APPENDIX 8: BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Modification 4 – Western Extension – Cabbage Tree Road Sand Quarry

Biodiversity Development Assessment Report

442 Cabbage Tree Road, Williamtown

Report prepared for:
Williamtown Sand Syndicate Pty Ltd

Rev 1
5 February 2025

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Version Control

Rev. No.	Revision Date	Author/s	Reviewer	Details
Rev 1	5 February 2025	Ashley Elise Owen	Samara Schulz/Mark Dean	Final (Submitted with Mod 4)

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Report Authorised by:
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BAAS24008

I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 of the Biodiversity Conservation Act 2016 (BC Act).

Signed: __  __

Date: __05/02/2024__

This BDAR has been prepared to meet the requirements of BAM 2020.

Executive Summary

ES1 Project description

Wedgetail Project Consulting (WPC) was engaged by Williamtown Sand Syndicate PTY LTD (WSS) to prepare a Biodiversity Development Application Report (BDAR) as part of a modification (MOD 4) to the Development Consent for the Cabbage Tree Road Sand Quarry (SSD-6125). WSS are the owners of the quarry operator Newcastle Sand.

The proposed modification seeks to amend the Consent in the following areas:

- Extend the boundary of the approved resource area in a westerly direction to recover additional sand resources;
- Expand road corridors for operational purposes.
- Amend the development footprint so that areas of remnant vegetation, previously approved for development can be incorporated into the on-site offset area, and replace areas required for road corridors.

ES2 Biodiversity Offset Scheme triggers

As the project is a modification to a Major Project that increases impacts on biodiversity, the BAM and BOS are automatically applied and a full BDAR is required under the BC Act.

The Development Modification is a Major Project and seeks to amend the Development Consent for the Cabbage Tree Road Sand Quarry, a State Significant Development (SSD-6125) therefore requires development approval by the Minister for Planning under Part 4, Division 4.7 of the EP&A Act.

ES3 Measures to avoid and minimise

Avoidance and minimisation of biodiversity impacts has been factored in when planning the proposal, this includes:

- Significant habitat features identified during the field surveys for the Biodiversity Development Assessment Report (BDAR) were communicated to the client to allow for potential avoidance and minimisation measures to be adapted.
- The proposed re-design has allowed areas of greater biodiversity value to be retained such as remnant vegetation that is connected to the proposed on-site offset area. This area contains habitat features suitable for threatened fauna found on-site, as well as threatened flora species.

ES4 Native vegetation

A total of 5.28 hectares (ha) of native vegetation was mapped within the Development Site.

One Plant Community Type (PCT) was identified within the Development Site:

- PCT 3544: Coastal Sands Apple-Blackbutt Forest

A total of three vegetation zones were identified within the Development Site for the single PCT. Zones were mapped based on condition, regeneration, previous disturbance and species

composition. Zones were designated as Moderate/Good, Disturbed and Rehabilitated. Additionally, 0.99 ha of Residences, Tracks and Unvegetated Areas occur within the Development Site.

There were no Threatened Ecological Communities (TEC's) identified within the Development Site.

ES5 Threatened Species

One threatened flora species, *Eucalyptus parramattensis* subsp. *decadens* (Earp's Gum) was identified within the Development Site.

Three threatened fauna species were recorded during targeted surveys, including:

- *Petaurus norfolcensis* (Squirrel Glider)
- *Crinia tinnula (Wallum Froglet)*
- *Uperoleia mahonyi* (Mahony's Toadlet)

One threatened fauna species, Koala (*Phascolarctos cinereus*) was assumed present.

ES6 Impacts

Direct impacts such as clearing of vegetation and earthworks will occur during the construction phase of the proposed works.

The proposal has the potential for increased edge effects on the vegetation surrounding the Development Site. Potential indirect impacts that could occur because of the proposed Modification include:

- Accidental incursions during clearing.
- Increased weed invasion due to edge effects.
- Increase in dust during clearing works.
- Increase in noise during clearing works.

The vegetation within the majority of the Development Site is of high quality, these indirect impacts have potential to reduce the integrity of the vegetation particularly around the edges.

Potential impacts on connectivity were the only Prescribed Impact identified as potentially occurring due to the proposal. The vegetation within the Development Site is part of a larger patch of vegetation in the local area including the proposed On-Site Offset, directly connected to extensive areas of forested habitat within the Tilligerry State Conservation Area (SCA) and adjacent areas around Tomago and Williamtown that provide connectivity and movement corridors.

One serious and irreversible impacts (SAII) was assessed for Diuris arenaria.

ES6 Mitigation measures

Mitigation measures for direct, indirect and prescribed impacts are outlined in **Table ES 1**:

Table ES 1: Mitigation measures

Impact	Action and Outcome	Responsibility	Timing
Direct and Prescribed Impacts			
Clearing of Native Vegetation	• Clearly delineate the boundaries of the Development Site to ensure no accidental incursions within retained vegetation	Construction Site Manager	Prior to, during and post

Impact	Action and Outcome	Responsibility	Timing
	• Ensure vehicle and equipment parking areas and stockpile areas are identified and sited to avoid areas containing ecological value wherever practicable • Appropriate signage such as 'No Go Zone' or 'Environmental Protection Area' to be installed • Identify and communicate the location of any 'No Go Zones' in site inductions. • Frog fencing has been installed around the boundary of the existing quarry and will extend around the proposed Development Area. This fence is similar to sediment fencing however it is installed on an angle that leans back away from the boundary. The backward angle directs frogs that jump onto the fencing back into the area they have come from. • Progressive rehabilitation of the Development Site in accordance with the exiting site Management Plan.		vegetation clearing
Removal of hollow-bearing trees, resulting in fauna injury and mortality	• All potential hollow-bearing trees to be marked prior to clearing. All other vegetation to be cleared, and hollow-bearing trees to be left for two nights to allow fauna to self-relocate • All habitat trees to be soft-felled to reduce potential impacts on inhabiting fauna • A suitably qualified and trained fauna handler is to be present during hollow-bearing tree clearing to rescue and relocate displaced fauna.	Construction site manager	Prior to and during habitat tree removal
Impacts to surface quality and quantity due to sediment run-off and/or contaminant runoff	• Source controls such as sediment fences, mulching and jute matting will be utilised where appropriate • Site-based vehicles will carry spill kits.	Construction site manager	During all surface disturbance works when the site is under construction
Indirect and Prescribed Impacts			
Transfer of weeds and pathogens	• Fungal pathogens, including *Phytophora cinnamomi* and Myrtle Rust (*Puccinia psidii*), can impact on native plant communities and inhabiting fauna if not managed. Vehicles and equipment to be washed down prior to arrival on-site • Ensure soil and seed material is not transferred on machinery though appropriate wash down procedures	Construction site manager	During construction works
Noise, vibration, waste and air pollution impacts to adjacent sensitive habitat areas	• Restriction of public access and associated impacts from domestic pets, waste dumping and damage to adjoining vegetation must be enforced pre, during and post construction • Fence sensitive areas to delineate 'no go' zones • Impacts of noise and light will be limited as night works are not proposed	Construction site manager	During construction works

Impact	Action and Outcome	Responsibility	Timing
	• Dust control measures will include covering loads where required; amending operations under excessive wind conditions including ceasing operations if required; use of water as required to control dust		

ES7 Offsets

Impacts that require an offset (as per BAM Subsection 9.2.2(2.) for ecosystem and species credits are identified in **Table ES 2** and **Table ES 3**.

Table ES 2: Impacts that require an offset – ecosystem credits

Zone	PCT & Condition Class	Area (ha)	Current Vegetation Integrity Score	Credits Required
1	3544 Moderate-Good	2.35	72.5	64
2	3544 Shrubby	1.58	20	12
3	3544 Managed	0.69	17.5	5
			Total	**81**

Table ES 3: Impacts that require an offset – species credits

Scientific Name	Common Name	Vegetation Zone	Loss of habitat (ha) or individuals	Credits Required
Eucalyptus parramattensis subsp. *decadens*	Earp's Gum	3544 ModGood	29	58
Phascolarctos cinereus	Koala	3544 ModGood	2.35 ha	85
Petaurus norfolcensis	Squirrel Glider	3544 Moderate-Good	2.35 ha	85
		3544 Shrubby	1.58 ha	16
Crinia tinnula	Wallum Froglet	3544 Moderate-Good	0.1 ha	3
		3544 Shrubby	0.03 ha	1
Uperoleia mahonyi	Mahony's Toadlet	3544 Moderate-Good	2.35 ha	85
		3544 Shrubby	1.58 ha	16
		3544 Managed	0.69 ha	6
Diuris arenaria	Sand Doubletail	3544 Moderate-Good	2.35 ha	9
		3544 Shrubby	1.58 ha	128
		3544 Managed	0.69 ha	24
			Total	**516**

ES7 Offset Replacement

Impacts that require replacement include:

- A total of 0.67 ha of Coastal Sand Apple-Blackbutt Forest (PCT3544) in moderate condition (0.47 ha), shrubby (0.03 ha) and managed condition (0.17 ha) occurs across these areas. These areas are primarily comprised of previously cleared areas, or vegetation that is bordered by clearing so that it is somewhat degraded.
- Threatened flora species and threatened fauna habitat features include
    - One *Eucalyptus parramattensis* subsp. *decadens* individual occurs within this area.
    - One hollow bearing tree (containing one large basal hollow)
    - Koala habitat (0.47 ha) comprised of both preferred koala habitat and koala habitat buffers over supplementary habitat.

This will be replaced by the proposed Increased Offset Area.

- A total of 1.17 ha of Coastal Sand Apple-Blackbutt Forest (PCT 3544) in moderate-good condition is being added into the offset area. The majority of this area is comprised of remnant vegetation that was not historically cleared, and has all strata layers intact - canopy, midstory and ground layers.
- Threatened flora species, including nine (9) Eucalyptus camfieldii individuals.
- These areas also contain mature trees and hollow-bearing trees that provide suitable habitat for threatened fauna species that have previously been found on-site or/are predicted to use the site.
- Koala habitat (1.13 ha) considered supplementary koala habitat and its buffers as well as preferred koala habitat
- Approximately 15 Hollow-bearing trees and dead stags that provide suitable habitat (6 small, 6 medium and 7 large hollows) for Squirrel Glider, Eastern Bentwing-bat, Eastern Freetail-Bat and Little Bentwing.
- All of this vegetation provides suitable habitat for Rufous Fantail and foraging habitat for Grey-headed Flying Fox.
- A small amount of this area (0.23 ha) occurs within habitat buffer areas for Wallum Froglet (*Crinia tinnula*), and all of these areas (1.17 ha) provide suitable habitat for Mahony's Toadlet (*Uperolia mahonii*).

Overall, the addition of these areas into the on-site offset areas leads to a net gain, positive impact.

Contents

Figures

Tables

Abbreviations

API	Aerial Photography Imagery
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BCD	Biodiversity Conservation Division
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offsets Scheme
DPE	NSW Department of Planning and Environment
DPIE	Department of Planning, Industry and Environment
DAWE	Commonwealth Department of Agriculture, Water and Environment
DFSI	NSW Department of Finance, Services and Innovation
DPI	NSW Department of Primary Industry
DoEE	Department of the Environment and Energy
EG	Fern Growth
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EPIs	environmental planning instruments
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
FG	Forb Growth
GG	Grass and grass-like
GIS	Geographic Information System
GPS	Global Positioning System
HBT	Hollow bearing tree
HTW	high threat weed
IBRA	Interim Biogeographic Regionalisation for Australia
ICOLL	Intermittently Closed and Open Lake and Lagoon
KLF	Kleinfelder Australia

LEP	Local Environment Plan
LGA	local government area
LHCCREMS	Lower Hunter Central Coast Regional Environment Strategy
MNES	Matters of National Environmental Significance
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
OG	Other Growth
PCT	plant community type
PMST	Protected Matters Search Tool
RDP	Random Data Point
SAII	Serious and Irreversible Impact
SCA	State Conservation Area
SEPPs	State Environmental Planning Policies
SG	Shrub Growth
SSD	State Significant Development
TBDC	Threatened Biodiversity Data Collection
TEC	threatened ecological community
TG	Tree Growth
VZ	Vegetation Zone
WoNS	Weeds of National Significance
WPC	Wedgetail Project Consulting
WSS	Williamtown Sand Syndicate

1. INTRODUCTION

1.1 PROPOSED DEVELOPMENT

1.1.1 Development overview

Wedgetail Project Consulting (WPC) was engaged by Williamtown Sand Syndicate PTY LTD (WSS) to prepare a Biodiversity Development Application Report (BDAR) as part of a modification (MOD 4) to the Development Consent for the Cabbage Tree Road Sand Quarry (SSD-6125). WSS are the owners of the quarry operator Newcastle Sand (NS).The Cabbage Tree Road Sand Quarry is located approximately 3 km south-west of Newcastle Airport within the Port Stephens Council local government area (LGA). Access is via Cabbage Tree Road between Nelson Bay Road and Masonite Road (**Figure 1**).

The proposed MOD 4 seeks to extend the boundary of the approved resource area in a westerly direction in order to access additional sand resources (**Figure 1**). The proposal would result in the extraction area extending into Lot 9 DP239608, which adjoins the western boundary of the Project Area (see **Table 1** for terms), and increase the Quarry Site within Lot 100 DP 1263921 (this area was previously not proposed for Extraction or Offset). Lot 9 DP239608 (10.66 ha) is privately owned at present, with an agreement in place to purchase if the MOD is approved. The Lot currently supports a rural residential dwelling, sheds and native vegetation. If approved, extension of the quarry footprint will require demolition of existing infrastructure and clearance of vegetation. It is noted that the proposed extension area was subject to RZM mining activities in the 1970's, with native vegetation having been cleared at that time. Vegetation on the site at present therefore consists of regrowth on rehabilitated land.

Additionally, MOD4 proposes to impact on a total of 1.03 ha within the current Project Area (Lot 100 DP 1263921; **Figure 1**). These areas are comprised of road edges or areas connecting the existing Quarry Site to the western extension and are required for operational purposes.

Impacts on native vegetation as part of the Modification are proposed to be offset as follows:

- Impacts within the Western Extension – Those areas not previously assessed as part of the impact area or offset package for the Cabbage Tree Road Quarry (SSD-6125).
    - All impacts to native vegetation and threatened species habitat within the Western Extension have been surveyed and assessed in accordance with the BAM.
    - Offsetting of these impacts will be in accordance with the BOS.
- Impacts within the Disturbance Expansion Area (was approved offset area) – Those areas which occur within the on-site offset area and formed part of the Cabbage Tree Road Quarry (SSD-6125) offset package.
    - All impacts to native vegetation and threatened species habitat within the Disturbance Expansion Area have been surveyed and assessed in accordance with the BAM.
    - It is proposed to replace these offset areas with the Proposed Increased Offset Areas within Lot 100. These Proposed Increased Offset Areas formed part of the originally approved Quarry Site and will be relinquished to form part of the On-site Offset Area. Details on the habitat and vegetation condition within the Disturbance Expansion Area

and the Proposed Increased Offset Areas is discussed in **Section 8.2**. The replacement offset strategy for impacts on the Disturbance Expansion Area will result in a net neutral/positive area for the On-Site Offset Area.

- Original Approved On-site Offset Area (SSD-6125) = 131.12 ha (listed in the development consent as 131 ha).
- Proposed Disturbance Expansion Area = 0.64 ha.
- Proposed Increased Offset Areas (relinquishment of approved Quarry Site to On-site Offset Area) = 1.17 ha.
- Proposed On-site Offset Area post MOD4 = 131.47 ha.

A summary of terms identifying project elements in this Biodiversity Development Assessment Report (BDAR) are described in **Table 1**.

Table 1: Terms identifying project elements within this BDAR.

Term	Description
Quarry Site / Extraction Area	Current area approved for sand extraction, infrastructure and site access within the Cabbage Tree Road Sand Quarry (**Figure 2**).
NS Project Area	All areas that are subject to the Cabbage Tree Road Sand Quarry (SSD-6125) (176.92 ha) (**Figure 2**).
On-Site Offset	Area to be conserved as on-site offsets (131.12 ha) within the Project Area (**Figure 2**).
Study Area	The Study area covers approximately 11.68 ha. This Includes the entire Lot 9 DP239608 area (10.66 ha), as well as small areas of Lot 100 DP 1263921 totalling 1.02 ha. Part of this links the current Quarry Site with the (Lot 9 DP239608) Western Extension and the other areas occur on the edges of clearing or haul roads (**Figure 2**).
Development Footprint / MOD4	Proposed Modification 4 Area that is comprised of part of Lot 9 DP239608, and part of Lot 100 DP 1263921 (Figure 3) covering **7.80** ha.
Western Extension	The main section of the proposed development footprint located within Lot 9, and a portion of Lot 100 covering 7.1 ha. All areas of impact to native vegetation and threatened species habitat within the Western Extension would be subject to offsetting requirements in accordance with the BAM. Labelled as W.E. **Figure 1.**
Disturbance Expansion Area	These parts of the proposed development footprint occur within the on-site offset area, and require replacement rather than offsetting and total 0.64 ha. These are labelled D1 – D6 on **Figure 1.**
Proposed increase in offset	These are sections that have previously been approved for extraction, however no extraction has occurred to date, and they are now being relinquished into the on-site offset, as replacements for the 'disturbance expansion areas' totalling 1.17 ha. These are labelled OF1- OF7 on **Figure 1.**

This assessment has been undertaken in accordance with the New South Wales (NSW) Department of Planning and Environment (DPE) Biodiversity Assessment Method (BAM) (DPIE 2020a) under the *Biodiversity Conservation Act 2016* (NSW) (BC Act) to support the Development Application.

1.1.2 History

The current proposal represents the fourth modification to the Cabbage Tree Road Sand Quarry Development (SSD-6125), previous modifications include:

- Modification 1: Glass Sand Trial – March 2020.
- Modification 2: Addition of wash plant and ancillary equipment – March 2021.
- Modification 3 (withdrawn): proposed extension within Lot 100.

1.2 INFORMATION SOURCES

This BDAR addresses relevant government assessment requirements, guidelines and policies, and has been prepared in accordance with Appendix C of the BAM (DPIE 2020a).

It is noted that credit calculations were performed using the BAM calculator available at the time of submission (Version 80).

Knowledge from existing literature pertaining to the Development Site and broader locality was used to inform the BDAR. The following information sources were utilised:

- The NSW OEH BioNet Vegetation Classification (https://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx)
- The NSW OEH BioNet Atlas of NSW (http://www.bionet.nsw.gov.au/)
- The NSW OEH Threatened Biodiversity Data Collection (part of BioNet)
- The Department of the Environment and Energy (DoEE) Protected Matters Search Tool (PMST) for Matters of National Environmental Significance (MNES) (http://www.environment.gov.au/epbc/pmst/)
- Relevant published literature (see **Section 10**)

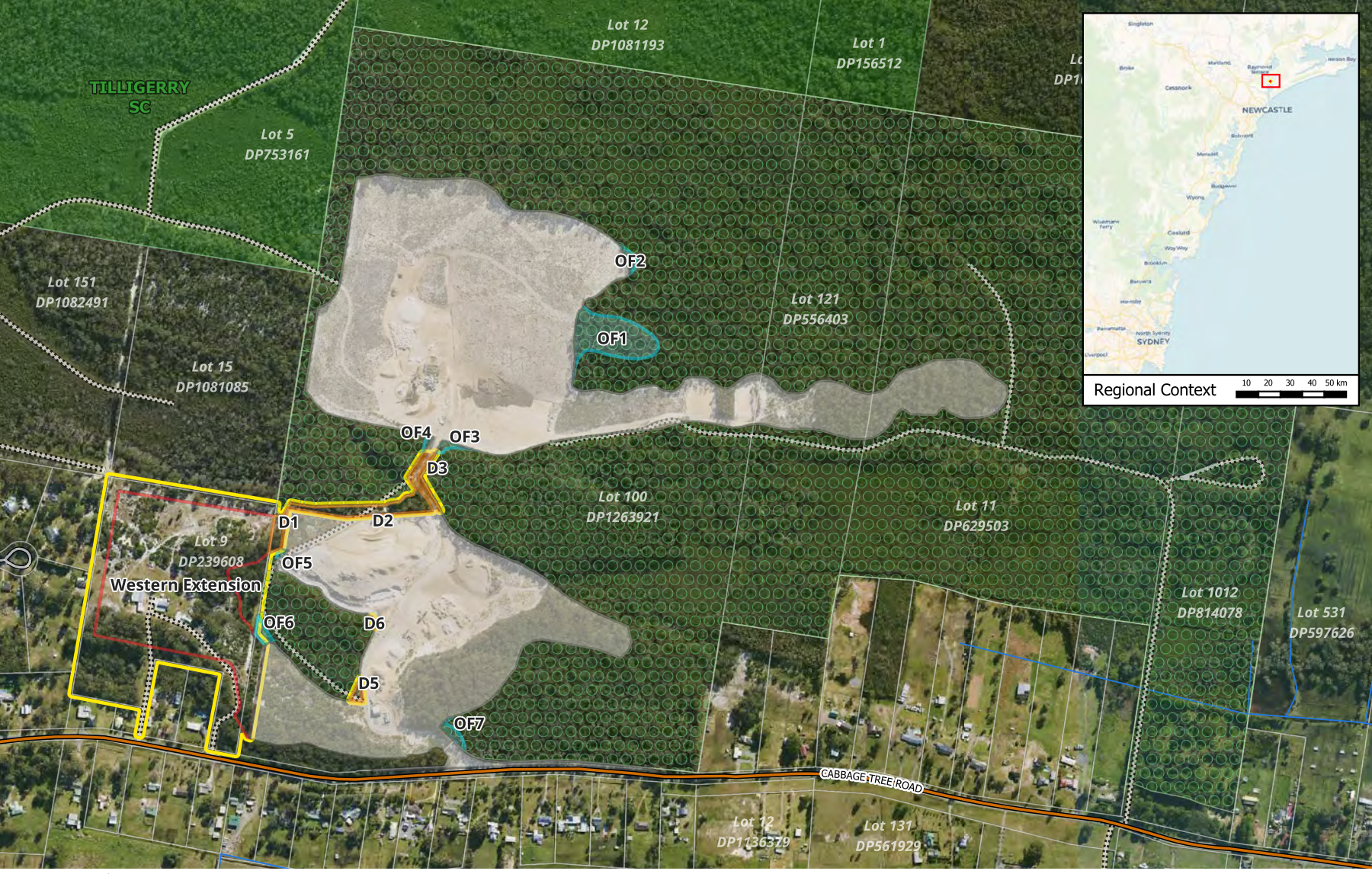
1.3 SPATIAL DATA

Base map data was obtained from NSW Department of Finance, Services and Innovation (DFSI) databases, with cadastral data obtained from DFSI digital cadastral database. Mapping for stream orders was obtained from NSW Department of Primary Industry (DPI).

The following spatial datasets were utilised during the development of this report:

- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7 (DoEE 2018).
- NSW (Mitchell) Landscapes Version V3.1 (OEH 2017).
- Directory of important wetlands in Australia (DAWE 2022a).
- Australian Ramsar Wetlands (DAWE 2022b).
- Fauna Corridors for North-East NSW (DPIE 2018).
- SEED Portal (Acid Sulfate Soil Risk) (NSW Government 2018).
- NSW Hydrography (Department of Finance, Services and Innovation 2018).

Mapping undertaken during the assessment was conducted using a hand-held GPS unit, mobile tablet computers running Terraflex for Trimble™ and aerial photo interpretation. Accuracy is subject to accuracy of GPS devices, generally ±5 m. In addition, a Trimble DA2 was used to get greater accuracy for the position of threatened tree locations, generally 0.6 – 2.0 m. Mapping has been produced using a Geographic Information System (GIS; QGIS).



WEDGETAIL
PROJECT CONSULTING PTY LTD

Wedgetail Project Consulting\Arbus - Documents\Newcastle Sand\MOD4 BDAR\@GIS\NS_MOD4_BDAR_Figures_250130.qgz

- Study Area (MOD4)
- Extraction Area (existing approval)
- Proposed Increase in Offset Area
- Disturbance Expansion Area
- Western Extension
- Proposed BSA
- Cadastre
- National Parks & Reserves
- Minor watercourse
- Arterial Road
- Local Road
- Track-Vehicular

Figure 1. Local & Regional Context

100 200 300 400 500 m

N

GDA94 / MGA zone 56
EPSG:28356

Map Produced: 03/02/2025
Produced By: Keryn Dowling

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Study Area (MOD4)
Disturbance Footprint (MOD4)
Newcastle Sand Project Area

Lot 9 DP239608
Proposed BSA
NSW LGA
IBRA subregion (v7)
Mitchell Landscapes (v31)

National Parks & Reserves
Arterial Road
Track-Vehicular
Minor watercourse

Figure 2. Site Map

N

GDA94 / MGA zone 56
EPSG:28356

100 200 300 400 500 m

Map Produced: 03/02/2025
Produced By: Keryn Dowling

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2. LEGISLATIVE CONTEXT

This chapter provides a brief outline of the key biodiversity legislation and government policy considered in this assessment.

2.1 COMMONWEALTH

2.1.1 Environmental Protection and Biodiversity Conservation Act 1999

The *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places and water resources which are defined as Matters of National Environmental Significance (MNES) under the EPBC Act. These are:

- World heritage properties
- Places listed on the National Heritage Register
- Ramsar wetlands of international significance
- Threatened flora and fauna species and ecological communities.
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- Water resources, in relation to coal seam gas or large coal mining development

An assessment of the Development Site against relevant EPBC Act matters is provided in **Section 9.1**.

2.2 STATE

2.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act was enacted to encourage the consideration and management of impacts of proposed development or land-use changes on the environment and the community. The EP&A Act is administered by the NSW Department of Planning, Industry and Environment (DPIE).

The EP&A Act provides the overarching structure for planning in NSW; however, is supported by other statutory environmental planning instruments (EPIs) including State Environmental Planning Policies (SEPPs). EPIs relevant to the Project are outlined further below.

2.2.2 State Environmental Planning Policy (Biodiversity and Conservation) 2021

Chapter 4 – Koala Habitat Protection 2021 of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (Biodiversity and Conservation SEPP) aims to encourage the conservation and management of areas of natural vegetation that provide habitat for Koalas to support a permanent free-living population over their present range and reverse the current trend of Koala population decline.

Chapter 4 applies to each Local Government Area listed in Schedule 2 of the Biodiversity and Conservation SEPP. Where a KPoM applies to the land, Clause 8 of the Koala SEPP 2021 applies to the development. In this case the proposed development must be consistent with the approved KPoM that applies to the land.

Port Stephens LGA is listed in Schedule 2 of the Biodiversity and Conservation SEPP 2021. However, as the Study Area is subject to the approved *Port Stephens Council Comprehensive Koala Plan of Management (CKPoM) (Port Stephens Council, 2002*), any Development Application to Council will need to be consistent with the requirements of the CKPoM.

Port Stephens Comprehensive Koala Plan of Management (CKPoM) 2002

The CKPoM was prepared by Port Stephens Council with the Australian Koala Foundation (2002) in accordance with SEPP 44 (now the Biodiversity and Conservation SEPP 2021) and activated by the proposed amending clause of the Port Stephens LEP (Appendix 3). This regulation represents an important means by which koala habitat can be protected and effectively managed. The general aims and objectives of these performance criteria are as follows:

i) To ensure that the koala population in the Port Stephens LGA is sustainable over the long-term.

ii) To protect koala habitat areas from any development which would compromise habitat quality or

integrity.

iii) To ensure that any development within or adjacent to koala habitat areas occurs in an environmentally sensitive manner.

iv) To ensure that acceptable levels of investigation are undertaken, considered and accepted prior to any development in or adjacent to koala habitat areas.

v) To encourage koala habitat rehabilitation and restoration.

vi) Maintain interconnection between areas of Preferred and Supplementary Koala Habitat and minimise threats to safe koala movements between such areas.

vii) To ensure that development does not further fragment habitat areas either through the removal of habitat or habitat links or through the imposition of significant threats to koalas.

viii) To provide guidelines and standards to minimise impacts on koalas during and after development, including any monitoring requirements.

ix) To provide readily understandable advice to proponents preparing development applications and for Council officers involved in the assessment of those applications.

According to the Guidelines for Koala Habitat Assessments in the PSC CKPoM (2002), to satisfy requirements for a development assessed under Part 4 of the EP&A Act, a Koala Habitat Assessment (Appendix 6) must be carried out by a suitably qualified person (a brief CV should be included for each person involved in the assessment), and include the following for steps:

1. Preliminary Assessment

2. Vegetation Mapping

3. Koala Habitat Identification

4. Assessment of Proposal

See **Section 9.2** for a summary of the Koala habitat assessment completed in accordance with the requirements of the CKPoM (Appendix 6) along with an assessment to meet performance criteria according to Appendix 6 of the CKPoM, with inclusion of consideration for the construction of roads according to Appendix 7 of the CKPoM.

2.2.3 State Environmental Planning Policy (Resilience and Hazards) 2021

Chapter 2 – Coastal Management applies to the coastal zones, including areas mapped as Coastal Wetlands and Littoral Rainforests. The aim of this Chapter is to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the Coastal Management Act 2016, including the management objectives for each coastal management area.

This Chapter of the Resilience and Hazards SEPP applied to the Development Modification and an assessment against the SEPP is outlined in **Section 9.3**.

2.3 BIODIVERSITY CONSERVATION ACT 2016

The BC Act is the legislation responsible for the conservation of biodiversity in NSW through the protection of threatened flora and fauna species, populations, and ecological communities. The BC Act, together with *the Biodiversity Conservation Regulation 2017* (BC Regulation), established the Biodiversity Offsets Scheme (BOS).

The BOS includes establishment of the BAM (DPIE 2020a) for use by accredited persons in biodiversity assessment under the scheme. The purpose of the BAM is to assess the impact of actions on threatened species and threatened ecological communities, and their habitats and determine offset requirements.

The BAM sets out the requirements for a repeatable and transparent assessment of terrestrial biodiversity values on land to:

- Identify the biodiversity values on land subject to proposed development.
- Determine the impacts of a proposed development, following all measures to avoid, minimise and mitigate impacts.
- Quantify and describe the biodiversity credits required to offset the residual impacts of proposed development on biodiversity values.

This biodiversity assessment has been undertaken in accordance with the requirements of the BAM (DPIE 2020).

2.3.1 Approval pathway

The BOS is the framework for assessing and offsetting unavoidable impacts on biodiversity from development. As the project is a modification to a Major Project that increases impacts on biodiversity, the BAM and BOS are automatically applied and a full BDAR is required under the BC Act.

The Development Modification is a Major Project and seeks to amend the Development Consent for the Cabbage Tree Road Sand Quarry, a State Significant Development (SSD-6125) therefore requires development approval by the Minister for Planning under Part 4, Division 4.7 of the EP&A Act.

The Biodiversity Offsets and Agreement Management Systems (BOAMS) case number for this BDAR is 00052110/BAAS24008/24/00052111.

2.4 BIOSECURITY ACT 2015

The primary objective of the *Biosecurity Act 2015* is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

The *Biosecurity Act 2015* stipulates management arrangements for weed biosecurity risks in NSW, with the aim to prevent, eliminate and minimise risks. Management arrangements include:

- Any land managers and users of land have a responsibility for managing weed biosecurity risks that they know about or could reasonably be expected to know about
- Applies to all land within NSW and all waters within the limits of the State
- Local strategic weed management plans will provide guidance on the outcomes expected to discharge duty for the weeds in that plan

The *Biosecurity Act 2015* imposes a general duty on persons who deal with biosecurity matters to prevent, minimise and eliminate the risk so far as is reasonably practicable, and imposes mandatory measures for Weeds of National Significance (WoNS) as per Part 2, Division 8, clause 33 of the *NSW Biosecurity Regulation 2018*, being that a person must not import into the State or sell.

3. LANDSCAPE CONTEXT

3.1 LANDSCAPE FEATURES

The identification of landscape features within the Development Site was undertaken in accordance with Section 3 of the BAM (DPIE 2020a) are described in **Table 2** and shown on **Figure 3**.

Table 2: Landscape features of the Modification Site

Landscape Features	Development Site
Interim Biogeographic Regionalisation for Australia (IBRA) bioregion & Subregion	NSW North Coast IBRA Bioregion Karuah Manning IBRA Sub-region
LGA	Port Stephens Council
NSW (Mitchell) Landscapes	Sydney – Newcastle Barriers and Beaches
Rivers, streams and estuaries	No mapped water courses occur within the Development Site. No estuaries occur within the Development Site.
Habitat connectivity	The Development Site is part of a larger patch of vegetation in the local area, directly connected to extensive areas of forested habitat within the Tilligerry State Conservation Area (SCA) and adjacent areas around Tomago and Williamtown that provide connectivity and movement corridors.
Wetlands	There are no local or important wetlands within or adjoining to the site. However, Kooragang Nature Reserve a listed RAMSAR Wetland, is within 1 km south of the Development Site.
Geological features of significance	There are no karst, caves, cliffs, rocks or other geological features of significance within the Development Site.
Areas of outstanding biodiversity value	There are no areas of outstanding biodiversity value mapped within the Development Site.

3.1.1 Soil Landscapes

The Development Site occurs on two soils landscapes:

- Tea Gardens Variant A.
- Shoal Bay Variant A.

Tea Gardens Variant A Soil Landscape (DPE 2022a): This landscape is described as Pleistocene beach ridges and sandsheets consisting of marine and aeolian quartz sands. Soils are deep (>200 cm), well-drained Humus Podzols (Uc2.33) on ridges with deep (>200 cm), poorly drained Peaty/Humus Podzols (Uc2.33) in swales and deep (>200 cm), very poorly drained Acid Peats (O) in swamps.

Shoal Bay Variant A Soil Landscape (DPE 2022a): This landscape is described as Pleistocene aeolian sandsheets and low dunes composed of quartz sands. Gently inclined sandsheets to elongated, low undulating dunes. Slope gradients generally <15%. Local relief generally <10 m and elevation <15 m. Dunes are usually well drained, but minor swampy areas may occur in depressions. The dunes taper from a broad western end to a fine eastern point.

3.2 NATIVE VEGETATION COVER

Native vegetation cover was assessed as per Section 3.2 of the BAM (DPIE 2020a). Whereby, the native vegetation cover is assessed within the Development Site and within a 1,500 m buffer area surrounding the outside edge of the boundary of the Development Site. This 1,500 m site buffer has an area of 996 ha and there is native vegetation cover of 688 ha or 69% (30-70%).

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Native Vegetation Extent
1500m Assessment Buffer
Newcastle Sand Project Area
Lot 9 DP239608
Study Area
Disturbance Footprint (MOD4)

Figure 3. Native Vegetation Assessment

200 400 600 800 1,000 m

N

GDA94 / MGA zone 56
EPSG:28356

Map Produced: 31/01/2025
Produced By: Keryn Dowling

Wedgetail Project Consulting\Arbus - Documents\Newcastle Sand\MOD4 BDAR\@GIS\NS_MOD4_BDAR_Figures_250130.qgz

4. NATIVE VEGETATION

4.1 METHODOLOGY

Native vegetation across the Development Site was assessed in accordance with Section 4 of the BAM (DPIE 2020a).

4.1.1 Threatened Ecological Communities

There were no TECs identified within the Development Site.

4.1.2 Data Review

Three vegetation studies were reviewed prior to conducting the vegetation assessment within the Development Site. These studies were used to assist with the stratification of the site into vegetation zones, selection of plot/transect locations and determination of plant community types (PCTs), these included:

- *Vegetation Survey Classification and Mapping Lower Hunter and Central Coast Region* (LHCCREMS; NPWS 2000)
- *State Vegetation Type Mapping C2.0*
- Surveys were undertaken by WPC (2022) as part of a BSSAR and this survey effort was reviewed to inform this report.

Data was also reviewed from previous impact assessments and monitoring reports from compliance activities undertaken across the site.

- Ecological Constraints and Opportunities Assessment (RPS 2011)
- *Ecological Assessment Proposed Sand Quarry, Cabbage Tree Road, Williamtown* (Umwelt 2015)
- *Environmental Impact Assessment: Proposed Sand Quarry, Cabbage Tree Road Summary Report*. Kleinfelder (2016).
- *Newcastle Sand – Annual Amphibian Monitoring*. Kleinfelder (2021).
- *Newcastle Sand – Annual Amphibian Monitoring*. Kleinfelder (2022).

4.1.3 Vegetation Surveys

4.1.3.1 Aerial Photograph Interpretation

Prior to field surveys, the spatial distribution of the vegetation and key features across the Development Site were mapped remotely from aerial photography and satellite imagery (API) through systematic visual inspection by an experienced botanist. This process involved digitising polygons around vegetation patches with homogenous combinations of the following parameters: dominant species, ground cover, woody cover, and growth stage at a scale of approximately 1:500 using a Geographic Information System (GIS).

4.1.3.2 Historic Aerial Imagery

Historic Aerial Imagery was reviewed to identify areas of vegetation that have been historically disturbed as part of previous mining activities in the area.

4.1.3.3 Vegetation Mapping and Surveys

The boundaries of each of the identified vegetation communities within the Development Site were mapped using a combination of rapid data points (RDP) and walking transects, using the polygons produced through API to assist in targeting survey effort. Random data points (RDPs) involved collecting waypoints over the Development Site using hand-held GPS units and recording dominant species, structure, and condition. Walking transects involved verifying polygons which were homogenous in floristic composition and condition, as well as walking vegetation ecotones and using the recorded tracks to define vegetation community boundaries. Latest aerial imagery was downloaded from

4.1.3.4 Linework and Attribution

The RDPs and survey tracks were then overlaid on an aerial photograph and used to delineate and/or clarify vegetation boundaries. RDPs and plots were classified and tagged with a Plant Community Type (PCT) by field surveyors. Polygons produced from the API work adopted the PCT of the sample point that they intersected.

4.1.3.5 Plant Community Type and TEC Determination

The identification of vegetation communities was based on dominant species present in the overstorey, mid-storey, shrub and ground layers as recorded in the floristic quadrats. The closest equivalent PCT for the vegetation community was determined through a comparison of the floristic descriptions of PCTs in the database with the plot / transect data collected from the site. In addition to floristic and structural similarity, the landscape position, soil type and other diagnostic features of the vegetation communities on the sites were also compared to the descriptions in the database in order to determine the most suitable PCT.

To determine the conservation status of each community within the Development Site, the floristic and structural composition, as well as landscape position, soil type and other diagnostic features, of each vegetation community was also compared against Threatened Ecological Communities (TECs) listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

4.1.3.6 Vegetation Zones

Vegetation zones were identified and delineated within the Development Site in accordance with Section 4.3 of the BAM (DPIE 2020a). A vegetation zone is defined in the BAM (DPIE 2020a) as a relatively homogenous area that is the same vegetation type and broad condition.

4.1.3.7 Assessing Vegetation Integrity (Site Condition)

Following stratification of the Development Site into vegetation zones, plots/transects were undertaken to collect site condition data for the composition, structure and function attributes listed in **Table 3** in accordance with Section 4.3 of the BAM (DPIE 2020a). The location of the plots/transects were selected through stratified random sampling to provide a representative sample of the variation in vegetation composition and condition within each vegetation zone.

Table 3: Composition, structure and function components of vegetation integrity

Growth form groups used to assess composition (species richness) and structure (percent foliage cover)	Function attributes
• Tree (TG) • Shrub (SG) • Grass and grass-like (GG) • Forb (FG) • Fern (EG) • Other (OG)	• Number of large trees • Tree regeneration (presence/absence) • Tree stem size class (presence/absence) • Total length of fallen logs • Litter cover • High threat exotic vegetation cover (HTE) • Hollow-bearing trees (HBT)

The number of plots/transects undertaken across the site meets the minimum number of transects required for each vegetation zone area as detailed in Section 4.3.4, Table 3 of the BAM (DPIE 2020a). The locations of the plots/transects undertaken on the Development Site are shown on **Figure 4** in the following section. Plot data is provided in **Appendix A**.

4.1.3.8 Floristic Identification and Nomenclature

Floristic identification and nomenclature are based on classification by Royal Botanic Gardens and Domain Trust, Sydney, published on PlantNET (the NSW Plant Information Network System http://plantnet.rbgsyd.nsw.gov.au).

For use in the BAM Calculator, native species were assigned to growth forms as per their classification in BioNet, and High Threat Weeds were classified as per the list published by The Biodiversity Conservation Division (BCD; Version 3, 2022b).

4.2 ASSESSMENT RESULTS

4.2.1 Native Vegetation Extent

A total of 5.29.ha of native vegetation was mapped as occurring within the Development Site. This includes 4.61 ha of native vegetation in the Western Extension area.

The extent of native vegetation differs from the aerial image as there has been significant regrowth since the most recently available aerial image was taken (MetroMap).

4.2.2 Historic Landuse

The Western Extension was completely cleared to bare sand, shown in (**Figure 5**). historic imagery taken in 1979. The area within the Lot 9 boundary that has been avoided and incorporated into the proposed on-site offset area, was partially cleared, with mny mature trees being left. The majority of areas proposed to be developed, that occur outside the western extension area, were also cleared to bare sand, apart from some areas that retained mature trees on the edges of clearing. The area shows regrowth across these bare sand areas in imagery from 1984, and then in 1993 this regrowth appears to have developed further to begin closing the bare gaps of sand. Based on this imagery, it appears the majority of the proposed development has been almost entirely cleared prior to 1979 and is made up of revegetated areas.

4.2.3 Vegetation Zones

Two PCTs were identified within the Study Area, however only one of these PCT's occurs within the Development Site:

- PCT 3544: Coastal Sands Apple-Blackbutt Forest
- PCT 3996: Coastal Sand Swamp Mahogany Dry Forest (outside the Development Site)

A total of three vegetation zones were identified within the Development Site. Zones were mapped based on condition, regeneration, previous disturbance and species composition. Zones were designated as Moderate/Good and Managed. In addition, there areas within the Development Site that were excluded from assessment included Exotic Grassland, tracks and residences.

Details on each vegetation zone, including condition class, area and survey effort, are outlined in **Table 4**. **Figure 4** shows the locations of PCT and vegetation zones within the Development Site. A description of the PCT, species used for identification, justification for the PCT selection, EEC status and percent cleared of the PCT is in the following sections.

Table 4: Vegetation Zones within the Development Site

Zone	PCT	Condition Class	Western Extension Area (ha)	Total Area (ha)	Plots	
					Required	Conducted
1	3544	Moderate	2.35	2.82	2	2
2	3544	Shrubby regrowth	1.58	1.61	1	1
3	3544	Managed	0.69	0.86	1	1
-	-	Exotic Grassland	1.53	1.53	0	1
-	-	Excluded Areas: Residences, Tracks and Unvegetated Areas	0.96	0.98		
Native Vegetation Total			**4.61**	**5.29.**		
Total area within the development footprint			**7.10**	**7.80**		

A plot (Q4) was conducted within the exotic grassland to determine the percentage of native and exotic species within this area of the development site. This vegetation was comprised of approximately 87% exotic species, primarily dominated by *Eragrostis curvula* (African Lovegrass), a High Threat Weed species.

PCT 3996 also occurs within the Study Area, however, is outside the development footprint.

Due to the small and patchy occurrence of some vegetation zones within the Development Site, plot locations were modified to allow for a representative sample of each vegetation zone. Plot locations are provided on **Figure 4**.

One plot location within Vegetation Zone (VZ) 1 occurs entirely within the vegetation zone, and within the Development Site, and the second (Q3) occurs entirely within VZ 1 and partly within the Development Site. The plot location for VZ 2 & VZ 3 occurs entirely within the vegetation zone, however the majority of the plot and transect of Q2 and Q5 occurs outside the Development Site (within the Study Area). A plot was not required for the exotic grassland, however, was undertaken to determine species composition, and percentage cover of exotic species.

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Study Area
Disturbance Footprint (MOD4)
Plot / transect
Contours (5m)
Arterial Road

Figure 4. Plant Community Types

N

GDA94 / MGA zone 56
EPSG:28356

50 100 150 200 m

Map Produced: 31/01/2025
Produced By: Keryn Dowling

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Extraction Area (existing approval)
Proposed Increase in Offset Area
Disturbance Expansion Area
Western Extension

Figure 5. Hisotorical Imagery 1979

N

100 200 300 400 500 m

GDA94 / MGA zone 56
EPSG:28356

Map Produced: 03/02/2025
Produced By: Keryn Dowling

Wedgetail Project Consulting\Arbus - Documents\Newcastle Sand\MOD4 BDAR\@GIS\NS_MOD4_BDAR_Figures_250130.qgz

i. PCT 3544: Coastal Sands Apple-Blackbutt Forest

Plate 1: **PCT 3544 Moderate within the Development Site (Q01, VZ1).**

Plate 2: **PCT 3544 (Shrubby) within Development Site (Q2, VZ2).**

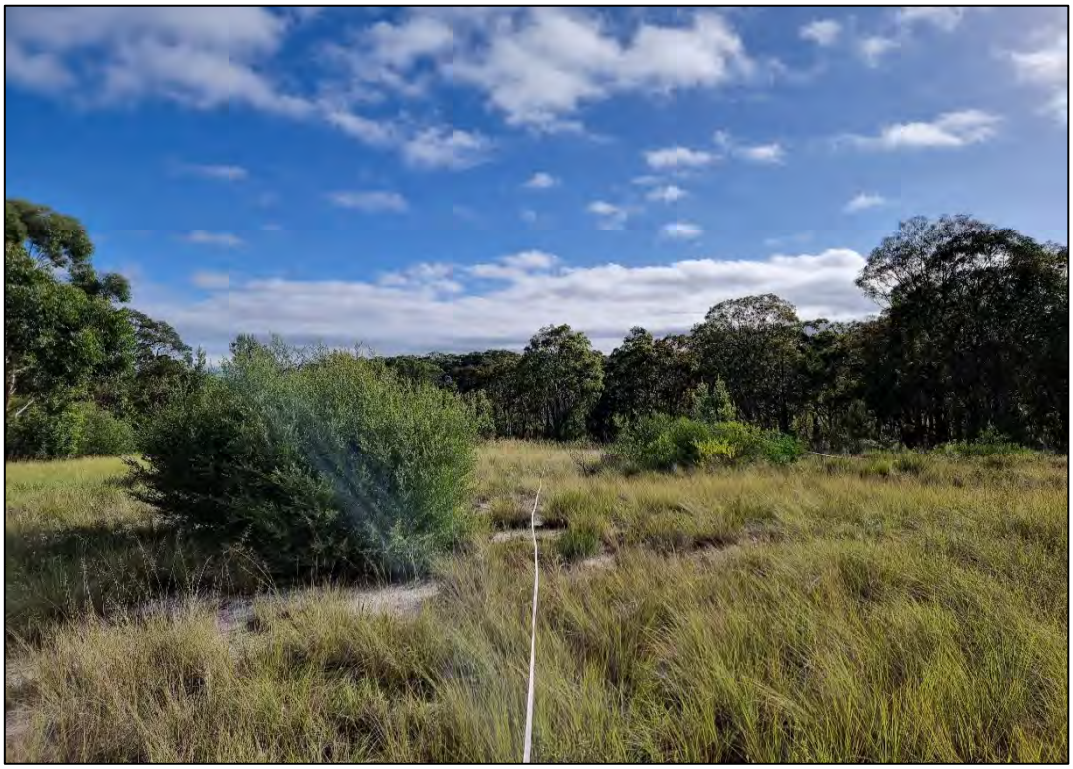


Plate 3: PCT 3544 (Managed) within the Study Area (Q5, VZ3).

PCT 3544: Coastal Blackbutt Apple Forest	
Vegetation Formation & Class	Dry Sclerophyll Forests (Shrubby Sub-formation). Coastal Dune Dry Sclerophyll Forests.
PCT % Cleared	22%
Area within Development Site	2.82ha – Moderate (VZ1)
Floristic Description	The canopy of this community is dominated by *Angophora costata* and *Eucalyptus pilularis* dominating with *Corymbia gummifera,* and *Eucalyptus haemastoma* occurring throughout. Scattered occurrences of other canopy species include *Eucalyptus parramattensis subsp. decadens*, *Eucalyptus capitellata*. The midstorey is dominated by *Leptospermum polygalifolium, Acacia longifolia,* and *Banksia serrata.* The shrub layer is dominated by *Monotoca elliptica* and *Acacia longifolia* with occurrences of *Bossiaea heterophylla, Acacia ulicifolia, Daviesia ulicifolia, Persoonia levis, Aotus ericoides, Ricinocarpa pinifolius Pimelea linifolia, Persoonia lanceolata, Myoperum acuminatum, Leptospermum polygalifolium, Euryomyrtus ramosissima* and *Persoonia lanceolata.* The groundcover is dominated by *Pteridium esculentum*, *Dianella caerulea* var. *producta.* and *Pomax umbellata.* The climbing species *Pandorea pandorana* and *Parsonsia straminea* occur at a low density throughout.
Justification for PCT Selection	The structure of this community, being a Eucalypts canopy over a dense shrubby understorey, places it within the Dry Sclerophyll Forest (Shrubby Sub-formation) Vegetation Formation. As the community occurs within the coastal sandsheets and dune system it falls within the Coastal Dune Dry Sclerophyll Forest Vegetation Class.

PCT 3544: Coastal Blackbutt Apple Forest	
	A search of the VIS Database using the criteria of the Karuah-Manning IBRA Sub-region, Coastal Dune Dry Sclerophyll Forest Vegetation Class, *Angophora costata, Eucalyptus pilularis* and *Corymbia gummifera* returned three PCTs; 3544, 3545, 3549, 3546 and 3555. PCT 3545 and 3555 were excluded based on species composition, they were lacking many of the dominant species within the community. PCT 3545 and 3549 were both a close fit. However, the position in the landscape and locality, along with species composition was all a better fit with PCT3544 when the three PCTs were compared.
Condition within the Development Site (Vegetation Zones)	This PCT was identified as occurring in three condition states within the Development Site: • Vegetation Zone 1 (Mod/Good): Moderate to good condition, This area has been historically cleared and is therefore regrowth. However, it has had time to mature, and the community has a good structure with canopy, shrub and ground layer present as well as vines and a diverse mix of species with a very low occurrence of weeds. o *Eucalyptus parramattensis* subsp. *decadens* is not typical of the community and occurs throughout VZ 1, and this has likely been planted or spread from planting in the neighbouring area. • Vegetation Zone 2 (shrubby regrowth): These areas may have been more recently cleared. They have a similar species assemblage, however, are lacking canopy, and the shrub layer is very dense and over 2.5 m high throughout much of the zone. There are some juvenile trees occurring throughout this zone. • Vegetation Zone 3 (managed): This zone includes areas of the PCT that have been cleared or slashed. There is still a high level of diversity, however only a ground layer is present within this zone.
Status	Not listed

4.2.4 Assessment of Patch Size

All vegetation zones have a patch size of >100 ha as they are zones of native vegetation which are connected to larger areas of native vegetation in the surrounding areas. The patch size for each vegetation zone is outlined in **Table 5**.

4.2.5 Vegetation Integrity Score

The current vegetation integrity score of the vegetation zones is outlined in **Table 5**.

Table 5: Current vegetation integrity score for the vegetation zones.

Zone	PCT & Class	Area (ha)	Patch Size	Condition Scores (Current Scores)			Vegetation Integrity Score
				Composition	Structure	Function	
1	3544 Moderate	2.82	>100	71	68.7	78.1	72.5
2	3544 Shrubby	1.61	>100	64.5	7.2	17.2	20
3	3544 Managed	0.86	>100	50	24.5	4.4	17.5

5. THREATENED SPECIES

5.1 ECOSYSTEM CREDIT SPECIES

Predicted ecosystem species credits for the Development Site were identified and assessed in accordance with Section 5.2, steps 1 and 2 of the BAM (DPIE 2020a). No ecosystem credit species were excluded from the predicted species list. The predicted species report is provided in **Appendix B**.

5.2 SPECIES CREDIT SPECIES

5.2.1 Threatened Species for Assessment

The species credit species listed in **Table 6** are those species credit species requiring assessment in accordance with Section 5.2 of the BAM. An assessment of habitat constraints and vagrant species, and habitat suitability was conducted in accordance with Section 5.2.2 and 5.2.3 of the BAM. This assessment is summarised in **Table 7** and outlined in **Section 5.2.1.1**.

Table 6: Species Credit Species for Assessment

Scientific Name	Common Name	Candidate Species	Habitat Assessment / Justification
Flora			
Allocasuarina simulans	Nabiac Casuarina	Yes	
Angophora inopina	Charmhaven Apple	Yes	
Asperula asthenes	Trailing Woodruff	Yes	
Callistemon linearifolius	Netted Bottle Brush	Yes	
Commersonia prostrata	Dwarf Kerrawang	Yes	
Corybas dowlingii	Red Helmet Orchid	Yes	
Cryptostylis hunteriana	Leafless Tongue Orchid	Yes	
Cynanchum elegans	White-flowered Wax Plant	Yes	
Diuris arenaria	Sand Doubletail	Yes	
Diuris praecox	Rough Doubletail	Yes	
Eucalyptus camfieldii	Camfield's Stringybark	Yes	Manually added to calculator
Eucalyptus parramattensis subsp. decadens	Eucalyptus parramattensis subsp. decadens	Yes	
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	Yes	
Lindernia alsinoides	Noah's False Chickweed	Yes	
Prostanthera densa	Villous Mint-bush	Yes	
Rhizanthella slateri	Eastern Australian Underground Orchid	Yes	
Rhizanthella slateri - endangered population	Eastern Australian Underground Orchid	No	Geographic Limitation: Study Area not located within the Mid Coast Council LGA
Rhodomyrtus psidioides	Native Guava	Yes	

Scientific Name	Common Name	Candidate Species	Habitat Assessment / Justification
Senecio spathulatus	Coast Groundsel	No	Geographic Limitation: Study Area is not located on headlands
Syzygium paniculatum	Magenta Lilly Pilly	Yes	
Tetratheca juncea	Black-eyed Susan	Yes	
Fauna			
Aepyprymnus rufescens	Rufous Bettong	No	Geographic Limitation: Study Area is not located North of Gloucester
Anthochaera phrygia	Regent Honeyeater	No	Habitat Constraints: Subject Site not with areas of important habitat mapping
Burhinus grallarius	Bush Stone-curlew	Yes	
Callocephalon fimbriatum	Gang-gang Cockatoo	No	Habitat Constraints: No suitable hollows present. (Eucalypt tree species with hollows at least 3 m above the ground and with hollow diameter of 7 cm or larger)
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	No	Habitat Constraint: No suitable hollows - Living or dead tree with hollows greater than 15cm diameter and higher than 8m above ground
Cercartetus nanus	Eastern Pygmy-possum	Yes	
Crinia tinnula	Wallum Froglet	Yes	
Dromaius novaehollandiae - endangered population	Emu	Yes	
Esacus magnirostris	Beach Stone-curlew	Yes	
Haliaeetus leucogaster	White-bellied Sea-Eagle	Yes	
Hieraaetus morphnoides	Little Eagle	Yes	
Hoplocephalus stephensii	Stephens' Banded Snake	No	(Species microhabitats are not present / degraded on the subject land (Section 5.2.a BAM (2020a)). The species uses very old primary forest with many large old hollow bearing trees (TBDC). This type of habitat is not present within the Study Area. Vegetation at the site consists of regrowth as it was historically mined (sand). Bionet records of the species do not occur in the locality.
Lathamus discolor	Swift Parrot	No	Habitat Constraints: Subject Site not with areas of important habitat mapping
Litoria aurea	Green and Golden Bell Frog	Yes	
Lophoictinia isura	Square-tailed Kite	Yes	

Scientific Name	Common Name	Candidate Species	Habitat Assessment / Justification
Miniopterus australis	Little Bent-winged Bat	No	Habitat Constraint: No caves, tunnels, mines, culverts or other structure known or suspected to be used for breeding present within the Study Area
Miniopterus orianae oceanensis	Large Bent-winged Bat	No	Habitat Constraint: No caves, tunnels, mines, culverts or other structure known or suspected to be used for breeding present within the Study Area
Myotis macropus	Southern Myotis	No	Habitat Constraint: No waterbodies with permanent pools/stretches 3m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other waterbodies, on or within 200m of the Study Area
Ninox connivens	Barking Owl	No	Habitat Constraint: No suitable large hollows (greater than 20 cm) above 4m occur within the Study Area
Ninox strenua	Powerful Owl	No	Habitat Constraint: No suitable large hollows (greater than 20 cm) above 4m occur within the Study Area
Pandion cristatus	Eastern Osprey	No	Habitat Constraint: Study Area not within 100m of a floodplain
Petauroides volans	Southern Greater Glider	Yes	
Petaurus norfolcensis	Squirrel Glider	Yes	
Petrogale penicillata	Brush-tailed Rock-wallaby	No	Habitat Constraint: Study Area is not within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines
Phascogale tapoatafa	Brush-tailed Phascogale	Yes	
Phascolarctos cinereus	Koala	Yes	
Planigale maculata	Common Planigale	Yes	
Potorous tridactylus	Long-nosed Potoroo	Yes	
Pteropus poliocephalus	Grey-headed Flying-fox	No	Habitat Constraint: No breeding camps present
Tyto novaehollandiae	Masked Owl	No	Habitat Constraint: No suitable hollows (living or dead tree with a hollow >20 cm diameter that occurs >4 metres above the ground) occur within the Study Area
Uperoleia mahonyi	Mahony's Toadlet	Yes	
Vespadelus troughtoni	Eastern Cave Bat	No	Habitat Constraint: Study Area not within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two

Scientific Name	Common Name	Candidate Species	Habitat Assessment / Justification
			kilometres of old mines, tunnels. However old buildings sheds are present.

Candidate Species – Further Justification

In Accordance with Section 5.2.3 of the BAM (DPIE 2020a) a candidate species credit species is considered unlikely to occur on the subject land (or specific vegetation zones) if one of the following applies:

A. After carrying out a field assessment:

- the assessor determines that microhabitats required by a species are absent from the subject land (or specific vegetation zone). The assessor must include a description of the microhabitats assessed as being required by the species in the BAR. This must be based on evidence such as published literature, or
- the assessor determines that the habitat constraints or microhabitats are degraded to the point that the species is unlikely to use the subject land (or specific vegetation zones).

B. An expert report (prepared as per Box 3) states that the species is unlikely to be present on the subject land or specific vegetation zones

A candidate species credit species that does not have suitable habitat as per (2.a.) [point 'a' above] or (2.b.) [point 'b' above] does not require further assessment (BAM 2020a).

A total of sixteen (18) candidate species credit species were identified as not requiring further assessment based on the absence of suitable habitat in accordance with the requirements of Section 5.2.3 of the BAM (DPIE 2020a). Justification for this determination is detailed below.

5.2.1.1 Habitat Assessment

Species credit species for assessment were assessed in accordance with Section 5.2, steps 2 and 3 of the BAM (DPIE 2020a).

Flora

Generally, habitat for candidate threated flora species within the Development Site is of Moderate condition except for Veg Zones 2 and 5 which are both managed. Veg Zone 5, Exotic Grassland contains two access roads providing access to the main property which are both well maintained.

Fauna

Vegetation within the Development Site contains some suitable fauna habitat, including foraging habitat for several fauna species. Three hollow-bearing trees and one dead stag were detected on site.

In addition, old sheds were present on-site. As there is potential for bat habitat to be present within these structures, they were all inspected. No potential habitat was identified within these structures as there were no enclosed cavities.

Habitat Tree Survey

A habitat tree survey was undertaken on October 2022, 30 November 2023 and May 2024 to locate hollow-bearing trees, and dead stags. Hollow sizes were defined as small (<8 cm diameter), medium

(8 – 20 cm diameter) and large (>20 cm diameter). The location of Habitat Trees and the type of feature it contained was recorded using a handheld GPS. Other potential habitat features such as medium to large stick nests were also surveyed for.

Hollow-bearing trees were detected within the development site including two (2) hollow-bearing trees. A total of one (1) large and one (1) small hollow-bearing trees were recorded (**Figure 14**). The one (1) large hollow was at ground level and not suitable for large forest owl or large parrot species.

5.2.2 Candidate Species

Based on the outcomes of the above habitat assessment, a Candidate Species was generated and is provided in **Table 7**. The Candidate Species Report is provided in **Appendix C**. Details of the surveys conducted for candidate threatened species are provided in the following sub-sections and summarised in **Table 7**.

Table 7: Candidate Species Credit Species

Scientific Name Common Name	Species Presence	Survey Method	Survey Dates			Conclusion
			TBDC	WPC Surveys – Western Extension	WPC Surveys – (Newcastle Sand Project Area)	
Flora						
Allocasuarina simulans Nabiac Casuarina	No (Surveyed)	Parallel traverses at 10-20 m intervals across all areas of habitat.	All year	**Round 3** 8th of November 2023, and 13th May 2024	**Round 3** 3rd December 2021	Species not detected; No further assessment required
Angophora inopina Charmhaven Apple	No (Surveyed)	Parallel traverses at 10-20 m intervals across all areas of habitat.	All year	**Round 4** 9th May 2024	**Round 4** 10th December 2021	Species not detected; No further assessment required
Asperula asthenes Trailing Woodruff	No (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat	October to December	**Round 3** 8th November, 2023	No suitable habitat	Species not detected; No further assessment required
Callistemon linearifolius Netted Bottle Brush	No (Surveyed)	Parallel traverses at 10 m intervals across all areas of habitat.	October to January	**Round 3** 8th of November 2023 and 2nd Sept, 2024	**Round 3** 3rd December 2021	Species not detected; No further assessment required
Commersonia prostrata Dwarf Kerrawang	No (Surveyed)	Parallel traverses at 10 m intervals across all areas of habitat.	All year	**Round 1** 18th October 2023 and 13th May 2024	-	Species not detected; No further assessment required
Corybas dowlingii Red Helmet Orchid	No (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat.	June – July	**Round 5** 21st June 2024	**Round 5** 1 July 2024	Species not detected; No further assessment required
Cryptostylis hunteriana Leafless Tongue Orchid	No (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat.	November to January	**Round 2** 8th of November 2023 28th of January, 2025	**Round 2** 4 & 5 November 2021	Species not detected; No further assessment required
Cynanchum elegans White-flowered Wax Plant	No (Surveyed)	Parallel traverses at 5-10 m intervals across all areas of habitat.	All year	**Round 2** 18th of October 2023 and 13th of May 2024	-	Species not detected; No further assessment required

Scientific Name Common Name	Species Presence	Survey Method	Survey Dates			Conclusion
			TBDC	WPC Surveys – Western Extension	WPC Surveys – (Newcastle Sand Project Area)	
Diuris arenaria Sand Doubletail	Assume presence	Parallel traverses at 5 m intervals across all areas of habitat.	September	**Round 7** 9th September, 2024	**Round 7** 7 September 2022 &15 September 2022 (2 rounds)	**Species detected; further assessment required.**
Diuris praecox Rough Doubletail	Assume presence	Parallel traverses at 5 m intervals across all areas of habitat.	August	**Round 6** 27th August, 2024 & 2nd September, 2024	**Round 6** 1st August, 2022	Species not detected; No further assessment required
Eucalyptus camfieldii Camfield's Stringybark	No (Surveyed)	Parallel traverses at 20 m intervals across all areas of habitat.	All year	**Round 4** 9th of May 2024	**Round 4** 10 December 2021	Species not detected; No further assessment required
Eucalyptus parramattensis subsp. *decadens*	Yes (Surveyed)	Parallel traverses at 20 m intervals across all areas of habitat.	All year	**Round 4** 9th of May 2024	**Round 4** 10 December 2021	**Species detected; further assessment required.**
Grevillea parviflora subsp. *parviflora* Small-flower Grevillea	No (Surveyed)	Parallel traverses at 10 m intervals across all areas of habitat.	August to November	**Round 1** 18th of October 2023 and 2nd Sept, 2024	**Round 1** 3rd December 2021	Species not detected; No further assessment required
Lindernia alsinoides Noah's False Chickweed	No (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat	November to February	**Round 2** 8th of November	No suitable habitat	Species not detected; No further assessment required
Prostanthera densa Villous Mint-bush	No (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat.	All year	**Round 2** 8th of November 2023 and 13th May 2024	**Round 2** 3rd December 2021	Species not detected; No further assessment required
Rhizanthella slateri Eastern Australian Underground Orchid	No (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat.	All year	**Round 1** 18th of October 2023, and 2nd Sept, 2024	**Round 1** 21 & 22 October 2021	Species not detected; No further assessment required
Rhodomyrtus psidioides Native Guava	No (Surveyed)	Parallel traverses at 10 m intervals across all areas of habitat.	All year	**Round 3** 8th of November 2023 and 13th May 2024	No suitable habitat	Species not detected; No further assessment required

Scientific Name Common Name	Species Presence	Survey Method	Survey Dates			Conclusion
			TBDC	WPC Surveys – Western Extension	WPC Surveys – (Newcastle Sand Project Area)	
Syzygium paniculatum Magenta Lilly Pilly	No (Surveyed)	Parallel traverses at 10 m intervals across all areas of habitat.	May - July	**Round 3** 8th November 2023 and 13th May 2024	No suitable habitat	Samples collected samples from one *Syzygium* sp. in May 2024. Sample was identified as *S. oleosum* due to numerous large oil glands present in the leaves. Species not detected; No further assessment required.
Tetratheca juncea Black-eyed Susan	No (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat.	October to November	**Round 1** 18th October 2023 and 2nd Sept, 2024	**Round 1** 21 & 22 October 2021	Species not detected; No further assessment required
Fauna						
Burhinus grallarius Bush Stone-curlew	No (Surveyed)	Spotlighting and call playback (2 separate nights)	All year	Spotlighting 8-9th May 2024	-	Species not detected; No further assessment required
Callocephalon fimbriatum Gang-gang Cockatoo	No (surveyed)	Tree hollow/nest search	October - January	HBT Surveys 13th May 2024 and 30th October 2024	HBT Survey 21 October 2021	Species not detected; no further assessment required.
Cercartetus nanus Eastern Pygmy-possum	No (Surveyed)	Remote cameras (4 consecutive weeks)	October – March	Remote Cameras 5th Jan to 1st Feb 2024 Spotlighting 8-9th May 2024	-	Species not detected; No further assessment required
Crinia tinnula Wallum Froglet	Yes (Surveyed)	Spotlighting and call playback (2 separate nights)	All year	Nocturnal Surveys 8-9th May 2024	Nocturnal Surveys 26 March 2020 11 November 2020 8 November 2021 2 February 2022 31 January 2023, 20 February 2024 and 9 January 2025.	**Species detected; further assessment required.**

Scientific Name Common Name	Species Presence	Survey Method	Survey Dates			Conclusion
			TBDC	WPC Surveys – Western Extension	WPC Surveys – (Newcastle Sand Project Area)	
Dromaius novaehollandiae - endangered population	No (Surveyed)	Remote cameras (4 consecutive weeks)	All year	Remote Cameras 5th Jan to 1st Feb 2024	-	Species not detected; No further assessment required
Esacus magnirostris Beach Stone-curlew	No (Surveyed)	Spotlighting and call playback (2 separate nights)	All year	Spotlighting 8-9th May 2024	-	Species not detected; No further assessment required
Haliaeetus leucogaster White-bellied Sea-Eagle	No (Surveyed)	Habitat Assessment - Hollow-bearing Tree Survey	July - December	HBT/Nest Surveys 13th May 2024 and 30th October 2024	21 October 2021	Survey determined no suitable habitat present. No further assessment required
Hieraaetus morphnoides Little Eagle	No (Surveyed)	Habitat Assessment - Hollow-bearing Tree Survey	August to October	HBT/Nest Surveys 13th May 2024 and 30th October 2024	21 October 2021	Survey determined no suitable habitat present. No further assessment required
Hoplocephalus stephensii Stephens' Banded Snake	No (Surveyed)	Habitat Assessment – Hollow- bearing tree survey	October to March	HBT/Nest Surveys 13th May 2024 and 30th October 2024	21 October 2021	No suitable habitat present. No further assessment required
Litoria aurea Green and Golden Bell Frog	No (Surveyed)	Habitat Assessment Spotlighting and call detection (4 separate nights)	November to March	Habitat Assessment 13th May 2024 and 30th October 2024 Nocturnal Surveys 8th to 9th May 2024	Nocturnal Surveys 26 March 2020 11 November 2020 8 November 2021 2 February 2022 31 January 2023, 20 February 2024 and 9 January 2025.	Species not detected; no further assessment required.
Lophoictinia isura Square-tailed Kite	No (Surveyed)	Habitat Assessment - Hollow-bearing Tree Survey	September to January	HBT/Nest Surveys 13th May 2024 and 30th October 2024	21 October 2021	No suitable habitat present. No further assessment required
Pandion cristatus Eastern Osprey	No (Surveyed)	Habitat Assessment - Hollow-bearing Tree Survey	April to November	HBT/Nest Surveys 13th May 2024 and 30th October 2024	21 October 2021	No suitable habitat present. No further assessment required

Scientific Name Common Name	Species Presence	Survey Method	Survey Dates			Conclusion
			TBDC	WPC Surveys – Western Extension	WPC Surveys – (Newcastle Sand Project Area)	
Petauroides volans Southern Greater Glider	No (Surveyed)	Camera trapping (4 consecutive weeks)	All year	Remote Cameras 5th Jan to 1st Feb 2024 Nocturnal Surveys 8th to 9th May 2024	-	Species not detected; No further assessment required
Petaurus norfolcensis Squirrel Glider	Yes (Surveyed)	Camera trapping (4 consecutive weeks)	All year	Remote Cameras 5th Jan to 1st Feb 2024 Nocturnal Surveys 8th to 9th May 2024	-	**Species detected; further assessment required.**
Phascogale tapoatafa Brush-tailed Phascogale	No (Surveyed)	Camera trapping (4 consecutive weeks)	All year	Remote Cameras 5th Jan to 1st Feb 2024 Nocturnal Surveys 8th to 9th May 2024	-	Species not detected; No further assessment required
Phascolarctos cinereus Koala	Assume presence	-	All year	Assumed presence		**Species assumed presence; Further assessment required**
Planigale maculata Common Planigale	No (Surveyed)	Pitfall Traps	All year	Pitfall Trapping 29th Jan to 3rd of Feb 2024	-	Species not detected; No further assessment required
Potorous tridactylus Long-nosed Potoroo	No (Surveyed)	Remote Cameras	All year	Remote Cameras 5th Jan to 1st Feb 2024 Nocturnal Surveys 8th to 9th May 2024	-	Species not detected; No further assessment required
Pteropus poliocephalus Grey-headed Flying-fox	Yes (Surveyed)	Spotlighting	October to December	HBT/Nest Surveys 13th May 2024 and 30th October 2024 Nocturnal Surveys 8th to 9th May 2024	-	There are no breeding camps present. Foraging habitat only is present within the development site. No further assessment required
Uperoleia mahonyi Mahony's Toadlet	Pitfalls	Spotlighting and call detection (4 separate nights) Pitfall trapping surveys (4 separate nights)	October to March	Pitfall Trapping 29th Jan to 3rd of Feb 2024 Nocturnal Surveys 8th to 9th May 2024	Nocturnal Surveys 26 March 2020 11 November 2020 8 November 2021 2 February 2022 31 January 2023, 20 February 2024 and 9 January 2025.	**Species detected; further assessment required.**

5.2.2.1 Flora Surveys

Methodology

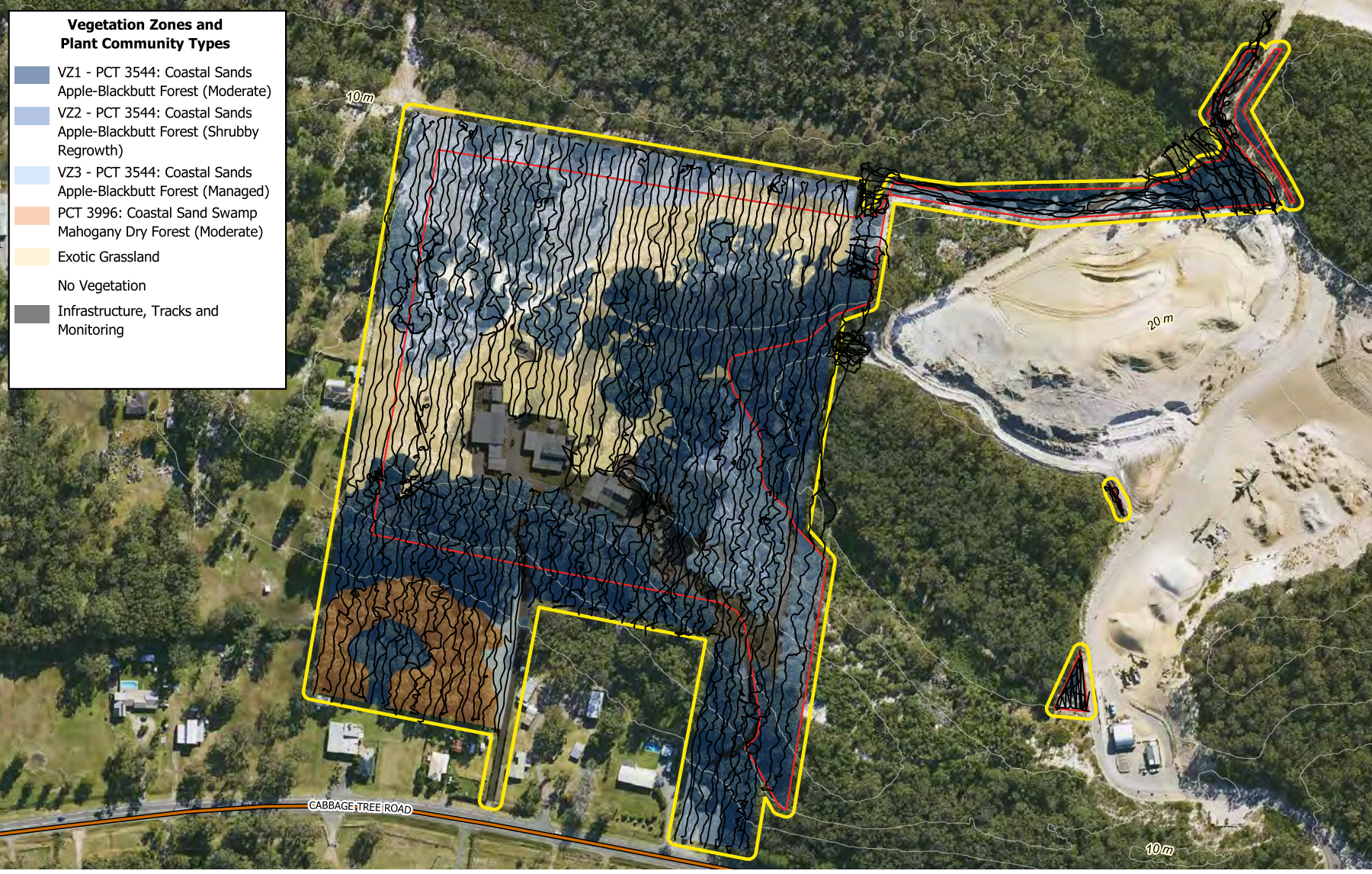
The candidate threatened flora species were surveyed within the Development Site in accordance with the NSW Guide to Surveying Threatened Plants (DPIE, 2020b). All surveys were conducted using systematic parallel transects. Parallel field traverses were separated by 5 m in dense vegetation and 10 m in open vegetation for orchids, herbs and forbs, 10 m for shrubs and sub-shrubs, and 20 m for tree species. Survey tracks are provided on **Figure 6, Figure 7, Figure 8, Figure 9, Figure 10** and **Figure 11**.

Results

Two threatened flora species, *Eucalyptus parramattensis* subsp. *decadens* (Earp's Gum) and *Diuris arenaria* (Sand Doubletail) were recorded during targeted surveys.

A total of 32 *Eucalyptus parramattensis* subsp. *decadens* individuals were identified within the Study Area; of these 29 occur within Vegetation Zone 1 (moderate condition) of the Western Extension, one occurs within Vegetation Zone 1 within the Disturbance Expansion Area, and two individuals within the Study Area (outside the Development Site). A 30 m buffer was applied to all locations to generate the species polygon for this count based species (**Figure 12**).

One *Diuris arenaria* was identified in Vegetation Zone 3 (Managed) within the Disturbance Expansion Area. All native vegetation zones within the Development Site were assessed as representing suitable habitat for the species. The species polygon occurs across the entire Western Extension Impact Area; 2.35 ha of Vegetation Zone 1 (Moderate), 1.58 ha of Vegetation Zone 2 (Shrubby Regrowth) and 0.69 ha of Vegetation Zone 3 (Managed) (**Figure 13**).



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Study Area (MOD4)
Disturbance Footprint (MOD4)
Round 1 (Oct/Dec 2021, Oct 2023, May 2024)
Contours (5m)
Arterial Road

Figure 6. Threatened Flora Survey Effort Round 1

N

GDA94 / MGA zone 56
EPSG:28356

50 100 150 200 m

Map Produced: 03/02/2025
Produced By: Keryn Dowling

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Study Area (MOD4)
Disturbance Footprint (MOD4)
Round 2 (Nov/Dev 2021, Nov/Dec 2023, May 2024, Jan 2025)
Contours (5m)
Arterial Road

Figure 7. Threatened Flora Survey Effort Round 2

N

GDA94 / MGA zone 56
EPSG:28356

50 100 150 200 m

Map Produced: 03/02/2025
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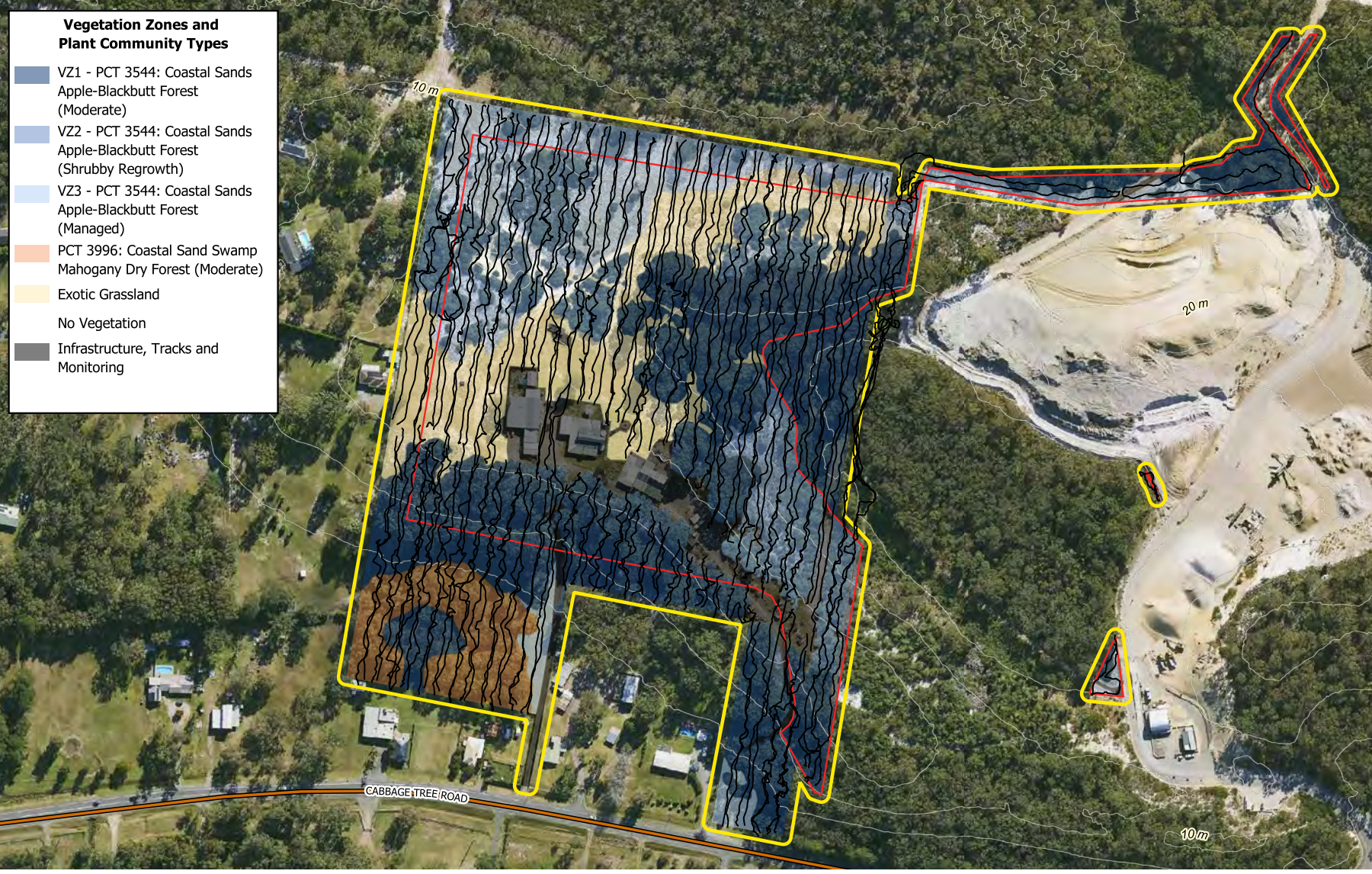

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Study Area (MOD4)
Disturbance Footprint (MOD4)
Round 3 (Dec 2021, Nov 2023, May 2024)
Contours (5m)
Arterial Road

Figure 8. Threatened Flora Survey Effort Round 3

N

GDA94 / MGA zone 56
EPSG:28356

50 100 150 200 m

Map Produced: 03/02/2025
Produced By: Keryn Dowling

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Study Area (MOD4)
Disturbance Footprint (MOD4)
Round 4 (Dec 2021, May 2024)
Contours (5m)
Arterial Road

Figure 9. Threatened Flora Survey Effort Round 4

N

GDA94 / MGA zone 56
EPSG:28356

50 100 150 200 m

Map Produced: 03/02/2025
Produced By: Keryn Dowling

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Study Area (MOD4)
Disturbance Footprint (MOD4)
Round 5 (Jul/Jun 2024)
Contours (5m)
Arterial Road

Figure 10. Threatened Flora Survey Effort Round 5

N

GDA94 / MGA zone 56
EPSG:28356

50 100 150 200 m

Map Produced: 03/02/2025
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Study Area (MOD4)
Disturbance Footprint (MOD4)
Round 6 (Aug 2022, Aug/Sep 2024)
Round 7 (Sep 2022, Sep 2024)
Contours (5m)
Arterial Road

Figure 11. Threatened Flora Survey Effort Round 6 and 7

50 100 150 200 m

N

GDA94 / MGA zone 56
EPSG:28356

Map Produced: 03/02/2025
Produced By: Keryn Dowling

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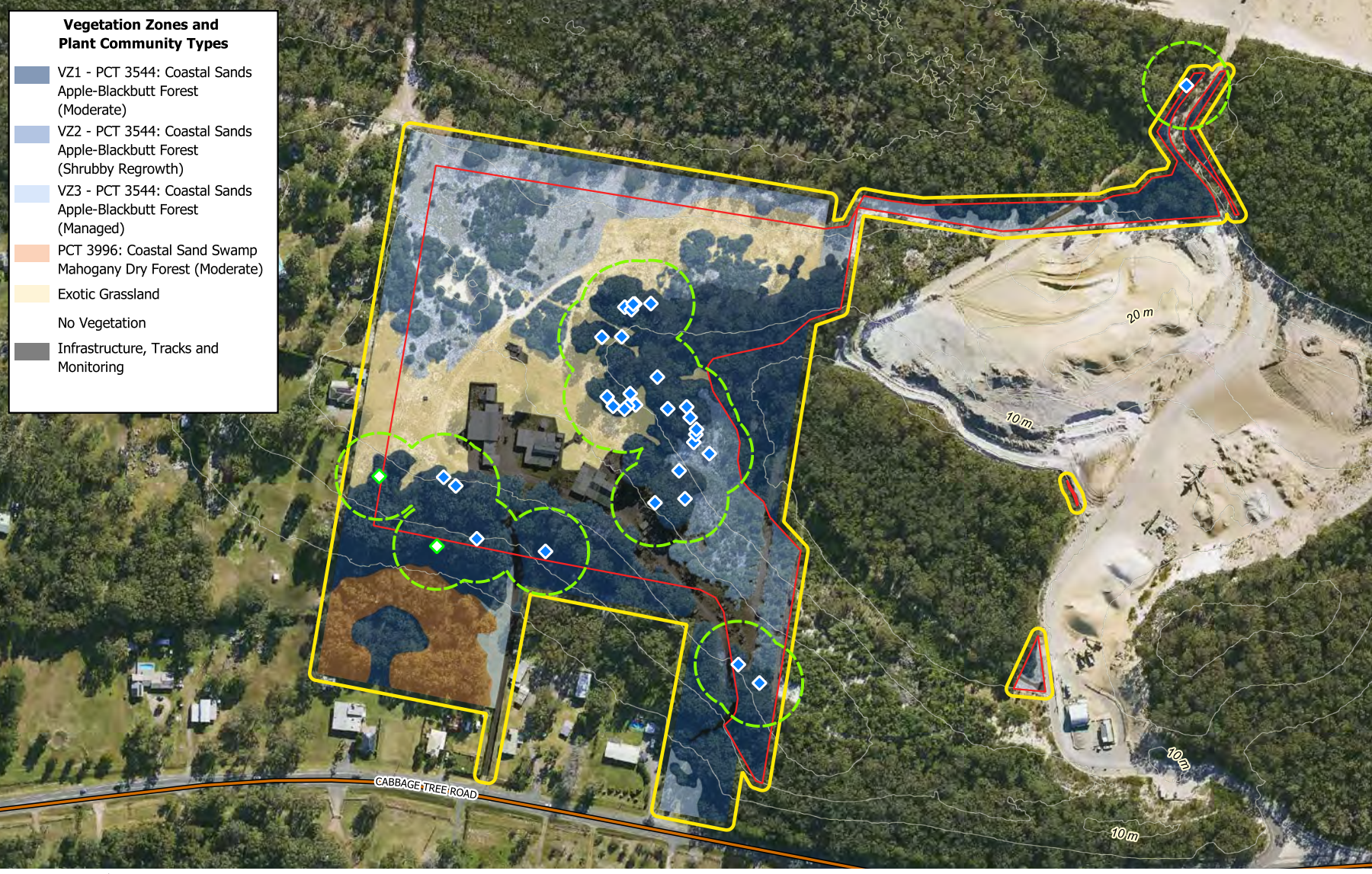

WEDGETAIL
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Study Area (MOD4)
Disturbance Footprint (MOD4)
Eucalyptus parramatensis subsp.*decadens* (Impacted)
Eucalyptus parramatensis subsp.*decadens* (Not Impacted)
Eucalyptus parramatensis subsp.*decadens* 30m Buffer
Contours (5m)
Arterial Road

Figure 12. Threatened Flora Survey Results *Eucalyptus parramattensis* subsp. *decadens*

50 100 150 200 m

N

GDA94 / MGA zone 56
EPSG:28356

Map Produced: 03/02/2025
Produced By: Keryn Dowling

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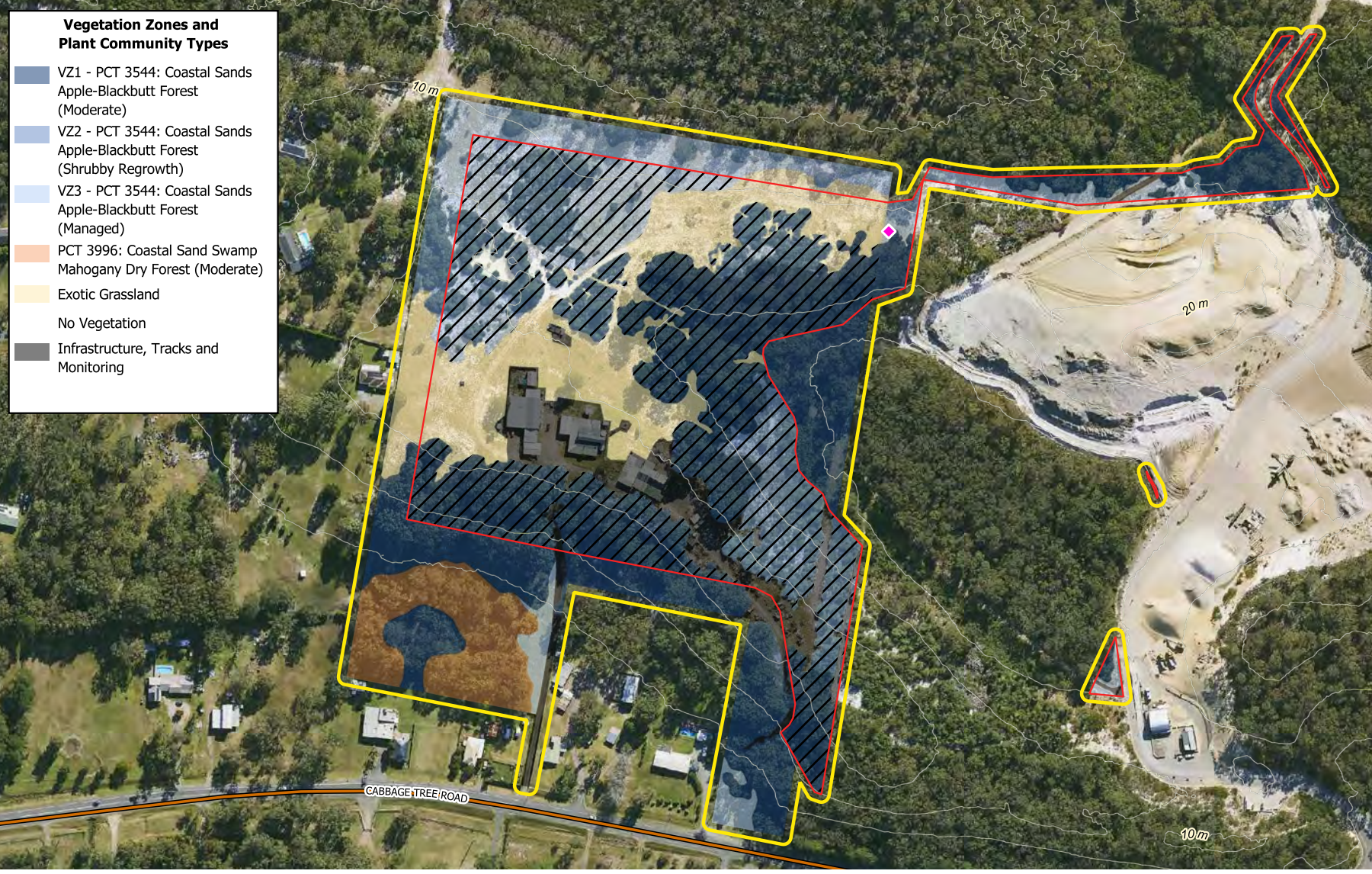

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Study Area (MOD4)
Disturbance Footprint (MOD4)
Diuris arenaria recorded
D. arenaria Species Polygon

Figure 13. Threatened Flora Survey Results *Diuris arenaria*

50 100 150 200 m

N

GDA94 / MGA zone 56
EPSG:28356

Map Produced: 03/02/2025
Produced By: Keryn Dowling

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5.2.2.2 Fauna Survey

Methodology

i. Arboreal Mammals

A total of 30 remote trigger cameras were installed consisting of 16 Arboreal cameras at heights of approximately 3m, 6 Arboreal Pygmy Cameras at heights of approximately 1.5-2M and 8 Terrestrial cameras at heights of approximately 0-1m (**Figure 14**). Cameras were active onsite for 32 consecutive nights from 05 January 2024 to 02 February 2024 (4 weeks). Cameras were baited with an oats, peanut butter, treacle, vanilla essence and truffle oil mixture in a mesh canister, and the surrounding area (including the tree trunk) was sprayed with honey water. Cameras were re-baited once during the survey period, after two weeks. Images were analysed to identify species captured on camera.

Spotlighting surveys were conducted on 8 & 9 May 2024 using high-powered headtorches to search for all types of nocturnal fauna. Spotlighting was undertaken via random meanders for one-person hour traversing the Study Area. Surveys were focussed within areas of the most suitable habitat.

ii. Terrestrial Mammals

Nine pit-fall trap arrays, each comprising 10 m of drift-fence with two black 20 L buckets with lids (**Figure 14**). Buckets were dug into the ground at the end of the drift-fence and the lid was be elevated 2 to 3 cm above the lip of the bucket. Leaf litter and small twigs was placed in the bottom of each bucket to provide shelter for trapped animals. The survey effort was designed in consideration of the requirements under the TBDC.

Two trapping lines of 25 Elliott A's were deployed within the Development area, each running adjacent to the Eastern and Western boundaries.

Elliot A's were baited with an oats, peanut butter, treacle, vanilla essence and truffle oil mixture, and trapping was conducted for a period of four consecutive nights; from 29 January 2024 – 02 February 2024.

iii. Amphibian Surveys

Targeted amphibian surveys were carried out within suitable habitat across the Subject Land and adjacent areas known to have standing water over seven (7) nights (26 March 2020, 11 November 2020, 8 November 2021, 2 February 2022, 31 January 2023, 20 February 2024 and 9 January 2025). Surveys were completed after rainfall in accordance with the methods described in the *NSW Survey Guide for Threatened Frogs* (DPIE 2020g). Areas of suitable amphibian habitat were also inspected during other targeted surveys including spotlighting surveys (**Figure 15**).

iv. Koala

The extent and quality of Koala habitat within the On-site Offset Area was determined using the methodology described in *Appendix 6 - Guidelines for Koala Habitat Assessments* of the *Port Stephens Council Comprehensive Koala Plan of Management* (CKPoM) (PSC 2002). The Koala Habitat Assessment is undertaken in four major parts:

1. **Preliminary Assessment:** examination of the Koala Habitat Planning Map of the Port Stephens LGA (see **Figure 20**) to determine mapped Koala Habitat and undertake an inspection of the

site to determine whether it contains individuals of preferred Koala feed trees (**Table 8**) outside areas mapped as Preferred Koala Habitat.

2. **Vegetation Mapping**: mapping vegetation types across the Development Site using aerial photography and detailed ground-truthing. Floristic and structural characteristics of each vegetation community was determined using plot-based survey methods.

3. **Koala Habitat Identification:** If the LGA-wide Koala habitat map produced by PSC is inaccurate for the site, a revised map must be developed in accordance with the Koala habitat categories defined in the CKPoM. If it is identified that the site contains either preferred or supplementary Koala habitat, habitat buffers or Habitat linking areas then proceed to Step 4.

4. **Assessment of Proposal:** At this point, a map needs to be produced showing information gathered in Steps 1, 2 and 3. The appropriateness of the proposal is assessed using performance criteria from Appendix 4 of the CKPoM. This has been conducted as part of the Ecological Impact Assessment and is detailed in the Environmental Impact Assessment: Proposed Sand Quarry, Cabbage Tree Road Summary Report (Kleinfelder 2016).

Table 8: Preferred Koala feed trees in the Port Stephens LGA recorded within the Development Site.

Scientific Name	Common Name
Eucalyptus robusta	Swamp Mahogany
Eucalyptus tereticornis	Forest Red Gum
Eucalyptus parramattensis subsp. *decadens*	Earp's Gum

v. Birds

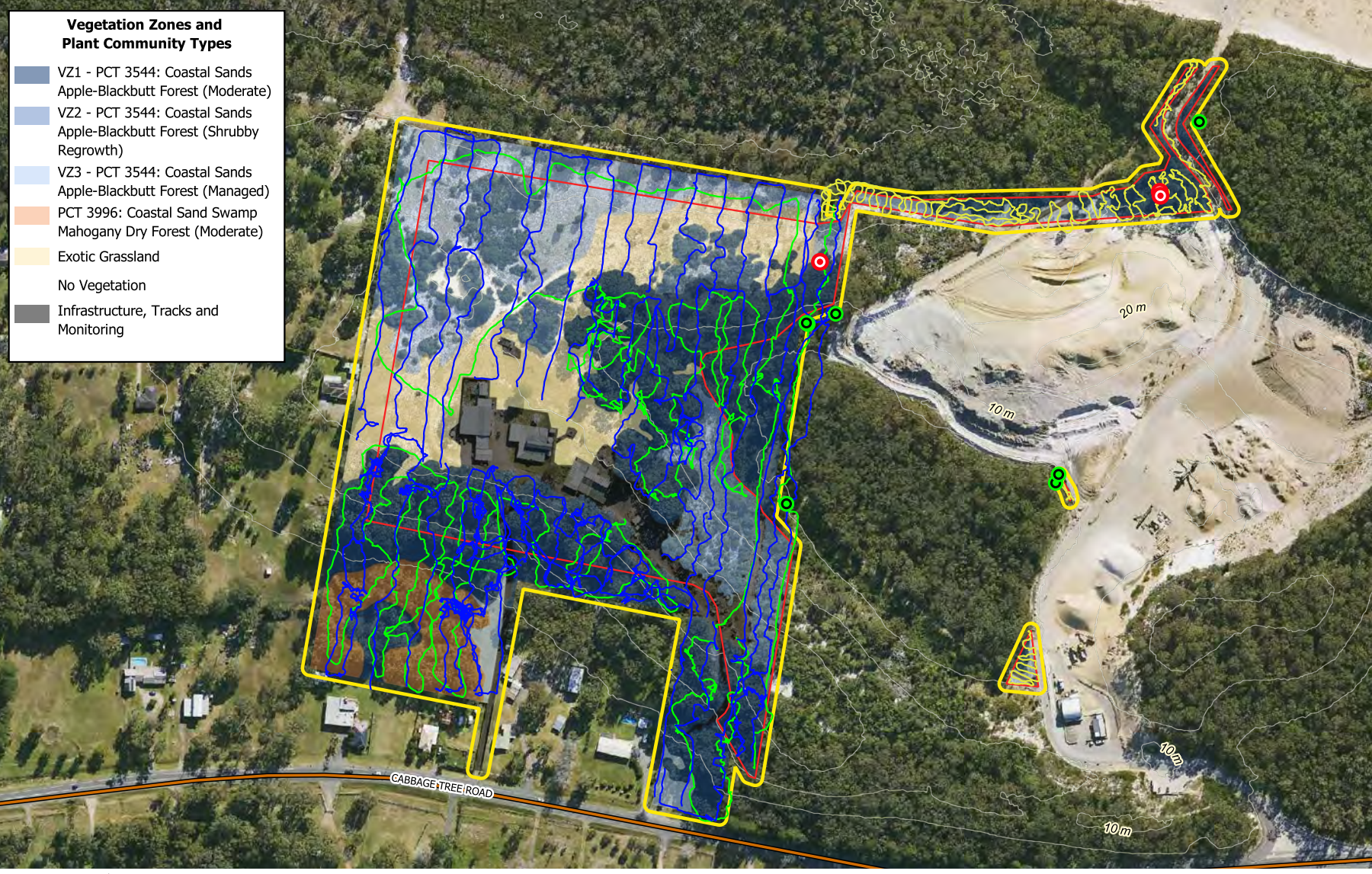
Surveys for potential breeding habitat for Gang-gang Cockatoo and Glossy Black-Cockatoo were undertaken during the hollow-bearing tree survey on 31st October, 2022, 30 October 2023 and 13th May 2024. This survey involved searching for potential nest trees with suitable hollows as described in **Table 9**.

Table 9: Potential Nest tree characteristics for Gang-gang Cockatoo and Glossy Black-Cockatoo.

Scientific Name	Common Name	Nest Tree Characteristics
Callocephalon fimbriatum	Gang-gang Cockatoo	Approximately 3 m above the ground with a hollow diameter ≥ 7 cm (DPE 2022a). Hollow height above ground usually 7.5 m (5 - 9.4 m). Preferred hollow entrance height of 21.3 cm (minimum 12 cm) and width 13.1 cm (9-24 cm). (DAWE, 2022).
Calyptorhynchus lathami lathami	Glossy Black-Cockatoo	8 m above the ground; and (ii) in stems with a diameter of at least 15 cm; and (iii) hollow diameter is at least 15 cm; and (iv) stem angle is at least 45 degrees and may be near-vertical or vertical (DCCEEW, 2022).

One tree with a large hollow in the base and one tree with a small hollow <8cm are present within the Study Area. Therefore, no suitable hollows were present within the site for large forest owls and large parrot species. No suitable nest trees were detected during these surveys for any raptor species. (see **Figure 14**)

Bush Stone-Curlew and Beach Stone-Curlew were both surveyed over two nights; 8 & 9 May 2024. Surveys comprised of two Ecologist undertaking spotlighting transects and call playback through suitable habitat within the Study Area.



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Study Area (MOD4)
Disturbance Footprint (MOD4)
Hollow-bearing Tree - Impacted
Hollow-bearing Tree - Not Impacted
HBT Survey (Oct 2023)
HBT & Nest Survey (Oct 2022)
HBT & Nest Survey (May 2024)

Figure 14. HBT locations and HBT and nest survey tracks

N

GDA94 / MGA zone 56
EPSG:28356

50 100 150 200 m

Map Produced: 03/02/2025
Produced By: Keryn Dowling

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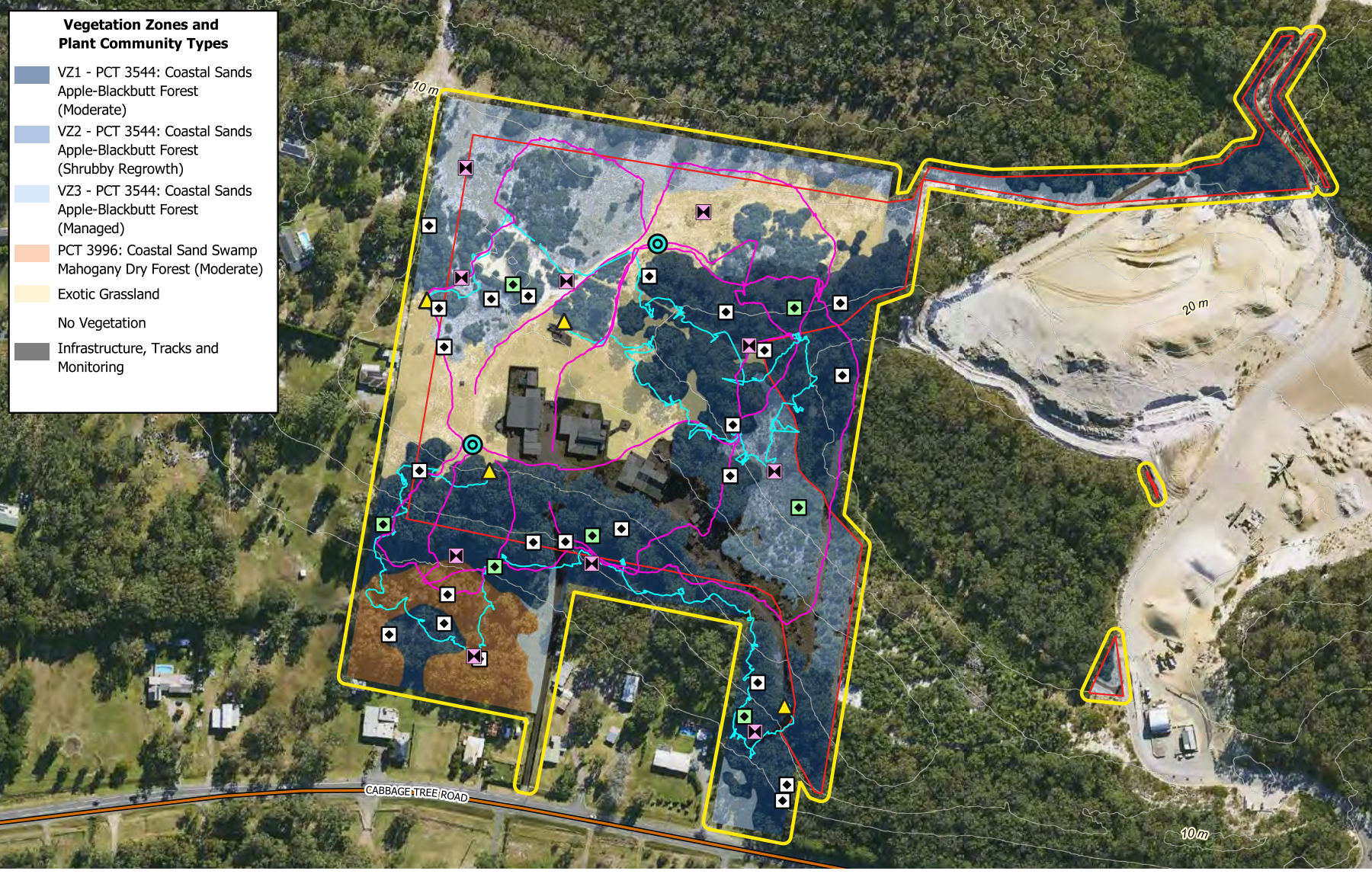

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Disturbance Footprint (MOD4)
Study Area (MOD4)
Call Playback Location
Camera - Arboreal
Camera - Terrestrial
Elliot A - Terrestrial
Pitfall Trap Line
Fauna Survey Tracks
Elliot track
Spotlighting

Figure 15. Spotlighting and Fauna Survey Locations

50 100 150 200 m

N

GDA94 / MGA zone 56
EPSG:28356

Map Produced: 03/02/2025
Produced By: Keryn Dowling

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Fauna Survey Results

Habitat trees

Eight hollow-bearing trees (HBT's) were located within the Study Area, however only two occur within the Development Footprint. These HBTs each contained one hollow each:

- One large hollow was present at ground level at the base of the tree.
- One small hollow

Arboreal Mammals

Squirrel Glider

Glider species (*Petaurus* sp.) were identified on site via remote camera trapping at eight locations (Cameras 35, 36, 39, 40, 43, 52, 54 and 56). At these eight locations, a total of fifteen detections were made, with four individuals identified as the Squirrel Glider (*Petaurus norfolcensis*) (one sighting only identified a 'possible' detection), other glider detections were identified as common Sugar Glider (*Petaurus breviceps*) and Feathertail Glider (*Acrobates pygmaeus*). Species were distinguished based on tail characteristics (width and taper), and snout characteristics (length). Sample photos of the Squirrel Gliders are **Plate 4**.

Details of the time and camera locations are detailed in **Table 10** and shown on **Figure 14**.

Table 10: Squirrel Glider details captured during remote camera surveys

Date	Species	Camera Number
22 Jan 2024	Squirrel Glider (*Petaurus norfolcensis*)	36
6 Jan 2024	Squirrel Glider (*Petaurus norfolcensis*)	39
25 January 2024	Squirrel Glider (*Petaurus norfolcensis*) - possible	39
5 Jan 2024	Squirrel Glider (*Petaurus norfolcensis*)	43

The species polygon for the Squirrel Glider was mapped as occurring within all vegetation zones which contained suitable foraging and nesting resources, including PCT 3544 ModGood (VZ 1) and Shrubby Rehabilitation (VZ 2) totalling 4.61 ha. An area of 3.93 ha occurs within the Westerm Extension area and 0.51 ha of this occurs within the Disturbance Extension Area. The areas of PCT 3544 Managed (VZ 3) were not mapped as forming part of the species polygon due to the lack of a canopy layer.

Plate 4:Squirrel Gliders recorded within the Development Site (Camera 36 – Top; Camera 39 (x2) – Middle; Camera 43 – Bottom).

Koala

A review of historical records for Koala returned 693 individual sightings within 5 km of the Development Site. Due to the high number of records and preferred feed tree species identified during vegetation integrity surveys, the Koala was assumed present.

Forty-eight (48) *Eucalyptus robusta* (Swamp Mahogany) were recorded within the PCT 3996 (VZ4) Category B as defined by Lunney et al (1998); Open Swamp Mahogany and Swamp Oak Forest with Swamp Mahogany dominant, covering an area of 0.45 ha outside the development footprint.

Thirty-four *E. parramattensis* subsp. *decadens* was recorded on site within PCT 3544 (VZ1), this species is a preferred Koala feed tree in Port Stephens. This PCT3544 is considered Category B as defined by Lunney et al (1998); Tall Open Blackbutt and Sydney Red Gum Forest with Scribbly Gum. Thirty of these trees occur within the development footprint.

A total of 2.82 ha of Koala habitat was identified within the development footprint within PCT 3544 Moderate (VZ1) (**Figure 19**). VZ2 & VZ3 as well as the Exotic Grassland were not mapped as forming part of the species polygon due to the lack of a canopy layer.

Grey-headed Flying-fox

A Grey-headed Flying-fox was detected during spotlighting surveys 8 & 9 May 2024. Foraging habitat for the species is an ecosystem credit. As no roosting camps were identified, no further assessment is required.

Amphibians

Two threatened frog species was recorded during targeted surveys. Mahony's Toadlet (*Uperoleia mahonyi*) was recorded at six separate locations within the Development Site, details are shown in **Table 11**. Wallum Froglet (*Crinia tinnula*) was heard on one occasion during targeted surveys within the Development Site.

Table 11: Mahony's Toadlet details captured during Frog surveys.

Date	Species	Survey location
1 February 2024	Mahony's Toadlet (*Uperoleia mahonyi*)	Pitfall 1, 6, 8, 10
2 February 2024	Mahony's Toadlet (*Uperoleia mahonyi*)	Pitfall 1, 7, 8, 9, 10
3 February 2024	Mahony's Toadlet (*Uperoleia mahonyi*)	Pitfall 7, 9, 10

Wallum Froglet

To generate a species polygon for the Wallum Froglet, the NSW Survey Guide for Threatened Frogs (DPIE 2020c) states that the species polygon should align with aquatic habitats linked directly with records and a buffer of 50 m incorporating all PCTs associated with the species. The 50 m buffer should be applied form the top of bank. All PCTs within the Development Site are listed as suitable habitat for the species under the TBDC.

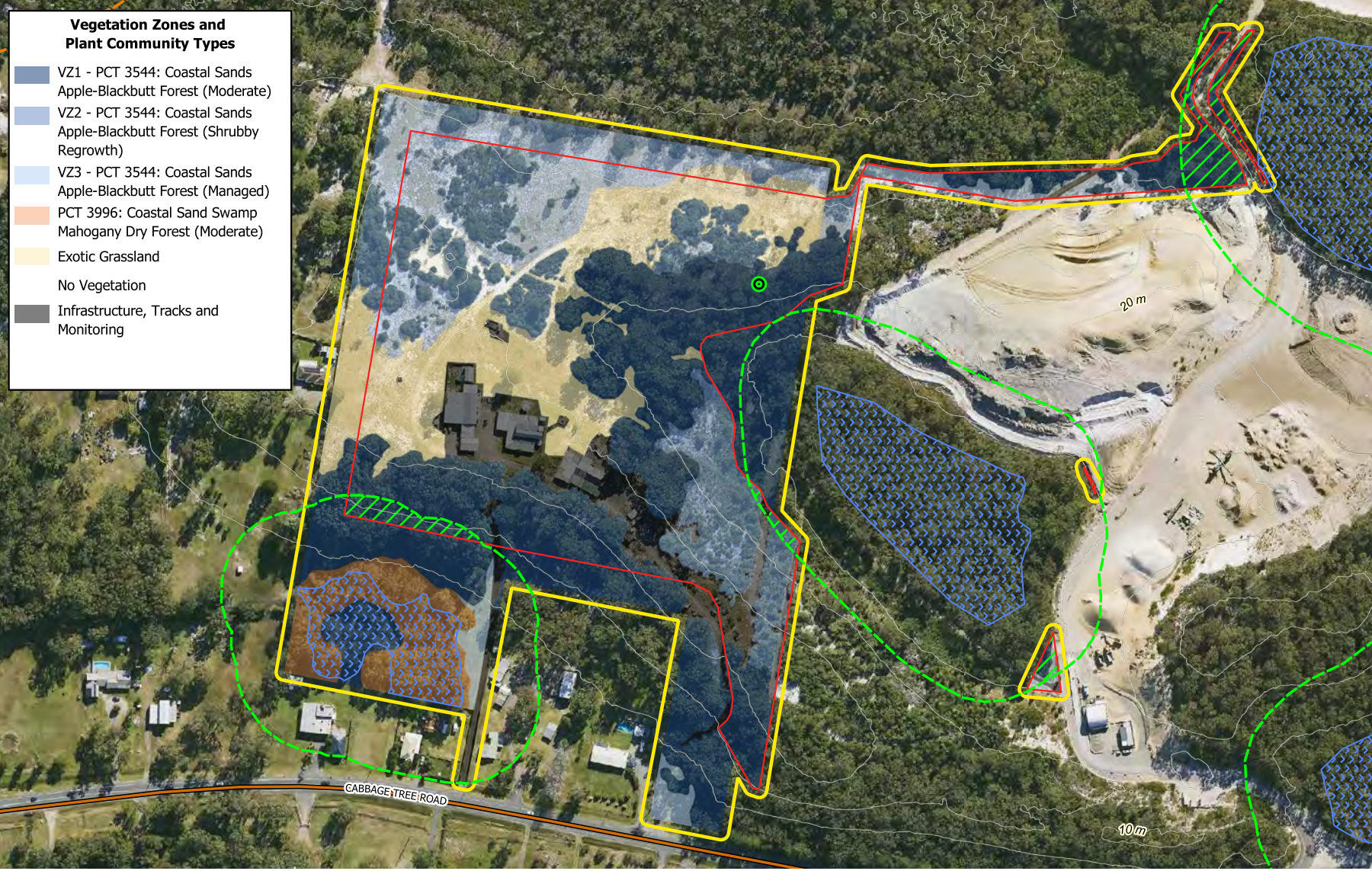
The Wallum Froglet species polygon has been generated by applying a 50 m buffer to areas of suitable aquatic habitat in which the species has previously been recorded. Suitable aquatic habitat has been defined as frequently inundated vegetation zones. The vegetation zone boundary has been used to define the edge of the aquatic habitat as defining the 'top of bank' is difficult as the lower

lying areas of the site are relatively flat. The Species Polygon for Wallum Froglet is 0.36 ha (**Figure 16**), including 0.32 ha of PCT 3544 Mod-Good (VZ1), 0.02 ha of PCT 3544 Shrubby (VZ 2) and 0.01ha of PCT3544 Managed (VZ3). An area of 0.13 ha occurs within the Western Extension Area and 0.23 ha within the Development Expansion Area.

Mahony's Toadlet

The Mahony's Toadlet (DPIE 2020c) species polygon boundary should align with aquatic habitats linked directly to the record and a buffer, incorporating the PCTs with which the species is associated, of 400 metres radius from the top of bank of the breeding site.

The Mahony's Toadlet species polygon has been generated by applying a 400 m buffer to areas of suitable aquatic habitat in which the species has been recorded. Suitable aquatic habitat includes wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgelands and wet heathlands. They can also be found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests. All PCTs within the Development Site are listed as suitable habitat for the species under the TBDC (**Figure 17**). The Species Polygon for Wallum Froglet is 5.29. ha, all vegetation zones of the Development Site occur within the 400 m buffer. However, 4.61 ha of this occurs within the Western Extension Area and 0.68 ha occurs within the Development Expansion Area.



WEDGETAIL PROJECT CONSULTING

Disturbance Footprint (MOD4)
Study Area (MOD4)
Wallum Froglet (*Crinia tinnula*) heard
Wallum Froglet (*Crinnia tinula*) Species polygon
Aquatic Habitat
Aquatic Habitat 50 m
Contours (5m)
Arterial Road

Figure 16. Threatened Fauna Survey Results - Wollum Froglet

N

GDA94 / MGA zone 56
EPSG:28356

50 100 150 200 m

Map Produced: 03/02/2025
Produced By: Keryn Dowling

Wedgetail Project Consulting\Arbus - Documents\Newcastle Sand\MOD4 BDAR\@GIS\NS_MOD4_BDAR_Figures_250130.qgz

WEDGETAIL PROJECT CONSULTING

Disturbance Footprint (MOD4)
Study Area (MOD4)
Mahony's toadlet (*Uperoleia mahonyi*) Detected
Mahony's toadlet (*Uperoleia mahonyi*) Species Polygon
Aquatic Habitat
Aquatic Habitat 400 m
Contours (5 m)
Minor watercourse
Arterial Road

Figure 17. Threatened Fauna Survey Results - Mahoney's Toadlet (*Uperoleia mahonyi*)

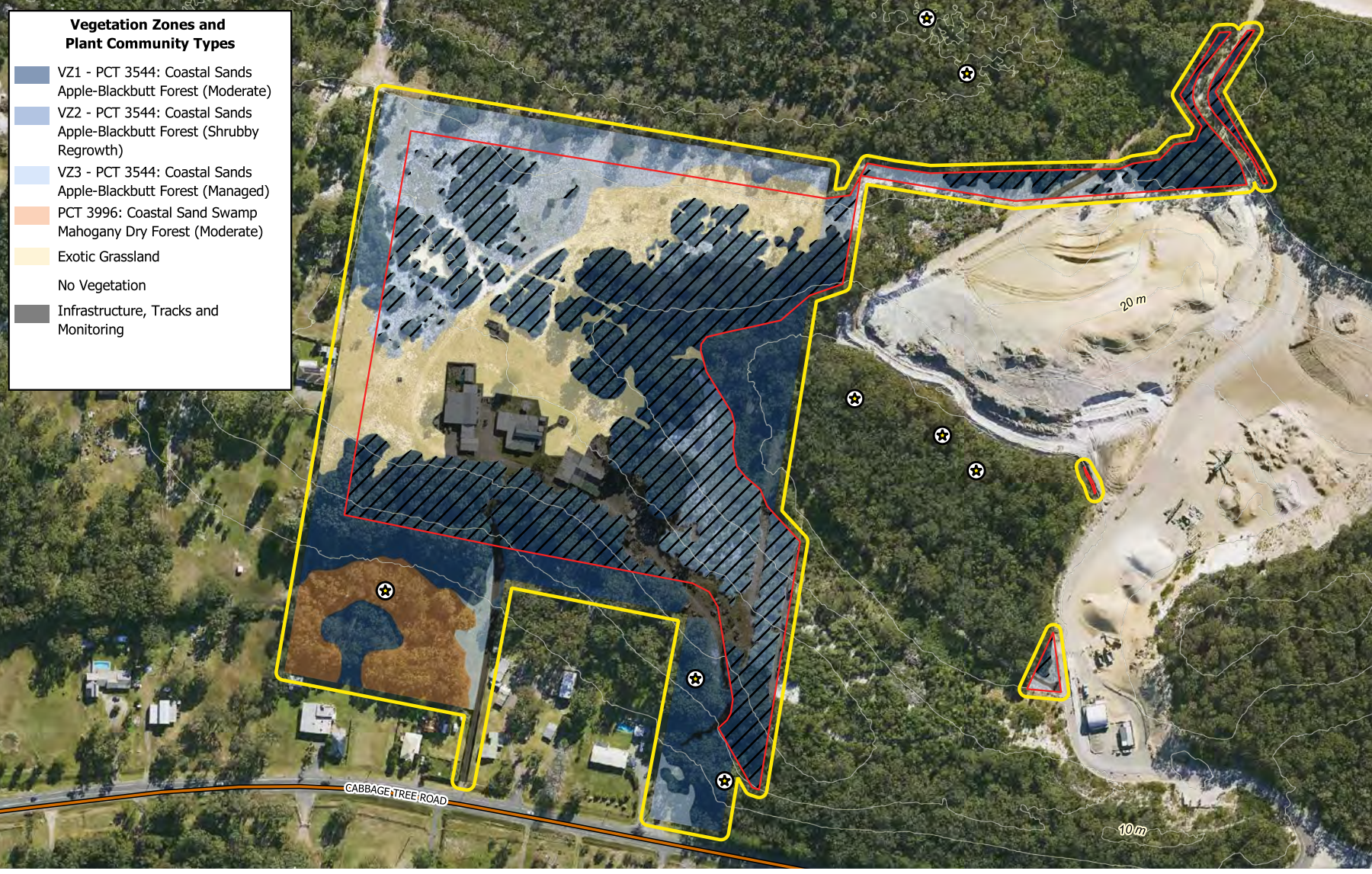
50 100 150 200 m

N

GDA94 / MGA zone 56
EPSG:28356

Map Produced: 03/02/2025
Produced By: Keryn Dowling

Wedgetail Project Consulting\Arbus - Documents\Newcastle Sand\MOD4 BDAR\@GIS\NS_MOD4_BDAR_Figures_250130.qgz



WEDGETAIL PROJECT CONSULTING

Disturbance Footprint (MOD4)
Study Area (MOD4)
Squirrel Glider (*Petarus norfolcensis*) detected
Squirrel Glider (*Petarus norfolcensis*) Species polygon
Contours (5m)
Arterial Road

Figure 18. Threatened Fauna Survey Results - Squirrel Glider (*Petarus norfolcensis*)

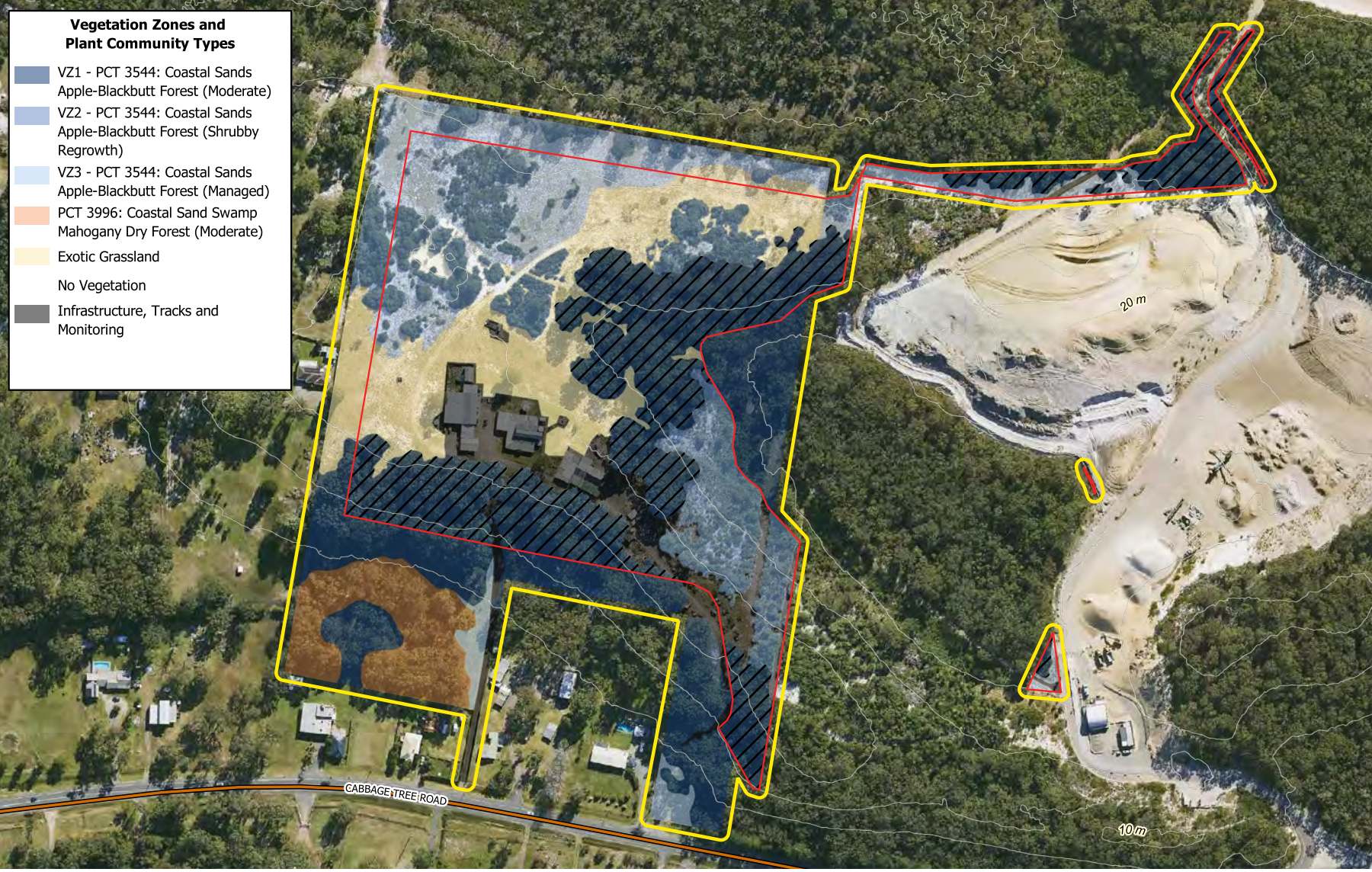
50 100 150 200 m

N

GDA94 / MGA zone 56
EPSG:28356

Map Produced: 03/02/2025
Produced By: Keryn Dowling

Wedgetail Project Consulting\Arbus - Documents\Newcastle Sand\MOD4 BDAR\@GIS\NS_MOD4_BDAR_Figures_250130.qgz



WEDGETAIL PROJECT CONSULTING

Study Area
Disturbance Footprint (MOD4)
Koala (*Phascolarctos cinereus*) Species polygon
Contours (5m)
Arterial Road

Figure 19. Koala (*Phascolarctos cinereus*) Habitat Map

N

GDA94 / MGA zone 56
EPSG:28356

50 100 150 200 m

Map Produced: 03/02/2025
Produced By: Keryn Dowling

Wedgetail Project Consulting\Arbus - Documents\Newcastle Sand\MOD4 BDAR\@GIS\NS_MOD4_BDAR_Figures_250130.qgz

6. PRESCRIBED IMPACTS

An assessment of the potential for the Development Site to have Prescribed Impacts on biodiversity is provided in **Table 12**.

Table 12: Prescribed Biodiversity Impact Assessment

Prescribed Impact	Present	Description of Feature	Potential Impact	Threatened Species or Community Dependent on Feature	Section of BDAR where Impact Addressed
Karst, caves, crevices, cliffs, rocks and other geological features of significance	No	Due to the low and relatively flat nature of the landform in the locality none of the geological features are present within the Development Site or the locality.	-	-	-
Human-made structures and	Yes	House, and sheds in Development Site area (Lot 9 DP 239 608) An office/amenity building, and weighbridge were constructed as part of the Sand Quarry development.	The house and sheds do not represent suitable breeding habitat for cave dwelling bats as they are not dark enough (windows or large door openings, and do not create the right temperature and humidity requirements for maternal caves. The office/amenity building, and weighbridge will not be impact by the proposed development.	-	-
Non-native vegetation	Yes	Minimal non-native vegetation was identified within the Development Site. Non-native vegetation is mainly comprised of exotic grasses along tracks and surrounding the residences.	Non-native vegetation within the Development Site does not provide suitable habitat for any threatened species.	-	-

Prescribed Impact	Present	Description of Feature	Potential Impact	Threatened Species or Community Dependent on Feature	Section of BDAR where Impact Addressed
Habitat Connectivity	Yes	The Development Site provides connectivity to surrounding areas of vegetation.	Four threatened species utilise the native vegetation within the Development Site. However, the Development Site is surrounded by a Biodiversity Stewardship Site and is also connected to the Tilligerry SCA. The removal of the vegetation within the Development Site is minimal when compared to the available habitat within proximity.	Koala, Squirrel Glider, Mahony's Toadlet and Wallum Froglet.	Avoid & minimise **Section 7.1**, Assessment of impacts **Section 7.2.3** and Mitigation **Section 7.3**
Water bodies, water quality and hydrological processes	No	No waterbodies occurring within the Development Site.	-	-	-
Wind Farm Development	No	No wind farm proposed.	-	-	-
Vehicle strikes	Yes	No new roads will be constructed, however the area where quarry machinery and vehicles access will be extended.	Potential fauna mortality when crossing areas of cleared vegetation	Koala, Squirrel Glider, Mahony's Toadlet and Wallum Froglet.	Mitigation measures outlined in **Section 7.3**.

7. IMPACT ASSESSMENT

7.1 AVOID AND MINIMISE

Measures taken to avoid and minimise the impacts of the project on biodiversity is provided in **Table 13**.

Table 13: Avoidance and Minimisation Measures on Biodiversity and Prescribed Impacts

Impact Type	Location	Design
Direct and Indirect Impacts to Biodiversity	• There are limited options in regard to the location of the development, as it is dictated by where the resources is available. • Suitable areas are also limited by what occurs above the water table. • Wetland mapping sourced from the Port Stephens LEP was reviewed in conjunction with ground truthing to inform quarry design minimising impacts to local wetlands, as such avoiding impacts on Swamp vegetation types (TECs) within the Studyt Area. • The alternative of not conducting the proposal was also considered, but there is a high demand for the resources across NSW, particularly from the Sydney metropolitan area, as well as across the Hunter. There are currently no operating sources of fully graded, premium quality, construction sand reserve for the Sydney Metropolitan Area. Expansion of an existing sand quarry was a better alternative to a new quarry.	• The design was reviewed several times and feedback provided to the client to allow consideration of biodiversity values. The main alternative that was considered entailed the expansion to the east of the resource boundary; however, this option has been withdrawn due to concerns regarding the potential impacts on habitat areas and connectivity features throughout the site. • The western expansion has allowed opportunity to exploit a resource that is located beneath areas of regrowth vegetation that were disturbed by RZM operations in the late 1970s. (See historic imagery, **Figure 5**). • The following biodiversity values were considered through the design process o High quality habitat areas were avoided or incorporated into the proposed on-site offset area Site. o Seven areas (OF1 -7 **Figure 1**) that have previously been approved for development, are now being relinquished to conservation (into the BOS). Features that are being retained in these areas include: ▪ Hollow-bearing trees ▪ In-tact vegetation that has not been previously disturbed, that contains mature trees ▪ Nine individual (threatened) Camfield's Stringybark trees ▪ Preferred koala feed trees have been retained where possible. • No additional clearing is required for ancillary facilities, as the existing plant and equipment, processing facilities from the approved quarry area are being used. • The established haul road is being used, and additional tracks have been planned to utilise areas where resources will first be extracted, so as to avoid additional clearing • The design has incorporated widening existing roads (see D2, D3 and D4 **Figure 1),** where surrounding vegetation and habitat is degraded

Impact Type	Location	Design
Prescribed Impacts	• Impacts on habitat connectivity was the only Prescribed Impact identified as occurring due to the proposal. • Avoidance and minimisation discussion as above.	• The width of the proposed corridor that connects the western extension to the central haul roads has been reduced to 20 m wide, so that it is still possible for fauna to move to and from the patch of vegetation that will temporarily be isolated. In addition, the adjacent approved extraction area is scheduled to be progressively rehabilitated. • The proposed 20 m wide corridor that connects this western resource to the current haul roads (through D1, **Figure 1)** will reduce the haulage distance by almost 3,200 km over the 12-month extraction process, reducing the amount of fuel and vehicle maintenance required to run.

7.2 ASSESSMENT OF IMPACTS

7.2.1 Impacts on Native Vegetation, Threatened Ecological Communities and Threatened Species Habitat

7.2.1.1 Direct Impacts

Direct impacts of the proposed modification are expected to occur during the construction phase when clearing and earthworks will occur. Within the Development Site, all native vegetation will be removed (total **5.29.** ha). Each vegetation zone equates to one management zone; and the future value of each attribute (composition, structure, and function) will be zero. As such the vegetation integrity score for all management zones within the Development Site following development will be zero (refer to **Section 8.2.1**).

7.2.2 Indirect Impacts

The proposal has the potential for increased edge effects on the vegetation surrounding the Development Site. Potential indirect impacts that could occur because of the proposed Modification include:

- Accidental incursions during clearing.
- Increased weed invasion due to edge effects.
- Increase in dust during clearing works.
- Increase in noise during clearing works.

The vegetation within the majority of the Development Site is of high quality, these indirect impacts have potential to reduce the integrity of the vegetation particularly around the edges.

7.2.3 Prescribed Impacts

Potential impacts on connectivity was the only Prescribed Impact identified as potentially occurring due to the proposal. The vegetation within the Development Site is part of a larger patch of vegetation in the local area including the proposed On-Site Offset, directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamtown that provide connectivity and movement corridors. Within the locality, the proposal will not impact on connectivity, as there is no movement corridor through The Project Area north-south, as there is no connected vegetation on the southern site of Cabbage Tree Road.

The Proposed Modification has the potential to increase fragmentation of habitat on a local scale, within The Project Area. The habitat occurring to the east of the 'western extension' area will be temporarily fragmented. However, as the proposed Development Site will be progressively rehabilitated post extraction, impacts on local connectivity will be temporary. As such, impacts on connectivity are unlikely to being significant.

7.3 MITIGATION MEASURES

Mitigation measure proposed for the construction phase to limit the potential impacts on retained biodiversity are provided in **Table 14**.

Table 14: Mitigation Measures

Impact	Action and Outcome	Responsibility	Timing
Direct and Prescribed Impacts			
Clearing of Native Vegetation	• Clearly delineate the boundaries of the Development Site to ensure no accidental incursions within retained vegetation • Ensure vehicle and equipment parking areas and stockpile areas are identified and sited to avoid areas containing ecological value wherever practicable • Appropriate signage such as 'No Go Zone' or 'Environmental Protection Area' to be installed • Identify and communicate the location of any 'No Go Zones' in site inductions. • Frog fencing has been installed around the boundary of the existing quarry and will extend around the proposed Development Area. This fence is similar to sediment fencing however it is installed on an angle that leans back away from the boundary. The backward angle directs frogs that jump onto the fencing back into the area they have come from. • Progressive rehabilitation of the Development Site in accordance with the exiting site Management Plan.	Construction Site Manager	Prior to, during and post vegetation clearing
Removal of hollow-bearing trees, resulting in fauna injury and mortality	• All potential hollow-bearing trees to be marked prior to clearing. All other vegetation to be cleared, and hollow-bearing trees to be left for two nights to allow fauna to self-relocate • All habitat trees to be soft-felled to reduce potential impacts on inhabiting fauna • A suitably qualified and trained fauna handler is to be present during hollow-bearing tree clearing to rescue and relocate displaced fauna.	Construction site manager	Prior to and during habitat tree removal
Impacts to surface quality and quantity due to sediment run-off and/or contaminant runoff	• Source controls such as sediment fences, mulching and jute matting will be utilised where appropriate • Site-based vehicles will carry spill kits.	Construction site manager	During all surface disturbance works when the site is under construction

Impact	Action and Outcome	Responsibility	Timing
Indirect and Prescribed Impacts			
Transfer of weeds and pathogens	• Fungal pathogens, including *Phytophora cinnamomi* and Myrtle Rust (*Puccinia psidii*), can impact on native plant communities and inhabiting fauna if not managed. Vehicles and equipment to be washed down prior to arrival on-site • Ensure soil and seed material is not transferred on machinery though appropriate wash down procedures	Construction site manager	During construction works
Noise, vibration, waste and air pollution impacts to adjacent sensitive habitat areas	• Restriction of public access and associated impacts from domestic pets, waste dumping and damage to adjoining vegetation must be enforced pre, during and post construction • Fence sensitive areas to delineate 'no go' zones • Impacts of noise and light will be limited as night works are not proposed • Dust control measures will include covering loads where required; amending operations under excessive wind conditions including ceasing operations if required; use of water as required to control dust	Construction site manager	During construction works

8. IMPACT SUMMARY

8.1 SERIOUS AND IRREVERSIBLE IMPACTS

One species identified in the TBDC database as a potential SAII entity, as per Section 6.5 of the BC Act, was recorded within the Development Site. The species is identified as a Serious and Irreversible Impact (SAII) entity according to the 'Guidance to assist a decision-maker to determine a serious and irreversible impact' (DPIE 2019). This is based on principle 1 & 3 as set out in clause 6.7 of the *Biodiversity Conservation Regulation 2017 (BC Regulation) 1 - The impact will cause a further decline of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline; and 3 – The impact is made on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.*

***Diuris arenaria* (Sand Doubletail)**

An assessment of the potential for the development to result in serious and irreversible impacts on the *Diuris arenaria* (Sand Doubletail) was undertaken using the assessment criteria for threatened species or populations set out in subsection 9.1 of the BAM (DPIE 2020a), is provided in **Appendix I**. In summary, this assessment determined the following:

> Sand Doubletail is a small ground orchid, known from the Tomaree Peninsula near Newcastle, NSW (TBDC). Found in coastal heath and dry grassy eucalypt forest on sandy flats (TBDC). It is currently known from three main locations, two of which are reserved but occur in areas subject to disturbance (TBDC). Other scattered individuals are known to occur outside reserves (OEH, 2000). Light purple to mauve flowers appears through the months of August to September and are 20-30 mm wide. Flowering stems can be up to 40 cm high. Usually there are two leaves, 15-50 cm long by 2-6 mm wide, growing from the base of the plant (TBDC). The Sand Doubletail is listed as Endangered. The survival of the species is threatened due to its small population size, along with disturbance, habitat loss, weeds, fire and land management practices.

8.2 OFFSET REQUIREMENTS FOR IMPACTS

The Western Extension of this development requires offsetting, and the remaining areas require replacement (**Table 15**). The areas requiring replacement can be offset by finding equivalent areas within the Project Area and adding them into the Proposed On-site Offset Area. This section details the Offset requirements first, followed by areas requiring replacement.

Table 15: Areas within the Western Extension and Disturbance Expansion Area

Zone	PCT	Condition Class	Western Extension Area (ha)	Disturbance Expansion Area	Total Area (ha)
1	3544	Moderate	2.35	0.47	2.82
2	3544	Shrubby regrowth	1.58	0.03	1.61
3	3544	Managed	0.69	0.17	0.86
-	-	Exotic Grassland	1.53	0	1.53
-	-	Excluded Areas	0.96	0	0.98

Zone	PCT	Condition Class	Western Extension Area (ha)	Disturbance Expansion Area	Total Area (ha)
Native Vegetation Total			4.61	0.68	5.29
Total area within the development footprint			7.1	0.68	7.8

8.2.1 Western Extension Offsets

The Western Extension of this development will be offset in accordance with the BOS.

8.2.1.1 Impacts on Native Vegetation and TECs (Ecosystem Credits)

A summary of the impacts within the Development Site on native vegetation and the required ecosystem credits is provided in **Table 16**. The Biodiversity Credit Report is provided in **Appendix 4.**

Table 16: Summary of Ecosystem Credit Requirements

Zone	PCT & Condition Class	Area (ha)	Change in Vegetation Integrity	Credits Required
1	3544 Moderate-Good	2.35	-72.5	64
2	3544 Shrubby	1.58	-20	12
3	3544 Managed	0.69	-17.5	5
			Total	**81**

8.2.1.2 Impacts on Threatened Species or Habitat (Species Credits)

A summary of the impacts within the Development Site on threatened species and required species credits is provided in **Table 17**.

Table 17: Summary of Species Credits Requirements

Scientific Name	Common Name	Vegetation Zone	Loss of habitat (ha) or individuals	Credits Required
Eucalyptus parramattensis subsp. *decadens*	Earp's Gum	3544 ModGood	29	58
Phascolarctos cinereus	Koala	3544 ModGood	2.35 ha	85
Petaurus norfolcensis	Squirrel Glider	3544 Moderate-Good	2.35 ha	85
		3544 Shrubby	1.58 ha	16
Crinia tinnula	Wallum Froglet	3544 Moderate-Good	0.1 ha	3
		3544 Shrubby	0.02 ha	1
Uperoleia mahonyi	Mahony's Toadlet	3544 Moderate-Good	2.35 ha	85
		3544 Shrubby	1.58 ha	16

Scientific Name	Common Name	Vegetation Zone	Loss of habitat (ha) or individuals	Credits Required
		3544 Managed	0.69 ha	6
Diuris arenaria	Sand Doubletail	3544 Moderate-Good	2.35 ha	9
		3544 Shrubby	1.58 ha	128
		3544 Managed	0.69 ha	24
			Total	**516**

8.2.2 Offset Replacement

Following is a summary of the impacts within the Development Site on native vegetation and the replacement areas being incorporated into the On-site offset area.

Disturbance Expansion Area

A total of 0.67 ha of Coastal Sand Apple-Blackbutt Forest (PCT3544) in moderate condition (0.47 ha), shrubby (0.03 ha) and managed condition (0.17 ha) occurs across these areas. These areas are primarily comprised of previously cleared areas, or vegetation that is bordered by clearing so that it is somewhat degraded.

Threatened flora species and threatened fauna habitat features include

- One *Eucalyptus parramattensis* individual occurs within this area.
- One hollow bearing tree (containing one large basal hollow)
- Koala habitat (0.47 ha) comprised of both preferred koala habitat and koala habitat buffers over supplementary habitat.

Proposed Increased Offset Area

A total of 1.17 ha of Coastal Sand Apple-Blackbutt Forest (PCT 3544) in moderate-good condition is being added into the offset area. The majority of this area is comprised of remnant vegetation that was not historically cleared, and has all strata layers intact - canopy, midstory and ground layers.

These areas contain threatened flora species, including nine *Eucalyptus camfieldii* individuals.

These areas also contain mature trees and hollow-bearing trees that provide suitable habitat for threatened fauna species that have previously been found on-site or/are predicted to use the site.

- Koala habitat (1.13 ha) considered supplementary koala habitat and its buffers as well as preferred koala habitat
- Approximately 15 Hollow-bearing trees and dead stags that provide suitable habitat (6 small, 6 medium and 7 large hollows) for Squirrel Glider, Eastern Bentwing-bat, Eastern Freetail-Bat and Little Bentwing.
- All of this vegetation provides suitable habitat for Rufous Fantail and foraging habitat for Grey-headed Flying Fox.

- A small amount of this area (0.23 ha) occurs within habitat buffer areas for Wallum Froglet (*Crinia tinnula*), and all of these areas (1.17 ha) provide suitable habitat for Mahony's Toadlet (*Uperolia mahonii*).

Overall, the addition of these areas into the on-site offset areas results in a net gain into the on-site offset area.

9. ASSESSMENT OF OTHER RELEVANT BIODIVERSITY LEGISLATION

9.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

9.1.1 ASSESSMENT REQUIREMENTS

The EPBC Act requires that developments or undertakings that are likely to have a significant impact on MNES be referred for a determination as to whether they are a controlled action that requires approval under the EPBC Act (Section 1.5.1). These impacts have been conducted across the entire Development Footprint.

Of the nine MNES listed under the Act, the one MNES considered relevant to the Study Area was potential impacts on marginal habitat for listed threatened species. An assessment of the relevant threatened species databases and an assessment of the likelihood of occurrence of threatened and migratory species is provided in Appendix E. Seven EPBC listed species were assessed as having potential habitat within the Subject Land; Earps Gum (*Eucalyptus parramattensis* subsp. *decadens*), Koala (*Phascolarctos cinereus*), New Holland Mouse (*Pseudomys novaehollandiae*), Grey-headed Flying-fox (*Pteropus poliocephalus*), Large-eared Pied Bat (*Chalinolobus dwyeri*), Mahony's Toadlet (*Uperolia mahonyi*) and Swift Parrot (*Lathamus discolor*). An assessment of significance was completed for these species in accordance with EPBC Act Matters of National Environmental Significance Significant impact guidelines 1.1 (Department of the Environment [DotE], 2013) (provided in **Appendix F**). Impacts to any EPBC-listed species are unlikely to be significant. As such, a referral to the Commonwealth Minister for the Environment is not considered necessary.

A search of relevant threatened species databases and an assessment of the likelihood of occurrence of threatened and migratory species is provided in **Appendix E**. Several threatened fauna species, and migratory species were assessed as having potential habitat within the Development Site.

Assessment against the significant impact criteria for these threatened species assessed as being 'affected' by the proposal are provided in **Appendix F**. The assessment concluded that the project is unlikely to have a significant impact on MNES and is not required to be referred to DAWE for approval.

9.2 STATE ENVIRONMENTAL PLANNING POLICY (BIODIVERSITY AND CONSERVATION) 2021

Port Stephens LGA is listed in Schedule 2 of the Biodiversity and Conservation SEPP 2021. Therefore, the Study Area is subject to an approved CKPoM, the *Port Stephens Comprehensive*

Koala Plan of Management (CKPoM) (PS 2002), any Development Application to PSC will need to be consistent with the requirements of the CKPoM.

9.2.1 Port Stephens Council Comprehensive Koala Plan of Management (CKPoM).

A site inspection was undertaken to confirm mapping and record occurrence of Koala feed trees (i.e. *Eucalyptus robusta, E. parramattensis* and *E. tereticornis*) within the Subject Land. The results of the site inspection revealed that 34 of *E. parramattensis* subsp. *decadens* occur within the Study Area (5 m buffer to allow for GPS accuracy of ±5 m) with 29 within 10 m the Development Footprint. (**Figure 12 and Figure 19**).

A vegetation assessment undertaken identified two native plant communities as occurring within the Study Area (**Section 4.2.3**), along with exotic vegetation. Following a review of the definitions of 'Preferred', 'Supplementary' and 'Marginal' Koala Habitat detailed by Lunney *et al.* (1998), it was determined that the areas mapped as PCT 3544 (Coastal Sands Apple-Blackbutt Forest) (Zone 1) and PCT 3996 (Coastal Sand Swamp Mahogany Dry Forest) (Zone 4) would likely constitute 'Preferred' Koala Habitat, due to the percentage of koala use trees being 10-35% (where field survey 'Secondary' and community survey category A/B overlap) (see **Table 18**). The current mapping of the 'Mainly cleared – Preferred Habitat Link' areas are accurate; however, the preferred and marginal koala habitat is not accurate. This area has been historically mined, therefore the rehabilitation that has grown has become suitable koala habitat since the time this koala habitat map was created. See **Figure 20** for broad koala habitat mapping and **Figure 21** for a site-specific Koala Habitat map.

Table 18: Classification of Koala habitat within Subject Land

PCT	Applicable Vegetation Zones	Community Based Survey Equivalent	Koala Feed Tree* Comp %	Proposed Koala Habitat Mapping
PCT 3544	Zone 1	Category A/B	10-35%	'Preferred' Koala Habitat
PCT 3544	Zone 2	Cleared (Mainly cleared land, some trees)	<10%	'Marginal' Koala Habitat
PCT 3544	Zone 3	Cleared (Mainly cleared land, some trees	<10%	'Mainly Cleared'
PCT 3996	Zone 4	Category A	Approx. 50%	Likely 'Preferred' Koala Habitat, however no survey data to determine use by koala
Exotic Grassland	-	Cleared	NA	'Mainly Cleared'

*Preferred Koala Feed Trees: *Eucalyptus tereticornis*, *Eucalyptus robusta*, *Eucalyptus parramattensis* (Lunney *et al.* 1998)

Performance Criteria for development (Appendix 5 of CKPoM)

The performance criteria for the proposed development are addressed below:

a) **Minimise the removal or degradation of native vegetation within Preferred Koala Habitat or Habitat Buffers.**

A total of 2.82 ha of 'Preferred' Koala Habitat is proposed for removal. However, 1.98 ha of preferred habitat is being avoided within the Study Area. Once extraction is completed, the (western extension area) property will be revegetated with native vegetation and return to a similar land use. In addition, 1.19 ha of preferred koala habitat is being avoided and added into the on-site offset area, to replace areas being cleared within the Newcastle Sand Project Area.

b) Maximise retention and minimise degradation of native vegetation within Supplementary Koala Habitat and Habitat Linking Areas.

The remaining areas of the site that are not preferred koala habitat are considered koala habitat links over cleared land, and 2.44 ha of native vegetation will be removed from these areas (**Figure 20**). The remainder of the site is covered by exotic grass, tracks or infrastructure that will also be removed totalling 2.54 ha. This site will be revegetated after extraction with a native vegetation predominantly a grassland community, that is conducive to a similar land use to the existing land use (i.e. a residential dwelling with associated fire breaks). Therefore, is likely to remain the same over the longer term, with a short-term reduction in habitat linkage areas, throughout the extraction process.

c) **Minimise the removal of any individuals of preferred koala food trees, wherever they occur on a development site. In the Port Stephens LGA these tree species are Swamp Mahogany (*Eucalyptus robusta*), Parramatta Red Gum (*Eucalyptus parramattensis*), and Forest Red Gum (*Eucalyptus tereticornis*), and hybrids of any of these species. An additional list of tree species that may be important to koalas based on anecdotal evidence is included in Appendix 8**

Thirty (30) Koala feed trees (*E. parramattensis* subsp. *decadens*) that require removal; however, these trees represent a small proportion of the total number of trees within the vegetation community. A total of 633 *E. parramattensis* subsp. *decadens* individuals will be retained within the proposed on-site offset area. Also, a total of 48 individuals of Swamp Mahogany (*Eucalyptus robusta*) will be retained within the avoided vegetation in the western extension area.

d) Make provision, where appropriate, for restoration or rehabilitation of areas identified as Koala Habitat including Habitat Buffers and Habitat Linking Areas over Mainly Cleared Land. In instances where Council approves the removal of koala habitat (in accordance with dot points 1-4 of the above waive clause), and where circumstances permit, this is to include measures which result in a "net gain" of koala habitat on the site and/or adjacent land;

The on-site offset area on adjacent land will be increased as part of this proposal by 1.19 ha.

Preferred Koala Habitat will be retained within the Study Area. Approximately 1.98 ha of preferred koala habitat will be retained within the Study Area.

Progressive rehabilitation of the extraction area will be conducted with locally occurring native species. Within the areas of rehabilitation that occur within the Newcastle Sand Project Area covering 1.03 ha, preferred koala feed trees will be included to replace the 30 koala feed trees that will be removed. These will be monitored so that koala feed trees achieve a canopy cover >15% across the onsite offset area.

As such, the proposal is consistent with this objective.

e) Make provision for long term management and protection of koala habitat including both existing and restored habitat;

An on-site offset area is being established in the area surrounding the Quarry, that will protect koala habitat in perpetuity. This covers an area of 131.47 ha. In addition, areas of native vegetation that are proposed to be cleared are being revegetated after extraction. These will be monitored according to the performance criteria outlined in the Newcastle Sand Biodiversity and Rehabilitation Management Plan (NS BRMP), which specifies performance criteria of achieving 'preferred koala feed trees at a suitable density across rehabilitation area to support koala population.' And corrective actions are required if 'the feed trees occupy less than 15% of the canopy'.

There is also an offset obligation being met for native vegetation (Ecosystem Credits) proposed to be cleared within the western extension area that will fund activities related to the protection of koala habitat in perpetuity. This is outlined in detail in Section 8.2.1 above.

f) Not compromise the potential for safe movement of koalas across the site. This should include maximising tree retention generally and minimising the likelihood that the proposal would result in the creation of barriers to koala movement, such as would be imposed by certain types of fencing. The preferred option for minimising restrictions to safe koala movement is that there be no fencing (of a sort that would preclude koalas) associated with dog free developments within or adjacent to Preferred or Supplementary Koala Habitat, Habitat Buffers or Habitat Linking Areas. Suitable fencing for such areas could include:

i) fences where the bottom of the fence is a minimum of 200 mm above ground level that would allow koalas to move underneath;

ii) fences that facilitate easy climbing by koalas; for example, sturdy chain mesh fences, or solid style fences with timber posts on both sides at regular intervals of approximately 20 m;

or iii) open post and rail or post and wire (definitely not barbed wire on the bottom strand).

The proposed modification occurs to the north of Cabbage Tree Road. The intact areas of native vegetation all occur to the north of this road, both on-site and in connected vegetation offsite, and therefore there is not likely to be much movement from north to south throughout the project area but rather across the site in an easterly or westerly direction. The development is surrounded by the proposed on-site offset area within which there is a large area of intact vegetation for koala movement.

As the proposed western extension occurs adjacent to other rural / residential blocks, it is unlikely to impact on koala movement through the area, as there is little habitat on the south or west of the footprint.

Any fencing that is required on-site will include koala crossings as per the NS BRMP, where the land borders on other koala habitat. However, fencing is more likely required to prevent movement of koalas from the site onto Cabbage Tree Road, in line with the NS BRMP.

Checklist for development applications

The proposed development contains Preferred (Koala) Habitat, Habitat Buffers and Habitat Linking Areas, and so the following information must be submitted with the development application (see **Table 19**).

Table 19: Checklist of information to accompany development applications.

Information to Accompany Applications (Appendix 4 CKPoM).	Section of report that this has been included
1. An assessment of koala habitat, by a suitably qualified person, in accordance with the attached Guidelines for Koala Habitat Assessment, which appear in Appendix 6.	A list of staff who contributed to this BDAR are included in Appendix I with a description of the qualifications and experience for those who conducted specific assessments in relation to Koala Habitat, showing they are suitably qualified to undertake these assessments.
2. Clear details concerning which vegetation is to be cleared or disturbed and that which is to be retained.	**Section 4.2.3** details the vegetation to be cleared with areas detailed in **Table 4**
3. Details of any proposed building envelopes and fire fuel reduction zones and the means by which they are to be enforced.	N/A
4. Proposed measures to restore or rehabilitate koala habitat, including measures which will result in the net gain of koala habitat.	This is addressed above in **Section 9.2.1** performance criterion d).
5. Proposed measures to allow the safe movement of koalas across the site including road designs and speed mediation measures, fence construction details where fencing is proposed, and swimming pool specifications.	Safe movement of kolas will be maintained in accordance with the Newcastle Sand Biodiversity Rehabilitation Management Plan.
6. Proposed measures to mitigate the impacts on koalas by dogs.	Ongoing monitoring and management of wild dogs is required in accordance with the Newcastle Sand Biodiversity Rehabilitation Management Plan to protect all wildlife.
7. Details of any proposed program to monitor koalas and koala habitat, during and following development activity on a site. Monitoring programs would not be required for single lot developments. Rather, they would be expected for subdivisions. The following information must be submitted with applications for development on sites that are adjacent to Preferred or Supplementary Habitat, Habitat Buffers or Habitat Linking Areas.	A qualified fauna ecologist is to inspect vegetation on site prior to clearing and remain present on site through the process of clearing vegetation.
8. Proposed measures to mitigate the impacts by dogs on koalas which occupy adjacent habitat. This must include measures (such as education of dog owners, appropriate signs, or restrictions on dog ownership) that reduce the likelihood of domestic dogs straying into koala habitat.	Signage is required, as part of the on-site offset area, surrounding the quarry site, to notify neighbouring landowners that the area is used for conservation. In addition, pest control monitoring and activities are undertaken, including trapping animals and if they are a domestic animal, returning them to their owners.

Information to Accompany Applications (Appendix 4 CKPoM).	Section of report that this has been included
	In these ways, the neighbouring landowners are made aware of the importance of keeping their animals within their properties, and not allowing them onto the on-site offset area, and with these measures outlined within the NS BRMP, no further mitigation measures are required.
9. Proposed measures to mitigate the impact on koalas of motor vehicles travelling to the site. This must include appropriate traffic control measures on roads which run through or adjacent to nearby koala habitat and which are subject to increased traffic volumes due to the development on the site.	Addressed above in **Section 9.2.1** performance criteria f).

Guidelines for Koala Habitat Assessments in the Port Stephens LGA

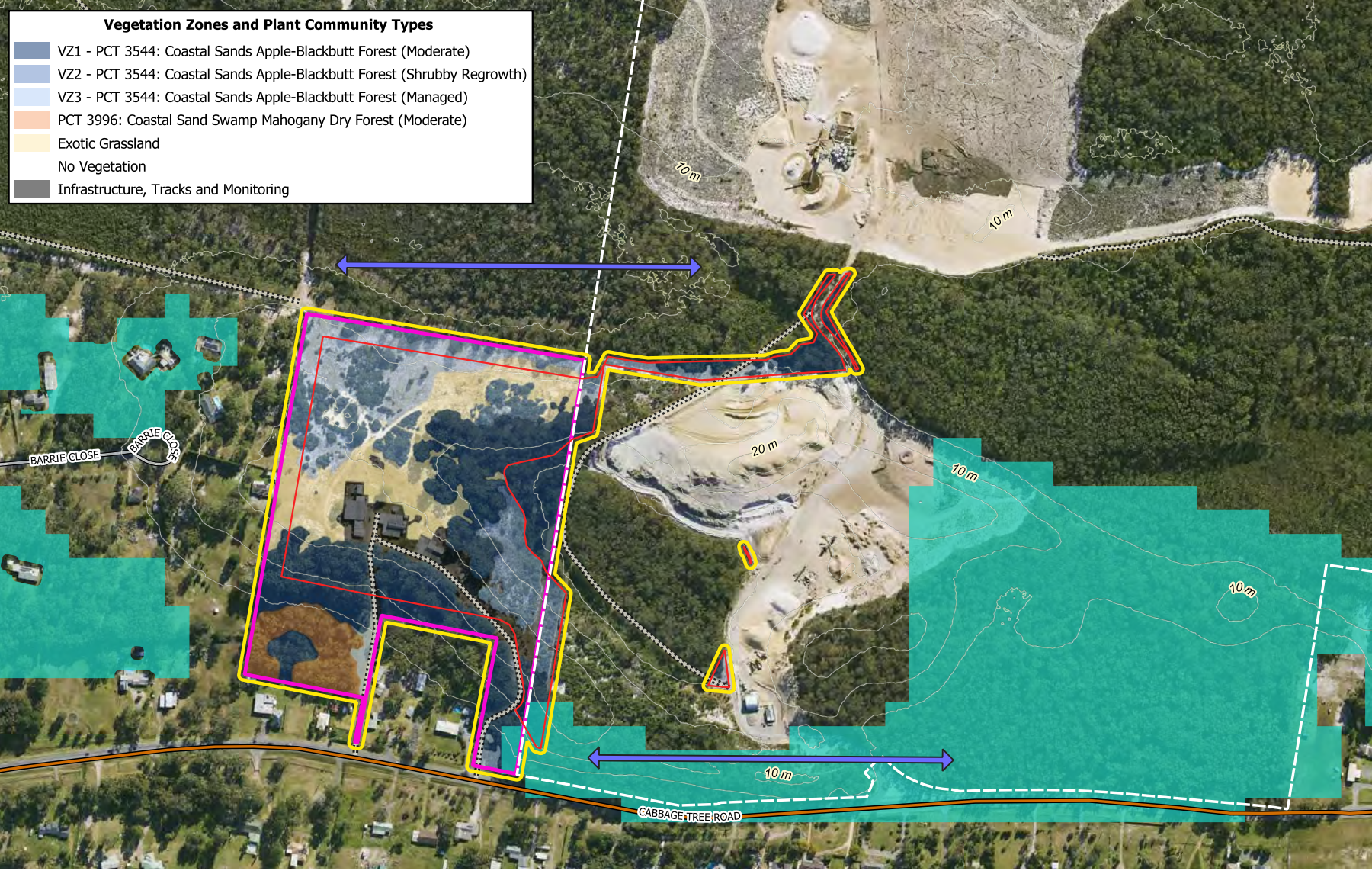
The Guidelines for Koala Habitat Assessments must be carried out by a person or persons with qualifications and experience in tree species identification and, in the case of assessments of koala habitat utilisation at Step 4, qualifications and experience in biological science and fauna survey and management. This should also include experience in conducting koala surveys. It is necessary that a brief curriculum vitae of each person involved with assessments conducted using these guidelines be appended to the survey report.

Koala Habitat Assessment in the Port Stephens LGA should include the following steps as the minimum acceptable approach.

The following table **(Table 20**) provides a checklist to ensure that all information has been provided as required in Appendix 6 of the PSC CKPoM, to cover the proposed development that is being assessed under Part 4 of the EP&A Act.

Table 20: Guidelines for Koala Assessments being considered under Part 4 of the EP&A Act (Appendix 6 CKPoM).

Guidelines for Koala Assessments being considered under Part 4 of the EP&A Act (Appendix 6 CKPoM).	Relevant section of this report
Preliminary Assessment	Reference to the Koala Habitat Mapping has been included in **Figure 20**.
Vegetation Mapping	**Figure 4** shows vegetation mapping across the site
Koala Habitat Identification	**Sections 9.2.1** outlines how koala habitat was determined across the site. **Figure 19** shows a site-specific koala habitat map
Assessment of the Proposal	Performance Criteria are assessed above in **Section 9.2.1**



WEDGETAIL
PROJECT CONSULTING PTY LTD

Study Area
Core Habitat within an approved Koala Plan of Management (Koala SEPP)
Fauna Movement Corridor
Contours (5m)

Arterial Road
Local Road
Track-Vehicular

Figure 20. Biodiversity Values

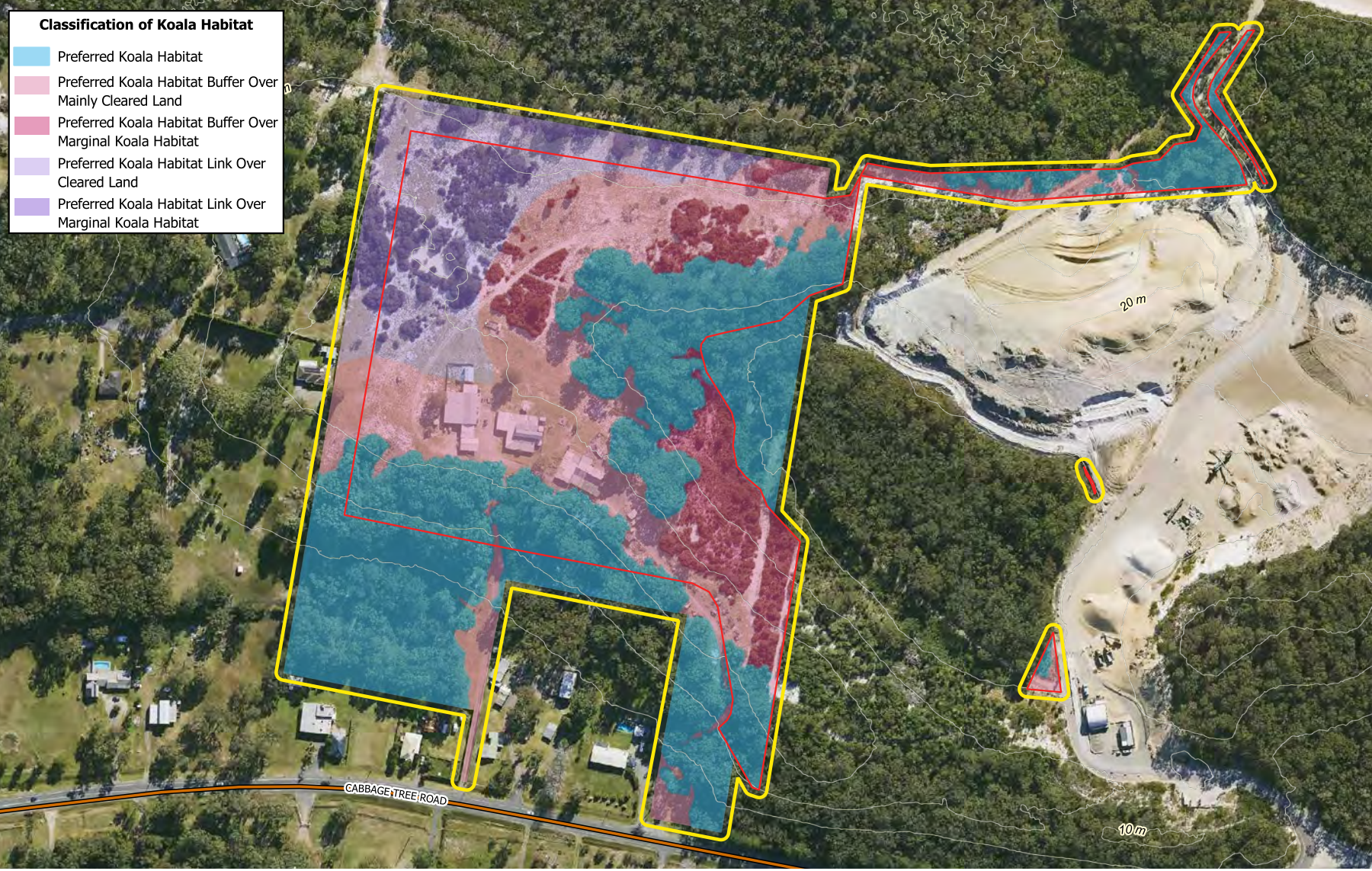
N

GDA94 / MGA zone 56
EPSG:28356

50 100 150 200 m

Map Produced: 03/02/2025
Produced By: Keryn Dowling

Wedgetail Project Consulting\Arbus - Documents\Newcastle Sand\MOD4 BDAR\@GIS\NS_MOD4_BDAR_Figures_250130.qgz



WEDGETAIL PROJECT CONSULTING

Study Area
Disturbance Footprint (MOD4)
Contours (5m)
Arterial Road

Figure 21. KPOM Mapping

N

GDA94 / MGA zone 56
EPSG:28356

50 100 150 200 m

Map Produced: 03/02/2025
Produced By: Keryn Dowling

Wedgetail Project Consulting\Arbus - Documents\Newcastle Sand\MOD4 BDAR\@GIS\NS_MOD4_BDAR_Figures_250130.qgz

9.3 STATE ENVIRONMENTAL PLANNING POLICY (RESILIENCE AND HAZARDS) 2021

A review of Chapter 2 of the Resilience and Hazards SEPP including the following mapped areas was conducted:

- Coastal Wetlands.
- Proximity Area for Coastal Wetlands.
- Littoral Rainforests.
- Proximity for Littoral Rainforests.

The Development Site is located outside the above listed mapped areas, as such, it is not considered to have an impact on any mapped wetlands or littoral rainforests.

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APPENDIX A. BAM PLOT DATA SHEETS

Quadrat Number: Q1 Date: 11/12/23 Recorder: AO 20 ✓Data entered 12/12/23 DP.

Vegetation Type: E1 Coastal Blackbutt Apple. Property Name or Project Name: Hovdas

Overstorey Species	F	Ab	Midstorey Species	F	Ab	Ground Cover (Shrubs)	F	Ab	Ground Cover (Grasses)	F	Ab	Ground Cover (Other)	F	Ab	Exotic	F	Ab
E. pilularis ✓ Blackbutt	35	5	Allocas	0.1	1	✓Myop.	1	10	✓Lom long	0.1	2	✓Flanell fl	0.1	20	Pine	0.1	1
✓ Scribbly	1	0	Persoonia laev	~~2~~	5	~~Pers. linea~~			✓L. glaud	0.1	2	✓Pteridium esculentum	1	100			
~~Stringy~~						✓Ac long	7	~~30~~				✓Pomaderris	0.1	20			
E. parramattensis ✓ Para	0.5	0	Pers lin	~~2~~ 1	5	~~Leuco app~~			✓Cyp	0.1	10	✓Dianella	2	50			
C. gummifera ✓ Gum	5	2				✓Div ulic	2	20				✓Leuco app (wh flow)	0.1	20			
			Bipinnate acacia Acacia terminalis	0.2	2	✓Ricinoc	2	20				~~Poa sp~~					
			✓Monotoca elliptica	40	100 many white flow	✓Wax flow	1	50				✓Discolourous shrub (pea)	2	20			
						✓Shrub ~ (fluffy seed)	1	50	← Pimelea			~~Poa~~ ~ shrub (pea) Aotus ericoides					
												~~Poa (round leaf)~~					
						✓Lepto. tea tree	5	20				wh. Umbel fl	1	50			
						✓Ac ulic (spikey)	1	20				✓Hibbertia	0.5	50			
						✓Ac (flattened stemwidth pod)	2	20				✓Notwoolsia	1	50			
						Same as Var leaf pea						✓Hardenbg	0.1	5			

Bossiaea heterophylla

Acacia Spikey = confirmed as Acacia ulicifolia (Prickly Moses)
Bipinnate acacia = Acacia terminalis (Sunshine Wattle)
Cyper. = Schoenus ericetorum (Heath Bog-rush)
Dianella = Dianella caerulea (Blue Flax-lily)
Discolours shrub (pea) = Aotus ericoides
Hibbertia Curly = Hibbertia linearis
Hibbertia Fine-leaf = Hibbertia fasiculata
Leafless Forb = Amperea xiphoclada var. xiphoclada
Lepto 1 Tea Tree = Gaudium laevigatum
Leptospermum Hairy = Leptospermum polygalifolium (Tantoon)
Leuco app (white flower) = Leucopogon ericoides (Pink Beard-heath)
Myoporum = Myoporum acuminatum (Boobialla)
Not Woolsia = Astroloma pinifolium (Pine Heath)
Pimelea (Fluffy Seed Shrub) = Pimelea linifolia
Poa sp. Bluegrass = Eragrostis curvula (African Lovegrass)
Variable Leaf Pea = Bossiaea rhombifolia & Bossiaea heterophylla
Wax flower shrub = Euryomyrtus ramosissima (Rosy Baeckea)
White umbel flower = Platysace ericoides
Epacrid (leaf margins) = Monotoca elliptica

F Foliage Projective Cover: within the boundaries of the plot including all attached plant material, alive or dead, rooted in or overhanging the plot. Cover should be recorded in decimals if less than 1% (0.1, 0.2, 0.3), in whole numbers up to 5% (1, 2, 3), to the nearest 5% if >5% (5, 10, 15, 20, 25, ...100%).
64 cm x 64 cm = 0.1%; 1 m x 1 m = 0.25%; 10 m^2 = 2.5%; 20 m^2 = 5%.

Ab Abundance Rating (no. of individuals or shoots rooted within the plot): 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc
(numbers > 20 are estimates only, and the recorded abundance is the upper end of each class, e.g. 50 represents an estimated abundance of between 20 and 50)

General Comments:

Quadrat Number: Q2 75 Date: 11/12/2023 Recorder: AO

✓Data entered 12/12/23 DP.

Vegetation Type: Heath 1 Property Name or Project Name: Harden

Overstorey Species	F	Ab	Midstorey Species	F	Ab	Ground Cover (Shrubs)	F	Ab	Ground Cover (Grasses)	F	Ab	Ground Cover (Other)	F	Ab	Exotic	F	Ab
Allo lit	0.1	1	Lepto 1	60	50	Ac long	2	20	Blue grass (sample)	0.1	20	Not woolsia	0.2	50	Pine tree	0.1	1
			Lepto hairy	10	20	Pers lin	0.5	5				Pomax	0.1	50			
						Sticky pea	0.5	10				White umbel fl	0.1	10			
						Monoto	0.2	10	Cyper	0.2	50	Hibbertia curly	0.2	50			
						Banksia serrata	0.1	1				Wax fl (pink)	0.2	50			
									Long lanc	0.1	5	Leuco app	0.2	20			
						Ac ulic	0.1	5%				Dianella	0.1	20			
						Div ulic	0.1	5				Ricino	0.2	10			
									Discolourous leaf plot			Disc leaf pea	0.1	2			
												Hibb fine leaf	0.1	20			
												Flannel fl	0.1	5			
												Lom long	0.1	5			
												~~Lepto 2~~					
												Epacrid (leaf margin)	0.2	10			
												Leaflets	0.1	2			
												Variable leaf pea	0.1	10			

Acacia Spikey = confirmed as Acacia ulicifolia (Prickly Moses)
Bipinnate acacia = Acacia terminalis (Sunshine Wattle)
Cyper. = Schoenus ericetorum (Heath Bog-rush)
Dianella = Dianella caerulea (Blue Flax-lily)
Discolours shrub (pea) = Aotus ericoides
Hibbertia Curly = Hibbertia linearis
Hibbertia Fine-leaf = Hibbertia fasiculata
Leafless Forb = Amperea xiphoclada var. xiphoclada
Lepto 1 Tea Tree = Gaudium laevigatum
Leptospermum Hairy = Leptospermum polygalifolium (Tantoon)
Leuco app (white flower) = Leucopogon ericoides (Pink Beard-heath)
Myoporum = Myoporum acuminatum (Boobialla)
Not Woolsia = Astroloma pinifolium (Pine Heath)
Pimelea (Fluffy Seed Shrub) = Pimelea linifolia
Poa sp. Bluegrass = Eragrostis curvula (African Lovegrass)
Variable Leaf Pea = Bossiaea rhombifolia & Bossiaea heterophylla
Wax flower shrub = Euryomyrtus ramosissima (Rosy Baeckea)
White umbel flower = Platysace ericoides
Epacrid (leaf margins) = *Monotoca elliptica*

F Foliage Projective Cover: within the boundaries of the plot including all attached plant material, alive or dead, rooted in or overhanging the plot. Cover should be recorded in decimals if less than 1% (0.1, 0.2, 0.3), in whole numbers up to 5% (1, 2, 3), to the nearest 5% if >5% (5, 10, 15, 20, 25, …100%).
64 cm x 64 cm = 0.1%; 1 m x 1 m = 0.25%; 10 m^2 = 2.5%; 20 m^2 = 5%.

Ab Abundance Rating (no. of individuals or shoots rooted within the plot): 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc
(numbers > 20 are estimates only, and the recorded abundance is the upper end of each class, e.g. 50 represents an estimated abundance of between 20 and 50)

General Comments:

✓ = Sample

✓Data entered 19/1/24 DP

Quadrat Number: Q3 **Date:** 19/1/24 **Recorder:** D. Plunkett + A. Owens

Vegetation Type: PCT 3544 **Property Name or Project Name:** Hardes ext.

Overstorey Species	F	Ab	Midstorey Species	F	Ab	Ground Cover (Shrubs)	F	Ab	Ground Cover (Grasses)	F	Ab	Ground Cover (Other)	F	Ab	Exotic	F	Ab
C. gum	2	2	Monotoca ellip.	20	20	Acacia ulicifolia	0.2	5	Lom. longifolia	10	20	Pomax umbellata	0.1	10			
Scribbly gum	9	1	✓Mistletoe (2)	0.1	2	~~Dill. retort. ?~~			~~Pomax umbellata~~			Dianella car.	5	20			
A. costata	2	3	Lepto. poly.	1	4	Hotus. eric.	0.2	2	Lom. glauca	0.1	3	~~Dodder sp.~~					
E. paramattensis	1	2	Acacia longi.	1	2	Dill. retort.	0.1	2	Shoenus ericit.	0.1	1	~~Cuscuta~~					
E. pilularis	15	3	✓Mistletoe (3)	0.1	1	Eurgomyrtus ram.	0.1	1				~~Cassytha glabella~~					
~~Blackbutt~~ Stringybark?	1		~~Ricinocarpos pin.~~			Leuco. eric.	0.1	2				✓Cuscuta camp (1)	0.1	3			
						Amperea xiph.	0.1	5				Parsonsia stam.	1	2			
						Ricinocarp. pin.	0.1	1				Pandorea pand.	0.1	5			
												Platysace. eric.	0.1	1			
												Actinotus. hel.	0.1	1			

E. signata

Red gum Blackbutt

Blackbutt ~~Stringybark?~~

Sample likely blackbutt.

F Foliage Projective Cover: within the boundaries of the plot including all attached plant material, alive or dead, rooted in or overhanging the plot. Cover should be recorded in decimals if less than 1% (0.1, 0.2, 0.3), in whole numbers up to 5% (1, 2, 3), to the nearest 5% if >5% (5, 10, 15, 20, 25, ...100%).
64 cm x 64 cm = 0.1%; 1 m x 1 m = 0.25%; 10 m^2 = 2.5%; 20 m^2 = 5%.

Ab Abundance Rating (no. of individuals or shoots rooted within the plot): 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc
(numbers > 20 are estimates only, and the recorded abundance is the upper end of each class, e.g. 50 represents an estimated abundance of between 20 and 50)

General Comments: Bossinea heterophylla just outside plot.

Canopy cover = 30%
Midstory cover = 25%
Ground cover = 15%

Data entered 10/5/24, DP.

Quadrat Number: Q4 **Date:** 9/5/24 **Recorder:** AO

Vegetation Type: Exotic Grass **Property Name or Project Name:** Hardes NS Exl

Overstorey Species	F	Ab	Midstorey Species	F	Ab	Ground Cover (Shrubs)	F	Ab	Ground Cover (Grasses)	F	Ab	Ground Cover (Other)	F	Ab	Exotic	F	Ab
			~~Ozothamnus diosmifolius~~			~~Cassinia~~	0.1	1	Lom long	0.1	2	pom umb	0.2	20	~~Cell eragrostis~~		
			H. fasciculata			Hibbertia	0.1	5	Lom glauc	0.1	2	Solanum Photo	0.1	1	~~blue grass~~		
						~~Not Woolsia~~ Astro pinni	0.1	3	Cyperi	0.1	2	A. sisymbriifolium Arthropodium	0.1	5	red natal	2	~~200~~
			Casuarina leviga tum			Leptos	0.1	10	Yellow eragrostis	5	100	Pteridium	0.1	5	~~Cell erag~~ Era curv	~~40~~ 35	35/10000
									Eragrostis brownii			combo			~~(blue grass)~~	Eragrostis	~~curvula~~
						Spikey shrub	0.1	10	Hairy grass	10	1000	Dianella caerulea	0.1	5	+		
						Monotoca scoparia				+					blue grass dense flowerhead	35	35/10000
						Long thin leaf	0.1	5	Eragrostis curvula.						Eragrostis curvula		
						Hibbertia linearis.									TOTAL =		70/20,000
						Spikey leuco (ericoides)	0.1	5									
						Confirmed - L. ericoides											
						Ac long	0.1	1									
						(tea round leaf)	0.1	1									
						Boss rhomb											
						Monotelip	0.1	5									
						Parsoonia linearis	0.1	1									

F Foliage Projective Cover: within the boundaries of the plot including all attached plant material, alive or dead, rooted in or overhanging the plot. Cover should be recorded in decimals if less than 1% (0.1, 0.2, 0.3), in whole numbers up to 5% (1, 2, 3), to the nearest 5% if >5% (5, 10, 15, 20, 25, ... 100%).
64 cm x 64 cm = 0.1%; 1 m x 1 m = 0.25%; 10 m^2 = 2.5%; 20 m^2 = 5%.

Ab Abundance Rating (no. of individuals or shoots rooted within the plot): 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc
(numbers > 20 are estimates only, and the recorded abundance is the upper end of each class, e.g. 50 represents an estimated abundance of between 20 and 50)

General Comments:

Data entered 14/5/24, DP

Quadrat Number: Q5 **Date:** 13-5-24 (May) **Recorder:** Ao

Vegetation Type: Native **Property Name or Project Name:** Hardes

Overstorey Species			Midstorey Species			Ground Cover (Shrubs)			Ground Cover (Grasses)			Ground Cover (Other)			Exotic		
	F	Ab		F	Ab		F	Ab		F	Ab		F	Ab		F	Ab
						Tea tree			E. brownii	2	2000	Dianella caerulea	0.1	50	E. curvula	40	1000
						Lepido/Gaud	5	200	Shoen								
									~~Cyper~~ erioc	0.1	5	Pom umb	0.1	20	~~Hairy blue grass~~		
						Persoon lin	1	100							✓		
									Lom glauc	0.1	2	flannelflow	0.1	10			
						~~Dill ect~~ Platysace erio	0.2	20							Red natal	0.5	100
						Monot elli	15	2100	Themeda triandra	0.1	2	L					
						Hibbertia (long thin leaf) linearis	1	100									
						Boss rhom	7	200									
						Not woolsia Astrologa pin	1	100									
						Ac long	1	50									
						Leuco appr	0.5	50									
						Perso laurc (broad leaf)	1	50									
						Hibbertia (fine small leaf) fasciculata	1	100									

F Foliage Projective Cover: within the boundaries of the plot including all attached plant material, alive or dead, rooted in or overhanging the plot. Cover should be recorded in decimals if less than 1% (0.1, 0.2, 0.3), in whole numbers up to 5% (1, 2, 3), to the nearest 5% if >5% (5, 10, 15, 20, 25, ... 100%).
64 cm x 64 cm = 0.1%; 1 m x 1 m = 0.25%; 10 m^2 = 2.5%; 20 m^2 = 5%.

Ab Abundance Rating (no. of individuals or shoots rooted within the plot): 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc
(numbers > 20 are estimates only, and the recorded abundance is the upper end of each class, e.g. 50 represents an estimated abundance of between 20 and 50)

General Comments:

Data entered 10/15/24, DP.

1,000 m² PLOT

Tree Stem Size Class*		Trees^
Count of Large Trees Record DBH of each tree at 1.3 m from ground.	80+ cm	0
	50+ cm	0
All other Trees: Only record ***presence or absence*** of trees in these stem size classes. Record DBH of each tree at 1.3 m from ground.	30-49 cm	0
	20-29 cm	0
	10-19 cm	0
	5-9 cm	0
Presence or absence of **Regeneration#** Maximum stem diameter of <5 cm regardless of height.	<5 cm	0

Count of HBTs†
0

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present;

#Record presence of regeneration for any tree with a maximum stem diameter of <5 cm, regardless of height (i.e., record presence of regeneration if sapling or seedings that are <1.3 m heigh and have DBH <5 cm).

^Includes species classified as Trees under the BAM Growth Form Table.

†Count of **hollow-bearing *trees*** and ***shrubs***; includes living and dead; record by stem size class.

Length of logs (m) Fallen logs = >10 cm diameter, that is dead and entirely or partly on the ground within the 1,000 m² plot. Only the length of log within the plot is recorded.	Tally	TOTAL LENGTH (m)
	0m	0m

1 m² sub PLOT

	Litter cover (%)				
Subplot	10	5	5	5	15
Average					

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**. Include all plant material that is detached from a plant and forms part of the litter layer on the ground surface. Litter cover is the two-dimensional litter layer in contact with the ground surface, including litter under the canopies of erect plants. Plant material that is not detached should be assessed as foliage cover, regardless of whether it appears alive or dead.

Quadrat Number: Q4 **Date:** 9/5/2024 **Recorder:** D. Plunkett

Property Name or Project Name: Hardes NS

☑ Both Start and End points collected on GPS

☑ Start and End locations are approximately 50 m apart on GPS

Data entered 14/5/24, DP.

1,000 m² PLOT

Tree Stem Size Class*		Trees^
Count of Large Trees Record DBH of each tree at 1.3 m from ground.	80+ cm	0
	50+ cm	0
All other Trees: Only record ***presence or absence*** of trees in these stem size classes. Record DBH of each tree at 1.3 m from ground.	30-49 cm	0
	20-29 cm	0
	10-19 cm	0
	5-9 cm	✓
Presence or absence of **Regeneration#** Maximum stem diameter of <5 cm regardless of height.	<5 cm	0

*Banksia serrata

Count of HBTs†
0

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present;

#Record presence of regeneration for any tree with a maximum stem diameter of <5 cm, regardless of height (i.e., record presence of regeneration if sapling or seedings that are <1.3 m heigh and have DBH <5 cm).

^Includes species classified as Trees under the BAM Growth Form Table.

†Count of **hollow-bearing *trees*** and ***shrubs***; includes living and dead; record by stem size class.

Length of logs (m) Fallen logs = >10 cm diameter, that is dead and entirely or partly on the ground within the 1,000 m² plot. Only the length of log within the plot is recorded.	Tally	TOTAL LENGTH (m)
	0m	0m

1 m² sub PLOT

	Litter cover (%)				
Subplot	15	5	5	30	20
Average					

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**. Include all plant material that is detached from a plant and forms part of the litter layer on the ground surface. Litter cover is the two-dimensional litter layer in contact with the ground surface, including litter under the canopies of erect plants. Plant material that is not detached should be assessed as foliage cover, regardless of whether it appears alive or dead.

Quadrat Number: Q5 **Date:** 13/05/2024 **Recorder:** D. Plunkett

Property Name or Project Name: NS Hardes

☑ Both Start and End points collected on GPS

☑ Start and End locations are approximately 50 m apart on GPS

✓ Data entered 12/12/23 DP.

1,000 m² PLOT

Tree Stem Size Class*		Trees^
Count of Large Trees Record DBH of each tree at 1.3 m from ground.	80+ cm	
	50+ cm	|||||
All other Trees: Only record ***presence or absence*** of trees in these stem size classes. Record DBH of each tree at 1.3 m from ground.	30-49 cm	✓
	20-29 cm	✓
	10-19 cm	✓
	5-9 cm	
Presence or absence of **Regeneration#** Maximum stem diameter of <5 cm regardless of height.	<5 cm	✓

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present;

#Record presence of regeneration for any tree with a maximum stem diameter of <5 cm, regardless of height (i.e., record presence of regeneration if sapling or seedings that are <1.3 m heigh and have DBH <5 cm).

^Includes species classified as Trees under the BAM Growth Form Table.

Count of HBTs†
0

†Count of **hollow-bearing *trees*** and ***shrubs***; includes living and dead; record by stem size class.

Length of logs (m) Fallen logs = >10 cm diameter, that is dead and entirely or partly on the ground within the 1,000 m² plot. Only the length of log within the plot is recorded.	Tally	TOTAL LENGTH (m)
	3	3

1 m² sub PLOT

	Litter cover (%)				
Subplot	75	90	65	95	85
Average	82				

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**. Include all plant material that is detached from a plant and forms part of the litter layer on the ground surface. Litter cover is the two-dimensional litter layer in contact with the ground surface, including litter under the canopies of erect plants. Plant material that is not detached should be assessed as foliage cover, regardless of whether it appears alive or dead.

Quadrat Number: Q1 **Date:** 11 / 12 / 2023 **Recorder:** D. Plunkett

Property Name or Project Name: Hardes

☑ Both Start and End points collected on GPS

☑ Start and End locations are approximately 50 m apart on GPS

✓ Data entered 12/12/23 DP.

1,000 m² PLOT

Tree Stem Size Class*		Trees^
Count of Large Trees Record DBH of each tree at 1.3 m from ground.	80+ cm	
	50+ cm	
All other Trees: Only record ***presence or absence*** of trees in these stem size classes. Record DBH of each tree at 1.3 m from ground.	30-49 cm	
	20-29 cm	
	10-19 cm	
	5-9 cm	✓
Presence or absence of **Regeneration#** Maximum stem diameter of <5 cm regardless of height.	<5 cm	

Count of HBTs†
0

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present;

#Record presence of regeneration for any tree with a maximum stem diameter of <5 cm, regardless of height (i.e., record presence of regeneration if sapling or seedings that are <1.3 m heigh and have DBH <5 cm).

^Includes species classified as Trees under the BAM Growth Form Table.

†Count of ***hollow-bearing trees*** and ***shrubs***; includes living and dead; record by stem size class.

Length of logs (m) Fallen logs = >10 cm diameter, that is dead and entirely or partly on the ground within the 1,000 m² plot. Only the length of log within the plot is recorded.	Tally	TOTAL LENGTH (m)
	0	0m

1 m² sub PLOT

	Litter cover (%)				
Subplot	15	80	100	95	90
Average	76				

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**. Include all plant material that is detached from a plant and forms part of the litter layer on the ground surface. Litter cover is the two-dimensional litter layer in contact with the ground surface, including litter under the canopies of erect plants. Plant material that is not detached should be assessed as foliage cover, regardless of whether it appears alive or dead.

Quadrat Number: Q2 **Date:** 11/12/2023 **Recorder:** D-Plunkett

Property Name or Project Name: Hardes

☑ Both Start and End points collected on GPS

☑ Start and End locations are approximately 50 m apart on GPS

✓ Data entered 19/1/24 OP.

1,000 m² PLOT

Tree Stem Size Class*		Trees^
Count of Large Trees Record DBH of each tree at 1.3 m from ground.	80+ cm	0
	50+ cm	III
All other Trees: Only record ***presence or absence*** of trees in these stem size classes. Record DBH of each tree at 1.3 m from ground.	30-49 cm	✓
	20-29 cm	✓
	10-19 cm	✓
	5-9 cm	0
Presence or absence of **Regeneration#** Maximum stem diameter of <5 cm regardless of height.	<5 cm	✓

Count of HBTs†
0

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present;

#Record presence of regeneration for any tree with a maximum stem diameter of <5 cm, regardless of height (i.e., record presence of regeneration if sapling or seedings that are <1.3 m heigh and have DBH <5 cm).

^Includes species classified as Trees under the BAM Growth Form Table.

†Count of **hollow-bearing *trees*** and ***shrubs***; includes living and dead; record by stem size class.

Length of logs (m) Fallen logs = >10 cm diameter, that is dead and entirely or partly on the ground within the 1,000 m² plot. Only the length of log within the plot is recorded.	**Tally**	**TOTAL LENGTH (m)**
	8m	8m

1 m² sub PLOT

	Litter cover (%)				
Subplot	100	100	95	100	100
Average					

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**. Include all plant material that is detached from a plant and forms part of the litter layer on the ground surface. Litter cover is the two-dimensional litter layer in contact with the ground surface, including litter under the canopies of erect plants. Plant material that is not detached should be assessed as foliage cover, regardless of whether it appears alive or dead.

Quadrat Number: Q3 **Date:** 19/1/24 **Recorder:** D. Plunkett + A. Owens

Property Name or Project Name: Hardes

☑ Both Start and End points collected on GPS

☑ Start and End locations are approximately 50 m apart on GPS

APPENDIX B. PREDICTED SPECIES REPORT

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00052110/BAAS24008/24/00052111	NS Mod4 BDAR Dec2024 - Western Extension	28/10/2024
Assessor Name	**Report Created**	**BAM Data version ***
Mark Dean	05/02/2025	Current classification (live - default) (80)
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS24008	Major Projects	Finalised
Assessment Revision		**Date Finalised**
6		05/02/2025

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Beach Stone-curlew	Esacus magnirostris	3544-Coastal Sands Apple-Blackbutt Forest
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	3544-Coastal Sands Apple-Blackbutt Forest
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	3544-Coastal Sands Apple-Blackbutt Forest
Common Blossom-bat	Syconycteris australis	3544-Coastal Sands Apple-Blackbutt Forest
Diamond Firetail	Stagonopleura guttata	3544-Coastal Sands Apple-Blackbutt Forest
Dusky Woodswallow	Artamus cyanopterus cyanopterus	3544-Coastal Sands Apple-Blackbutt Forest
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	3544-Coastal Sands Apple-Blackbutt Forest
Eastern False Pipistrelle	Falsistrellus tasmaniensis	3544-Coastal Sands Apple-Blackbutt Forest
Eastern Osprey	Pandion cristatus	3544-Coastal Sands Apple-Blackbutt Forest

Gang-gang Cockatoo	Callocephalon fimbriatum	3544-Coastal Sands Apple-Blackbutt Forest
Golden-tipped Bat	Phoniscus papuensis	3544-Coastal Sands Apple-Blackbutt Forest
Greater Broad-nosed Bat	Scoteanax rueppellii	3544-Coastal Sands Apple-Blackbutt Forest
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	3544-Coastal Sands Apple-Blackbutt Forest
Grey-headed Flying-fox	Pteropus poliocephalus	3544-Coastal Sands Apple-Blackbutt Forest
Large Bent-winged Bat	Miniopterus orianae oceanensis	3544-Coastal Sands Apple-Blackbutt Forest
Little Bent-winged Bat	Miniopterus australis	3544-Coastal Sands Apple-Blackbutt Forest
Little Eagle	Hieraaetus morphnoides	3544-Coastal Sands Apple-Blackbutt Forest
Little Lorikeet	Glossopsitta pusilla	3544-Coastal Sands Apple-Blackbutt Forest
New Holland Mouse	Pseudomys novaehollandiae	3544-Coastal Sands Apple-Blackbutt Forest
Regent Honeyeater	Anthochaera phrygia	3544-Coastal Sands Apple-Blackbutt Forest
Scarlet Robin	Petroica boodang	3544-Coastal Sands Apple-Blackbutt Forest
South-eastern Glossy Black-Cockatoo	Calyptorhynchus lathami lathami	3544-Coastal Sands Apple-Blackbutt Forest
Speckled Warbler	Chthonicola sagittata	3544-Coastal Sands Apple-Blackbutt Forest
Spotted Harrier	Circus assimilis	3544-Coastal Sands Apple-Blackbutt Forest
Spotted-tailed Quoll	Dasyurus maculatus	3544-Coastal Sands Apple-Blackbutt Forest
Square-tailed Kite	Lophoictinia isura	3544-Coastal Sands Apple-Blackbutt Forest
Superb Fruit-Dove	Ptilinopus superbus	3544-Coastal Sands Apple-Blackbutt Forest
Swift Parrot	Lathamus discolor	3544-Coastal Sands Apple-Blackbutt Forest
Turquoise Parrot	Neophema pulchella	3544-Coastal Sands Apple-Blackbutt Forest
Varied Sittella	Daphoenositta chrysoptera	3544-Coastal Sands Apple-Blackbutt Forest
White-bellied Sea-Eagle	Haliaeetus leucogaster	3544-Coastal Sands Apple-Blackbutt Forest
White-throated Needletail	Hirundapus caudacutus	3544-Coastal Sands Apple-Blackbutt Forest

Yellow-bellied Glider	Petaurus australis	3544-Coastal Sands Apple-Blackbutt Forest
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	3544-Coastal Sands Apple-Blackbutt Forest

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Black-necked Stork	Ephippiorhynchus asiaticus	3544-Coastal Sands Apple-Blackbutt Forest

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Black-necked Stork	Ephippiorhynchus asiaticus	Refer to BAR

APPENDIX C. CANDIDATE SPECIES REPORT

BAM Candidate Species Report

Proposal Details

Assessment Id 00052110/BAAS24008/24/00052111	Proposal Name NS Mod4 BDAR Dec2024 - Western Extension	BAM data last updated * 28/10/2024
Assessor Name Mark Dean	Report Created 05/02/2025	BAM Data version * Current classification (live - default) (80)
Assessor Number BAAS24008	Assessment Type Major Projects	BAM Case Status Finalised
Assessment Revision 6		Date Finalised 05/02/2025

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Allocasuarina simulans Nabiac Casuarina	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Angophora inopina Charmhaven Apple	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Asperula asthenes Trailing Woodruff	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Burhinus grallarius Bush Stone-curlew	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Callistemon linearifolius Netted Bottle Brush	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Cercartetus nanus Eastern Pygmy-possum	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Commersonia prostrata Dwarf Kerrawang	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Corybas dowlingii Red Helmet Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Crinia tinnula Wallum Froglet	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Cryptostylis hunteriana Leafless Tongue Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Cynanchum elegans White-flowered Wax Plant	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Diuris arenaria Sand Doubletail	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Diuris praecox Rough Doubletail	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Dromaius novaehollandiae - endangered population Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Esacus magnirostris Beach Stone-curlew	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Eucalyptus camfieldii Camfield's Stringybark	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Eucalyptus parramattensis subsp. decadens Eucalyptus parramattensis subsp. decadens	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Grevillea parviflora subsp. parviflora Small-flower Grevillea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Litoria aurea Green and Golden Bell Frog	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Petauroides volans Southern Greater Glider	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☑ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider	Yes (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Phascogale tapoatafa Brush-tailed Phascogale	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Planigale maculata Common Planigale	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Potorous tridactylus Long-nosed Potoroo	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Prostanthera densa Villous Mint-bush	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Rhizanthella slateri Eastern Australian Underground Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Rhodomyrtus psidioides Native Guava	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Syzygium paniculatum Magenta Lilly Pilly	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tetratheca juncea Black-eyed Susan	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Uperoleia mahonyi Mahony's Toadlet	Yes (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

Common Name	Scientific Name
Camfield's Stringybark	Eucalyptus camfieldii

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Barking Owl	Ninox connivens	Habitat constraints
Brush-tailed Rock-wallaby	Petrogale penicillata	Habitat constraints
Coast Groundsel	Senecio spathulatus	Habitat constraints
Eastern Cave Bat	Vespadelus troughtoni	Habitat constraints

Eastern Osprey	Pandion cristatus	Habitat constraints
Gang-gang Cockatoo	Callocephalon fimbriatum	Habitat constraints
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
Little Eagle	Hieraaetus morphnoides	Habitat constraints
Masked Owl	Tyto novaehollandiae	Habitat constraints
Noah's False Chickweed	Lindernia alsinoides	Habitat constraints
Powerful Owl	Ninox strenua	Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Rhizanthella slateri (Rupp) M.A. Clem. & Cribb in the Great Lakes local government area	Rhizanthella slateri - endangered population	Refer to BAR
Rufous Bettong	Aepyprymnus rufescens	Refer to BAR
South-eastern Glossy Black-Cockatoo	Calyptorhynchus lathami lathami	Habitat constraints
Southern Myotis	Myotis macropus	Habitat constraints
Square-tailed Kite	Lophoictinia isura	Habitat constraints
Stephens' Banded Snake	Hoplocephalus stephensii	Habitat constraints
Swift Parrot	Lathamus discolor	Habitat constraints
White-bellied Sea-Eagle	Haliaeetus leucogaster	Habitat constraints

APPENDIX D. BIODIVERSITY CREDIT REPORT

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00052110/BAAS24008/24/00052111

Proposal Name
NS Mod4 BDAR Dec2024 - Western Extension

BAM data last updated *
28/10/2024

Assessor Name
Mark Dean

Assessor Number
BAAS24008

BAM Data version *
Current classification (live - default) (80)

Proponent Names
Darren Williams

Report Created
05/02/2025

BAM Case Status
Finalised

Assessment Revision
6

Assessment Type
Major Projects

Date Finalised
05/02/2025

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Diuris arenaria / Sand Doubletail

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Ephippiorhynchus asiaticus / Black-necked Stork

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3544-Coastal Sands Apple-Blackbutt Forest	Not a TEC	4.6	0	81	81

3544-Coastal Sands Apple-Blackbutt Forest	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	Coastal Dune Dry Sclerophyll Forests This includes PCT's: 3544, 3545, 3546, 3547, 3548, 3549, 3550, 3551, 3552, 3553, 3554, 3555, 3556	Coastal Dune Dry Sclerophyll Forests <50%	3544_Mod_Good	No	64	Karuah Manning, Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Coastal Dune Dry Sclerophyll Forests This includes PCT's: 3544, 3545, 3546, 3547, 3548, 3549, 3550, 3551, 3552, 3553, 3554, 3555, 3556	Coastal Dune Dry Sclerophyll Forests <50%	3544_Moderate	No	12	Karuah Manning, Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Coastal Dune Dry Sclerophyll Forests This includes PCT's: 3544, 3545, 3546, 3547, 3548, 3549, 3550, 3551, 3552, 3553, 3554, 3555, 3556	Coastal Dune Dry Sclerophyll Forests <50%	3544_Managed	No	5	Karuah Manning, Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Crinia tinnula / Wallum Froglet	**3544_Moderate, 3544_Mod_Good**	0.1	4.00
Diuris arenaria / Sand Doubletail	**3544_Mod_Good, 3544_Moderate, 3544_Managed**	4.6	161.00
Eucalyptus parramattensis subsp. decadens / Eucalyptus parramattensis subsp. decadens	**3544_Mod_Good**	29.0	58.00
Petaurus norfolcensis / Squirrel Glider	**3544_Moderate, 3544_Mod_Good**	3.9	101.00
Phascolarctos cinereus / Koala	**3544_Mod_Good**	2.4	85.00
Uperoleia mahonyi / Mahony's Toadlet	**3544_Moderate, 3544_Managed, 3544_Mod_Good**	4.6	107.00

Credit Retirement Options

Like-for-like credit retirement options

Crinia tinnula / Wallum Froglet	Spp	IBRA subregion
	Crinia tinnula / Wallum Froglet	Any in NSW
Diuris arenaria / Sand Doubletail	Spp	IBRA subregion
	Diuris arenaria / Sand Doubletail	Any in NSW

Eucalyptus parramattensis subsp. decadens / Eucalyptus parramattensis subsp. decadens	Spp	IBRA subregion
	Eucalyptus parramattensis subsp. decadens / Eucalyptus parramattensis subsp. decadens	Any in NSW
Petaurus norfolcensis / Squirrel Glider	Spp	IBRA subregion
	Petaurus norfolcensis / Squirrel Glider	Any in NSW
Phascolarctos cinereus / Koala	Spp	IBRA subregion
	Phascolarctos cinereus / Koala	Any in NSW
Uperoleia mahonyi / Mahony's Toadlet	Spp	IBRA subregion
	Uperoleia mahonyi / Mahony's Toadlet	Any in NSW

APPENDIX E. LIKELIHOOD OF OCCURRENCE ASSESSMENT

The table below summarises the likelihood of NSW and Commonwealth listed threatened species, and EPBC Act listed migratory species occurring within the Development Site based on the habitat requirements of each species. A brief definition of the likelihood of occurrence criteria is provided below:

- Known – species identified within the site during surveys.
- High – species known from the area (OEH Wildlife Atlas records), suitable habitat (such as roosting and foraging habitat) present within the site.
- Moderate – species may be known from the area; potential habitat is present within the site.
- Low – species not known from the area and/or marginal habitat is present within the site.
- Nil – habitat requirements not met for this species within the site.

Pelagic species, marine mammals and migratory marine species have been excluded from this assessment. This includes albatross, sea-turtles, whales and sharks.

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
Ecological Communities								
1.	Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions	-	E	0	PMST	A tall closed-forest, tall open-forest, closed forest, open forest, tall woodland, or woodland with canopy cover of >20%. Canopy dominated by one or a combination of Angophora, Corymbia, Eucalyptus, Lophostemon and/or Syncarpia tree species, but NOT dominated by Eucalyptus robusta. Other canopy tree species may be present, and in some areas rainforest trees may be prominent. A mid/shrub-layer may be present, sparse or absent; and fauna may be abundant or rare. Requires alluvial soils including silts, clay loams, sandy loams, gravel and cobbles. Does not occur on marine sands. Occurs on floodplains, in riparian zones and creek gullies.Located in NSW North Coast (NNC) bioregion in lower reaches of catchments east of the Great Dividing Range, between 50-250m ASL. SPRAT DCCEEW.	**While this community is known to occur in the locality, it was not identified within the Development Site during field surveys.**	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
2.	Central Hunter Valley eucalypt forest and woodland	-	CE	0	PMST	Eucalypt woodland/ open forest occuring in the Hunter River catchment, mainly in Muswellbrook, Singleton and Cessnock LGAs. Typically found on lower hillslopes and low ridges, with soil dervied from fine-grained sedimentary rocks, with high clay content and medium fertility. Does not occur on alluvial flats, river terraces, windblown sands, Triassic sediments or escarpments. Across the range of the ecological community, one or more of a complex of four eucalypt tree species usually dominate the canopy, including: narrow-leaved ironbark (Eucalyptus crebra), spotted gum (Corymbia maculata, slaty gum (Eucalyptus dawsonii) and grey box (Eucalyptus moluccana). Allocasuarina luehmannii (bulloak or buloke), May be part of the mix of dominants. Typically, the woodland has a sparse mid layer of native flowering shrubs and a ground layer of grasses, daisies, lilies, orchids and other flowers. SPRAT DCCEEW.	**While this community is known to occur in the locality, it was not identified within the Development Site during field surveys.**	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
3.	Subtropical and Temperate Coastal Saltmarsh	-	V	0	PMST	Coastal Saltmarsh ecological community consists mainly of salt-tolerant vegetation (halophytes) including: grasses, herbs, sedges, rushes and shrubs. Succulent herbs, shrubs and grasses generally dominate and vegetation is generally of less than 0.5 m height. Associated with the soft substrate shores of estuaries and embayments (sandy and/or muddy) and on some open, low wave energy coasts. Occurs on sandy or muddy substrate and may include coastal clay pans, and may also have salinity levels much higher than seawater due to evaporation. Occurs within a narrow margin of the NSW coastline, in subtropical and temperate climates, in areas under regular or intermittent tidal influence. May also include areas that have groundwater connectivity to tidal water bodies. SPRAT DCCEEW.	**While this community is known to occur in the locality, it was not identified within the Development Site during field surveys.**	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
4.	Lowland Rainforest of Subtropical Australia	-	CE	0	PMST	Found on basalt and alluvial soils, including sand and old/elevated alluvial soils as well as floodplain alluvia. Typically <300 m above sea level in areas with high annual rainfall (>1300 mm). 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. The canopy is often multilayered with upper, discontinuous layer of emergents, over the main canopy and subcanopy. Below the canopy is an understorey of sparse shrubs and seedlings. Buttresses are common as is an abundance and diversity of vines. Distributed from Maryborough in Queensland to the Clarence River (Grafton) NSW, also including isolated areas between the Clarence River and Hunter River such as the Bellinger and Hastings Valleys. SPRAT DCCEEW.	**While this community is known to occur in the locality, it was not identified within the Development Site during field surveys.**	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
5.	River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	-	CE	0	PMST	Occurs as a tall closed-forest, tall open-forest, closed forest, open forest, tall woodland, or woodland with canopy cover of >20%. Canopy dominated by one or a combination of: Angophora floribunda, A. subvelutina, Eucalyptus amplifolia, E. baueriana, E. benthamii, E. bosistoana, E. botryoides, E. botryoides x E. saligna, E. elata, E. grandis, E. longifolia, E. moluccana, E. ovata, E. saligna, E.tereticornis, E. viminalis. Occurs on alluvial soils including silts, clay loams, sandy loams, gravel and cobbles. Does not occur on marine or aeolian sands. Occurs on alluvial landforms related to coastal river floodplains and associated sites where transient water accumulates. Occurs at elevations up to 250 metres above sea-level (ASL), typically below 50 metres ASL. Occurs within catchments of the eastern and southern watershed of the Great Dividing Range. Occurs in the South East Corner and Sydney Basin IBRA7 Bioregions, in eastern VIC and south eastern NSW. SPRAT DCCEEW.	**While this community is known to occur in the locality, it was not identified within the Development Site during field surveys.**	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
6.	Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	-	E	0	PMST	Has an open woodland, woodland, forest or closed forest structure, with canopy cover of >10%, dominated by Casuarina glauca. Occurs in coastal catchments up to 50m ASL, but typically <20m ASL. Found on unconsolidated sedminents (including alluvium), typically grey-black clay-loam and/or sandy loam and sometimes peaty soils. Occurs on coastal flats, lake and wetland margins where soils are occasionally saturated, water-logged or innundated, typically where ground water is saline or brackish. Usually <30km of coast, occasionally >100km inland e.g. along tidal river cathments. Not found on rocky headlands, sea cliffs or other consolidated sediments. Occurs from south-east QLD to southern NSW within the South Eastern QLD, NSW North Coast, Sydney Basin, or South East Corner bioregions. SPRAT DCCEEW.	**While this community is known to occur in the locality, it was not identified within the Development Footprint during field surveys.**	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
7.	Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	-	E	0	PMST	Vegetation structure varies from closed to open forest to woodland, to dense closed shrubland with canopy cover typically 50-70%, located in coastal catchments 20-220m ASL. Soils are hydric, with intermittent to episodic innundation. From South East QLD to the Sydney Basin the canopy is typically dominated or co-dominated by Melaleuca quinquenervia and/or Eucalyptus robusta. In some areas, the canopy may be locally dominated by other melaleuca species including M. biconvexa (mid-NSW coast to south of Sydney), frequently with Parsonsia straminea climbing on the trunks of canopy species. Distributed typically within 20 km of coast from South East Queensland to south-eastern NSW specifically in NSW North Coast (NNC); Sydney Basin (SYB) and the Bateman sub-region of the South East Corner (SEC) Bioregions. SPRAT DCCEEW.	**While this community is known to occur in the locality, it was not identified within the Development Footprint during field surveys. PCT3996 (Coastal Sand Swamp Mahogany Dry Forest) was identified on-site, however it is not considered to form part of this TEC.**	Low
Flora								
1.	*Angophora inopina* Charmhaven Apple	V	V	0	PMST	This species is endemic to the central coast region of NSW and is known to occur in four main vegetation communities: Eucalyptus haemastoma / Corymbia gummifera / Angophora inopina woodland / forest; Hakea teretifolia / Banksia oblongifolia wet heath; Eucalyptus resinifera / Melaleuca sieberi / Angophora inopina sedge / woodland; and Eucalyptus capitellata / Corymbia gummifera / Angophora inopina woodland / Forest elegans. Flowering generally poor and sporadic.	**No records occur within the locality. Species not identified during field surveys.**	Low

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
2.	*Asperula asthenes* Trailing Woodruff	V	V	0	PMST	This small herb occurs only in NSW. It is found in scattered locations from Bulahdelah north to near Kempsey, with several records from the Port Stephens/Wallis Lakes area. Occurs in damp sites, often along river banks.	**Marginal habitat within the Development Site. No records occur within locality. Species not identified during field surveys.**	Low
3.	*Caladenia tessellata* Thick Lip Spider Orchid	E1, P,2	V	0	PMST	Occurs from Central Coast NSW to southern VIC. Mostly coastal but extends inland to Braidwood in southern NSW. In NSW grows in grassy dry sclerophyll woodland on clay loam or sandy soils, and less commonly in heathland on sandy loam soils.	**Marginal habitat present within the Development Site. The northern extent of this species' range is approximately 40 km south of the Development Site. Species not identified during field surveys.**	Low
4.	*Callistemon linearifolius* Netted Bottle Brush	V,3	-	1	BioNet	This shrub grows up to 3-4 m tall, with red flowers that are clustered into the typical "bottlebrushes". The species grows in dry sclerophyll forest on the coast and adjacent ranges.	**Known to be associated with PCT3544, with 1 record within 10km search radius (DPIE BioNet Altas search). Species not identified during field surveys.**	**Low**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
5.	*Commersonia prostrata* Dwarf Kerrawang	E1	E	12	BioNet	Ground-hugging shrub that forms mats to more than 1 m across. Occurs on sandy, sometimes peaty soils in a wide variety of habitats. Distribution limits: Southern Highlands to North Coast (Tomago). (DPIE EPBC). It typically occurs on ecotones between swamp and dry forest. The species need disturbance esuch as fire to germinate.	**Known to be associated with PCT3544, and recorded within 10km search radius (DPIE BioNet Altas search). Species not identified during field surveys.**	**Low**
6.	*Cryptostylis hunteriana* Leafless Tongue Orchid	V,P, 2	V	0	PMST	The species occurs in coastal areas from East Gippsland to southern Queensland. Habitat preferences for this species are not well defined, however it is known to grow in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. Prefers open areas in the understorey and is often found in association with Cryptostylis subulata and Cryptostylis erecta.	**Known to be associated with PCT3544. No records occur within locality. Species not identified during field surveys.**	**Low**
7.	*Cynanchum elegans* White-flowered Wax Plant	E1	E	0	PMST	The species occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby LGAs, may also occur in the western part of Gosford LGA. Habitat for the species includes Hawkesbury sandstone, commonly amongst rocky outcrops and boulders in sheltered forests on mid- to lower slopes and valleys.	**Known to be associated with PCT3544. No records occur within locality. Species not identified during field surveys.**	**Low**
8.	*Diuris praecox* Rough Doubletail	V,P, 2	V	0	PMST	Occurs between Ourimbah and Nelson Bay on the New South Wales (NSW) north coast. This species has also been identified on the Wallarah Peninsula, near Lake Macquarie in NSW. Grows on hills and slopes of near-coastal districts, in open heathy forests which have a grassy to fairly dense understorey.	**Potential habitat within the Development Site. No records within locality.**	**Low**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
9.	Eucalyptus camfieldii Camfield's Stringybark	V	V	2270	BioNet	Occurs from Raymond Terrace to Waterfall, with populations known from Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai and the Royal NP. Occurs in exposed situations on sandstone plateaus, ridges and slopes near the coast, often on the boundary of tall coastal heaths or low open woodland. It grows in shallow sandy soils overlying Hawkesbury sandstone.	**Recorded (Sept. 2016) in close proximity to the northern boundary. Suitable habitat present on site. Species not identified during field surveys.**	**Low**
10.	*Eucalyptus parramattensis subsp. decadens*	V	V	1401	BioNet	A woodland tree, up to 15 m in height. Bark sheds in large plates to leave a smooth, granular and mottled white or grey surface. It occurs in dry sclerophyll woodland with dry heath understorey requiring deep, low-nutrient sands.	**Records occur within the locality and habitat is present within the Development Site. Several individuals identified during field surveys.**	**Known**
11.	*Euphrasia arguta*	E4A	CE	0	PMST	Known from Nundle State Forest and adjacent private land, in New South Wales. The species is known from three locations in two areas approximately 14 km apart. Occur in eucalypt forest with a mixed grass and shrub understorey within Nundle State Forest.	**No suitable habitat within the Development Site. No records in locality. Species not identified during field surveys.**	**Nil**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
12.	*Grevillea parviflora subsp. parviflora* Small-flower Grevillea	V	V	1	BioNet & PMST	The species distribution is between Moss Vale/Bargo and the lower Hunter Valley, with most occurrences in Appin, Wedderburn, Picton and Bargo. The habitat for the species is broad including heath, shrubby woodland and open forest on light clay or sandy soils, and often in disturbed areas such as on the fringes of tracks.	**Recorded in proximity to the northern site. Known to be associated with PCT3544. Species not identified during field surveys.**	**Low**
13.	*Lindernia alsinoides* Noah's False Chickweed	E1	-	1	BioNet	Small annual herb occurring in heath and sclerophyll forest in swampy areas. DPIE.	**Recorded within 4km NW of site (Dec. 2009). Marginal suitable habitat within the Development Site. Species not identified during field surveys.**	**Low**
14.	*Maundia triglochinoides*	V	-	4	BioNet	Restricted to coastal NSW and extending into southern Queensland. The current southern limit is Wyong; former sites around Sydney are now extinct. Grows in swamps, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients.	**Records occur approximately 4km East of site. No suitable habitat within the Development Site. Species not identified during field surveys.**	**Low**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
15.	*Melaleuca biconvexa* Biconvex Paperbark	V	V	0	PMST	Scattered, disjunct populations in coastal areas from Jervis Bay to Port Macquarie, with most populations in the Gosford-Wyong areas. Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	**No records occur in locality, however known to be associated with PCT3802. Species not identified during field surveys.**	**Low**
16.	*Persicaria elatior* Tall Knotweed	V	V	3	BioNet & PMST	Grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	**Records of the species are in the locality. Marginal suitable habitat within the Development Site. Species not identified during field surveys.**	**Low**
17.	*Prasophyllum sp. Wybong* A Leek-orchid	P	CE	0	PMST	The species occurs within the Sydney Basin, New England Tablelands, Brigalow Belt South and NSW South Western Slopes IBRA Bioregions and the Border Rivers–Gwydir, Namoi, Hunter–Central Rivers and Central West Natural Resource Management Regions. The distribution of this species overlaps with the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland EPBC Act-listed threatened ecological community.	**No records within the locality, No suitable habitat within the Development Site.**	**Low**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
18.	*Rhizanthella slateri* Eastern underground Orchid	E2, V,P, 2	E	0	PMST	The species grows in eucalypt forest but no informative assessment of the likely preferred habitat for the species is available. Currently known only from 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra.	**Possible association with PCT3544. No records within locality. Species not identified during surveys.**	Low
19.	*Rhodamnia rubescens* Scrub Turpentine	E4A	CE	0	PMST	Shrub or small tree to 25 m high found in rainforest and riparian vegetation along the coast and up to 600 m ASL. Flowers in late winter through to spring, with a peak in October, and fruits typically begin to appear in December in the Sydney region. Distribution limits N-Tweed Heads S-Batemans Bay. DPIE EPBC.	**No records with locality. No suitable habitat within Development Site due to lack of rainforest and wet sclerophyll forest. No further assessment required.**	**Nil**
20.	*Rhodomyrtus psidioides* Native Guava	E4A	CE	0	PMST	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. Populations are typically restricted to coastal and sub-coastal areas of low elevation however the species does occur up to c. 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges in NSW. Distribution N – Maryborough Qld, S – Broken Bay NSW. DPIE EPBC.	**No records within the locality. Marginal suitable habitat within the Development Site. Species not recorded during field surveys.**	**Low**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
21.	*Syzygium paniculatum* Magenta Lilly Pilly	E1	V	0	PMST	The species occurs in a narrow coastal strip from Bulahdelah to Conjola State Forest. Rainforest on sandy soils or stabilised Quaternary sand dunes at low altitudes in coastal areas, often in remnant littoral or gallery rainforests Plants produce white flower-clusters at the end of each branch is the preferred habitat for this species. The petals are small accompanied by prominent long stamens.	**No records within the locality. Marginal suitable habitat within the Development Site. Species not recorded during field surveys.**	**Low**
22.	*Tetratheca juncea* Black-eyed Susan	V	V	0	PMST	Regarded as extinct within the Sydney area, current range from Wyong north to Bulahdelah and inland 50km to edge of Sugarloaf Range. Occurs predominately in areas of over 1000 mm annual rainfall, within dry sclerophyll forest, and sometimes heath and moist forest, with a preference for Coastal Plains Smooth-barked Apple Woodland and Coastal Plains Scribbly Gum Woodland.	**No records in locality. However potential habitat within the Development Site. Associated with PCT3544 which occurs on site. Species not identified during field surveys.**	**Low**
23.	*Thesium australe* Austral Toadflax	V	V	0	PMST	The species occurs in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Habitat for this species includes grassland on coastal headlands or grassland and grassy woodland away from the coast.	**No records in occur within locality, however potential habitat occurs within the Development Site. Species not identified during field surveys.**	**Low**
Amphibians								

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
1.	*Crinia tinnula* Wallum Froglet	V	-	78	BioNet	Found in a wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgelands and wet heathlands under leaf litter, vegetation and other debris. In NSW the species extends from north of the Queensland border south to Kurnell. Breeding occurs in colder months.	**Known records within Development Site (DPIE BioNet Atlas search). Associated with PCT3544 which occurs on site. Potential suitable habitat available on site.**	**Known Identified onsite during targeted surveys. (08/05/2024)**
2.	*Litoria aurea* Green and Golden Bell Frog	E	V	3	BioNet & PMST	Formerly occurred from Brunswick Heads to Victoria, but >80% populations now extinct. Inhabits marshes, natural and artificial freshwater to brackish wetlands, dams and in stream wetlands. Prefers sites containing cumbungi (Typha spp.) or spike rushes (Eleocharis spp.), which are unshaded and have a grassy area and/or rubble as shelter/refuge habitat nearby. Gambusia holbrooki is a key threat as they feed on green and Golden Bell Frog eggs and tadpoles.	**No suitable habitat within the Development Site. Some records of the species in the locality.**	**Low**
3.	*Mixophyes balbus* Stuttering Frog	E	V	0	PMST	The species occurs along the east coast of Australia. Habitat for the species includes rainforest and wet, tall, open forest, sheltering in deep leaf litter and thick understorey vegetation on the forest floor. Within Sydney Basin the species is now confined to populations in the Watagan Mountains, the southern Blue Mountains and Macquarie Pass. The species does not occur in areas where the riparian vegetation has been disturbed or where there have been significant upstream human impacts.	**No suitable habitat within the Development Site. No records of the species in the locality.**	**Nil**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
4.	*Uperoleia mahonyi* Mahony's Toadlet	E	E	71	BioNet & PMST	Inhabits ephemeral and semi-permanent swamps and swales on the coastal fringe of its range. Known records occur in heath or wallum habitats almost exclusively associated with leached (highly nutrient impoverished) white sand. Commonly associated with acid paperbark swamps, also is known to occur in wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. Distribution limit: N-Seal Rocks S-Kangy Angy (to date)	**Known records within Development Site (DPIE BioNet Atlas search). Suitable foraging habitat on site.**	**Known Identified onsite during targeted surveys. (01/02/2024 – 03/02/2024)**
Birds								
1.	*Anthochaera phrygia* Regent Honeyeater	E	CE	0	PMST	In NSW the species is confined to two known breeding areas: the Capertee Valley and Bundarra-Barraba region. Non-breeding flocks are seen occasionally in coastal areas foraging in flowering Spotted Gum and Swamp Mahogany forests. Habitat for the species includes dry open forest and woodlands, particularly Box-Ironbark woodland and riparian forests of River Sheoak, with an abundance of mature trees, high canopy cover and abundance of mistletoes.	**No records occur within locality. Marginal suitable habitat available on site.**	**Low**
2.	*Ardenna carneipes* Flesh-footed Shearwater	V	J,K	0	PMST	Ranges throughout the Pacific and Indian Oceans. There are two main breeding areas in the world: one in the South West Pacific includes Lord Howe Island and New Zealand; the other along the coast of Western Australia.	**No records occur within locality. No suitable habitat on Development Site.**	**Nil**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
3.	*Artamus cyanopterus cyanopterus* Dusky Woodswallow	V	-	2	BioNet	Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland. The Tasmanian breeding population migrates north during the cooler months and can be found in southeast NSW. The species is an aerial forager and prefers woodland habitats.	**Two known records within locality (DPIE BioNet Altas search). Potential suitable habitat on site.**	**Moderate**
4.	*Botaurus poiciloptilus* Australasian Bittern	E	E	31	BioNet & PMST	The species is widespread but uncommon over most NSW except the northwest. Habitat for the species includes permanent freshwater wetlands with tall dense reedbeds particularly Typha spp. and Eleocharis spp, with adjacent shallow, open water for foraging. Roosting occurs during the day amongst dense reeds or rushes and feeding occurs mainly at night.	**Recorded within the locality however there is no suitable habitat within the Development Site.**	**Nil**
5.	*Calidris ferruginea* Curlew Sandpiper	E	CE,C, J,K	30	BioNet & PMST	The species occurs along the entire coast of NSW, particularly in the Hunter Estuary, and freshwater wetlands in the Murray-Darling Basin. Breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving between August and November, and departing between March and mid-April. It generally occupies littoral and estuarine habitats, and in New South Wales can be found mainly in intertidal mudflats of sheltered coasts.	**Records occur within the Hunter Estuary 2 km south of the Development Site. However, no suitable habitat was identified within the Development Site.**	**Nil**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
6.	*Calidris tenuirostris* Great Knot	V	CE,C, J,K	0	PMST	In NSW, occurs in scattered sites along the coast to Narooma – it has been observed inland at Tullakool, Armidale, Gilgandra and Griffith. Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	**No records occur within the locality. No suitable habitat within the Development Site.**	**Nil**
7.	*Callocephalon fimbriatum* Gang-gang Cockatoo	V	E	0	PMST	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. May also occur in sub-alpine Snow Gum (*Eucalyptus pauciflora*) woodland and occasionally in temperate rainforests.	**No records occur within locality. Marginal suitable habitat present within the Development Site.**	**Low**
8.	*Calyptorhynchus lathami lathami* South-eastern Glossy Black-Cockatoo	V	V	2	BioNet & PMST	Widespread but uncommon from coast to southern tablelands and central western plains. Feeds almost exclusively on the seeds of Allocasuarina species. Prefers woodland and open forests, rarely away from Allocasuarina. Roost in leafy canopy trees, preferably eucalypts, usually <1 km from feeding site. Nests in large (approx. 20 cm) hollows in trees, stumps or limbs, usually in Eucalypts.	**Records occur within proximity to the north of the Development Site. Low number of Allocasuarina species present within the development footprint. No suitable hollows on site.**	**Low**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
9.	*Charadrius mongolus* Lesser Sand-plover	V	E,C,J, K	1	BioNet & PMST	Found around the entire coast but is most common in the Gulf of Carpentaria, and along the east coast of Queensland and northern NSW. Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms.	**Recorded within the locality however there is no suitable habitat within the Development Site**	**Nil**
10.	*Circus assimilis* Spotted Harrier	V	-	6	BioNet	Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn).	**No recent records within the locality (Jun 1992). Marginal suitable habitat available within Development site.**	**Low**
11.	*Climacteris picumnus victoriae* Brown Treecreeper (eastern subspecies)	V	-	0	PMST	Small grey-brown bird with black streaking on the lower breast/belly and black bars on the undertail. Inhabits Box-Gum woodlands and dry open forest of inland slopes and plains. Preferred woodlands dominant by stringybarks or other rough-barked eucalypts. Forages in trees and on the ground. Endemic to eastern Australia, occurring from the coast to inland plains and western slopes of the great dividing range. Nests in tree or stump hollows greater than 6cm.	**No records occur within locality. Marginal suitable habitat within Development Site.**	**Low**
12.	*Diomedea antipodensis* Antipodean Albatross	V	V	0	PMST	A large Albatross species, with breeding confined to New Zealand, the species ranges across the southern Pacific Ocean, east to the coast of Chile and west to eastern Australia. This species regularly occurs in small numbers off the NSW south coast from Green Cape to Newcastle during winter where they feed on cuttlefish.	**No records within the locality. No suitable habitat on site.**	**Nil**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
13.	*Diomedea exulans* Wandering Albatross	E	E	0	PMST	Visits Australian waters extending from Fremantle, Western Australia, across the southern water to the Whitsunday Islands in Queensland between June and September. The species has the largest wingspan of all albatross measuring up to 3.5 m.	**No records within the locality. No suitable habitat on site.**	**Nil**
14.	*Dromaius novaehollandiae* Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	E	-	23	BioNet	Occur in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as the ecotones between these habitats. Breeding occurs in late autumn and winter	**Records occur within 3-4km to the East and South East of the Development Site (Mar 2021). Marginal suitable habitat on site.**	**Low**
15.	*Ephippiorhynchus asiaticus* Black-necked Stork	E1	-	20	BioNet	Primarily inhabits permanent freshwater wetlands and surrounding vegetation including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters. Will also forage in inter-tidal shorelines, mangrove margins and estuaries. Feeds in shallow, still water. This species breeds during summer, nesting in or near a freshwater swamp.	**Records occur within the locality, however no suitable habitat on site.**	**Nil**
16.	*Epthianura albifrons* White-fronted Chat	V	-	122	BioNet	Short slender bill, long spindly legs, a short square-tipped tail and rounded wings. Detectable all year, gregarious species, usually found foraging on bare or grassy ground in wetland areas. Essential habitat as per vegetation type.	**Records occur within the locality, however no suitable habitat on site.**	**Low**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
17.	*Erythrotriorchis radiatus* Red Goshawk	E	V	0	PMST	Inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers.	**Marginal habitat within the Development Site. Closest record is approximately 34 km south west to the Development Site.**	**Nil**
18.	*Falco hypoleucos* Grey Falcon	V	V	0	PMST	Medium-sized, compact, pale falcon with a heavy, thick-set, deep-chested appearance. The species is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	**No suitable habitat in the Development Site, and species not known from the locality.**	**Nil**
19.	*Glossopsitta pusilla* Little Lorikeet	V	-	6	BioNet	The species occurs from the coast to western slopes of the Great Dividing Range and inhabits dry, open eucalypt forests and woodlands. Occurrence is positively associated with patch size, and with components of habitat complexity including canopy cover, shrub cover, ground cover, logs, fallen branches and litter. Feed primarily on profusely-flowering eucalypts and a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands *Eucalyptus albens* and *E. melliodora* are particularly important food sources for pollen and nectar respectively. Mostly nests in small (opening approx. 3cm) hollows in living, smooth-barked eucalypts, especially Eucalyptus viminalis, E. blakelyi and E. dealbata. Most breeding records are from the western slopes.	**Records occur within locality (Apr 2022). Associated with PCT3544 which occurs on site. Potential suitable habitat on site.**	**Moderate**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
20.	*Grantiella picta* Painted Honeyeater	V	V	-	PMST	The species is nomadic, occurring in low densities across most of NSW. Highest concentrations and almost all breeding occur on inland slopes of the Great Dividing Range. Habitat for the species includes Boree, Brigalow and Box Gum woodlands and Box-Ironbark forests.	**No records occur within locality. No suitable habitat occurs on the Development Site.**	**Nil**
21.	*Haematopus longirostris* Pied Oystercatcher	E	-	1	BioNet	Scattered along NSW coast. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide. Nests mostly on coastal or estuarine beaches; occasionally saltmarsh or grassy areas.	**Records occur within the locality, however no suitable habitat on site.**	**Nil**
22.	*Haliaeetus leucogaster* White-bellied Sea-Eagle	V	-	163	BioNet	The White-bellied Sea-Eagle is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion. Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass.	**Known records occur in the locality. However, species was not identified during surveys.**	**High**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
23.	*Hieraaetus morphnoides* Little Eagle	V	-	4	BioNet	Occurs throughout NSW except most densely forested parts of the Dividing Range escarpment. Occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring.	**Known records occur in the locality (Sept 2019). Potential aerial foraging habitat above Development Site. Marginal potential nesting habitat within Development Site. However, species was not identified during targeted surveys.**	**Low-moderate**
24.	*Hirundapus caudacutus* White-throated Needletail	-	V,C,J, K	17	BioNet & PMST	Widespread in eastern and south-eastern Australia. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground.	**Potential aerial foraging habitat above Development Site; however, it is considered unlikely for this species to be present within the Development Site.**	**Low**
25.	*Lathamus discolor* Swift Parrot	E	CE	5	BioNet & PMST	A migratory species that travels to the mainland from March to October, the species breeds in Tasmania from September to January. Principal over-winter habitat is box-ironbark communities on the inland slopes and plains. Eucalyptus robusta, Corymbia maculata and C. gummifera dominated coastal forests are also important habitat.	**Potential foraging opportunities within canopy due to the presence of *E. haemastoma*. Species is known to the locality.**	**Low-moderate**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
26.	*Limicola falcinellus* Broad-billed Sandpiper	V	C,J,K	0	PMST	Favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs. Diet includes insects, crustaceans, molluscs, worms and seeds.	**No records occur within the locality. No suitable habitat within the Development Site.**	**Nil**
27.	*Limosa limosa* Black-tailed Godwit	V	C,J,K	8	BioNet & PMST	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the north and south coast, and inland. Records in western NSW indicate that a regular inland passage is used by the species, as it may occur around any of the large lakes in the western areas during summer, when the muddy shores are exposed. It is usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. It has also been found around muddy lakes and swamps, wet fields and sewerage treatment works.	**There are some records within the locality however, there is no suitable habitat within the Development Site.**	**Low**
28.	*Lophoictinia isura* Square-tailed Kite	V	-	1	BioNet	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Breeding is from July to February.	**Records occur within 7km NW of the Development Site. Marginal suitable habitat available on site. However, species was not identified during surveys.**	**Low-moderate**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
29.	*Melanodryas cucullata cucullata* Hooded Robin (south-eastern form)	V	-	0	PMST	Widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. The south-eastern form (subspecies cucullata) is found from Brisbane to Adelaide and throughout much of inland NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	**No records in the locality. Habitat is potentially suitable for the species.**	**Low.**
30.	*Ninox strenua* Powerful Owl	V	-	10	BioNet	Occurs from the coast to the western slopes. Solitary and sedentary species. Inhabits a range of habitats from woodland and open sclerophyll forest to tall open wet forest and rainforest. Prefers large tracts of vegetation. Nests in large tree hollows (> 0.5 m deep), in large eucalypts (dbh 80-240 cm) that are at least 150 years old. Pairs have high fidelity to a small number of hollow-bearing nest trees and defend a large home range of 400 - 1,450 ha. Forages within open and closed woodlands as well as open areas.	**Records occur within 1km to the North of the Development Site. Field surveys found no suitable large hollows occur within the development footprint. Suitable habitat within the surrounding area.**	**Moderate**
31.	*Numenius madagascariensis* Eastern Curlew		CE,C, J,K	11	BioNet & PMST	The eastern curlew is Australia's largest shorebird and a long-haul flyer. It is easily recognisable, with its long, down-curved bill. The species takes an annual migratory flight to Russia and northeastern China to breed, arriving back home to Australia in August.	**Recorded within the locality however there is no suitable habitat within the Development Site.**	**Nil**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
32.	*Pandion cristatus* Eastern Osprey	V	-	6	BioNet & PMST	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	**This species was observed roosting in proximity to the Development Site in 2011. However, the species was not identified during surveys.**	**High**
33.	*Ptilinopus magnificus* Wompoo Fruit-Dove	V	-	1	BioNet	Occurs from Hunter River to Cape York, but rare south of Coffs Harbour. No recent records from Illawarra where it once occurred. Inhabits rainforest, low elevation moist eucalypt forest and brush box forests, mostly in mature forest but also remnant and regenerating rainforest. Feeds on fruit and is locally nomadic following food availability. Builds nest platform on thin branch or palm frond, often over water, usually 3-10m above ground.	**One record occurs within the locality, however no suitable habitat within the Development Site**	**Nil**
34.	*Pycnoptilus floccosus* Pilotbird	-	V	0	PMST	Pilotbirds are small terrestrial ground-dwelling birds, living on the ground in dense forests with heavy undergrowth. Critical habitat includes wet sclerophyll forests in temperate zones in moist gullies with dense undergrowth, and dry sclerophyll forests and woodlands occupying dry slopes and ridges. Lowland Pilotbirds occur in forests from the Blue Mountains west of Newcastle, around the wetter forests of eastern Australia, to Dandenong near Melbourne.	**No suitable habitat within the Development Site**	**Nil**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
35.	*Rostratula australis* Australian Painted Snipe	E	E	0	PMST	Normally found in permanent or ephemeral shallow inland wetlands, either freshwater or brackish. The species nests on the ground amongst tall reed-like vegetation near water. Habitat for the species includes the fringes of swamps, dams and nearby marshy areas with cover of grasses, lignum, low scrub or open timber.	**Species has been recorded approximately 10 km south of the Development Site at Kooragang Island. No suitable habitat within the Development Site.**	**Nil**
36.	*Stagonopleura guttata* Diamond Firetail	V	-	0	PMST	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum (Eucalyptus pauciflora) Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Groups separate into small colonies to breed, between August and January.	**No records occur within the locality. Associated with PCT3544 which occurs on site.**	**Low**
37.	*Thalassarche bulleri* Buller's Albatross	-	V	0	PMST	Abundant, small albatross occurring around coastal areas of New Zealand. During the breeding season it is commonly found in seas off the South Island and off south-eastern Australia.	**No records occur within the locality. No suitable habitat within the Development Site.**	**Nil**
38.	*Thalassarche salvini* Salvin's Albatross	-	V	0	PMST	Large albatross, with a wingspan of 212–256 cm. The species is predominately marine occurring in subantarctic and sub-tropical waters. The breeding biology of Salvin's Albatross is poorly known.	**No records occur within the locality. No suitable habitat within the Development Site.**	**Nil**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
39.	*Tyto longimembris* Eastern Grass Owl	V	-	11	BioNet	Recorded occasionally in all mainland states of Australia but are most common in northern and north-eastern Australia. In NSW they are more likely to be resident in the north-east. The species is found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains.	**Records occur within 4km to the South West of the site (Jul 2012). However, marginal suitable habitat available within the Development Site.**	**Low**
40.	*Tyto novaehollandiae* Masked Owl	V	-	5	BioNet	Occurs across NSW except NW corner. Most common on the coast. Inhabits dry eucalypt woodlands from sea level to 1100 m. Roosts and breeds in large (>40cm) hollows and sometime caves in moist eucalypt forested gullies. Hunts along the edges of forests and roadsides. Home range between 500 ha and 1000 ha. Prey mostly terrestrial mammals but arboreal species may also be taken.	**Records occur within the locality. Marginal suitable habitat available within the Development Site.**	**Low**
Mammals								
1.	*Chalinolobus dwyeri* Large-eared Pied Bat	V	V	0	PMST	The species occurs from the coast to the western slopes of the divide. The largest numbers of records are from sandstone escarpment country in the Sydney Basin and Hunter Valley. The species roosts in caves and mines and most commonly recorded from dry sclerophyll forests and woodlands. In southern Sydney appears to be largely restricted to the interface between sandstone escarpments and fertile valleys.	**Potential foraging habitat present within the Development Site. No caves within 2km. No records within the locality.**	**Low**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
2.	*Dasyurus maculatus* Spotted-tailed Quoll	V	E	2	BioNet & PMST	Found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania the species has been recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline	**Marginal habitat present within the Development Site. The closest record was made in 2019 approximately 6.5km North West of the Development Site.**	**Low**
3.	*Falsistrellus tasmaniensis* Eastern False Pipistrelle	V	-	3	BioNet	The species occurs on southeast coast and ranges. Prefers tall (>20m) and wet forest with dense understorey. Absent from small remnants, preferring continuous forest but can move through cleared landscapes and may forage in open areas. Roosts include hollow trunks of Eucalypts, underneath bark or in buildings. Forages in gaps and spaces within forest, with large foraging range (12km foraging movements recorded).	**Three records occur within the locality. No suitable habitat within the Development Site.**	**Low**
4.	*Micronomus norfolkensis* Eastern Coastal Free-tailed Bat	V	-	8	BioNet	Inhabits open forests and woodlands foraging above the canopy and along the edge of forests. Roosts in tree hollows, under bark and buildings. Distribution limit: N-Woodenbong. S-Pambula. (DPIE).	**Several records occur within the locality. Although field surveys found limited to no hollows for roosting, potential suitable foraging habitat occurs within the Development Site.**	**Low-moderate**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
5.	*Miniopterus australis* Little Bent-winged Bat	V	-	16	BioNet	The species occurs from Cape York to Sydney. Inhabits rainforests, wet and dry sclerophyll forests, paperbark swamps and vine thickets. Only one maternity cave known in NSW, shared with Eastern Bentwing-bats at Willi Willi, near Kempsey. Outside breeding season roosts in caves, tunnels and mines and has been recorded in a tree hollow on one occasion. Forages for insects beneath the canopy of well-timbered habitats.	**Potential foraging habitat within the Development Site with some records within locality.**	**Moderate**
6.	*Miniopterus orianae oceanensis* Large Bent-winged Bat	V	-	10	BioNet	Prefers areas where there are caves, old mines, old buildings, stormwater drains and well-timbered areas. Distribution limit: N-Border Ranges National Park. S-South of Eden. DPIE.	**Potential foraging habitat within the Development Site with some records within locality**	**Moderate**
7.	*Myotis macropus* Southern Myotis	V	-	5	BioNet	Mainly coastal but may occur inland along large river systems. Usually associated with permanent waterways at low elevations in flat/undulating country, usually in vegetated areas. Forages over streams and watercourses feeding on fish and insects from the water surface. Roosts in a variety of habitats including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage, typically in close proximity to water. The breeding period for this species is November or December.	**Some records in locality, however no suitable waterbodies for foraging occur within the development site.**	**Low**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
8.	*Notamacropus parma* Parma Wallaby	V	V	0	PMST	Inhabits rainforests and wet and dry sclerophyll forests with a dense understorey and associated grassy patches. Distribution limit: N-Border Ranges National Park. S-Morton National Park. DPIE.	**No records occur within the locality. No suitable habitat occurs within the Development Site.**	**Nil**
9.	*Petauroides volans* Southern Greater Glider	E	E	0	PMST	The species occurs in eucalypt forests and woodlands along the east coast of Australia from north east Queensland to the Central Highlands of Victoria. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Occupy a relatively small home range with an average size of 1 to 3 ha.	**No records within the locality. Marginal suitable habitat within the Development Site.**	**Nil**
10.	*Petaurus australis* Yellow-bellied Glider	V	V	0	PMST	Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Very mobile species known to occupy large home ranges between 20 to 85 ha.	**No records within the locality. Marginal suitable habitat within the Development Site.**	**Nil**
11.	*Petaurus norfolcensis* Squirrel Glider	V	-	25	BioNet	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum Forest west of the Great Dividing Range and Blackbutt-Bloodwood Forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey.	**Known to the locality. Suitable hollows not located during field surveys; however potential foraging habitat occurs within the Development Site.**	**Known. Identified onsite during targeted surveys.**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
12.	*Phascogale tapoatafa* Brush-tailed Phascogale	V	-	3	BioNet	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. Mating occurs May – July.	**Recorded 6km to Northwest of the Development Site (Jul 2006). Potential suitable habitat within the development site.**	**Moderate. Species not identified during targeted surveys.**
13.	*Phascolarctos cinereus* Koala	E	E	693	BioNet & PMST	Fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests feeding on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	**Potential foraging opportunities within the Development Site, records within the locality.**	**Known.** **Species not identified during targeted surveys.**
14.	*Planigale maculata* Common Planigale	V	-	1	BioNet	Occupies coastal north-eastern NSW, coastal east Queensland and Arnhem Land. The species reaches its confirmed southern distribution limit on the NSW lower north coast. Common Planigales inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water.	**Limited potential habitat within the Development Site. One record within the locality.**	**Low.** **Species not identified during targeted surveys.**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
15.	*Potorous tridactylus* Long-nosed Potoroo	V	V	1	BioNet & PMST	Restricted to east of the Great Dividing Range, with annual rainfall >760 mm. Inhabits coastal heath and dry and wet sclerophyll forests. Requires relatively thick ground cover and appears restricted to areas of light and sandy soil. Feeds on fungi, roots, tubers, insects and their larvae, and other soft-bodied animals in the soil.	**Potential suitable habitat within the Development Site. Only one old record (Sept 2009) within the locality, 4km to the East of the Development Site. Not recorded during targeted surveys.**	**Low**
16.	*Pseudomys novaehollandiae* New Holland Mouse	-	V	64	BioNet & PMST	The species occurs in disjunct, coastal populations from Tasmania to Queensland. In NSW it inhabits a variety of coastal habitats including heathland, woodland, dry sclerophyll forest with a dense shrub layer and vegetated sand dunes. Species presence is strongly correlated with understorey vegetation density, and high floristic diversity in regenerating heath.	**Potential habitat within the Development Site. Records within the locality.**	**High**
17.	*Pteropus poliocephalus* Grey-headed Flying-fox	V	V	35	BioNet & PMST	Generally, this species is found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. Inhabit subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	**Potential foraging within canopy. Records occur within locality. Identified foraging on-site during spotlighting surveys. No breeding camps present within Development Site.**	**Moderate-high. Species identified onsite during targeted surveys.**

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
18.	*Saccolaimus flaviventris* Yellow-bellied Sheathtail-bat	V	-	4	BioNet	Migrates from tropics to SE Aus in summer. Forages across a range of habitats including those with and without trees, from wet and dry sclerophyll forest, open woodland, Acacia shrubland, mallee, grasslands and desert. Seasonal movements are unknown.	**Potential foraging habitat occurs within Development Site. Records occur within the locality.**	**Moderate-high**
19.	*Scoteanax rueppellii* Greater Broad-nosed Bat	V	-	11	BioNet	The species is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however, does not occur at altitudes above 500 m. Inhabits a variety of habitats from woodland to wet and dry sclerophyll forests and rainforest, also remnant paddock trees and timber-lined creeks.	**Marginal suitable habitat occurs within Development Site, with species foraging along creek and river corridors and preferring wet sclerophyll and rainforest habitat. Records occur within locality.**	**Low**
Migratory Terrestrial Species								
1.	*Apus pacificus* Fork-tailed Swift	-	C,J,K	P	PMST	The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia. They mostly occur over inland plains but sometimes above foothills or in coastal areas.	**No suitable habitat within the Study Area. No records within the locality.** **Not recorded during site assessment.**	Low
2.	*Ardenna carneipes* Flesh-footed Shearwater	V,P	J,K	P	PMST	Ranges throughout the Pacific and Indian Oceans. There are two main breeding areas in the world: one in the South West Pacific includes Lord Howe Island and New Zealand; the other along the coast of Western Australia.	**No suitable habitat within the Study Area. No records within the locality.** **Not recorded during site assessment.**	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
3.	*Calidris tenuirostris* Great Knot	V	CE,C, J,K	P	PMST	In NSW, occurs in scattered sites along the coast to Narooma – it has been observed inland at Tullakool, Armidale, Gilgandra and Griffith. Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	**No habitat within the Study Area. No records within the locality.** **Not recorded during site assessment.**	Nil
4.	*Charadrius mongolus* Lesser Sand-plover		E,C,J, K	P	PMST	Found around the entire coast but is most common in the Gulf of Carpentaria, and along the east coast of Queensland and northern NSW. Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms.	**No habitat within the Study Area. No records within the locality.** **Not recorded during site assessment.**	Nil
5.	*Cuculus optatus* Oriental Cuckoo	-	C,J,K	P	PMST	Mainly inhabits forests, occurring in coniferous, deciduous and mixed forest. It feeds mainly on insects and their larvae, foraging for them in trees and bushes as well as on the ground.	**No habitat within the Study Area. No records within the locality.** **Not recorded during site assessment.**	Low
6.	*Hirundapus caudacutus* White-throated Needletail	-	V,C,J, K	P	PMST	Widespread in eastern and south-eastern Australia. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground.	**Broadly suitable habitat within the Study Area. No records within the locality.** **Not recorded during site assessment.**	Low

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
7.	*Limicola falcinellus* Broad-billed Sandpiper	V	C,J,K	0	PMST	Favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs. Diet includes insects, crustaceans, molluscs, worms and seeds.	**Broadly suitable habitat within the Study Area. No records within the locality.** **Not recorded during site assessment.**	Nil
8.	*Limosa lapponica* Bar-tailed Godwit	-	C,J,K	1,P	BioNet PMST	Bar-tailed Godwits are quite large waders, with females being bigger than males. The Bar-tailed Godwit is mainly mottled brown above and lighter and more uniform buff below. The species arrives in Australia each year in August from breeding grounds in the northern hemisphere. The species is known to inhabit estuarine mudflats, mangroves and beaches.	**No habitat within the Study Area. Records within the locality.** **Not recorded during site assessment.**	Nil
9.	*Limosa limosa* Black-tailed Godwit	V	C,J,K	P	PMST	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the north and south coast, and inland. Records in western NSW indicate that a regular inland passage is used by the species, as it may occur around any of the large lakes in the western areas during summer, when the muddy shores are exposed. It is usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. It has also been found around muddy lakes and swamps, wet fields and sewerage treatment works.	**No habitat within the Study Area. No records within the locality.** **Not recorded during site assessment.**	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
10.	*Motacilla flava* Yellow Wagtail	-	C,J,K	P	PMST	The yellow wagtail typically forages in damp grassland and on relatively bare open ground at edges of rivers, lakes and wetlands, but also feeds in dry grassland and in fields of cereal crops.	**Broadly suitable habitat within the Study Area. No records within the locality.** **Not recorded during site assessment.**	Low
11.	*Numenius madagascariensis* Eastern Curlew	-	CE,C, J,K	2,P	BioNet PMST	The eastern curlew is Australia's largest shorebird and a long-haul flyer. It is easily recognisable, with its long, down-curved bill. The species takes an annual migratory flight to Russia and northeastern China to breed, arriving back home to Australia in August.	**No habitat within the Study Area. Records within the locality.** **Not recorded during site assessment.**	Nil
Migratory Wetland Species								
1.	*Calidris acuminata* Sharp-tailed Sandpiper	-	C,J,K	1	BioNet PMST	In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	**No habitat within the Study Area. One record within the locality.** **Not recorded during site assessment.**	Nil
2.	*Calidris ferruginea* Curlew Sandpiper	E	CE,C, J,K	12	BioNet PMST	The species occurs along the entire coast of NSW, particularly in the Hunter Estuary, and freshwater wetlands in the Murray-Darling Basin. Breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving between August and November, and departing between March and mid-April. It generally occupies littoral and estuarine habitats, and in New South Wales can be found mainly in intertidal mudflats of sheltered coasts.	**No habitat within the Study Area. Records within the locality.** **Not recorded during site assessment.**	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
3.	*Calidris melanotos* Pectoral Sandpiper	-	J,K	P	PMST	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	**No habitat within the Study Area. No records within the locality.** **Not recorded during site assessment.**	Nil
4.	Gallinago hardwickii Latham's Snipe	-	J,K	4,P	BioNet PMST	In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level.	**No habitat within the Study Area. No records within the locality.** **Not recorded during site assessment.**	Nil
5.	*Tringa brevipes* Grey-tailed Tattler	-	C,J,K	P,1	BioNet PMST	Occurs along most of the coast from QLD border, south to Tilba Lake. It is more heavily distributed along coastal regions north of Sydney. Found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. Most abundant in areas with dense beds of seagrass. Occasionally found around near-coastal wetlands, such as lagoons and lakes and ponds in sewage farms. Forages in shallow water, on hard intertidal substrates, such as reefs and rock platforms. Roosts in the branches of mangroves or, rarely, in dense stands of other shrubs, or on snags or driftwood. (DCCEEW SPRAT)	**No habitat within the Study Area. Records within the locality.** **Not recorded during site assessment.**	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
6.	*Tringa nebularia* Common Greenshank	-	C,J,K	2	BioNet	Found in a wide variety of inland wetlands and sheltered coastal habitats (with large mudflats and saltmarsh, mangroves or seagrass) of varying salinity, Habitats include embayments, harbours, river estuaries, deltas and lagoons. It uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. Also artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores. In NSW the Hunter River estuary has been identified as a site of international importance. Breeds in Eurasia, the northern British Isles, Scandanavia, east Estonia and north-east Belarus, through Russia and east.	**No habitat within the Study Area. Records within the locality.** **Not recorded during site assessment.**	Nil

APPENDIX F. EPBC ACT SIGNIFICANT IMPACT CRITERIA ASSESSMENT

Table A6:1 Significant impact criteria assessment – Vulnerable flora

Species assessed	***Eucalyptus parramattensis* subsp. *decadens***
Criteria	**Discussion**
Lead to a long-term decrease in the size of a population	***Eucalyptus parramattensis* subsp. *decadens*** This species has been identified within the approved quarry footprint and surrounding areas as it was used in the seed mix during rehabilitation for previous mining operations. The population within the Development Site is not considered an important population as it is not near the limits of this species range. The 33 individuals identified within the Development Site are a result from rehabilitation actions. The naturally occurring individuals within the northern portion of the Project Area (outside the Development Site) likely form part of an important population of the species within the Tomago Area.
Reduce the area of occupancy for an important population	As the individuals within the Development Site are not considered to form part of an important population, the proposal will not reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations	The Development Site has not been identified as supporting an important population of the species, as such it will not fragment an important population.
Adversely affect habitat critical to the survival of a species	As the suitable habitat for the species only within the Development Site only occurs within the Rehabilitation (4.43 ha), this habitat is not considered critical to the survival of the species as it is not its naturally occurring habitat. Higher quality habitat occurs outside the Development Site, in the northern portion of the Project Area within the Tomago Sand Swamp Woodland. This area of habitat will not be impacted on due to the proposal.
Disrupt the breeding cycle of an important population	The Development Site has not been identified as supporting an important population of this species.
Modify, destroy, remove, isolate or decrease the availability of habitat to the extent that the species is likely to decline.	A small area (4.43 ha) of marginal habitat (Rehabilitation) and thirty-three individuals of *Eucalyptus parramattensis* subsp. *decadens* will be removed due to the proposal. Due to the relatively small impact on habitat in which the species has been planted, it is unlikely to decrease the availability of habitat to the extent that the species is likely to decline. Higher quality habitat occurs outside the Development Site, in the northern portion of the Project Area within the Tomago Sand Swamp Woodland. This area of habitat will not be impacted on due to the proposal.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Weed invasion has been identified as a threat to these species. Based on the proposed mitigation measures it is not expected that the works will result in an increase of invasive species.
Introduce disease that may cause the species to decline	It is unlikely that a disease that could cause the species to decline would be introduced (e.g. Phytophthora or Myrtle Rust) would be introduced due to the proposed Action. All machinery being used for the operational works of the Quarry are on site.
Interfere substantially with the recovery of the species	Habitat loss and fragmentation resulting from land clearing development, particularly sand mining, road construction and residential/industrial developments is identified as a main threat for this species. The proposed works will remove approximately 4.43 ha of marginal habitat and one individual This loss of this planted individual and small area of habitat is not considered to Interfere substantially with the recovery of the species.

Table A6:1 Significant impact criteria assessment – Vulnerable flora

Conclusion	The proposed works are unlikely to result in a significant impact to these species as: o Thirty planted individuals will be removed o there is a small direct impact of 3.36 ha of habitat to be removed o the works will not have a significant impact on important populations size, area or increase isolation of this species o no listed important habitat will be directly impacted on o the proposed action will not disrupt the breeding cycle of this species and o mitigation measures including well identified exclusion zones and weed management plan are proposed.

Table A6 2: Significant impact criteria assessment – Critically Endangered birds

Species assessed	**Swift Parrot (*Lathamus discolor*)**
Criteria	**Discussions**
Lead to a long-term decrease in the size of a population	The Development Site is not located within mapped important area for the Swift Parrot. However, the are some foraging opportunities for this species including winter flowering species such as *E. haemastoma*. The Development Site is bordered by the proposed On-Site Offset, directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamtown that provide connectivity and movement corridors. Therefore, due to the large amount of available habitat within the locality, the proposed works are not considered to lead to a long-term decrease in the size of the Swift Parrot population.
Reduce the area of occupancy for of the species	A small area of suitable habitat will be removed (2.82 ha), this area has some connectivity to the larger tracts of vegetation within the proposed On-Site Offset and within the Tilligerry SCA and adjacent areas around Tomago and Williamtown that provide connectivity and movement corridors. The proposed works will remove approximately 2.82 ha of suitable habitat for this species, and as the habitat is surrounded by larger areas of higher quality habitat it is unlikely to reduce the area of occupancy within the local area.
Fragment an existing population into two or more populations	The Swift Parrot is a highly mobile species. As such, it is not considered that the proposed works will fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species	No critical habitat such as breeding habitat for the Swift Parrot is within the Development Site. As such, it is not considered that the proposed works will adversely affect habitat critical to the survival of this species.
Disrupt the breeding cycle of a population	The Swift Parrot does not breed within NSW. As such, it is not considered that the proposed works will disrupt the breeding cycle of this species' populations.
Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline	The proposed works will remove potential foraging habitat for this species. The removal of some of the foraging habitat within the Development Site is part of a larger area of habitat within the Hunter and Karuah Manning subregions. As no breeding habitat is to be impacted on, it is not considered that the proposed works will modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critical endangered species becoming established in the critically endangered species' habitat	Feral cats are identified as a pest animal for this species. There is potential for feral cats to be attracted to the area as a result of waste created during construction and not being disposed of correctly. Proposed mitigation measures, if implemented correctly should reduce the risk of any feral cats being attracted to the area.
Introduce disease that may cause the species to decline	*Psittacine cirovirus* is identified as a disease that causes beak and feather vulnerability. This disease occurs naturally in the wild. It is not considered the actions from the construction and operation of the project will introduce disease that may cause the species to decline.
Interfere substantially with the recovery of the species	Habitat loss and industrial development are listed in the National Recovery Plan as actions that pose a significant threat to habitat. The project will directly impact 2.82 ha of potential foraging habitat. There is approximately 515.78 ha of suitable habitat for the Swift Parrot within a 5 km radius of the Development Site. The proposed Development Modification will clear 2.82 ha, approximately 0.5% of available habitat. The Swift Parrot is a highly mobile species, and due to the amount of available foraging habitat within the area, it is considered the impacts from the project will not interfere substantially with the recovery of this species.
Conclusion	The proposed works are unlikely to result in a significant impact to these species as: • no key habitat will be directly impacted on; and • the proposed action will not disrupt the breeding cycle of the species.

Table A6 3 Significant impact criteria assessment – Endangered mammals

Species assessed	**Koala (*Phascolarctos cinereus*)**
Criteria	**Discussion**
Lead to a long-term decrease in the size of a population	The proposed works will remove approximately 2.82 ha of suitable habitat for this species. The habitat in the Development Site has connectivity to the larger tracts of vegetation within the On-Site Offset and is directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamtown that provide connectivity and movement corridors. As such, any impacts to this species habitat are not considered to lead to a long-term decrease in the size to its population.
Reduce the area of occupancy for of the species	A small area of suitable habitat will be removed, this area has connectivity to the larger tracts of vegetation within the approved On-Site Offset and is directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamtown that provide connectivity and movement corridors. The proposed works will remove approximately 2.82 ha of suitable habitat for this species, and as the habitat is surrounded by larger areas of higher quality habitat it is unlikely to reduce the area of occupancy within the local area.
Fragment an existing population into two or more populations	The vegetation within the Development Site is part of a larger patch of vegetation in the local area including the approved On-Site Offset, directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamtown that provide connectivity and movement corridors. Within the locality, the proposal will not impact on connectivity, as there is no movement corridor through The Project Area north-south, as there is no connected vegetation on the southern site of Cabbage Tree Road. The Proposed Modification has the potential to increase fragmentation of habitat on a local scale, within The Project Area. However, as the proposed Development Site will be progressively rehabilitated post extraction, impacts on local connectivity will be temporary. As such, impacts on connectivity are unlikely to being significant.
Adversely affect habitat critical to the survival of a species	The habitat within the Development Site was identified as Supplementary under the Port Stephens CKPoM. There are areas of more suitable habitat (Preferred Habitat under the CKPoM) which occur within the On-Site Offset. As only a small area of Supplementary habitat will be removed due to the proposal, it is unlikely that the proposed works will adversely affect habitat critical to the survival of this species.
Disrupt the breeding cycle of a population	Access within the grounds of the Newcastle Sand quarry is restricted, as such the level of disturbance would return to its current level on completion of the construction works. As the Development Site has connectivity to larger areas of habitat within the On-Site Offset, Tilligerry SCA and adjacent areas around Tomago and Williamtown, it is considered that the proposed works will not disrupt the breeding cycle of this species population.
Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline	The proposed works will remove approximately 2.82 ha of suitable habitat for this species. The habitat to be removed within the Development Site has some connectivity to larger areas of habitat within On-Site Offset and Tilligerry SCA and adjacent areas around Tomago and Williamtown. Additionally, the Development Site will be progressively rehabilitated post extraction. As such, it is considered that the proposed works will not modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	The clearing of vegetation within the Development Site may increase the movement of invasive predatory species into new habitat that may be occupied by this species. Red fox (*Vulpes Vulpes*) has been identified as a threat from invasive species for this species. To avoid, minimise and/or manage impact identified in **Section 7.3** predator control program to control feral animals is to be put in place for the proposed works.
Introduce disease that may cause the species to decline	Koala retrovirus (KoRV) and Chlamydia (*Chlamydia percorum*) are identified diseases in the Conservation Advice for the Koala (DAWE 2022c). Wild populations carry disease pathogens. Inadvertent spread of disease also occurred historically following koala translocations. The proposed works will not introduce disease that may cause the species to decline.

Table A6 3 Significant impact criteria assessment – Endangered mammals

Species assessed	**Koala (*Phascolarctos cinereus*)**
Interfere substantially with the recovery of the species	Habitat loss and degradation, vehicle strikes, and dog attacks are listed in the Conservation Advice as threats to the Koala. The proposed works will involve clearing 2.82 ha of potential habitat for the Koala. The proposed Development Site is an extension of an existing quarry, therefore a number of vehicles and machinery already traverse the site. When there is human activity there is a chance wild and/or domestic dogs will be attracted to the site searching for food. To mitigate the impacts of clearing native vegetation and reduce potential fragmentation. Measures such as reducing the width of cleared areas will reduce the impacts of habitat loss. Ensuring quarry vehicles and machinery drive at reduced speeds ensure drivers have the time to stop and avoid potential strikes of koala when driving onsite. Pre-clearing surveys, focusing on identifying and avoiding any occupied trees will be conducted prior to the commencement of any clearing works. To reduce the potential for wild and/or domestic dogs being attracted to the site, all waste will be disposed of correctly and rubbish bin will have secured and have appropriately fitted lids avoiding them being pushed over and spilling contents. With connectivity to larger areas of habitat, vehicle speed limits and ensuring waste is disposed of correctly and securely, it is considered the project will not Interfere substantially with the recovery of the species.
Conclusion	The proposed works are unlikely to result in a significant impact to this species as: • the works will not have a significant impact on the size, area, populations or increase isolation of this species; and • no critical habitat will be directly impacted on.

Table A6 4: Significant impact criteria assessment - Vulnerable mammal (New Holland Mouse)

Species assessed	**New Holland Mouse (*Pseudomys novaehollandiae*)**
Criteria	**Discussions**
Lead to a long-term decrease in the size of an important population of a species	The species was not detected within the development footprint during surveys, however in previous surveys within the Newcastle Sand property, the species was detected on two occasions. In addition, historic records on the species are present in the locality. With reasonably frequent fires occurring within the Project Area (historically) and the Locality the Development Site and the Project Area contain suitable habitat for the species. The individuals within the Project Area form part of the Port Stephens metapopulation of the species. Due to the relatively small area of habitat removal (4.43 ha) in the context of the surrounding Project Area and the adjacent Tilligerry SCA, it is unlikely that the proposal will lead to the long-term decline in the population.
Reduce the area of occupancy for an important population	A small area of suitable habitat will be removed, this area has some connectivity to the larger tracts of vegetation within the approved On-Site Offset and is directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamtown that provide connectivity and movement corridors. The proposed works will remove approximately 4.43 ha of suitable habitat for this species, and as the habitat is surrounded by larger areas of higher quality habitat it is unlikely to reduce the area of occupancy within the local area.
Fragment an existing important population into two or more populations	The vegetation within the Development Site is part of a larger patch of vegetation in the local area including the approved On-Site Offset, directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamtown that provide connectivity and movement corridors. Within the locality, the proposal will not impact on connectivity, as there is no movement corridor through The Project Area north-south, as there is no connected vegetation on the southern site of Cabbage Tree Road. The Proposed Modification has the potential to increase fragmentation of habitat on a local scale, within The Project Area. The habitat occurring within the centre on the eastern border of the western extension, will be cut off from other vegetation temporarily. Additionally, as the proposed Development Site will be progressively rehabilitated post extraction, impacts on local connectivity will be temporary. As such, impacts on connectivity are unlikely to being significant.
Adversely affect habitat critical to the survival of a species	Due to the small are of habitat occurring within the Development Site (4.43 ha) and considering the large area of suitable habitat within the surrounding On-Site Offset and adjacent Tilligerry SCA, it is unlikely that the proposed Action will adversity affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	Due to the stage nature and relatively small area of habitat removal, in the context of the available habitat in the area, it is unlikely that any potential disruption to the species breeding will be significant.
Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline	The removal of potential habitat within the Development Site is part of a larger area of habitat associated with the On-Site Offset, Tilligerry SCA and adjacent areas around Tomago and Williamtown. Additionally, the Development Site will be progressively rehabilitated post extraction. As such, it is considered unlikely that the proposed action will impact the species habitat such that its extent is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Red Fox, Feral cat (*Felis catus*) and Wild dog (*Canis lupus familiaris*) are listed a known threats to the New Holland Mouse. A predator control program has already been implemented within the current Biodiversity Management Plan for the Newcastle Sand Quarry, this area is to be extended into the current Study Area.
Introduce disease that may cause the species to decline	No introduced diseases have been identified for as impacting the New Holland Mouse.

Table A6 4: Significant impact criteria assessment - Vulnerable mammal (New Holland Mouse)

Interfere substantially with the recovery of the species	The temporary removal of 4.43 ha of habitat for the species is unlikely to interfere with its recovery. Additionally, the progressive rehabilitation of the extraction area will create areas of suitable habitat for the species in the future.
Conclusion	The proposed works are unlikely to result in a significant impact to New Holland Mouse as: • the works will not have a significant impact on the size, area, populations or increase isolation of these species; and • no critical habitat will be directly impacted on.

Table A6 5: Significant impact criteria assessment - Vulnerable mammals

Species assessed	**Grey-headed Flying-fox (*Pteropus poliocephalus*)**
Criteria	**Discussions**
Lead to a long-term decrease in the size of an important population of a species	The Development Site represents potential foraging habitat (4.43 ha) for the species. The Grey-headed Flying-fox was identified foraging in a *Banksia serrata* during field surveys. It is unlikely that the proposed Development Site contains an important population of the species as they are not at the extent of the species' ranges, they are unlikely to be key source populations and unlikely to be necessary for maintaining genetic diversity.
Reduce the area of occupancy for an important population	No important populations of these species have been identified within the Development Site.
Fragment an existing important population into two or more populations	No important populations of these species have been identified within the Development Site.
Adversely affect habitat critical to the survival of a species	Due to the small are of habitat occurring within the Development Site (4.43 ha) and considering the large area of suitable habitat within the surrounding On-Site Offset and adjacent Tilligerry SCA, it is unlikely that the proposed Action will adversity affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	No important populations of these species have been identified within the Development Site.
Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline	The removal of potential habitat within the Development Site is part of a larger area of habitat associated with the On-Site Offset, Tilligerry SCA and adjacent areas around Tomago and Williamtown. As such, it is considered unlikely that the proposed action will impact the species habitat such that its extent is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	A predator control program has already been implemented within the current Biodiversity Management Plan for the Newcastle Sand Quarry, this area is to be extended into the current Study Area.
Introduce disease that may cause the species to decline	**Grey-headed Flying Fox** The Australian bat Lyssavirus (ABL) is identified in the Conservation Advice for the Grey-headed Flying listed as a minor threat to this species. The incidence of ABL very low whilst (TSSC 2001) and it is not considered the actions from the construction and operation of the project will introduce disease that may cause the species to decline.
Interfere substantially with the recovery of the species	**Grey-headed Flying Fox** As listed under Recovery Objective 1 of the Grey-headed Flying Fox Recovery Plan, *Foraging habitat loss and degradation pose the most significant threat to Grey-headed Flying-foxes. There is evidence that winter and spring are periods of limited food availability and are therefore likely to be population limiting periods for the species* (DAWE 2021). The proposed works will remove approximately 4.43 ha of potential foraging habitat for this species. This area to be cleared is considered relatively low compared to the available forging habitat within the surrounding On-Site Offset, Tilligerry SCA and adjacent areas around Tomago and Williamtown. It is considered the removal of this vegetation will not interfere substantially with the recovery of the species.

Table A6 5: Significant impact criteria assessment - Vulnerable mammals

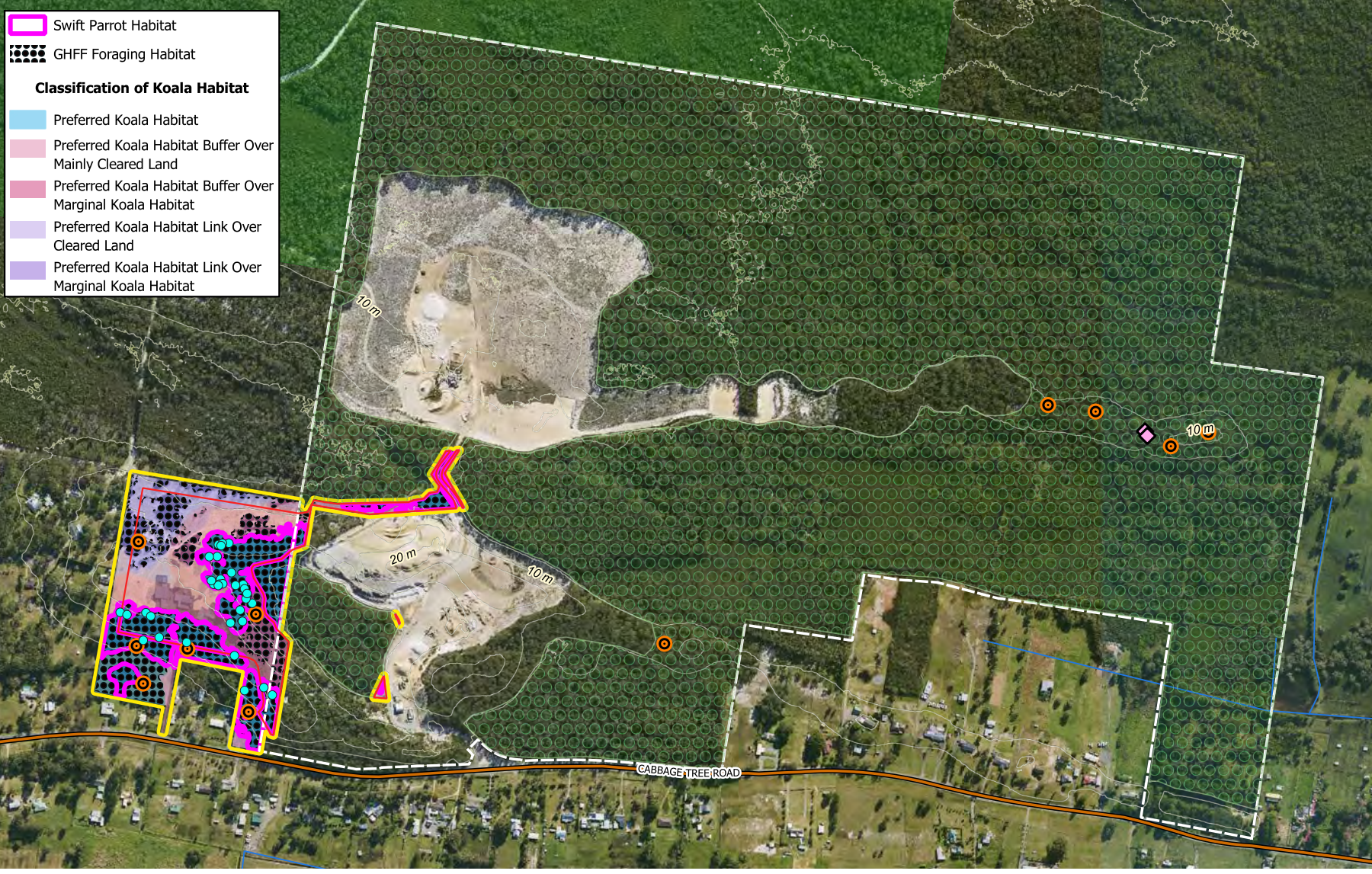
Conclusion	The proposed works are unlikely to result in a significant impact to Grey-headed Flying-fox as: • the works will not have a significant impact on the size, area, populations or increase isolation of these species; and • no critical habitat will be directly impacted on.

Table A6 6: Significant impact criteria assessment – Endangered Frogs

Species assessed	**Mahony's Toadlet (*Uperoleia mahonyi*)**
Criteria	**Discussions**
Lead to a long-term decrease in the size of a population	The species was identified during field surveys (pit fall trapping) and is known from the surrounding Swamp Habitat (within the On-site Offset). High quality habitat for the species includes wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. Aquatic vegetation at breeding sites includes sedges (*Schoenoplectus* spp., *Baumea* spp. and *Lepironia articulata*) and Broadleaf Cumbungi (*Typha orientalis*). Breeding habitat for Mahony's Toadlet includes permanent or semi-permanent swamps and ponds of moderate size with no apparent flow of water (TSSC 2020). Areas of this higher quality breeding habitat for the species is located within proximity to the Development Site, however it is outside of the area to be cleared within the On-Site Offset. Vegetation to be cleared within the Development Site comprises of Smooth-barked Apple-Blackbutt-Old Man Banksia woodland and is considered to be marginal, or supplementary habitat for Mahony's Toadlet. The proposed works will remove approximately 5.28 ha of supplementary habitat for this species. The habitat in the Development Site is connect to the larger tracts of vegetation within the approved On-Site Offset and Tilligerry SCA. As such, impacts to this species are not considered to lead to a long-term decrease in the size to its population.
Reduce the area of occupancy for of the species	A small area of suitable habitat will be removed, this area has some connectivity to the larger tracts of vegetation within the approved On-Site Offset and is directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamtown that provide connectivity and movement corridors. The proposed works will remove approximately 5.28 ha of suitable habitat for this species, and as the habitat is surrounded by larger areas of higher quality habitat it is unlikely to reduce the area of occupancy within the local area.
Fragment an existing population into two or more populations	The vegetation within the Development Site is part of a larger patch of vegetation in the local area including the approved On-Site Offset, directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamtown that provide connectivity and movement corridors. Within the locality, the proposal will not impact on connectivity, as there is no movement corridor through The Project Area north-south, as there is no connected vegetation on the southern side of Cabbage Tree Road. The Proposed Modification has the potential to increase fragmentation of habitat on a local scale, within The Project Area. The habitat occurring within the centre on the eastern border of the western extension, will be cut off from other vegetation temporarily. However, as the proposed Development Site will be progressively rehabilitated post extraction, impacts on local connectivity will be temporary. As such, impacts on connectivity are unlikely to being significant.
Adversely affect habitat critical to the survival of a species	As the proposed Development Site does not contain any swamp vegetation or swales suitable for breeding, it is unlikely that it contains habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	The Development Site is not located within breeding habitat for Mahony's Toadlet. As such, it is not considered that the proposed works will disrupt the breeding cycle of this species' populations. The Development Site is likely used for dispersal of the species, however, as the proposal will not isolate any patches of habitat and as rehabilitation will occur progressively within the Development Site it is unlikely that there will be a significant impact on movement of the species.
Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline	The removal of potential habitat within the Development Site is part of a larger area of habitat associated with the On-Site Offset, Tilligerry SCA and adjacent areas around Tomago and Williamtown. Additionally, the Development Site will be progressively rehabilitated post extraction. As such, it is considered unlikely that the proposed action will impact the species habitat such that its extent is likely to decline.

Table A6 6: Significant impact criteria assessment – Endangered Frogs

Result in invasive species that are harmful to a critical endangered species becoming established in the critically endangered species' habitat	The Plague Minnow *Gambusia holbrooki* is an introduced egg and tadpole predator, and it is considered due to other Uperoleia are moderately impacted by Plague Minnow (TSSC 2020). The proposed Activity is unlikely to result in the increased occurrence of the Plague Minnow.
Introduce disease that may cause the species to decline	Susceptibility to the amphibian chytrid fungus (*Batrachochytrium dendrobatidis*) is unconfirmed in Mahony's Toadlet (TSSC 2020). It is unlikely that the proposal will result in the introduction of chytrid fungus. Mitigation measures are within the existing management plan to ensure any survey works conducted in Frog habitat adhere to appropriate control measures.
Interfere substantially with the recovery of the species	There is no National Recovery Plan program for this species, however habitat loss, disturbance and modification are listed as a threat in the NSW Save our Species program and threat information. The proposed works will not remove, disturb or modify any habitat critical for this species and therefore will not interfere substantially with the recovery of the species.
Conclusion	The proposed works are unlikely to result in a significant impact to these species as: • the works will not have a significant impact on the size, area, populations or increase isolation of these species; and • no critical habitat will be directly impacted on.



WEDGETAIL PROJECT CONSULTING

Wedgetail Project Consulting\Arbus - Documents\Newcastle Sand\MOD4 BDAR\@GIS\NS_MOD4_BDAR_Figures_250130.qgz

Study Area (MOD4)
Disturbance Footprint (MOD4)
Proposed BSA
Newcastle Sand Project Area

Eucalyptus parramattensis subsp. *decadens*
Mahony's toadlet (*Uperoleia mahonyi*) Detected
New Holland Mouse (*Pseudomys novaehollandiae*)

Contours (5m)
Arterial Road
Minor watercourse
National Parks & Reserves

Figure 22. EPBC Map

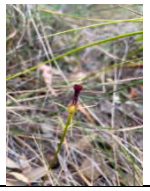
100 200 300 400 m

N

GDA94 / MGA zone 56
EPSG:28356

Map Produced: 03/02/2025
Produced By: Keryn Dowling

APPENDIX H. TARGET ORCHID SURVEY COMMUNICATIONS

Species	Contact	Date	Reference Population/ Email Comms	Photo
Diuris arenaria	Port Stephens Council – Ashley Bacales	05/09/2024	Confirmation Email	
Diuris praecox	Samara Schulz	19/08/2021	Glenrock National Park	
	Daniel Allen at Central Coast Council	8/8/2023	Confirmation Email	
Corybas dowlingii	Environmental Planning Team (Ashley Bacales) at Port Stephens Council	6 June 2024	Stoney Ridge Reserve reference populations -	
	Paul Hillier DCCEEW	17th June 2024	Grahamstown Dam	
Cryptostylis hunteriana	Samara Schulz	04/11/2021	Lake Munmorah -	
	David Martin	November 2024	Lake Munmorah	

Confirmation of *Diuris arenaria* found on-site by the National Herbarium:

From: Andrew Orme
To: Ashley Owen
Subject: RE: plant identification service - potential Diuris arenaria ~ BIS 22758
Date: Friday, 15 November 2024 7:31:41 PM
Attachments: image001.png
image003.png

Hello Ashley,

I apologise for the delay in responding.

Yes, I have confirmed your specimen as *Diuris arenaria* – conf. 14th Nov 2024.

It has been retained for the herbarium collection.

With kind regards,

Andrew

Andrew Orme
Identifications Senior Technical Officer
Botanical Identification Service
National Herbarium of New South Wales

Locked Bag 6002
Mount Annan NSW 2567
0410 025 101 | 02 4631 5136
andrew.orme@botanicgardens.nsw.gov.au
botanical.is@botanicgardens.nsw.gov.au
https://www.botanicgardens.org.au/our-science/our-services/plant-identification-service

We pay respect to all Elders and Traditional Custodians of the lands and waters that we nurture and care for.

APPENDIX I. SAII ASSESSMENT

Introduction

The concept of Serious and Irreversible Impacts (SAII) in the NSW Biodiversity Offset Scheme (BOS) aims to protect threatened species and threatened ecological communities that are most at risk of extinction from potential development impacts or activities.

The consent authority is to consider SAII on biodiversity values that remain after the measures proposed to be taken to avoid or minimise the impact on biodiversity values of the proposed development or activity (s7.16 of the BC Act). The consent authority must refuse to grant consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in the case of an application for development consent (other than for State significant development), if it is of the opinion that the proposed development is likely to have serious and irreversible impacts on biodiversity values.

There are four (4) key principles provided for in the BC Act (Section 6.5) and clause 6.7 of the BC Regulation that define the assessment of SAII. These four (4) principles include the following:

- **Principle 1:** *Species or ecological community currently in a rapid rate of decline*
- **Principle 2:** *Species or ecological communities with a very small population size*
- **Principle 3:** *Species or area of ecological community with very limited geographic distribution*
- **Principle 4:** *Species or ecological community that is unlikely to respond to management and is therefore irreplaceable*

The document titled '*Guidance to assist a decision-maker to determine a serious and irreversible impact'* (DPIE 2019) provides addition guidance and defines the criteria for listing biodiversity values at risk of a SAII (Section 2.3), as outlined below:

"*The Department has applied the criteria to all threatened species and threatened ecological communities listed under the BC Act. Entities that meet the criteria under one or more principle are identified as entities at risk of a SAII in the Threatened Biodiversity Data Collection housed in BioNet and displayed on the Department website*".

Assessment Requirements

To assist the decision-maker to evaluate the extent and severity of the impact on an entity at risk of an SAII, the BDAR or BCAR must contain details of the assessment of SAIIs, in accordance with the criteria set out in Subsection 9.1.1 of the BAM for impacts on each TEC and in Subsection 9.1.2 for each threatened species. All criteria must be addressed for each TEC or threatened species at risk of an SAII and likely to be impacted by the proposal. The assessment for each entity is provided in the following subsections.

Assessments for one (1) species at risk of SAII have been completed for this development, including:

- *Diuris arenaria (Sand Doubletail)*

Diuris arenaria (Sand Doubletail)

Species Summary

Sand Doubletail is a small ground orchid, known from the Tomaree Peninsula near Newcastle, NSW (TBDC). Found in coastal heath and dry grassy eucalypt forest on sandy flats (TBDC). It is currently known from three main locations, two of which are reserved but occur in areas subject to disturbance (TBDC). Other scattered individuals are known to occur outside reserves (OEH, 2000). Light purple to mauve flowers appear through the months of August to September, and are 20-30 mm wide. Flowering stems can be up to 40 cm high. Usually there are two leaves, 15-50 cm long by 2-6 mm wide, growing from the base of the plant (TBDC).

Surveys completed

The species was recorded during targeted flora surveys undertaken within the Disturbance Footprint. One individual *Diuris arenaria* plant was recorded within the Disturbance Footprint. This individual was recorded within Vegetation Zone 3 (Managed - Coastal Sands Apple-Blackbutt Forest) community. Additional surveys were conducted across the NS Project Area, however no other individuals were located.

Impact to species

One individual *Diuris arenaria* plant occurs within the Development Site and will be directly impacted by the proposed development.

Table 6-A: Impact Assessment for SAII species - *Diuris arenaria* (Sand Doubletail)

Criteria	Comments
1. Impact Avoidance	
What actions and measures were taken to avoid direct and indirect impacts on the species at risk of an SAII? Consistent with Criteria A within the Guidance Document (DPIE 2019): "The action and measures taken to avoid the direct and indirect impact on the potential entity for a SAII".	The proposed development will impact one individual and **5.29.** ha of suitable habitat for the species. Avoidance of the individual would be challenging as the individual is located in an area that provides access to the resource that is in demand. Therefore, no actions have been taken to avoid direct impact to one individual SAII species.
2. Current Population	
Principle 1: species or ecological community currently in a rapid rate of decline.	Definitions: **Rapid decline:** In accordance with the Guidance to assist a decision-maker to determine a serious and irreversible impact' (DPIE 2019) a rapid decline is defined as when a "species has an observed, estimated, inferred, suspected or projected **population reduction of ≥80% in 10 years or three generations** (whichever is longer)".

Criteria	Comments
Evidence of rapid decline *i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or* *ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasite*	*i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or* As the species is listed as **Endangered** under the NSW BC Act, it is likely that the species was determined to meet the minimum requirements for eligibility for listing as an **Endangered** species (>50% reduction). Therefore, it is reasonable to conclude that the species' population has experienced a rapid rate of decline (>50% decline) in NSW over the past 10 years or three generations. • **Endangered species** o **"**large" population reduction in accordance with Subclause 4.2(1b) in the NSW Biodiversity Conservation Regulation 2017. o A population reduction of >50% (in accordance with the more stringent A2, A3 and A4 of IUCN (2001)) o A population reduction of >70% (in accordance with the more stringent A2, A3 and A4 of IUCN (2001))
	Conclusion **<u>The species meets Principle 1</u>**, the evidence available does confirm the species is experiencing a rapid decline.
Principle 2: species or ecological communities with a very small population size. *Evidence of small population size* *i. an estimate of the species' current population size in NSW, and* *ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and* *iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations* *Consistent with Criteria B within the Guidance Document (DPIE 2019): "The size of the local population directly and indirectly impacted by the development, clearing or biodiversity certification".*	*Definitions* **Very small population size:** species within a known population size that is either: • Fewer than 50 mature individuals independent of whether there are any threats, or • Fewer than 250 mature individuals and the species has an observed, estimated or projected continuing decline: Of at least 25% in three years or one generation (whichever is longer) OR; Where the number of mature individuals in each subpopulation is <50 OR; The percentage of mature individuals in one subpopulation is 90-100% OR; The population is subject to extreme fluctuations in the number of individuals **Population:** means the total number of mature individuals in NSW. **Mature individuals:** include individuals known, estimated or inferred to be capable of reproduction. **Subpopulations:** geographically or otherwise distinct groups in the total population between which there is little demographic or genetic exchange
	i. New South Wales Population The Saving Our Species 2020-2021 annual report card for this species conducts monitoring of individuals at five locations: • Heatherbrae – accidental disturbance occurred, no data. • North Tomaree – population trend unknown • Shoal Bay – population trend unknown • South Tomaree – 273 individuals • Woromi – 4,255 total individuals (3,135 individuals at the primary monitoring site and 1,120 individuals at second monitoring site (this monitoring occurred after a prescribed burn in 2019 which saw an increase of 50%).) *i. Decline in NSW Population in three years* Data is not available. *i. Number of mature individuals in each subpopulation* Data is not available

Criteria	Comments
	Conclusion **<u>The species does not meet Principle 2</u>** and is not characterized as having a very small population in accordance with *Guidance to assist a decision-maker to determine a serious and irreversible impact'* (DPIE 2019).
Principle 3: species or area of ecological community with **very limited geographic distribution** ***Evidence of limited geographic range*** *i. extent of occurrence* *ii. area of occupancy* *iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and* *iv. whether the species' population is likely to undergo extreme fluctuations* *Consistent with Criteria B within the Guidance Document (DPIE 2019): "The size of the local population directly and indirectly impacted by the*	*Definitions* **Very limited geographic distribution for a species:** species have a very limited geographic distribution are generally known to: • Have an area of occupancy of <10 km^2 • Have an extent of occurrence of <100 km^2 • Have at least two of the following three conditions: - Are severely fragmented or only known from one location - Continuing decline - Extreme fluctuations • Inhabit less than or equal to three locations in New South Wales **Severe fragmentation;** occurs where there are increased extinction risks when most of the individuals of a species are found in relatively small and isolated populations. **Decline** can be observed, estimated, inferred or projected in any of the following: extent of occurrence; area of occupancy; area, extent and/or quality of habitat; number of locations or subpopulations; number of mature individuals. **Fluctuations** can be in any of the following: extent of occurrence; area of occupancy; number of locations or subpopulations; number of mature individuals. **Location** means a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat (IUCN 2017).

Criteria	Comments
development, clearing or biodiversity certification".	*i. Extent of Occurrence* The extent of occurrence (EOO) was estimated to be 21,426 km2. The EOO is estimated based on a minimum convex polygon enclosing all mapped occurrences of the species, the method of assessment recommended by IUCN (2017). The species therefore meets the minimum EOO threshold of <100 km^2 to be considered as having a "*Very limited geographic distribution*". *ii. Area of Occupancy* The area of occupancy (AOO) was estimated to be 72 km2. This calculation was based on the species occupying 18 (2 km x 2 km) grid cells, the spatial scale of assessment recommended by IUCN (2017). The species meets the minimum AOO threshold of <10km^2 to be considered as having a "*Very limited geographic distribution*". As the species meets the two (2) of the criteria above, and inhabits ≤ 3 locations, other factors were not assessed. *Other factors* In accordance with the Guidelines a species is considered to have a very limited geographic distribution if the species can meet at least two of the following three conditions: • **Are severely fragmented or only known from one location** – Not assessed • **Continuing decline** – Not assessed • **Extreme fluctuations** – Not assessed *iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences)* **-** Not assessed *iv. whether the species' population is likely to undergo extreme fluctuations* Not assessed. *Inhabit less than or equal to three locations in New South Wales* The species occurs at ≤ three locations, however other scatter individuals are known to occur.
	Conclusion **<u>The species meets Principle 3</u>** as it is characterised as having a very limited geographic distribution in accordance with Guidance to assist a decision-maker to determine a serious and irreversible impact' (DPIE 2019). The species occurs within ≤ 3 locations and has an AOO < 10km2 and EOO < 100 km2).
Principle 4 – species or ecological community that is unlikely to respond to	The consideration of whether an entity is unlikely to respond to management encompasses two key elements. 1. **The Species** – this is based on the best current ecological knowledge of the species including **life history traits** and **characteristics** of the species. Some

Criteria	Comments
management and is therefore irreplaceable *Evidence that the species is unlikely to respond to management* i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site. ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or *iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).*	species display particular life history traits that severely limit the species' ability to increase in abundance, these are species with: • **Life history traits** and/or ecology which is known, but the ability to control key threats at the site scale is negligible. In general, these are species significantly threatened by uncontrollable disease (e.g. frogs are highly threatened by chytrid fungus) • **Known reproductive characteristics** that severely limit their ability to increase the existing population on, or occupy new habitat at, a stewardship site. In general, these are plants that are sterile or largely clonal with no or very limited capacity to increase in number through seed production and recruitment. 2. **Irreplaceable** - Whether an impact on an entity is considered irreplaceable takes into account two factors. The first factor is the likely success in achieving gain in condition, abundance or habitat area. For potential species that are identified in criteria 1 and 2 above, the likelihood of achieving an offset gain is extremely low or highly uncertain. The second factor takes into account consideration of impacts on habitat components that cannot readily be re-created. In general, these are impacts on essential habitat such as caves or cliff lines that are used by threatened species.
	i. known reproductive characteristics severely limit the ability to increase the existing population on or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site. Not applicable *ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site* Not applicable *iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).* No, the key threatening process is clearing, and this can be controlled on a BSS
	Conclusion The **species does not meet Principle 4** as the species does not meet the minimum requirements of a species that is unlikely to respond to management.
Is the species at risk of Serious and Irreversible Impacts?	**The species is at risk of Serious and Irreversible Impacts (SAII)** – the species meets Principle 1 & 3, as such it is considered a species at risk of SAII.
3. Impacts of the proposal on the SAII species	

<table>
<tr><th>Criteria</th><th>Comments</th></tr>
<tr><td>Impact on the species' population
i) Estimate of the number of individuals present in the subpopulation on the subject land and as a percentage of the total NSW population
ii) an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population,
Consistent with Criteria B within the Guidance Document (DPIE 2019): "The size of the local population directly and indirectly impacted by the development, clearing or biodiversity certification" in Guidance Document (DPIE 2019).
iii) if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal.
Consistent with Criteria D in the Guidance Document (DPIE 2019).
Consistent with Criteria E in the Guidance Document (DPIE 2019).</td><td>Subject Land
A total of one individual Diuris arenaria was recorded within the Study Area, and this is located within the proposed Development Footprint, and will be impacted by the development.</td></tr>
<tr><td>Impact on geographic range
i) the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW
ii) the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted.</td><td>i. area of species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW
The proposal will result in impacts to 5.29. ha of habitat for the species (Vegetation Zones 3).
Area of Occupancy (AOO) and Extent of Occurrence (EOO) have been calculated for the species in NSW in accordance with the IUCN Guidelines for Using the IUCN Red List Categories and Criteria (2022) as detailed above. The results are as follows:
• Total Extent of Occurrence (EOO) = 21,426 km2
• Total Area of Occupancy (AOO) = 72 km2
The impact of the proposed development on the species as a percentage of EOO and AOO are detailed below.
<table>
<tr><th>Measure</th><th>Impact</th><th>NSW AOO / percentage impact (%)</th><th>NSW EOO / percentage impact (%)</th></tr>
<tr><td>Habitat Area (ha)</td><td>5.29. ha</td><td>72 km2
(<0.07%)</td><td>21,426 km2
(<0.001%)</td></tr>
</table>
</td></tr>
</table>

Criteria	Comments
ii) to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species *iv) to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.* Consistent with ***Criteria F*** in the Guidance Document (DPIE 2019). Consistent with ***Criteria G*** in the Guidance Document (DPIE 2019). Consistent with ***Criteria H*** in the Guidance Document (DPIE 2019).	*ii. Impact on Subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted.* The proposed development will directly impact a total of **one individual** of the species and a total of **5.29. ha of suitable habitat** for the species. However, the surrounding area also provides suitable habitat including within the on-site offset area, which covers approximately 131.47 ha, and includes 39 ha of suitable habitat for the species. *ii. Fragmentation of Subpopulation* The proposed development will impact a total of **5.29.** ha of suitable habitat for the species amongst a much larger area of habitat including the on-site offset area (131.47 ha) and the connected Tilligerry State Conservation Area. Considering the above the proposal is not anticipated to lead to the fragmentation of a subpopulation of the species.
Criteria I in the Guidance Document (DPIE 2019); *An estimate of the area, or number of populations and size of populations that is in the reserve system in NSW,*	The most recent accessible data from OEH SoS team is from the 2020-2021 annual report card for the species which provides numbers of individuals in the following two locations located within reserves: • South Tomaree – 273 individuals • Woromi – 4,255 total individuals

Criteria	Comments
the IBRA region and the IBRA subregion.	Data was not available for other locations.
4. New Information	
The assessor may also provide new information that can be used to demonstrate that the principle identifying the species as at risk of an SAII, is inaccurate.	Not Applicable

Conclusion

The proposal will result in direct impact to one individual *Diuris arenaria* and **5.29.** ha of suitable habitat for the species. No avoidance of this SAII species has been taken for the proposed development. However, it is located adjacent a larger area of suitable habitat within the on-site offset area, and this is connected to the Tilligerry State Conservation Area. In addition, the area will be rehabilitated post extraction, and top soil utilised immediately within the areas currently in process of being rehabilitated.

APPENDIX J. FLORA SPECIES LIST

Family	Scientific Name	Plot ID	Q01		Q2		Q3		Q04		Q05	
		BAM Growth Form / High Threat Weeds	C	Ab	C	Ab	C	Ab	C	Ab	C	Ab
Apiaceae	*Actinotus helianthi*	Forb (FG)	0.1	20	0.1	5	0.1	1	0.1	5	0.1	10
Apiaceae	*Platysace ericoides*	Shrub (SG)	1	50	0.1	10	0.1	1			0.2	20
Apocynaceae	*Parsonsia straminea*	Other (OG)					1	2				
Asteraceae	*Ozothamnus diosmifolius*	Shrub (SG)							0.1	1		
Bignoniaceae	*Pandorea pandorana*	Other (OG)					0.1	5				
Casuarinaceae	*Allocasuarina littoralis*	Tree (TG)	0.1	1	0.1	1						
Commelinaceae	*Tradascantia fluminensis*	Exotic										
Cyperaceae	*Schoenus ericetorum*	Grass & grasslike (GG)	0.1	10	0.2	50	0.1	1	0.1	2	0.1	5
Dennstaedtiaceae	*Pteridium esculentum*	Fern (EG)	1	100					0.1	5		
Dilleniaceae	*Hibbertia fasciculata*	Shrub (SG)			0.1	20			0.1	5	1	100
Dilleniaceae	*Hibbertia linearis*	Shrub (SG)	0.5	50	0.2	50			0.1	5	1	100
Ericaceae	*Astroloma pinifolium*	Shrub (SG)	1	50	0.2	5			0.1	3	1	100
Ericaceae	*Leucopogon appressus*	Shrub (SG)									0.5	50
Ericaceae	*Leucopogon ericoides*	Shrub (SG)	0.1	20	0.2	20	0.1	2	0.1	5		
Ericaceae	*Monotoca elliptica*	Shrub (SG)			0.2	10			0.1	5	15	100
Ericaceae	*Monotoca elliptica*	Shrub (SG)	40	100	0.2	10	20	20				
Ericaceae	*Monotoca scoparia*	Shrub (SG)							0.1	10		
Euphorbiaceae	*Amperea xiphoclada var. xiphoclada*	Shrub (SG)			0.1	2	0.1	5				
Euphorbiaceae	*Ricinocarpos pinifolius*	Shrub (SG)	2	20	0.2	10	0.1	1				
Fabaceae (Faboideae)	*Aotus ericoides*	Shrub (SG)	2	20	0.1	2	0.2	2				

Family	Scientific Name	Plot ID	Q01		Q2		Q3		Q04		Q05	
		BAM Growth Form / High Threat Weeds	C	Ab	C	Ab	C	Ab	C	Ab	C	Ab
Fabaceae (Faboideae)	*Bossiaea heterophylla*	Shrub (SG)	2	20	0.1	10						
Fabaceae (Faboideae)	*Bossiaea rhombifolia*	Shrub (SG)	2	20					0.1	1	7	200
Fabaceae (Faboideae)	*Daviesia ulicifolia*	Shrub (SG)	2	20	0.1	5						
Fabaceae (Faboideae)	*Dillwynia retorta*	Shrub (SG)			0.5	10	0.1	2				
Fabaceae (Faboideae)	*Hardenbergia violacea*	Other (OG)	0.1	5								
Fabaceae (Mimosoideae)	*Acacia longifolia*	Shrub (SG)	7	20	2	20	1	2	0.1	1	1	50
Fabaceae (Mimosoideae)	*Acacia terminalis*	Shrub (SG)	0.2	2								
Fabaceae (Mimosoideae)	*Acacia ulicifolia*	Shrub (SG)	1	20	0.1	5	0.2	5				
Hypoxidaceae	*Hypoxis hygrometrica var. hygrometrica*	Forb (FG)										
Lauraceae	*Cassytha pubescens*	Other (OG)					0.1	3				
Lomandraceae	*Lomandra glauca*	Grass & grasslike (GG)	0.1	2	0.1	5	0.1	3			0.1	2
Lomandraceae	*Lomandra longifolia*	Grass & grasslike (GG)	0.1	2	0.1	5	10	20	0.1	2		
Myoporaceae	*Myoporum acuminatum*	Shrub (SG)	1	10								
Myrtaceae	*Angophora costata*	Tree (TG)					2	3				
Myrtaceae	*Corymbia gummifera*	Tree (TG)	5	2			2	2				
Myrtaceae	*Eucalyptus haemastoma*	Tree (TG)	1	0			9	1				
Myrtaceae	*Eucalyptus parramattensis*	Tree (TG)	0.5	0			1	2				
Myrtaceae	*Eucalyptus pilularis*	Tree (TG)	35	5			15	3				
Myrtaceae	*Eucalyptus robusta*	Tree (TG)										
Myrtaceae	*Euryomyrtus ramosissima*	Shrub (SG)	1	50	0.2	50	0.1	1				

Family	Scientific Name	Plot ID	Q01		Q2		Q3		Q04		Q05	
		BAM Growth Form / High Threat Weeds	C	Ab	C	Ab	C	Ab	C	Ab	C	Ab
Myrtaceae	*Gaudium laevigatum*	Exotic	5	20	1	60			1	10	5	200
Myrtaceae	*Leptospermum polygalifolium*	Shrub (SG)	1	20	10	20	1	4				
Myrtaceae	*Syzygium oleosum*	Shrub (SG)										
Olacaceae	*Olax stricta*	Shrub (SG)										
Phormiaceae	*Dianella caerulea*	Forb (FG)	2	50	0.1	20	5	20	0.1	5	0.1	50
Phormiaceae	*Dianella longifolia*	Forb (FG)										
Phyllanthaceae	*Breynia oblongifolia*	Shrub (SG)										
Phyllanthaceae	*Glochidion ferdinandi var. ferdinandi*	Tree (TG)										
Pinaceae	*Pinus radiata*	Exotic			0.1	1						
Poaceae	*Eragrostis brownii*	Grass & grasslike (GG)							5	100	2	2000
Poaceae	*Eragrostis curvula*	HTW			0.1	20			70	20000	40	1000
Poaceae	*Melinis repens*	Exotic							2	2000	0.5	100
Poaceae	*themeda triandra*	Grass & grasslike (GG)									0.1	2
Proteaceae	*Banksia serrata*	Tree (TG)			0.1	1						
Proteaceae	*Conospermum ericifolium*	Shrub (SG)							0.1	1	1	100
Proteaceae	*Persoonia lanceolata*	Shrub (SG)	1	5	0.5	5					1	50
Proteaceae	*Persoonia levis*	Shrub (SG)	2	5								
Proteaceae	*Persoonia linearis*	Shrub (SG)										
Restionaceae	*Baloskion tetraphyllum*	Grass & grasslike (GG)										
Rubiaceae	*Pomax umbellata*	Forb (FG)	0.1	2	0.1	50	0.1	10	0.2	20	0.1	20
Solanaceae	*Solanum sisymbriifolium*	Exotic							0.1	5		
Thymelaeaceae	*Pimelea linifolia*	Shrub (SG)	1	50								
Verbenaceae	*Lantana camara*	HTW - Manageable										

Family	Scientific Name	Plot ID	Q01		Q2		Q3		Q04		Q05	
		BAM Growth Form / High Threat Weeds	C	Ab	C	Ab	C	Ab	C	Ab	C	Ab
Zamiaceae	*Macrozamia communis*	Other (OG)										

APPENDIX K. FAUNA SPECIES LIST

No.	Scientific Name	Common Name	Status		Observation Type*
			BC	EPBC	
1.	*Acrobates pygmaeus*	Feathertail Glider	P	-	Remote Camera
2.	*Amphibolurus muricatus*	Jacky Lizard	P	-	Pitfall Trap
3.	*Antechinus sp.*	Unidentified Antechinus	P	-	Elliot A, Remote Camera
4.	*Canis familiaris*	Dog	Feral	Feral	Remote Camera
5.	*Crinia signifera*	Common Eastern Froglet	P	-	Spotlighting
6.	*Crinia tinnula*	Wallum Froglet	V,P	-	Spotlighting
7.	*Eopsaltria australis*	Eastern Yellow Robin	P	-	Remote Camera
8.	*Hemiergis talbingoensis*	Eastern three-toed earless skink	P	-	Pitfall Trap
9.	*Lepus capensis*	Brown Hare	Feral	Feral	Remote Camera
10.	*Limnodynastes dumerilii*	Eastern Banjo Frog	P	-	Pitfall Trap
11.	*Limnodynastes peronii*	Brown-striped Frog	P	-	Pitfall Trap
12.	*Litoria peronii*	Peron's Tree Frog	P	-	Spotlighting
13.	*Litoria tyleri*	Tyler's Tree Frog	P	-	Spotlighting
14.	*Malurus cyaneus*	Superb Fairy-wren	P	-	Remote Camera
15.	*Mus musculus*	House Mouse	Feral	Feral	Remote Camera
16.	*Oryctolagus cuniculus*	Rabbit	Feral	Feral	Remote Camera, Sighted
17.	*Petaurus breviceps*	Sugar Glider	P	-	Remote Camera
18.	*Petaurus norfolcensis*	Squirrel Glider	V,P	-	Remote Camera
19.	*Platyplectrum ornatum*	Ornate Burrowing Frog	P	-	Spotlighting
20.	*pseudocheirus peregrinus*	Common Ringtail Possum	P	-	Remote Camera
21.	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	Spotlighting
22.	*Rattus fuscipes*	Bush Rat	P	-	Remote Camera
23.	*Rhipidura albiscapa*	Grey Fantail	P	-	Remote Camera
24.	*Sericornis frontalis*	White-browed Scrubwren	P	-	Remote Camera
25.	*Trichosurus vulpecula*	Common Brushtail Possum	P	-	Remote Camera, Spotlighting
26.	*Uperoleia fusca*	Dusky Toadlet	P	-	Pitfall Trap
27.	*Uperoleia mahonyi*	Mahony's Toadlet	E,P	-	Pitfall Trap
28.	*Varanus varius*	Lace Monitor	P	-	Opportunistic
29.	*Vulpes vulpes*	Fox	Feral	Feral	Remote Camera, Sighted

APPENDIX L. STAFF CONTRIBUTIONS

The following staff were involved in the project.

Name	Qualifications	Title	Contribution
Ashley Owen	BSc (Ecology) Accredited BAM Assessor	Ecologist	Vegetation mapping, flora surveys, preparation of report
George Plunkett	BSc (Hons) PhD Accredited BAM Assessor	Senior Ecologist	Vegetation mapping, flora surveys and preparation of report. Case party owner.
Jake Mauger	BEnvSc & Mgt	Ecologist	Flora and fauna surveys
Olivia Szekelyhidy	B Zoology	Ecologist	Fauna Surveys and reporting
Debbie Plunkett	BSc	Ecologist	Flora and Fauna Surveys
Theo Tasoulis	BSc PhD	Senior Ecologist	Flora and Fauna Surveys
Samara Schulz	BEnvSc & Mgt (Hons) Accredited BAM Assessor	Principal Botanist	Report Review
Kane Blundell	Grad Dip Spatial Science	GIS Analyst	Preparation of figures and area calculations
Carla Robertson	BEnvSc & Mgt	Ecologist	Flora Surveys
David Martin	MSc BEnvSc & Mgmt and MSc Accredited BAM Assessor	Senior Ecologist	Koala habitat assessments, Assistance with report
Rachael Neal	BBSc (Hons)	Ecologist	Flora and fauna assessments
Mark Dean	BEnvSc & Mgt Accredited BAM Assessor	Senior Ecologist	Fauna survey assessments and Report Review

APPENDIX M. SCIENTIFIC LICENCE

Wedgetail Project Consulting employees involved in the current study are licensed or approved under the *Biodiversity Conservation Act 2016* (License Number: SL102506, Expiry: 28 February 2025) and the *Animal Research Act 1985* to harm/trap/release protected native fauna and to pick for identification purposes native flora and to undertake fauna surveys.