	Discharge rate (m^3/s)	Bottom width of spillway (m)	Depth of water over weir (m)	Freeboard over water level to crest (m)
Sump B	B	50	3.5	8	0.36	0.39
Sediment Basin D	D	50	4.5	10	0.37	0.38
Sediment Basin E	E	50	4.2	9	0.38	0.37
Sediment Basin G	G	50	1.4	3.5	0.34	0.41

Catch Drain Calculations								
Channel ID	Channel Type	Manning n	Grade S	Base Width (m)	Depth (m)	Velocity (m/s)	Flow (m^3/s)	Depth & Velocity Product
CD1	Rock lined/Rip Rapped	0.02	0.02	1.0	0.25	2.1	1.1	0.5
CD2	Rock lined/Rip Rapped	0.02	0.11	2.5	0.25	4.8	3.2	1.2
CD3	Rock lined/Rip Rapped	0.02	0.13	2.5	0.2	5.2	3.4	1.0
CD4	Rock lined/Rip Rapped	0.02	0.12	2.0	0.2	5.0	2.8	1.0
CD5	Rock lined/Rip Rapped	0.02	0.03	0.5	0.25	2.2	0.8	0.5

REV	DESCRIPTION	DATE	BY

Data Sources:
Photography:
Topography: Fulton Hogan, 2012-09-03; Vekta 2011-03-23
Cadastre:
Ecosystem:
Other:

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Legend:
- Existing Ground
- Proposed Finished Level
- Sediment Basin

PROJECT: Blue Rock Quarry

CLIENT: Fulton Hogan

TITLE: Figure 5 - Stormwater Management Details

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SCALE: 1:1,000 When Printed On A3 (0 – 20)
DRAWING NUMBER: 982.137
REVISION: 2
DATE: 1 November 2012
DRAWN: LT
DATUM: HORIZONTAL / VERTICAL / ZONE
PRINTED: 1 November 2012
CHECKED:
MGA / AHD / 56

FILE NAME: P:\Jobs\900\982 Fulton Hogan Blue Rock\000 General\Drawing\982_137_stormwater_details.dwg
CREATED: 27 September 2012 JOB SUB #

appendices

Appendix A

Standard Specification Drawings of Stormwater Management Controls and Devices

Catch Drain - Grass Lined CD

→ CD →

Installation

1. Ensure all necessary soil testing (e.g. soil pH, nutrient levels) and analysis has been completed, and required soil adjustments performed prior to planting.
2. Clear the location for the catch drain, clearing only what is needed to provide access for personnel and equipment for installation.
3. Remove roots, stumps, and other debris and dispose of them properly. Do not use debris to build the bank.
4. Grade the drain to the specified slope and form the associated embankment with compacted fill. Note that the drain invert must fall 10cm every 10m for each 1% of channel gradient.
5. Ensure the sides of the cut drain are no steeper than a 1.5:1 (H:V) slope and the embankment fill slopes no steeper than 2:1.
6. Ensure the completed drain has sufficient deep (as specified for the type of drain) measured from the drain invert to the top of the embankment. Where necessary, cut the drain slightly deeper such that the correct channel dimensions are achieved following placement of the turf.
7. Ensure the drain has a constant fall in the desired direction free of obstructions.
8. Turf should be used within 12-hours of delivery, otherwise ensure the turf is stored in conditions appropriate for the weather conditions (e.g. a shaded area).
9. Moistening the turf after it is unrolled will help maintain its viability.
10. Turf should be laid on a minimum 75mm bed of adequately fertilised topsoil. Rake the soil surface to break the crust just before laying the turf.
11. During the warmer months, lightly irrigate the soil immediately before laying the turf.
12. Ensure the turf is not laid on gravel, heavily compacted soils, or soils that have been recently treated with herbicides.
13. For wide drains and high velocity chutes, lay the first row of turf in a straight line diagonal to the direction of flow. Stagger subsequent rows in a brick-like (stretcher bond) pattern. The turf should not be stretched or overlapped. Use a knife or sharp spade to trim and fit irregularly shaped areas.
14. For narrow drains, lay the turf along the direction of the drain, ensuring, wherever practicable, that a longitudinal joint between two strips of turf is not positioned along the invert of the drain.
15. Ensure the turf extends up the sides of the drain at least 100mm above the elevation of the channel invert, or at least to a sufficient elevation to fully contain expected channel flow.
16. On channel gradients of 3:1(H:V) or steeper, or in situations where high flow velocities (i.e. velocity >1.5m/s) are likely within the first 2-weeks following placement, secure the individual turf strips with wooden or plastic pegs.
17. Ensure that intimate contact is achieved and maintained between the turf and the soil such that seepage flow beneath the turf is avoided.
18. Water until the soil is wet 100mm below the turf. Thereafter, watering should be sufficient to maintain and promote healthy growth.
19. Ensure the drain discharges to a stable outlet such that down-slope soil erosion will be prevented from occurring. Ensure the drain does not discharge to an unstable fill slope.

Maintenance

1. Inspect all catch drains at least weekly and after runoff-producing storm events and repair any slumps, bank damage, or loss of freeboard.
2. Ensure fill material or sediment is not partially blocking the drain. Where necessary, remove any deposited material to allow free drainage.
3. Dispose of any sediment or fill in a manner that will not create an erosion or pollution hazard.

Removal

1. When the soil disturbance above the catch drain is finished and the area is stabilised, the drain and any associated banks should be removed, unless it is to remain as a permanent drainage feature.
2. Dispose of any sediment or earth in a manner that will not create an erosion or pollution hazard.
3. Grade the area and smooth it out in preparation for stabilisation.
4. Stabilise the area by grassing or as specified within the approved plan.

Reference: Witheridge 2010, *Erosion and Sediment Control - A field Guide for Construction Site Managers.* Catchments & Creeks Pty Ltd., Brisbane, Queensland

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TITLE: Catch Drain - Grass Lined

DRAWING NUMBER: SD-CD-3

REVISION:

Catch Drain - Rock Lined CD

→ CD →

Materials

Rock:
* All rock must be hard, weather resistant, and durable against disintegration under conditions to be met in handling, placement and operation.
* All rock must have its greatest dimension not greater than 3 times its least dimensions.
* The rock used in formation of the drain must be evenly graded with 50% by weight larger than the specified nominal rock size and have sufficient small rock to fill the voids between the larger rock. Dirt, fines, and smaller rock must not exceed 5% by weight.
* The diameter of the largest rock size should be no larger than 1.5 times the nominal rock size. Specific gravity to be at least 2.5.

Filter cloth:
* Geotextile fabric: heavy-duty, needle-punched, non-woven filter cloth, minimum 'bidim' A24 or equivalent.

Installation

1. Prior to placement, all rocks must be visually checked for size, elongation, cracks, deterioration and other visible defects. The degree and thoroughness of such checking must be appropriate for the potential consequences associated with failure of the structure or purpose for which the material will be used.
2. Clear the location for the catch drain, clearing only what is needed to provide access for personnel and equipment for installation.
3. Remove roots, stumps, and other debris and dispose of them properly. Do not use debris to build the bank.
4. Remove all soft, yielding material; replace with suitable on-site material; compact to smooth firm surface.
5. Excavate the drain to the lines and grades shown on the approved plans. Over-cut the drain to a depth equal to the specified depth of rock placement such that the finished top surface will be at the elevation of the surrounding land. Placement of the rock lining must not reduce the drain's top width and depth as specified within the approved plans.
6. Grade the drain to the specified slope and form the associated embankment with compacted fill. Note that the drain invert must fall 10cm every 10m for each 1% of channel gradient.
7. Ensure the sides of the cut drain are no steeper than a 1.5:1 (H:V) slope and the embankment fill slopes no steeper than 2:1.
8. If the drain is cut into a dispersive (sodic) soil, then prior to placing filter cloth, the exposed dispersive soil must be covered with a minimum 200mm thick layer of non-dispersive soil prior to placement of filter cloth or rocks.
9. If a filter cloth underlay is specified, place the filter fabric directly on the prepared foundation. If more than one sheet of filter cloth is required to over the area, overlap the edge of each sheet at least 300mm, and secure anchor pins at minimum 1m spacing along the overlap.
10. Ensure the filter cloth is protected from punching or tearing during installation of the fabric and the rock. Repair any damage by removing the rock and placing with another piece of filter cloth over the damaged area overlapping the existing fabric a minimum of 300mm.
11. Placement of rock should follow immediately after placement of the filter layer. Place rock so that it forms a dense, well-graded mass of rock with a minimum of voids.
12. Place rock lining to the extent and depth indicated within the approved plans.
13. Ensure the rock is placed in an appropriate manner to avoid displacing underlying materials or placing undue impact force on the bedding materials.
14. Ensure the rock is placed with a minimum thickness of 1.5 times the nominal rock size (d50).
15. Ensure materials that are d50 and larger are positioned flush with the top surface with faces and shapes matched to minimise voids.
16. Ensure projections above or depressions under the specified top surface are less than 20% of the rock layer thickness. The average surface plane of the finished rock is defined as the plane where 50% of the tops of rocks would contact.
17. Ensure the completed drain has sufficient deep (as specified for the type of drain) measured from the drain invert (average surface plane along channel invert) to the top of the embankment. The average surface plane of the finished rock is defined as the plane where 50% of the tops of rocks would contact.
18. To the maximum degree practicable, the material between larger rock must not be loose or easily displaced by the expected flow.
19. After placement of the rock lining, ensure the drain has a constant fall in the desired direction free of obstructions.
20. Ensure the drain discharges to a stable outlet such that soil erosion will be prevented from occurring. Ensure the drain does not discharge to an unstable fill slope.

Maintenance

1. Inspect all catch drains at least weekly and after runoff-producing storm events and repair any slumps, bank damage, or loss of freeboard.
2. Closely inspect the outer edges of the rock protection. Ensure water entry into the rock-lined area is not causing erosion along the edge of the rock protection.
3. Carefully check the stability of the rock looking for indications of piping, scour holes, or bank failures.
4. Replace or reposition the surface rock such that the drain functions as required and the drain's required hydraulic capacity is not reduced.
5. Replace any displaced rock with rock of a significantly (minimum 110%) larger size than the displaced rock.
6. Ensure sediment is not partially blocking the drain. Where necessary, remove any deposited material to allow free drainage.
7. Dispose of any sediment or fill in a manner that will not create an erosion or pollution hazard.

Removal

1. When the soil disturbance above the catch drain is finished and the area is stabilised, the drain and any associated banks should be removed, unless it is to remain as a permanent drainage feature.
2. Dispose of any sediment or earth in a manner that will not create an erosion or pollution hazard.
3. Grade the area and smooth it out in preparation for stabilisation.
4. Stabilise the area by grassing.

Reference: Witheridge 2010, *Erosion and Sediment Control - A field Guide for Construction Site Managers.* Catchments & Creeks Pty Ltd., Brisbane, Queensland

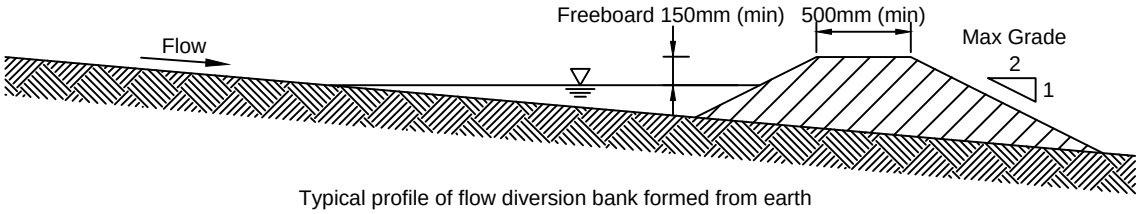
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TITLE:	DRAWING NUMBER:	REVISION:
Catch Drain - Rock Lined	SD-CD-5	

Flow Diversion Bank / Perimeter Bund DB / PB

→ DB →
→ PB →



Typical profile of flow diversion bank formed from earth

Installation

1. Clear the location for the bank, clearing only the area that is needed to provide access for personnel and equipment.
2. Remove roots, stumps, and other debris and dispose of them properly. Do not use debris to build the bank.
3. Form the bank from the topsoil and overburden material from the extraction area.
4. If earth is used, then ensure the sides of the bank are no steeper than a 2:1 (H:V) slope, and the completed bank must be at least 500mm high.
5. Check the bank alignment to ensure positive drainage in the desired direction.
6. The bank should be vegetated (turfed, seeded and mulched), or otherwise stabilised immediately, unless it will operate for less than 30 days or if significant rainfall is not expected during the life of the bank.
7. Ensure the embankment drains to a stable outlet, and does not discharge to an unstable slope.

Maintenance

1. Inspect flow diversion banks at least weekly and after runoff-producing rainfall.
2. Inspect the bank for any slumps, wheel track damage or loss of freeboard. Make repairs as necessary.
3. Check that fill material or sediment has not partially blocked the drainage path up-slope of the embankment. Where necessary, remove any deposited material to allow free drainage.
4. Dispose of any collected sediment or fill in a manner that will not create an erosion or pollution hazard.
5. Repair any places in the bank that are weakened or in risk of failure.

Removal

1. When the soil disturbance above the bank is finished and the area is stabilised, the flow diversion bank should be removed, unless it is to remain as a permanent drainage feature.
2. Dispose of any sediment or earth in a manner that will not create an erosion or pollution hazard.
3. Grade the area and smooth it out in preparation for stabilisation.
4. Stabilise the area by grassing or as specified in the approved plan.

Recommended dimensions of flow diversion banks

Parameter	Earth Banks	Vegetated Banks
Height (min)	500mm	500mm
Top Width (min)	500mm	500mm
Base Width (min)	2500mm	2500mm
Side Slope (max)	2:1 (H:V)	2:1 (H:V)
Freeboard	300mm	150mm

Reference: Witheridge 2010, *Erosion and Sediment Control - A field Guide for Construction Site Managers.* Catchments & Creeks Pty Ltd., Brisbane, Queensland

CREATED: 11 October 2011 PRINTED: 14 October 2011 FILE NAME: F:\Admin\Auto\CAD\Templates\SWMP -dwgs\SD-DB-1 Flow Diversion Bank.dwg

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TITLE: Flow Diversion Bank / Perimeter Bund

DRAWING NUMBER: SD-DB-1

REVISION:

Diversion Channel DC

→ DC →

Installation

1. Ensure all necessary soil testing (e.g. soil pH, nutrient levels) and analysis has been completed, and required soil adjustments performed prior to planting.
2. Clear the location for the channel, clearing only what is needed to provide access for personnel and construction equipment.
3. Remove roots, stumps, and other debris and dispose of them properly. Do not use debris to build any associated embankments.
4. Excavate the diversion channel to the specified shape, elevation and gradient. The sides of the channel should be no steeper than a 2:1 (H:V) if constructed in earth, unless specifically directed within the approved plans.
5. Stabilise the channel and banks immediately unless it will operate for less than 30 days. In either case, temporary erosion protection (matting, rock, etc.) will be required as specified within the approved plans or as directed.
6. Ensure the channel discharges to a stable area.

Additional requirements for turf placement:

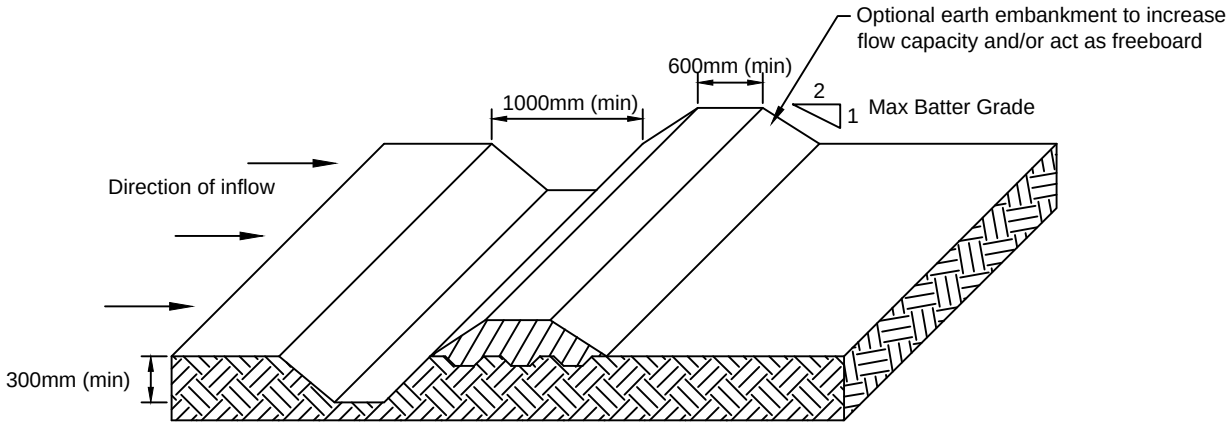
1. Turf should be used within 12 hours of delivery, otherwise ensure the turf is stored in conditions appropriate for the weather conditions (e.g. a shaded area).
2. Moistening the turf after it is unrolled will help maintain its viability.
3. Turf should be laid on a minimum 75mm bed of adequately fertilised topsoil. Rake the soil surface to break the crust just before laying the turf.
4. During the warmer months, lightly irrigate the soil immediately before laying the turf.
5. Ensure the turf is not laid on gravel, heavily compacted soils, or soils that have been recently treated with herbicides.
6. Ensure the turf extends up the sides of the drain at least 100mm above the elevation of the channel invert, or at least to a sufficient elevation to fully contain expected channel flow.
7. On channel gradients of 3:1(H:V) or steeper, or in situations where high flow velocities (i.e. velocity >1.5m/s) are likely within the first two week following placement, secure the individual turf strips with wooden or plastic pegs.
8. Ensure that intimate contact is achieved and maintained between the turf and the soil such that seepage flow beneath the turf is avoided.
9. Water until the soil is wet 100mm below the turf. Thereafter, watering should be sufficient to maintain and promote healthy growth

Maintenance

1. During the site's construction period, inspect the diversion channel weekly and after any increase in flows within the channel. Repair any slumps, wheel track damage or loss of freeboard.
2. Ensure fill material or sediment is not partially blocking the channel. Where necessary, remove any deposited material to allow free drainage.
3. Dispose of any collected sediment or fill in a manner that will not create an erosion or pollution hazard.

Removal

1. When the construction work above a temporary diversion channel is finished and the area is stabilised, the area should be appropriately rehabilitated.
2. Dispose of any collected sediment or fill in a manner that will not create an erosion or pollution hazard.
3. Grade the area and smooth it out in preparation for stabilisation.
4. Stabilise the area.



(a) Typical profile of diversion channel with bank

Reference: Witheridge 2010, *Erosion and Sediment Control - A field Guide for Construction Site Managers.* Catchments & Creeks Pty Ltd., Brisbane, Queensland

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TITLE: Diversion Channel

DRAWING NUMBER: SD-DC-1

REVISION:

Emergency Spillway ES

→ ES →

Construction

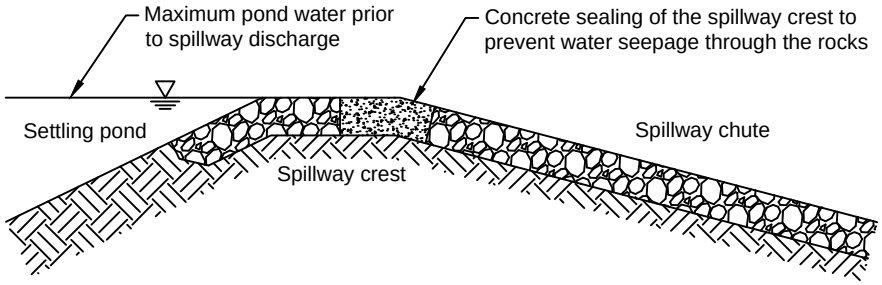
1. The spillway must be excavated, and the excavated material if classified as suitable, must be used in the embankment, and if not suitable it must be disposed of into spoil heaps.
2. Ensure excavated dimensions allow adequate boxing-out such that the specified elevations, grades, chute width, and entrance and exit slopes for the emergency spillway will be achieved after placement of the rock or other scour protection measures.
3. Place specified scour protection measures on the emergency spillway. Ensure the finished grade blends with the surrounding area to allow a smooth flow transition from spillway to downstream channel.
4. If a synthetic filter fabric underlay is specified, place the filter fabric directly on the prepared foundation. If more than 1 sheet of filter fabric is required, overlap the edges by at least 300mm and place anchor pins at minimum 1m spacing along the overlap. Bury the upstream end of the fabric a minimum 300mm below ground and where necessary, bury the lower end of the fabric or overlap a minimum 300mm over the next downstream section as required. Ensure the filter fabric extends at least 1000mm upstream of the spillway crest.
5. Take care not to damage the fabric during or after placement. If damage occurs, remove the rock and repair the sheet by adding another layer of fabric with a minimum overlap of 300mm around the damaged area. If extensive damage is suspected, remove and replace the entire sheet.
6. Where large rock is used, or machine placement is difficult, a minimum 100mm layer of fine gravel, aggregate, or sand may be needed to protect the fabric.
7. Placement of rock should follow immediately after placement of the filter fabric. Place rock so that it forms a dense, well-graded mass of rock with a minimum of voids. The desired distribution of rock throughout the mass may be obtained by selective loading at the quarry and controlled dumping during final placement.
8. The finished slope should be free of pockets of small rock or clusters of large rocks. Hand placing may be necessary to achieve the proper distribution of rock sizes to produce a relatively smooth, uniform surface. The finished grade of the rock should blend with the surrounding area. No overfall or protrusion of rock should be apparent.
9. Ensure that the final arrangement of the spillway crest will not promote excessive flow through the rock such that the water can be retained within the settling basin an elevation no less than 50mm above or below the nominated spillway crest elevation.

Maintenance

1. During the construction period, inspect the spillway prior to forecast rainfall, daily during extended periods of rainfall, after significant runoff producing storm events, or otherwise on a weekly basis. Make repairs as necessary.
2. Check for movement of, or damage to, the spillway's lining, including surface cracking.
3. Check for soil scour adjacent the spillway. Investigate the cause of any scour, and repair as necessary.
4. When making repairs, always restore the spillway to its original configuration unless an amended layout is required.

Removal

1. Temporary spillways should be removed when an alternative, stable, drainage system is available.
2. Remove all materials and deposited sediment, and dispose of in a suitable manner that will not cause an erosion or pollution hazard.
3. Grade the area in preparation for stabilisation, then stabilise the area.



(a) Example of seepage control on the spillway crest

Reference: Witheridge 2010, *Erosion and Sediment Control - A field Guide for Construction Site Managers.* Catchments & Creeks Pty Ltd., Brisbane, Queensland

CREATED: 14 October 2011 PRINTED: 14 October 2011 FILE NAME: F:\Admin\Auto\CAD\Templates\SWMP dwgs\SD-ES-1 Emergency Spillway.dwg

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TITLE: Emergency Spillways

DRAWING NUMBER: SD-ES-1

REVISION:

Grass Channel Linings GC

GC

Installation

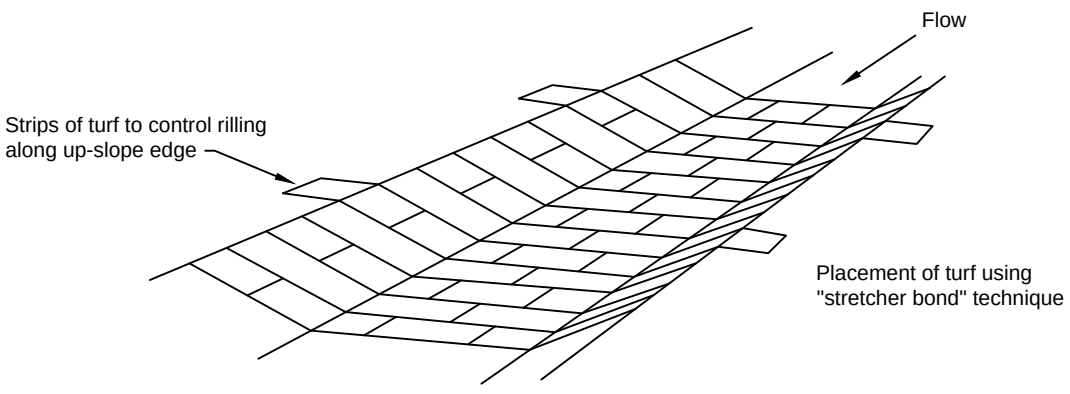
1. Ensure all necessary soil testing (e.g. soil pH, nutrient levels) and analysis has been completed, and required soil adjustments performed prior to planting.
2. Remove all trees, brush, stumps, and other objectionable material from the channel footprint and dispose of properly.
3. Excavate the channel and shape it to neat lines and dimensions shown on the approved plan. Ensure an adequate allowance in the excavated dimensions, typically 75mm, for the placement topsoil and turfing.
4. Remove and properly dispose of all excess soil so that surface water may enter the channel freely.
5. The procedures used to establish grass within the channel will depend upon the expected weather conditions, the type of grass, and the likely flow conditions within the channel during and immediately after planting. Ensure the adopted planting procedures are consistent with the approved plans or the recommendations of the landscape designers.

Additional requirements when laying turf within a drainage channel:

1. Turf should be used within 12-hours of delivery, otherwise ensure the turf is stored in conditions appropriate for the weather conditions (e.g. a shaded area).
2. Moistening the turf after it is unrolled will help maintain its viability.
3. Turf should be laid on a minimum 75mm bed of adequately fertilised topsoil. Rake the soil surface to break the crust just before laying the turf.
4. During the warmer months, lightly irrigate the soil immediately before laying the turf.
5. Ensure the turf is not laid on gravel, heavily compacted soils, or soils that have been recently treated with herbicides.
6. Lay the first row of turf in a straight line diagonal to the direction of flow. Stagger subsequent rows in a brick-like (stretcher bond) pattern. The turf should not be stretched or overlapped. Use a knife or sharp spade to trim and fit irregularly shaped areas.
7. Ensure the turf extends up the sides of the channel at least 100mm above the elevation of the channel bed, or at least to a sufficient elevation to fully contain the expected channel flow that is considered likely to occur within the first month after placement.
8. On channel gradients of 3:1(H:V) or steeper, or wherever erosion may be a problem, or in situations where high flow velocities (i.e. velocity > 1.5m/s) are likely within the first 2-weeks following placement, secure the individual turf strips with wooden pegs.
9. Ensure that intimate contact is achieved and maintained between the turf and the soil such that seepage flow beneath the turf is avoided.
10. Where practicable, once fixed in place, the turf should be rolled with a roller weighing 60 to 90kg/m width, then watered.
11. After rolling, lightly spread screened topsoil to replace topsoil lost from the turf and to fill any gaps between the rows.
12. Water until the soil is wet 100mm below the turf. Thereafter, watering should be sufficient to maintain and promote healthy growth.

Maintenance

1. During the initial root establishment period, check grassed channels after every rainfall.
2. After grass is established, periodically check the channel including after significant storm events.
3. Check for erosion along the edge of the turfed area. If erosion is occurring, take appropriate measures to avoid further erosion.
4. If damage has occurred, immediately initiate repairs with turf or by seeding as appropriate.
5. Remove excessive sediment deposition or debris from the channel to maintain the channel's required hydraulic capacity.
6. Maintain a healthy and vigorous grass condition whenever and wherever possible, including watering and fertilising as needed.
7. Ensure a minimum grass leaf blade length of 50mm is maintained in areas subject to medium to high flow velocities, and 20 to 50mm in low velocity areas.
8. Mowing should not be attempted until the turf is firmly rooted, usually 2 to 3 weeks after laying.
9. All reasonable measures shall be taken to collect grass clippings immediately after mowing if their removal by subsequent channel flows would contaminate sensitive downstream waterways or otherwise cause undesirable environmental harm.



Placement of turf within high velocity drains

Reference: Witheridge 2010, *Erosion and Sediment Control - A field Guide for Construction Site Managers.* Catchments & Creeks Pty Ltd., Brisbane, Queensland

CREATED: 12 October 2011 PRINTED: 12 October 2011 FILE NAME: H:\drafting Tools\SWMP dwgs\SD-GC-1 Grass Channel Linings.dwg

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TITLE: Grass Channel Linings

DRAWING NUMBER: SD-GC-1

REVISION:

Outlet Structure OS

OS

Materials (Rock pads)

* Rock: hard, angular, durable, weather resistant and evenly graded with 50% by weight larger than the specified nominal rock size and sufficient small rock to fill the voids between the larger rock. The diameter of the largest rock size should be no larger than 1.5 times the nominal rock size. Specific gravity to be at least 2.5.
* Geotextile fabric: heavy-duty, needle-punched, non-woven filter cloth, minimum 'bidim' A24 or equivalent.

Installation (Rock pads)

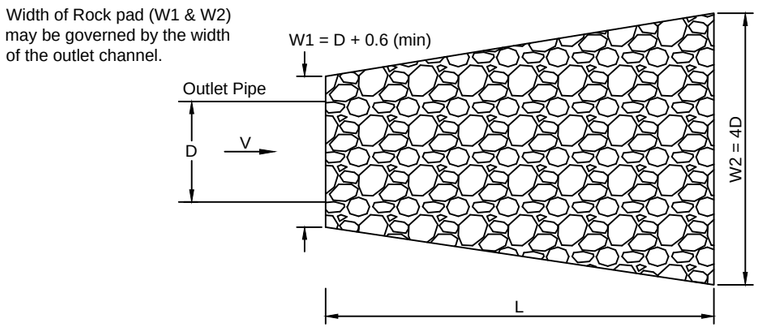
1. The dimensions of the outlet structure must align with the dominant flow direction.
2. Excavate the outlet pad footprint to the specified dimension such the when the rock is placed in the excavated pit the top of the rocks will be level with the surrounding ground, unless otherwise directed.
3. If the excavated soils are dispersive, over-excavated the rock pad by at least 300mm and backfill with stable, non-dispersive material.
4. Line the excavated pit with geotextile filter cloth, preferably using a single sheet. If joints are required, overlap the fabric at least 300mm.
5. Ensure the filter cloth is protected from punching or tearing during installation of the fabric and the rock. Repair any damage by removing the rock and placing with another piece of filter cloth over the damaged area overlapping the existing fabric a minimum of 300mm.
6. Ensure there are at least two layers of rocks. Where necessary, reposition the larger rocks to ensure two layers of rocks are achieved without elevating the upper surface above the pipe invert.
7. Ensure the rock is placed in a manner that will allow water to discharge freely from the pipe.
8. Ensure the upper surface of the rock pad does not cause water to be deflected around the edge of the rock pad.
9. Immediately after construction, appropriately stabilise all disturbed areas.

Maintenance

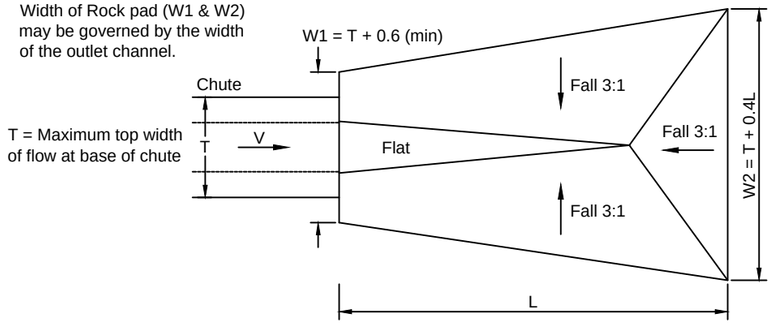
1. While construction works continue on the site, inspect the outlet structure prior to forecast rainfall, daily during extended periods of rainfall, after significant runoff producing rainfall, and on at least a weekly basis.
2. Replace any displaced rock with rock of a significantly (minimum 110%) larger size than the displaced rock.

Removal

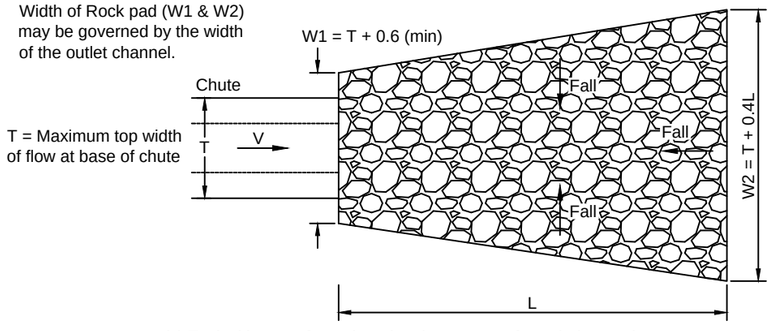
1. Temporary outlet structures should be completely removed, or where appropriate, rehabilitated so as not to cause ongoing environmental nuisance or harm.
2. Following removal of the device, the disturbed area must be appropriately rehabilitated so as not to cause ongoing environmental nuisance or harm.
3. Remove materials and collected sediment and dispose of in a suitable manner that will not cause an erosion or pollution hazard.



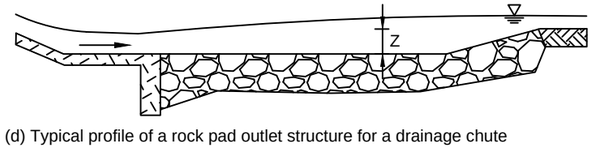
(a) Typical layout of rock pad outlet structure for pipe outlet



(b) Typical form of a rock pad outlet structure for a drainage chute



(c) Typical layout of a rock pad outlet structure for a drainage chute



(d) Typical profile of a rock pad outlet structure for a drainage chute

Notes:
1. Drawings applicable to temporary drainage chutes and slope drains.
2. Rock pad outlet structures for slope drains usually are not required to be recessed below natural ground level as is the case for chute outlets (see figure b).

Reference: Witheridge 2010, *Erosion and Sediment Control - A field Guide for Construction Site Managers.* Catchments & Creeks Pty Ltd., Brisbane, Queensland

CREATED: 14 October 2011 PRINTED: 14 October 2011 FILE NAME: P:\Admin\Auto\CAD\Templates\SWMP dwgs\SD-OS-1 Outlet Structure.dwg

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TITLE: Outlet Structures

DRAWING NUMBER: SD-OS-1

REVISION:

Revegetation - General R

R

Specifications for site revegetation vary considerably from site to site. Site supervisors should obtain site specific planting specifications.

Installation

1. Ensure all necessary soil testing (e.g. soil pH, nutrient levels) and analysis has been completed, and required soil adjustments performed prior to planting.
2. Apply soil conditioners and fertiliser as specified on the approved plans. Rip the soil 100 to 150mm to mix the components into the soil and to loosen and roughen the soil surface before seeding.
3. Where possible, there should be sufficient soil depth to provide an adequate root zone. The depth to rock or impermeable layers such as hardpans should be 300mm or more, except on slopes steeper than 2:1(H:V) where such soil depth may not be feasible.
4. Ensure the soil pH is within the specified range.
5. Apply seed uniformly by hand or with a cyclone seeder, drop-type spreader, drill, hydroseeder, hydromulcher, or other suitable equipment as specified.
6. When using broadcast-seeding methods, subdivide the area into workable sections and apply one-half the specified quantity of seed while moving back and forth across the area, making a uniform pattern. Then apply the second half in the same way, but moving at right angles to the first pass. Cover broadcast seed by raking or chain dragging; then firm the surface with a roller to provide good seed contact.
7. Apply seed at the recommended rate, and disc or otherwise mechanically treat the surface to bring the seed into contact with the soil.
8. The seeded area should be mulched as specified in the approved plan.

Maintenance

1. During the construction phase, inspect the treated area fortnightly and after runoff-producing rainfall. Make repairs as needed.
2. Watering the vegetation periodically is essential, especially in the first 7 days after establishment. Use low-pressure sprays because high-pressure jets can wash away the seed and mulch cover.
3. Watering should start immediately after planting. Watering should comply with specifications provided with the approved plans. Generally watering should vary according to weather and soil conditions. A typical watering schedule may consist of the following:
* 25mm every second day for the first three waterings;
* 25mm twice a week for the next three weeks; and
* 25mm once weekly for a further two weeks.
4. Monitor site revegetation, particularly after rainfall, and appropriate maintenance and/or amendment to ensure that the revegetation is controlling erosion and stabilising soil slopes as required.
5. Where practicable, fill in, or level out, any rill erosion between plants. If excessive erosion occurs, then consider increasing the planting density, applying appropriate erosion control measures, or introducing alternative, non-clumping plant species.
6. Areas must be re-seeded and mulched if the vegetation fails to establish or is damaged by runoff or construction activities.
7. If the temporary vegetation cover or erosion control measure (e.g. mulch cover) should fail for any reason before establishment of the permanent vegetation cover, then it must be replaced with an appropriate type of cover sufficient to control soil erosion.
8. If the permanent vegetation should fail to establish or to adequately restrain erosion for any reason during the construction or maintenance period, the area should be revegetated or protected with other erosion control measures as appropriate.
9. In areas where the obtained vegetation cover is considered inadequate for erosion control, the affected area should be over-seeded and fertilised using half the originally specified rates, or as directed.
10. Maintain grass blade length at a minimum 50mm height within medium to high velocity drainage areas, and 20 to 50mm within low velocity flow paths.
11. Where necessary, or as directed by the site supervisor, slash the temporary crop/grass cover to allow the successful growth of the underlying permanent vegetation cover.
12. Control weed growth within 1m of immature trees for 6 to 12 months for fast growing species, and 18 to 20 months for slower growing species, or until the end of the specified maintenance period.
13. Where mulch is used to control weed growth, inspect and where necessary, renew at maintenance periods not exceeding 4 to 6 months.
14. Apply additional seed, mulch and/or soil conditioning as required. Mulches usually need to be maintained or renewed (as necessary) 2 to 3 times a year.
15. Inspect and where necessary repair protective fencing at maintenance periods not exceeding 1 month.
16. Re-firm plants loosened by wind-rock, livestock or wildlife.
17. Replace dead or severely retarded plants.
18. Prune any plants of dead or diseased parts. Cut off all damaged tree limbs above the tree collar at the trunk or main branch. Use several cuts including undercutting to avoid peeling bark from the healthy areas of the tree.
19. Dispose of cleared vegetation in an appropriate manner such as chipping or mulching, on-site burial, or off-site disposal. Cleared vegetation should not be dumped near a watercourse or on a floodplain where is could be removed by floodwaters. Vegetation should not be burnt on-site without specific approval from the local authority.
20. Repair damaged tree roots by cutting off the damaged areas and sealing them with an approved product. Spread moist topsoil over exposed roots.

Reference: Witheridge 2010, *Erosion and Sediment Control - A field Guide for Construction Site Managers.* Catchments & Creeks Pty Ltd., Brisbane, Queensland

CREATED: 21 October 2011 PRINTED: 21 October 2011 FILE NAME: F:\Admin\Auto\CAD\Templates\SWMP dwgs\SD-R-1 Revegetation.dwg

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TITLE: Revegetation - General

DRAWING NUMBER: SD-R-1

REVISION:

Rock Check Dam RCD

RCD

Materials

* Rock: 150 to 300mm nominal diameter, hard, erosion resistant rock. Smaller rock may be used if suitable large rock is not available.
* Sandbags: geotextile bags (woven synthetic, or non-woven biodegradable) filled with clean coarse sand, clean aggregate, straw or compost.

Installation

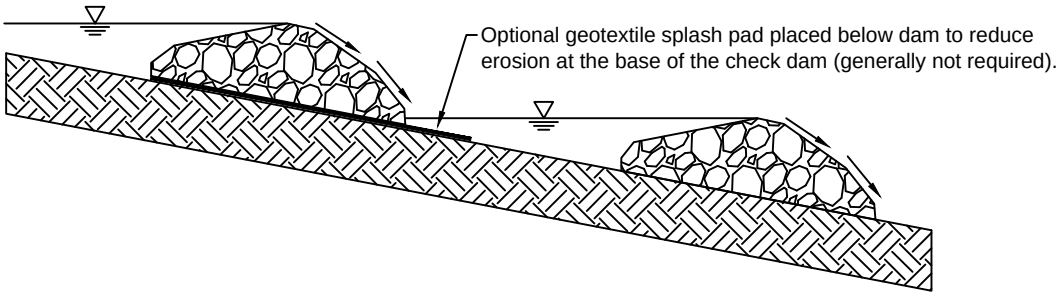
1. Prior to placement of the check dams, ensure the type and size of each check dams will not cause a safety hazard or cause water to spill out of the drain.
2. Locate the first check dam at the downstream end of the section of channel being protected. Locate each successive check dam such that the crest of the immediate downstream dam is level with the toe of the check dam being installed.
3. Ensure the channel slope is no steeper than 10:1 (H:V). Otherwise consider the use of a suitable channel liner instead of the check dams.
4. Construct the check dam to the dimensions and profile shown within the approved plan.
5. Where specified, the check dams shall be constructed on a sheet of geotextile fabric used as a downstream splash pad.
6. Each check dam shall be extended up the channel bank (where practicable) to an elevation at least 150mm above the crest level of the dam.

Maintenance

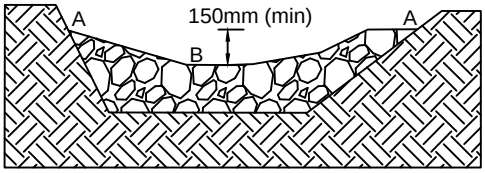
1. Inspect each check dam and the drainage channel at least weekly and after runoff-producing rainfall.
2. Correct all damage immediately. If significant erosion occurs between any of the check dams, then check the spacing of dams and where necessary install intermediate check dams or a suitable channel liner.
3. Check for displacement of the check dams
4. Check for soil scour around the ends of each check dam. If such erosion is occurring, consider extending the width of the check dam to avoid such problems.
5. If severe soil erosion occurs either under or around the check dams, then seek expert advice on an alternative treatment measure.
6. Remove any sediment accumulated by the check dams, unless it is intended that this sediment will remain within the channel.
7. Dispose of collected sediment in a suitable manner that will not cause an erosion or pollution hazard.

Removal

1. When construction work within the drainage area above the check dams has been completed, and the disturbed areas and the drainage channel are sufficiently stabilised to restrain erosion, all temporary check dams must be removed.
2. Remove the check dams and associated sediment and dispose of in a suitable manner that will not cause an erosion or pollution hazard.



(a) Layout of check dams (rock check dams shown)



Outer wing points A to be at least 150mm above crest level B

(b) Profile of check dams (rock check dams shown)

Reference: Witheridge 2010, *Erosion and Sediment Control - A field Guide for Construction Site Managers.* Catchments & Creeks Pty Ltd., Brisbane, Queensland

CREATED: 14 October 2011 PRINTED: 2 November 2011 FILE NAME: F:\Admin\Auto\CAD\Templates\SWMP dwgs\SD-RCD-1 Rock Check Dam.dwg

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TITLE: Rock Check Dam

DRAWING NUMBER: SD-RCD-1

REVISION:

Rock Linings RR

RR

Materials

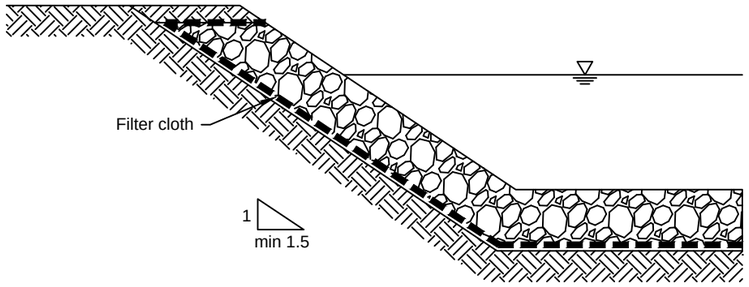
* Rock: hard, angular, durable, weather resistant and evenly graded with 50% by weight larger than the specified nominal rock size and sufficient small rock to fill the voids between the larger rock. The diameter of the largest rock size should be no larger than 1.5 times the nominal rock size. Specific gravity to be at least 2.5.
* Geotextile fabric: heavy-duty, needle-punched, non-woven filter cloth, minimum 'bidim' A24 or equivalent.

Installation

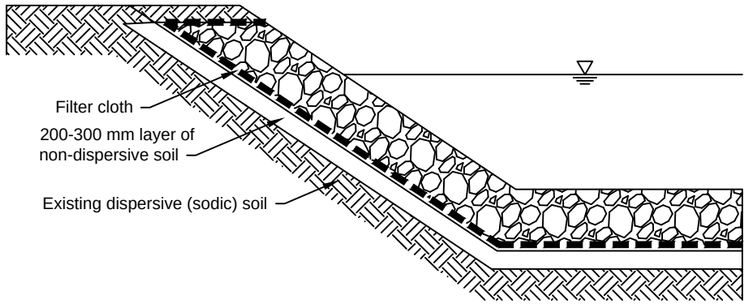
1. Clear the proposed channel area of trees, stumps, roots, loose rock, and other objectionable materials.
2. Excavate the channel to the lines and grades as shown on the plans. Over-cut the channel to a depth equal to the specified depth of rock placement such that the finished rock surface will be at the elevation of the surrounding land.
3. Rock must be placed within the channel, including the placement of any specified filter layer.
4. If details are not provided on the rock placement, then the primary armour rock must be either placed on:
* a filter bed formed from a layer of specified smaller rock (rock filter layer);
* an earth bed lined with filter cloth;
* an earth bed not lined in filter cloth, but only if all voids between the armour rock are to be filled with soil and pocket planted immediately after placement of the rock.
5. If a rock/aggregate filter layer is specified, then place the filter layer immediately after the foundations are prepared. Spread the filter rock in a uniform layer to the specified depth but a minimum of 150mm. Where more than one layer of filter material has been specified, spread each layer such that minimal mixing occurs between each layer of rock.
6. If a geotextile (filter cloth) underlay is specified, place the fabric directly on the prepared foundation. If more than one sheet of fabric is required to over the area, overlap the edge of each sheet at least 300mm and place anchor pins at minimum one metre spacing along the overlap.
7. Ensure the geotextile fabric is protected from punching or tearing during installation of the fabric and the rock. Repair any damage by removing the rock and placing with another piece of filter cloth over the damaged area overlapping the existing fabric a minimum of 300mm.
8. Where necessary, a minimum 100mm layer of fine gravel, aggregate or sand should be placed over the fabric to protect it from damage.
9. Placement of rock should follow immediately after placement of the filter layer. Place rock so that it forms a dense, well-graded mass of rock with a minimum of voids.
10. Place rock to its full thickness in one operation. Do not place rock by dumping through chutes or other methods that cause segregation of rock sizes.
11. The finished surface should be free of pockets of small rock or clusters of large rocks. Hand placing may be necessary to achieve the proper distribution of rock sizes to produce a relatively smooth, uniform surface. The finished grade of the rock should blend with the surrounding area. No overfall or protrusion of rock should be apparent.
12. Immediately upon completion of the channel, vegetate all disturbed areas or otherwise protect them against soil erosion.
13. Where specified, fill all voids with soil and vegetate the rock surface.

Maintenance

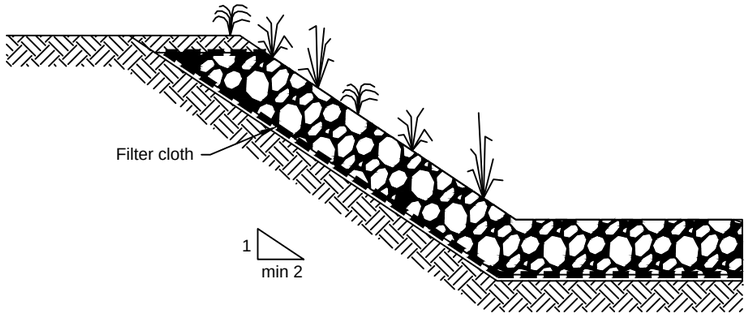
1. Rock-lined channels should be inspected periodically and after significant storm events. Check for scour or dislodged rock. Repair damaged areas immediately.
2. Closely inspect the outer edges of the rock protection. Ensure water entry into the channel or chute is not causing erosion along the edge of the rock protection.
3. Carefully check the stability of the rock looking for indications of piping, scour holes, or bank failures.
4. Replace any displaced rock with rock of a significantly (minimum 110%) larger size than the displaced rock.



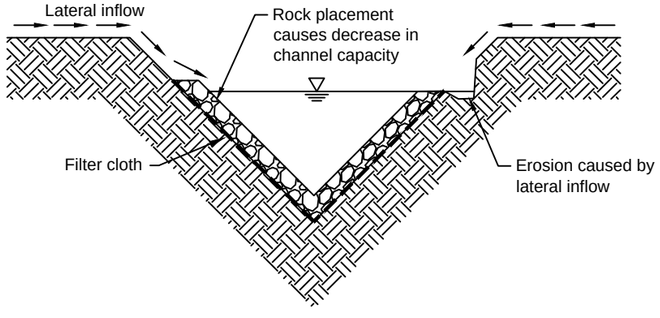
(a) Placement of rock with open voids



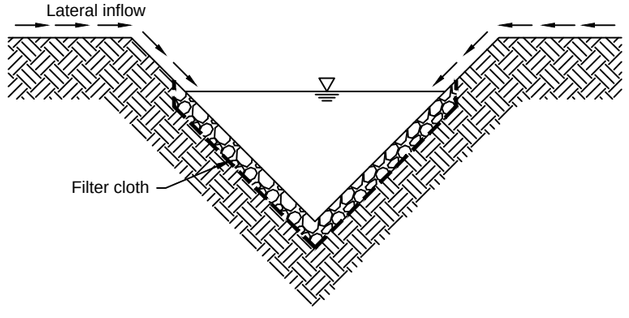
(b) Placement of rock within a channel cut into dispersive soils



(c) Placement of rock with voids filled with soil and vegetated



(d) Poor placement of rock along channel invert



(e) Good placement of rock along channel invert

Reference: Witheridge 2010, *Erosion and Sediment Control - A field Guide for Construction Site Managers.* Catchments & Creeks Pty Ltd., Brisbane, Queensland

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TITLE: Rock Linings

DRAWING NUMBER: SD-RR-1

REVISION:

Sediment Fence SF

SF

Materials

* Fabric: polypropylene, polyamide, nylon, polyester, or polyethylene woven or non-woven fabric, at least 700mm in width and a minimum unit weight of 140GSM. All fabrics to contain ultraviolet inhibitors and stabilisers to provide a minimum of 6 months of useable construction life (ultraviolet stability exceeding 70%).
* Fabric reinforcement: wire or steel mesh minimum 14-gauge with a maximum mesh spacing of 200mm.
* Support posts/stakes: 1500mm2 (min) hardwood, 2500mm2 (min) softwood, or 1.5kg/m (min) steel star pickets suitable for attaching fabric.

Installation

1. To the maximum degree practical, and where the plans allow, ensure the fence is located:
(i) totally within the property boundaries;
(ii) along a line of constant elevation wherever practical;
(iii) at least 2m from the toe of any filling operations that may result in shifting soil/fill damaging the fence.
2. Install returns within the fence at maximum 20m intervals if the fence is installed along the contour, or 5 to 10m maximum spacing (depending on slope) if the fence is installed at an angle to the contour. The 'returns' shall consist of either:
(i) V-shaped section extending at least 1.5m up the slope; or
(ii) sandbag or rock/aggregate check dam a minimum 1/3 and maximum 1/2 fence height, and extending at least 1.5m up the slope.
3. Ensure the extreme ends of the fence are turned up the slope at least 1.5m, or as necessary, to minimise water bypassing around the fence.
4. Ensure the sediment fence is installed in a manner that avoids the concentration of flow along the fence, and the undesirable discharge of water around the ends of the fence.
5. If the sediment fence is to be installed along the edge of existing trees, ensure care is taken to protect the trees and their root systems during installation of the fence. Do not attach the fabric to the trees.
6. Unless directed by the site supervisor, excavate a 200mm wide by 200mm deep trench along the proposed fence line, placing the excavated material on the up-slope side of the trench.
7. Along the lower side of the trench, appropriately secure the stakes into the ground spaced no greater than 3m if supported by a top support wire or weir mesh backing, otherwise no greater than 2m.
8. If specified, securely attach the support wire or mesh to the up-slope side of the stakes with the mesh extending at least 200mm into the excavated trench. Ensure the mesh and fabric is attached to the up-slope side of the stakes even when directing a fence around a corner or sharp change-of-direction.
9. Wherever possible, construct the sediment fence from a continuous roll of fabric. To join fabric either:
(i) attach each end to two overlapping stakes with the fabric folding around the associated stake one turn, and with the two stakes tied together with wire (Method 1); or
(ii) overlap the fabric to the next adjacent support post (Method 2).
10. Securely attach the fabric to the support posts using 25 x 12.5mm staples, or tie wire at maximum 150mm spacing.
11. Securely attach the fabric to the support wire/mesh (if any) at a maximum spacing of 1m.
12. Ensure the completed sediment fence is at least 450mm, but not more than 700mm high. If a spill-though weir is installed, ensure the crest of the weir is at least 300mm above ground level.
13. Backfill the trench and tamp the fill to firmly anchor the bottom of the fabric and mesh to prevent water from flowing under the fence.
14. If it is not possible to anchor the fabric in an excavated trench, then use a continuous layer of sand or aggregate to hold the fabric firmly on the ground.

Additional requirements for the installation of a spill-through weir

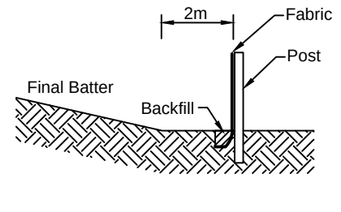
1. Locate the spill-through weir such that the weir crest will be lower than the ground level at each end of the fence.
2. Ensure the crest of the spill-through weir is at least 300mm the ground elevation.
3. Securely tie a horizontal cross member (weir) to the support posts/stakes each side of the weir. Cut the fabric down the side of each post and fold the fabric over the cross member and appropriately secure the fabric.
4. Install a suitable splash pad and/or chute immediately down-slope of the spill-through weir to control soil erosion and appropriately discharge the concentrated flow passing over the weir.

Maintenance

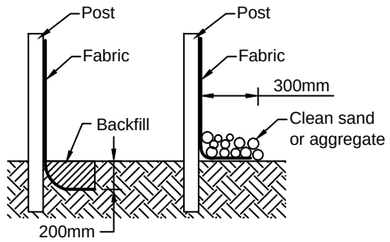
1. Inspect the sediment fence at least weekly and after any significant rain. Make necessary repairs immediately.
2. Repair any torn sections with a continuous piece of fabric from post to post.
3. When making repairs, always restore the system to its original configuration unless an amended layout is required or specified.
4. If the fence is sagging between stakes, install additional support posts.
5. Remove accumulated sediment if the sediment deposit exceeds a depth of 1/3 the height of the fence.
6. Dispose of sediment in a suitable manner that will not cause an erosion or pollution hazard.
7. Replace the fabric if the service life of the existing fabric exceeds 6-months.

Removal

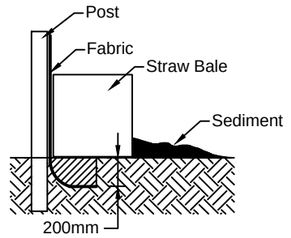
1. When disturbed areas up-slope of the sediment fence are sufficiently stabilised to restrain erosion, the fence must be removed.
2. Remove materials and collected sediment and dispose of in a suitable manner that will not cause an erosion or pollution hazard.
3. Rehabilitate/revegetate the disturbed ground as necessary to minimise the erosion hazard.



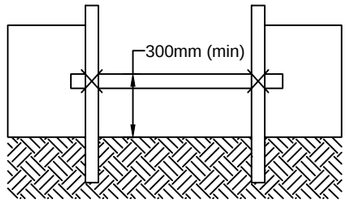
(a) Location of fence relative to base of slope



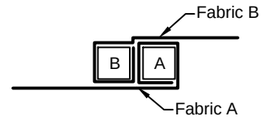
(b) Anchoring base of fabric



(c) Placement of up-slope straw bale

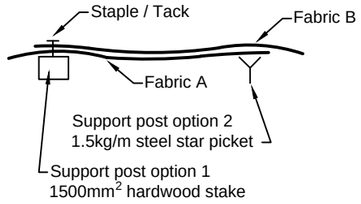


(d) Spill-through weir

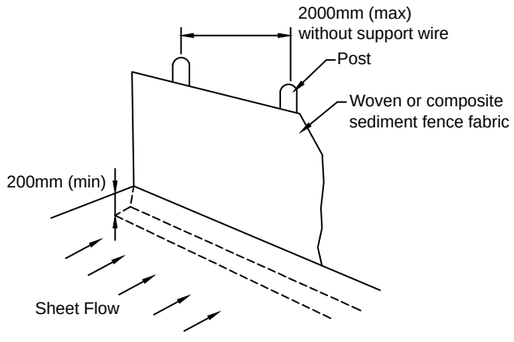


Fabric to fold around each stake one full turn.
Stake B to be driven tightly against Stake A.
The tops of both stakes to be secured with wire.

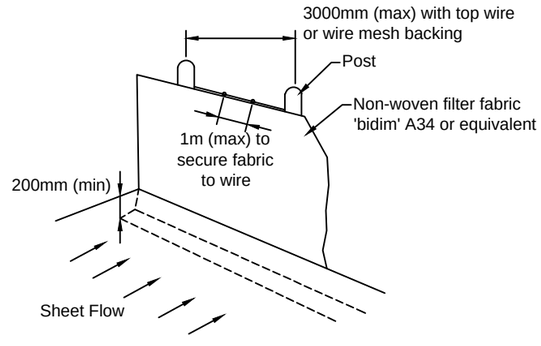
(e) Joining fabric - Method 1



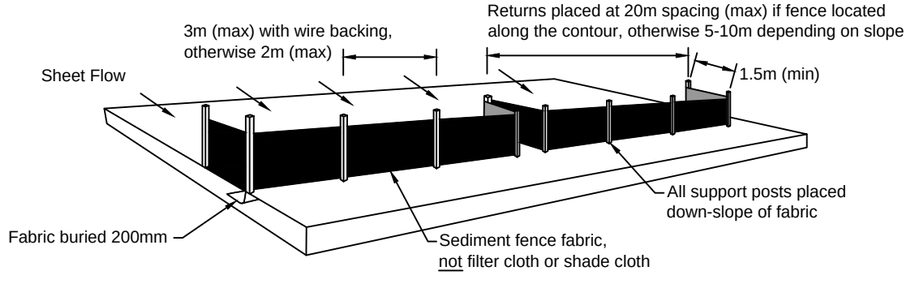
(f) Joining fabric - Method 2



(g) Installation without backing support



(h) Installation with top wire support



(i) Installation of sediment fence

Reference: Witheridge 2010, *Erosion and Sediment Control - A field Guide for Construction Site Managers.* Catchments & Creeks Pty Ltd., Brisbane, Queensland

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TITLE: Sediment Fence

DRAWING NUMBER: SD-SF-1

REVISION:

Appendix C

EPBC Offset Assessment Guide (OAG) – Macadamia integrifolia

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Macadamia
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**		Hectares	
			Quality		Scale 0-10	
			Total quantum of impact	0.00	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	Yes	Trees	15		Count	

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes		Adjusted hectares		**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00		0.00	0.00	0.00	#DIV/0!	#DIV/0!	
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**		0.00		0.00	0.00				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	Yes	15	Count				0		0		60		60	75%	45.00	45.00	300.00%	Yes		

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	15	45.00	300.00%	**Yes**	$0.00	N/A	$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0	0.00	#DIV/0!	**#DIV/0!**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**