Flora and Fauna Assessment

Warnervale Town Centre - Stage 10 - Road Reserve Upgrades

Hakone Road, Woongarrah

Project	Warnervale Town Centre – Stage 10 – Road Reserve upgrades
Report	Biodiversity Development Assessment Report
Client	Beveridge Williams
Author	Evelyn Craigie, Corey Mead
Version	Final V2
Date	19 May 2023

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Summary

Evolve Ecology Pty Ltd and Treehouse Ecology Pty Ltd have been engaged to prepare a flora and fauna assessment report for the road upgrade works of Hakone Road associated with Stage 10 of the Warnevale Town Centre. The subject land is located at 2 Woongarrah Road, Woongarrah.

The remaining area of the Warnervale Town Centre project is located within the biodiversity certified lands and therefore, biodiversity assessment for these lands under NSW legislation is not required.

Recent pre-clearing surveys have been undertaken within the adjacent biodiversity certified lands, and these findings have also been incorporated into this assessment for consideration. The portions of vegetation within the road reserve subject to proposed clearing may hereafter be referred to as the development footprint, the road reserve portion may be referred to as the subject lands and the subject lands together with recently surveyed adjacent habitats may be referred to as the study area.

In respect of matters required to be considered under the *EP&A Act* and relating to the species / provisions of the *BC Act*, five (5) threatened fauna species including White-bellied Sea Eagle (*Haliaeetus leucogaster*), Glossy Black-Cockatoo (*Calyptorhychus lathami*), Greater Broad-nosed Bat (*Scoteanax rueppellii*), Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*), and Large Bent-winged Bat (*Miniopterus orianae oceanensis*), no threatened flora species, and no threatened ecological communities (TECs) were recorded within the study area during combined recent ecological surveys.

In respect of matters required to be considered under the *EPBC Act*, no threatened fauna species, no protected migratory bird species, no threatened flora species and no threatened ecological communities listed under this Act were recorded within the study area during combined recent ecological surveys.

The proposal will result in removal of 588.97m^2 of native vegetation, which includes impacts to one Plant Community Type (PCT):

- PCT1619 - Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands (not a TEC).

The direct and indirect ecological impacts of the proposal have been carefully considered in Section 4. This section also advises recommended mitigation measures to minimise these impacts on recorded threatened biodiversity.

The assessment of significance test in accordance with Section 7.3 of the *BC Act* concluded that the proposal will not have a significant effect on any state listed threatened species, or endangered communities, or their habitat. Therefore a species impact statement or offsetting under the BOS are not required for the proposed activity.

The site also does not provide any likely important habitat for threatened species, communities or other matters of Matters of National Environmental Significance (MNES) listed under the EPBC Act 1999. As such a referral to the Commonwealth Department of Climate Change, Energy the Environment and Water is not required.

Contents

Abbreviations

Abbreviation	Definition
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BC Reg	Biodiversity Conservation Regulation 2017 (NSW)
BOS	Biodiversity Offsets Scheme
CEEC	critically endangered ecological community
DA	Development Application
DCCEEW	Commonwealth Department of Climate Change, Energy the Environment and Water
DBH	diameter at breast height over bark
DP	Deposited Plan
DPE	NSW Department of Planning and Environment
DPIE	NSW Department of Planning, Industry and Environment (now DPE)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EEC	endangered ecological community
FFA	Flora and Fauna Assessment
LEP	Local Environment Plan
LGA	Local Government Area
MNES	matters of national environmental significance
NSW	New South Wales
PCT	plant community type
TBDC	Threatened Biodiversity Data Collection
TEC	threatened ecological community

1. Introduction

This Flora and Fauna Assessment Report (FFA) has been prepared for Landcorp NSW Pty Ltd to support a development application (DA) for a residential subdivision (the project). The works are proposed at 2 Woongarrah Road, Woongarrah (the site) (Figure 2).

The project will be assessed in accordance with Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the biodiversity assessment requirements of the *Biodiversity Conservation Act 2016* (BC Act) and the *Biodiversity Conservation Regulation 2017* (BC Reg).

1.1 Background

The majority of the proposed subdivision occurs on certified land in the Warnervale Town Centre. An Order Conferring Biodiversity Certification on the Warnervale Town Centre was signed on 30th February 2014 (Figure 1). This has the effect of approving select vegetation removal within designated zonings of the study area to allow the development of the Town Centre, without the need for further environmental assessment under NSW Legislation. An ecological assessment in accordance with the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) was prepared by Travers bushfire & ecology (2018) for Stages 5-10.

The area that is the subject of this FFA is external to the certified land and therefore, an assessment of impacts to biodiversity in this area is required.

Figure 1: Warnervale Town Centre Biodiversity Certification

1.2 Proposed development

1.2.1 Development overview

The proposed development comprises a 54 lot residential subdivision that forms Stage 10 of the Warnervale Town Centre development (Figure 2). The subdivision includes upgrades to Hakone Road that would result in clearing of the natve vegetation in the Hakone Road reserve.

1.2.2 Location and Description

The site is located at 2 Woongarrah Road, Woongarrah within the Central Coast local government area (LGA) (Lot 1 DP 1275060) (Figure 2). The site is zoned RU6 Transition under the Central Coast Local Environment Plan 2022 (LEP).

The site is 985.65m^2 in area and comprises the area between the boundary of Lot 1 DP1275060 and the road. Regrowth native vegetation occurs in this area.

1.3 Applicable Legislation and Plans

1.3.1 Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) identifies and protects Matters of National Environmental Significance (MNES), including listed threatened species, ecological communities and migratory species protected under international agreements. Significant impacts to MNES require referral to the Federal Government Department of Climate Change, Energy the Environment & Water to determine whether further assessment and approval is required.

1.3.2 Environment Planning and Assessment Act 1979

The EP&A Act is the primary overarching planning legislation in NSW, providing the guiding principles for subordinate legislation and plans, and for the different types of environmental and planning assessment. Part 4 of the EP&A Act provides the requirements for development assessments.

Section 1.7 of the EP&A Act references the additional assessment requirements of the *Biodiversity Conservation Act 2016* (BC Act) and the *Fisheries Management Act 1994* (FM Act).

1.3.3 Biodiversity Conservation Act 2016 (NSW)

Native plants and animals in NSW are protected by the *Biodiversity Conservation Act 2016* (BC Act), with threatened species and ecological communities listed in the Schedules of the Act. The BC Act aims to conserve biodiversity in NSW through a variety of mechanisms including establishment of the BAM, the BAM Calculator and the Biodiversity Offset Scheme (BOS). The method incorporates the avoid, minimise and offset hierarchy, with an overall objective of ‘no net loss’ of biodiversity in NSW.

Application of the BOS
The BOS is triggered when a development:

- Is likely to significantly affect threatened species or ecological communities, or ther habitats, according to the test in Section 7.3 of the BC Act (the 5 part test), or
- Exceeds the BOS threshold as:
    - The area of clearing of native vegetation exceeds the area thresholds provided in Section 7.2 of the BC Reg; or
    - The native vegetation to be cleared is included in the Biodiversity Values Map; o
- It is carried out in a declared area of outstanding biodiversity value (AOBV).

The proposed development involves clearing of native vegetation, however, it does not trigger the BOS as:

- It is unlikely to significantly affect threatened species or ecological communities, or their habitats;
- It does not exceed the BOS clearing thresholds;
- It is not within a shaded area of the BVM (Figure 2); and
- It is not in a declared area of outstanding biodiversity value (AOBV).

Development that does not trigger the BOS can be assessed via a FFA.

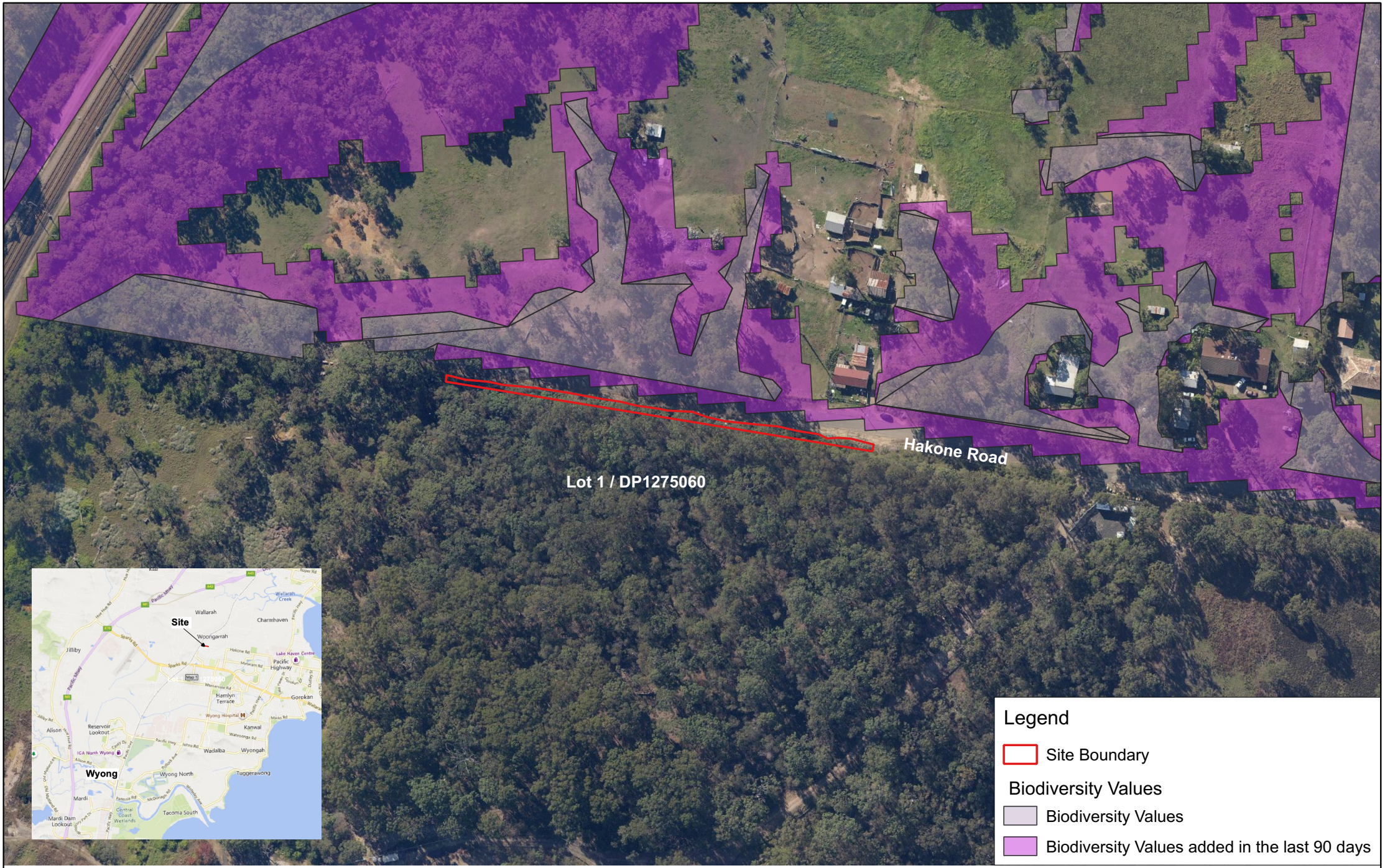

Figure 2 - Site Location and Biodiversity Values Map

Date: 13/12/2022
Project: Hakone Rd Reserve FFA
Coordinate System: GDA 1994 MGA Zone 56
Image Source: NSW DCS Imagery
Author: Evelyn Craigie

1.3.4 State Environmental Planning Policy (Biodiversity Conservation) 2021

In 2021, 45 previous SEPPs were consolidated into 11 new policies. State Environmental Planning Policy (Biodiversity and Conservation) 2021 now facilitates the land use planning and assessment framework for koala habitat, incorporating Koala Habitat Protection 2020 (Chapter 3) and Koala Habitat Protection 2021 (Chapter 4). It aims to encourage the conservation and management of Koala habitat and provides controls for development that is likely to impact on areas of Koala habitat.

The Koala SEPP 2021 applies and the site is assessed based on the following criteria:

- The Central Coast LGA is listed in Schedule 2, identified to the Central Coast Koala Management Area;
- The land is not certified, reserved under the NPW Act 1974 or dedicated under the Forestry Act 2012;
- The land has an area of at least 1 hectare (including adjoining land within the same ownership);
- The land does not have an approved koala plan of management applying;
- The land is not considered to support potential Koala Habitat under the definitions of a former Koala SEPP.

1.4 Matters of national environmental significance

The project does not require referral under the EPBC Act and is not a controlled action. The site does not provide any likely important habitat for threatened species, communities or other matters of Matters of National Environmental Significance (MNES). As such a referral to the Commonwealth Department of Climate Change, Energy the Environment and Water (DCCEEW) is not required.

HAKONE ROAD
(20.115 WIDE)

ROAD 8
(15 WIDE)

ROAD 7
(16.6 WIDE)

ROAD 6
(13.6 WIDE)

ROAD 5
(13.6 WIDE)

ROAD 1
(17.6 WIDE)

HILLTOP PARK
(OWNER: CENTRAL COAST COUNCIL)
LOT 2 DP 1275060

1001	332m²	1029	488m²
1002	332m²	1030	465m²
1003	332m²	1031	510m²
1004	332m²	1032	458m²
1005	332m²	1033	767m²
1006	332m²	1034	365m²
1007	332m²	1035	372m²
1008	332m²	1036	372m²
1009	333m²	1037	361m²
1010	338m²	1038	351m²
1011	355m²	1039	351m²
1012	388m²	1040	348m²
1013	422m²	1041	341m²
1014	461m²	1042	334m²
1015	508m²	1043	325m²
1016	368m²	1044	332m²
1017	368m²	1045	332m²
1018	368m²	1046	332m²
1019	368m²	1047	332m²
1020	368m²	1048	332m²
1021	397m²	1049	332m²
1022	559m²	1050	332m²
1023	565m²	1051	332m²
1024	643m²	1052	332m²
1025	529m²	1053	332m²
1026	442m²	1054	332m²
1027	408m²	1055	332m²
1028	385m²		

NOTE:
ALL BOUNDARIES, DIMENSIONS & AREAS ARE SUBJECT TO FINAL SURVEY.

EXTENTS OF STAGING:

- STAGE 9 LOTS
- STAGE 10 LOTS

HAKONE ROAD

HILLTOP PARK
(OWNER: CENTRAL COAST COUNCIL)
LOT 2 DP 1275060

B4 Mixed Use
TAVERN/PUB/HOTEL (STAGE 8)

MATARAM ROAD

32
DP 1198972
STAGE 5
(APPROVED DA/516/2018)

LOCATION KEY

Figure 3 - Development Layout

VER	BY	AMENDMENTS	DATE
A	M.W.	INITIAL ISSUE	03.05.22
B	N.T.	UPDATED CONTOURS	18.10.22
C	M.W.	LOT DIMENSIONS AND AREAS UPDATED	26.10.22
D	M.W.	LOT DIMENSIONS AND AREAS UPDATED	18.11.22
E			
F			
G			

- THE POSITION OF SERVICES SHOWN ON THIS DRAWING ARE INDICATIVE ONLY AND HAVE BEEN PLOTTED FROM PLANS AND DRAWINGS SUPPLIED BY RELEVANT AUTHORITIES.
- SERVICE AUTHORITY PITS, MANHOLES, POLES, MARKER POSTS, ETC., WHERE SIGHTED AT TIME OF SURVEY, HAVE BEEN LOCATED. THE SURVEY DOES NOT INCLUDE INVESTIGATION OR LOCATION OF UNDERGROUND INFRASTRUCTURE.
- SERVICES INFORMATION SHOWN ON THIS DRAWING HAS BEEN OBTAINED THROUGH A DIAL BEFORE YOU DIG SEARCH AND IS VALID FOR THE PERIOD OF TIME FROM THE DATE OF ISSUE NOMINATED BY THE AUTHORITY.
- PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION ON OR ADJACENT TO THE SITE IT IS THE RESPONSIBILITY OF THE DEVELOPER AND CONTRACTORS TO APPLY FOR AND OBTAIN UP TO DATE PLANS THROUGH A NEW DIAL BEFORE YOU DIG SEARCH AND TO CONTACT ALL THE RELEVANT AUTHORITIES TO ESTABLISH AND CONFIRM THE DETAILED LOCATION AND DEPTH OF ALL UNDERGROUND SERVICES.

www.dialbeforeyoudig.com.au
DIAL1100 BEFORE YOU DIG

CLIENT:
LANDCORP NSW PTY LTD

Beveridge Williams
Land Development Consultants
Registered Surveyors
Central Coast (02) 4351 2233 www.beveridgewilliams.com.au

DETAILS:
PLAN OF CONCEPT RESIDENTIAL SUBDIVISION
FOR PLANNING PROPOSAL PURPOSES
LOT 1 DP 1275060
HAKONE ROAD, WOONGARRAH

ORIGINAL
SCALE 1:200 SHEET SIZE A1
CAD REFERENCE: 1801942(10)-LL-001-D
0 10 20 30
SCALE ON ORIGINAL DRAWING AT 1:500

SURVEYOR:	N/A
DRAWN:	M.W.
CHECKED:	N.T.
SURVEY DATE:	N/A
VERTICAL DATUM:	AHD
HORIZONTAL DATUM:	MGA

PROJECT No. 1801942
DRAWING REF. LL-001
VERSION D
SHEET 1 OF 1

2. Methods

2.1 Desktop Review

A desktop review was undertaken to provide an initial understanding of the biodiversity values of the Site and the locality.

Documents reviewed:

- Plan of Concept Residential Subdivision (Beveridge Williams 2022).

Technical resources utilised:

Legislation

- *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*)
- *Biodiversity Conservation Act 2016* (*BC Act*)
- *Biodiversity Conservation Regulation 2017* (*BC Reg.*)
- *Fisheries Management Act 1994* (*FM Act*)

Survey Guidelines

- *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians* (DECC – April 2009a)
- *Hygiene Protocol for the Control of Diseases in Frogs* (DECC 2008)
- *Region based guide to the echolocation calls of Microchiropteran bats* (DEC 2004)
- *Species credit threatened bats and their habitats* (DPIE 2018)
- *Flora and Fauna Survey Guidelines - Version 2.0* (Wyong Shire Council 2014)
- *Flora and Fauna Guidelines* (Central Coast Council 2019)

Mapping Resources

- Aerial photographs (Google Earth Pro / Spatial Information Exchange)
- Topographical maps (scale 1:25,000)

Threatened species records

- *BioNet* database which holds data from a number of custodians (5/12/22 to 10km)
- EPBC *Protected Matters Search Tool - DCCEEW* (2022 to 10km)

Vegetation mapping/resources

- BioNet Vegetation Classification System
- *A Revised Interim Vegetation Classification of the Central Coast* (Eastcoast Flora Survey 2019)

2.2 Field Survey

2.2.1 Flora Survey

The flora survey was undertaken on 12 September 2022 and 2 March 2023. This involved a walking meander through the site, recording flora species observed. The site is very narrow (less than 5m in width) and therefore, a meander through the site would also meet the requirements for parallel flora transects.

2.2.2 Fauna Survey

Fauna survey effort also undertaken by TreeHouse Ecology as part of recent Stage 9 Wildlife Management Strategy works has also been incorporated into this assessment, where appropriate to better inform of local fauna. Fauna survey effort accounting for techniques deployed, duration, and weather conditions are outlined in Table 1 and fauna survey locations are depicted on Figure 3.

Diurnal birds - Three (3) diurnal bird census points were undertaken along Hakone Road adjacent to the subject site. A minimum of 15 minutes of survey was undertaken at each census point in an area radiating out to between 30-50m. Bird census points were selected to give an even spread and representation across the site and its communities (see Figure 3). Census points were also commenced in locations where bird activity was apparent, as often different small bird species are found foraging together. Opportunistic diurnal bird survey was conducted between census points and whilst undertaking other diurnal surveys.

Nocturnal birds - Given the suitability of habitat present Masked Owl (*Tyto novaehollandiae*), Powerful Owl (*Ninox strenua*), Barking Owl (*Ninox connivens*) and Bush Stone-curlew (*Burhinus grallarius*) were targeted by call-playback techniques.
Diurnal survey included searches for any signs of Powerful Owl roosting activity. This was undertaken where dense mid-storey foliage was present.

Arboreal and terrestrial mammals – These fauna species were targeted by visual observations, mostly targeted during nocturnal spotlighting survey.

Bats - Active microbat recording was undertaken throughout the nocturnal survey undertaken on the 3rd October 2021.

Amphibians - The study area does not provide any threatened amphibian species habitat potential.

Reptiles - The study area does not provide any threatened reptile species habitat potential.

Invertebrates - The study area does not provide any threatened invertebrate species habitat potential.

Habitat trees

Hollow-bearing trees survey was undertaken within the subject site. Where present, data such as hollow types, hollow size, tree species, diameter at breast height, canopy spread and overall height were collected and a metal tag with the tree number placed on the trunk for field relocation purposes. Other habitat features such as nests and significant sized mistletoe for foraging were also noted.

2.2.3 Field Survey Effort

Table 1 Environmental conditions during threatened species surveys

Survey undertaken (e.g. method / targeted species)	**Date**	**Time**	**Temp** (min. & max.)	**Wind** (light, mod…)	**Rainfall** (mm)	**Other conditions relevant to the species**
Diurnal bird census & opportunistic	14/9/22	15:00-18:00 (3hrs)	17-16°C	Light NE	none	combined habitat tree surveys
Nocturnal birds	3/10/22	19:00-20:400 (1hr 45min)	17-14°C	none	Pre-days	Dusk listening, call-playback, spotlighting
Arboreal & terrestrial mammals	14/9/22	17:45-19:00 (1hr 45min)	14°C	none	none	spotlighting
	3/10/22	19:00-20:400 (1hr 45min)	17-14°C	none	Pre-days	spotlighting & Koala / Squirrel Glider call-playback
	3-10/10/22	Mostly fine				3x arboreal / 2x terrestrial surveillance cameras
Microbats	14/9/22	17:45-19:00 (1hr 45min)	14°C	none	none	spotlighting / active monitoring
	3/10/22	19:00-20:40 (1hr 40min)	17-14°C	none	Pre-days	spotlighting / active monitoring
	3-10/10/22	Mostly fine				4x passive ultrasoninc recorders
Flora survey	12/09/22	15:00 – 16:30	19.6°C	none	none	N/A
Corunastylis sp. Charmhaven (parallel transects)	02/03/23	10:00 – 11:00	21.9 – 27.8	69km/h SSW	none	N/A

2.3 Survey limitations

Given the limited potential for threatened species to occur on site because of the disturbed and fragmented vegetation, together with the road presence and long-term management of the surrounding rural lands, there are not anticipated limitations of this study for accounting for threatened species considerations.

Figure 4 - Survey Effort

0 25 50 m

N

Date: 16/12/2022
Project: Hakone Rd Reserve FFA
Coordinate System: GDA 1994 MGA Zone 56
Image Source: NSW DCS Imagery
Author: Evelyn Craigie

3. Results

3.1 Plant community types

One Plant Community Type (PCT) occurs at the site: PCT1619 Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands (Figure 5). The vegetation comprises regrowth only and is dominated by shrub and grass species such as *Melaleuca nodosa* (Prickly-leaved Paperbark), *Entolaisa stricta* (Wiry Panic) and *Themeda australis* (Kangaroo Grass). Scattered juvenile tree species such as *Angophora costata* (Smooth-barked Apple) and *Allocasuarina littoralis* (Black-She-oak) occur, with *Gahnia clarkei* (Tall Saw-sedge) in small areas of poor drainage.A full species list is provided in Appendix C.

PCT1619 is not commensurate with any threatened ecological communities (TECs) listed under the BC Act or EPBC Act.

3.2 Flora

The database searches identified 28 threatened flora species that have been recorded, or have the potential to occur, at the site. A Likelihood of Occurrence assessment was undertaken for these species in Appendix A (Table A1) and concluded that potential habitat occurs for eight threatened flora and possible habitat occurs for a further two threatened flora (Table *2*). Nine of these species were not recorded during surveys undertaken within the survey timeframe specified in the Threatened Biodiversity Data Collection (TBDC).

A reference population for *Corunastylis* sp. Charmhaven was confirmed to be flowering during the 2 March 2023 survey (Mick Price, personal communication, 24 February 2023). A reference population for *Thelymitra adorata* was not observed during the September survey, however, sections of the plant other than the flowers would have been detectable at the time of the survey and were not observed.

Table 2: Threatened Flora Species with Suitable Habitat Present

Scientific Name	Common name	*BC Act*	*EPBC Act*	Potential to occur
Acacia bynoeana	Bynoe's Wattle	E	V	Not recorded
Angophora inopina	Charmhaven Apple	V	V	Not recorded
Caladenia tessellata	Thick Lip Spider Orchid	E	V	Not recorded
Callistemon linearifolius	Netted Bottle Brush	V	-	Not recorded
Corunastylis sp. Charmhaven		CE	CE	Not recorded
Genoplesium insigne	Variable Midge Orchid	CE	CE	Not recorded
Persoonia hirsuta	Hairy Geebung	E	E	Not recorded
Rhizanthella slateri	Eastern Underground Orchid	V	E	Not recorded
Rutidosis heterogama	Heath Wrinklewort	V	V	Not recorded
Tetratheca juncea	Black-eyed Susan	V	V	Not recorded
Thelymitra adorata	Wyong Sun Orchid	CE	CE	Not recorded

V=Vulnerable CE=Critically Endangered E=Endangered

3.3 Fauna

A summary of fauna habitats present is provided in Appendix E. Fauna species recorded during surveys are listed in Appendix D.

The database searches identified 49 threatened fauna species that have been recorded within 10km of the subject area. Strictly pelagic and marine species have not been included for consideration. A Likelihood of Occurrence assessment was undertaken for these species in Appendix A (Table A2) and concluded that varying potential habitat occurs for the following threatened fauna (Table 2).

Table 3: Threatened Fauna Species with Suitable Habitat Present

Common name	BC Act	EPBC Act	Potential to occur
White-bellied Sea Eagle	V	-	recorded
Glossy Black-Cockatoo	V	V	recorded
Eastern Coastal Free-tailed Bat	V	-	recorded
Greater Broad-nosed Bat	V	-	recorded
Large Bent-winged Bat	V	-	recorded
White-throated Needletail	-	V	P
Square-tailed Kite	V	-	P
Little Lorikeet	V	-	P
Barking Owl	V	-	P
Powerful Owl	V	-	P
Masked Owl	V	-	P
Varied Sittella	V	-	P
Squirrel Glider	V	-	P
Grey-headed Flying-fox	V	V	P
Yellow-bellied Sheathtail-bat	V	-	P
Eastern False Pipistrelle	V	-	P
Southern Myotis	V	-	P
Eastern Cave Bat	V	-	P
Little Bent-winged Bat	V	-	P
Wallum Froglet	V	-	low
Little Eagle	V	-	low
Dusky Woodswallow	V	-	low
Spotted-tailed Quoll	V	E	unlikely
Koala	E	E	unlikely
Large-eared Pied Bat	V	V	unlikely
Eastern Chestnut Mouse	V	-	unlikely

The EPBC Act Protected Matters Report provides additionally listed terrestrial, wetland and marine migratory species of national significance likely to occur, or with habitat for these species likely to occur, within a 10km radius of the development footprint. The habitat potential of migratory species is also considered in Appendix A (Table A3).

No nationally protected migratory bird species were recorded present within the study area during survey.

Following a review of the impact criteria for protected migratory bird species under the *EPBC Act* (Appendix 5), it is concluded that the proposal will not likely significantly impact on any nationally listed protected migratory species with considered potential to occur.

3.3.1 Koala SEPP

Within the subject area of the road reserve, there are only juvenile representations of tree species listed in Schedule 2 for the Central Coast Koala Management Area. These include juvenile individuals of *Angophora costata* and *Allocasuarina littoralis.* Historical Koala records do occur in the locality however no recent records exist. The closest is located 470m to the south, on the edge of the Biodiversity Certified Lands for the Warnervale Town Centre, from 1994. The most recent record within 5km is in 2007 over 3km west. There are no records from the last 20 years within 3km. Therefore, it is considered the development is likely to have low or no impact on koalas or koala habitat.

Figure 5 - Vegetation and Fauna

Date: 16/12/2022
Project: Hakone Rd Reserve FFA
Coordinate System: GDA 1994 MGA Zone 56
Image Source: NSW DCS Imagery
Author: Evelyn Craigie

4. Impacts

4.1 Direct impacts

The direct impacts of the proposal within the development footprint are considered as:

- Removal of 588.97m^2 of regrowth native vegetation commensurate with PCT1619
- Removal of seasonal flowering for foraging by nectivorous species
- Removal of dense mid-strorey shelter habitat for fauna

4.2 Indirect impacts

The potential indirect impacts of the proposal are considered as:

- Edge effects such as weed incursions caused from soil disturbance, repeated clearing and landscaping species becoming a nuisance in the adjacent areas of road reserve.
- Increased soil nutrients from changes to runoff that may provide further opportunities for weed plumes,
- Increased stepping stones of fragmented local habitats for fauna

4.3 Mitigation Measures

The measures detailed in Table 4 will be implemented to minimise the impacts associated with the project. There are no mitigation measure proposed to offset the impacts on fauna habitat.

Table 4: Mitigation Measures

Impact	Mitigation Measures
Removal of native vegetation	- All native trees and vegetation to be retained would be clearly identified on construction plans and in the study area to prevent damage occurring during construction. - Standard tree protection measures are to be implemented during construction. - Rehabilitate disturbed areas as soon as possible upon completion of construction.
Stormwater and soils	- Include the site in the Sedimentation & Erosion Control Plan for the entire Stage 10 development. - Sedimentation and erosion controls to be maintained throughout works. - Spill kits to be maintained on-site throughout the construction period. - Plant and machinery to be maintained in good working condition and inspected prior to works. - Works not to be undertaken when heavy rain is forecast. - Re-instate disturbed areas to pre-construction condition as soon as practicable upon completion of works.
Weeds	- Vehicles to be free of weeds prior to entering the study area. - Weeds removed to be disposed of at a suitable waste facility.

5. Conclusion

Ecological survey and assessment has been undertaken in accordance with relevant legislation including the EP&A Act 1979, the BC Act 2016 and the commonwealth EPBC Act 1999.

In respect of matters required to be considered under the *EP&A Act* and relating to the species / provisions of the *BC Act*, five (5) threatened fauna species including White-bellied Sea Eagle (*Haliaeetus leucogaster*), Glossy Black-Cockatoo (*Calyptorhychus lathami*), Greater Broad-nosed Bat (*Scoteanax rueppellii*), Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*), and Large Bent-winged Bat (*Miniopterus orianae oceanensis*), no threatened flora species, and no threatened ecological communities (TECs) were recorded within the study area during combined recent ecological surveys.

The state test of significance (Appendix B) has concluded that the proposal will not have a significant impact on any threatened species, populations or TECs. Therefore, the BOS is not triggered and a BDAR/SIS/offsetting is not required.

In respect of matters required to be considered under the EPBC Act, no threatened fauna species, no protected migratory bird species, no threatened flora species, and no TECs listed under this Act were recorded within the study area.

The proposal was not considered to have a significant impact on or be constrained by matters of national environmental significance. As such a referral to DCCEEW is not required.

6. References

Barker, J., Grigg, G. C. & Tyler, M. J. (1995) *A Field Guide to Australian Frogs.* Surrey Beatty & Sons.

Bell SAJ (2019), *A revised Interim Vegetation Classification of the Central Coast Local Government Area*. Unpublished report to Central Coast Council. July 2019.

Bennett, A. F. (1990a) *Habitat Corridors: Their Role in Wildlife Management and Conservation*. Department of Conservation and Environment, Victoria).

Central Coast Council (2019) *Flora and Fauna Survey Guidelines*.

Churchill, S. (2008) *Australian Bats, 2nd Ed*., Jacana Books, Crows Nest, Sydney.

Cogger, H. G. (1996) *Reptiles and Amphibians of Australia*. Reed Books, Australia.

DCCEEW (2022) Environmental Protection and Biodiversity Conservation Act 1999 - Protected Matters Search Tool - http://www.environment.gov.au/webgis-framework/apps/pmst
/pmst-coordinate.jsf

DEC (2004) *Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft)*, New South Wales Department of Environment and Conservation, Hurstville, NSW.

DECC (2008) *Hygiene protocol for the control of disease in frogs*. Information Circular Number 6. DECC (NSW), Sydney South.

DEWHA. 2010. *Survey guidelines for Australia's threatened bats*. Department of Environment Water Heritage and Arts.

DPE (2016), *NSW Mitchell Landscapes*.

DPE (2022a), *NSW BioNet Vegetation Classification Database*.

DPE (2022b), *Bionet Wildlife Atlas*.

DPE (2022c) *Threatened Biodiversity Database Collection*.

DPIE 2020a, *Biodiversity Assessment Methodology*. DPIE, Sydney.

DPIE 2022b *espade 2.2*.

Marchant, S., & P. J. Higgins (Eds) (1990) *Handbook of Australian, New Zealand and Antarctic Birds. Volumes 1-7* Oxford University Press, Melbourne.

Morrison, R. G. B. (1981) *A Field Guide to the Tracks & Traces of Australian Animals*. Rigby.

OEH (2018a) *'Species credit' threatened bats and their habitats, NSW survey guide for the Biodiversity Assessment Method.*

OEH (2018b) *Biodiversity Assessment Method Operational Manual – Stage 1*.

Simpson & Day (1996) *Field Guide to the Birds of Australia*. Viking.

Spatial Services (NSW) (2022) aerial imagery and mapping files.

Triggs, B. (1996) *Tracks, Scats & Other Traces: A Field Guide to Australian Mammals*. Oxford University Press, Melbourne.

Van Dyke, S. and Strahan, R. (Eds) (2008) *The Mammals of Australia (3rd Edn).* Reed New Holland. Sydney.

Wilson, K. W. and Knowles, D. G. (1988) *Australia's Reptiles - A Photographic Reference to the Terrestrial Reptiles of Australia*. Cornstalk Publishing.

Appendix A - Likelihood of Occurrence Assessment – Threatened & Migratory Species

Table A1 provides an assessment of potential habitat within the development footprint for state and nationally listed threatened flora species recorded within 10km on *Bionet* (DPE) or indicated to have potential habitat present within 10km on the *EPBC Act* Protected Matters Tool.

The DPE NSW Threatened Biodiversity Profile Search at: https://www.environment.nsw.gov.au/threatenedspeciesapp/, and
The DCCEEW National Species Profile and Threats Database at: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl
provide a summary of distribution, habitat and ecology for the following threatened species for consideration of suitable habitat.

Table A1 – Threatened flora habitat assessment

Scientific name	*BC Act*		*EPBC Act*		Suitable habitat present	Nearby and / or many record(s)	Record(s) from within 10 years	Recorded on site	Survey within timeframe specified in TBDC	Potential to occur	Considered in test of significance (Appendix 3)
	State Status	Bionet (10km)	National Status	PMST (10km)							
Acacia bynoeana	E	P	V	P	P	x	x	x	✓	Low	x
Angophora inopina	V	P	V	P	P	P	P	x	✓	Low	x
Caladenia tessellata	E	P	V	P	P	x	x	x	✓	x	x
Callistemon linearifolius	V	P	-	-	P	x	P	x	x*	x	x
Corunastylis sp. Charmhaven	CE	P	CE	P	P	P	P	x	✓	x	x
Cryptostylis hunteriana	V	x	V	P	Marginal	x	P	x	x	Not likely	x
Cynanchum elegans	E	x	E	P	x	x	x	x	✓	x	x
Diuris praecox	V	x	V	P	x	x	x	x	x	x	x
Eucalyptus camfieldii	V	P	V	P	x	x	P	x	✓	x	x
Eucalyptus parramattensis subsp. *parramattensis*	EP	P	-	-	x	x	x	x	✓	x	x
Euphrasia arguta	CE	x	CE	P	x	x	x	x	x	x	x
Genoplesium baueri	E	x	E	P	x	x	x	x	x	x	x
Genoplesium insigne	CE	P	CE	P	P	P	P	x	✓	x	x

Scientific name	BC Act		EPBC Act		Suitable habitat present	Nearby and / or many record(s)	Record(s) from within 10 years	Recorded on site	Survey within timeframe specified in TBDC	Potential to occur	Considered in test of significance (Appendix 3)
	State Status	Bionet (10km)	National Status	PMST (10km)							
Grevillea parviflora subsp. *parviflora*	V	P	V	P	Marginal	x	P	x	✓	x	x
Maundia triglochinoides	V	P	-	-	x	x	x	x	x	x	x
Melaleuca biconvexa	V	P	V	P	x	P	P	x	✓	x	x
Melaleuca deanei	V	x	V	P	x	x	x	x	✓	x	x
Persicaria elatior	V	x	V	P	x	x	x	x	x	x	x
Persoonia hirsuta	E	x	E	P	P	x	x	x	✓	x	x
Prostanthera askania	E	P	E	P	x	x	x	x	✓	x	x
Rhizanthella slateri	V	x	E	P	Possible	x	x	x	✓	x	x
Rhodamnia rubescens	CE	P	CE	P	x	x	x	x	✓	x	x
Rhodomyrtus psidioides	CE	x	CE	P	x	x	x	x	✓	x	x
Rutidosis heterogama	V	P	V	P	Possible	P	P	x	✓	x	x
Syzygium paniculatum	E	P	V	P	x	x	P	x	✓	x	x
Tetratheca juncea	V	P	V	P	P	P	P	x	✓	x	x
Thelymitra adorata	CE	P	CE	P	Possible	P	P	x	✓	x	x
Thesium australe	V	x	V	P	Marginal	x	x	x	x	x	x

TDBC – Threatened Biodiversity Data Collection

* Survey was not undertaken during survey timeframe specified in the TBDC, however, no similar Callistemon species were recorded and therefore, flowers are not required to confirm whether the species occurs at the site.

Table A2 provides an assessment of potential habitat within the development footprint for state and nationally listed threatened fauna species recorded within 10km on *Bionet* (DPE) or indicated to have potential habitat present within 10km on the *EPBC Act* Protected Matters Tool.

Table A1 –Threatened fauna habitat assessment

Common name	Scientific name	*BC Act*		*EPBC Act*		Recorded on site or nearby	If not recorded on site				Considered in test of significance (Appendix 3)
		State Status	Bionet (10km)	National Status	PMST (10km)		Suitable habitat present	Nearby and / or many record(s)	Record(s) from recent years	Potential to occur	
Wallum Froglet	*Crinia tinnula*	V	✓	-	-	x	marginal	✓	✓	low	✓
Giant Burrowing Frog	*Heleioporus australiacus*	V	-	V	✓	x	x	-	-	x	x
Stuttering Frog	*Mixophyes balbus*	E	-	V	✓	x	x	-	-	x	x
Giant Barred Frog	*Mixophyes iteratus*	E	✓	E	✓	x	x	-	-	x	x
Green and Golden Bell Frog	*Litoria aurea*	E	✓	V	✓	x	marginal	x	x	Not likely	x
Green-thighed Frog	*Litoria brevipalmata*	V	✓	-	-	x	x	-	-	x	x
Mahony's Toadlet	*Uperoleia mahonyi*	E	✓	E	-	x	x	-	-	x	x
Broad-headed Snake	*Hoplocephalus bungaroides*	E	-	V	✓	x	x	-	-	x	x
Stephens' Banded Snake	*Hoplocephalus stephensii*	V	✓	-	-	x	marginal	x	x	Not likely	x
Rose-crowned Fruit-dove	*Ptilinopus regina*	V	✓	-	-	x	x	-	-	x	x
Superb Fruit-dove	*Ptilinopus superbus*	V	✓	-	-	x	x	-	-	x	x
White-throated Needletail	*Hirundapus caudacutus*	-	✓	V	✓	x	✓	✓	✓	✓	✓
Black-necked Stork	*Ephippiorhynchus asiaticus*	E	✓	-	-	x	x	-	-	x	x
Australasian Bittern	*Botaurus poiciloptilus*	E	✓	E	✓	x	x	-	-	x	x
Black Bittern	*Ixobrychus flavicollis*	V	✓	-	-	x	x	-	-	x	x
Red Goshawk	*Erythrotriorchis radiatus*	E	-	V	✓	x	Sub-optimal	x	x	Not likely	x
White-bellied Sea Eagle	*Haliaeetus leucogaster*	V	✓	-	-	✓	-	-	-	-	✓
Little Eagle	*Hieraaetus morphnoides*	V	✓	-	-	x	✓	✓	x	low	✓
Square-tailed Kite	*Lophoictinia isura*	V	✓	-	-	x	✓	✓	✓	✓	✓
Eastern Osprey	*Pandion cristatus*	V	✓	-	-	x	x	-	-	x	x

Common name	Scientific name	BC Act		EPBC Act		Recorded on site or nearby	If not recorded on site				Considered in test of significance (Appendix 3)
		State Status	Bionet (10km)	National Status	PMST (10km)		Suitable habitat present	Nearby and / or many record(s)	Record(s) from recent years	Potential to occur	
Grey Falcon	*Falco hypoleucos*	V	-	V	✓	x	x	-	-	x	x
Australian Painted Snipe	*Rostratula australis*	E	-	E	✓	x	x	-	-	x	x
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	✓	E	✓	x	marginal	x	x	Not likely	x
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V	✓	V	-	✓	-	-	-	-	✓
Little Lorikeet	*Glossopsitta pusilla*	V	✓	-	-	x	✓	✓	✓	✓	✓
Swift Parrot	*Lathamus discolour*	E	✓	CE	✓	x	x	-	-	x	x
Barking Owl	*Ninox connivens*	V	✓	-	-	x	✓	✓	✓	✓	✓
Powerful Owl	*Ninox strenua*	V	✓	-	-	x	✓	✓	✓	✓	✓
Masked Owl	*Tyto novaehollandiae*	V	✓	-	-	x	✓	✓	✓	✓	✓
Sooty Owl	*Tyto tenebricosa*	V	✓	-	-	x	marginal	x	x	Not likely	x
Pilotbird	*Pycnoptilus floccosus*	-		V	✓	x	x	-	-	x	x
Regent Honeyeater	*Xanthomyza Phrygia*	E4A	✓	CE	✓	x	x	-	-	x	x
White-fronted Chat	*Epithianura albifrons*	V	✓	-		x	marginal	x	x	Not likely	x
Painted Honeyeater	*Grantiella picta*	V	✓	V	✓	x	marginal	x	x	Not likely	x
Varied Sittella	*Daphoenositta chrysoptera*	V	✓	-	-	x	✓	✓	✓	✓	✓
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	✓	-	-	x	✓	✓	x	low	✓
Spotted-tailed Quoll	*Dasyurus maculatus*	V	✓	E	✓	x	marginal	x	x	unlikely	✓
Koala	*Phascolarctos cinereus*	E	✓	E	✓	✓	Sub-optimal	✓	x	unlikely	✓
Eastern Pygmy Possum	*Cercatetus nanus*	V	✓	-	-	x	marginal	x	x	Not likely	x
Yellow-bellied Glider	*Petaurus australis*	V	✓	V	✓	x	marginal	x	x	Not likely	x
Squirrel Glider	*Petaurus norfolcensis*	V	✓	-	-	x	✓	✓	✓	✓	✓
Greater Glider	*Petauroides volans*	E	✓	E	✓	x	marginal	x	x	Not likely	x
Long-nosed Potoroo	*Potorous tridactylus*	V	-	V	✓	x	marginal	x	x	Not likely	x

Common name	Scientific name	BC Act		EPBC Act		Recorded on site or nearby	If not recorded on site				Considered in test of significance (Appendix 3)
		State Status	Bionet (10km)	National Status	PMST (10km)		Suitable habitat present	Nearby and / or many record(s)	Record(s) from recent years	Potential to occur	
Parma Wallaby	*Macropus parma*	V		V	✓	x	x	-	-	x	x
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	-	V	✓	x	x	-	-	x	x
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	✓	V	✓	x	✓	✓	✓	✓	✓
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	✓	-	-	x	✓	✓	✓	✓	✓
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	V	✓	-	-	✓	-	-	-	-	✓
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	✓	V	✓	x	marginal	x	x	unlikely	✓
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V		-		x	✓	✓	✓	✓	✓
Southern Myotis	*Myotis macropus*	V	✓	-	-	x	marginal	✓	✓	✓	✓
Golden-tipped Bat	*Kerivoula papuensis*	V	✓	-	-	x	x	-	-	x	x
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V	✓	-	-	✓	-	-	-	-	✓
Eastern Cave Bat	*Vespadelus troughtoni*	V	✓	-	-	x	marginal	✓	✓	✓	✓
Little Bent-winged Bat	*Miniopterus australis*	V	✓	-	-	x	✓	✓	✓	✓	✓
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	V	✓	-	-	✓	-	-	-	-	✓
Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*	V		-		x	marginal	x	x	unlikely	✓
New Holland Mouse	*Pseudomys novaehollandiae*	-		V	✓	x	x	-	-	x	x

V	Vulnerable
E / E1	Endangered
E4A / CE	Critically endangered

Table A1.3 provides an assessment of potential habitat within the development footprint for nationally *protected* migratory fauna species recorded within 10km on the *EPBC Act* Protected Matters Tool. Nationally *threatened* migratory species are considered in Table A1.2.

Table A2 – Migratory fauna habitat assessment

Common name *Scientific name*	Preferred habitat *Migratory breeding*	Suitable habitat present	Recorded on site	Comments
Oriental Cuckoo (*Cuculus optatus*)	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.	x	-	-
Osprey (*Pandion haliaetus*)	Occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging. They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They exhibit a preference for coastal cliffs and elevated islands in some parts of their range, but may also occur on low sandy, muddy or rocky shores and over coral cays. They may occur over atypical habitats such as heath, woodland or forest when travelling to and from foraging sites. Eastern Ospreys occur sympatrically and sometimes interact with White-bellied Sea-Eagles.	x	-	-
White-throated Needletail (*Hirundapus caudacutus*)	Airspace over forests, woodlands, farmlands, plains, lakes, coasts, towns; companies often forage along favoured hilltops and timbered ranges. *Breeds Siberia, Himalayas, east to Japan. Summer migrant to eastern Australia.*	✓	x	No likely impact
Black-faced Monarch (*Monarcha melanopsis*)	Rainforests, eucalypt woodlands; coastal scrubs; damp gullies in rainforest, eucalypt forest; more open woodland when migrating. *Summer breeding migrant to coastal south east Australia, otherwise uncommon*.	x	-	-
Spectacled Monarch (*Monarcha trivirgatus*)	Understorey of mountain / lowland rainforest, thickly wooded gullies, waterside vegetation, mostly well below canopy. *Summer breeding migrant to south-east Qld and north-east NSW down to Port Stephens from Sept / Oct to May. Uncommon in southern part of range.*	x	-	-
Satin Flycatcher (*Myiagra cyanoleuca*)	Heavily vegetated gullies in forests, taller woodlands, usually above shrub-layer; during migration, coastal forests, woodlands, mangroves, trees in open country, gardens. *Breeds mostly south-east Australia and Tasmania over warmer months, winters in north east Qld.*	x	-	-
Rufous Fantail (*Rhipidura rufifrons*)	Undergrowth of rainforests / wetter eucalypt forests / gullies; monsoon forests, paperbarks, sub-inland and coastal scrubs; mangroves, watercourses; parks, gardens. On migration, farms, streets buildings. *Breeding migrant to south-east Australia over warmer months. Altitudinal migrant in north-east NSW in mountain forests during warmer months.*	✓	x	No likely impact
Yellow Wagtail (*Motacilla flava*)	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.	x	-	-
Swinhoe's Snipe (*Gallinago megala*)	During the non-breeding season Swinhoe's Snipe occurs at the edges of wetlands, eg. wet paddy fields, swamps and freshwater streams. Also known in grasslands, drier cultivated areas and market gardens. Habitat specific to Australia includes the dense clumps of grass and rushes around the edges of fresh and brackish wetlands. This includes swamps, billabongs, river pools, small streams and sewage ponds. *Breeds in central Siberia and Mongolia and moving south for the boreal winter.*	x	-	-

Common name *Scientific name*	Preferred habitat *Migratory breeding*	Suitable habitat present	Recorded on site	Comments
Pin-tailed Snipe (*Gallinago stenura*)	During non-breeding period the Pin-tailed Snipe occurs most often in or at the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation. The species is also found in drier, more open wetlands such as claypans in more arid parts of species' range. It is also commonly seen at sewage ponds; not normally in saline or inter-tidal wetlands. *Breeds in Russia. Australian distribution is not well understood. There are confirmed records from NSW, with a single banded bird reported near West Wyalong.*	x	-	-
Latham's Snipe (*Gallinago hardwickii*)	Soft wet ground or shallow water with tussocks and other green or dead growth; wet parts of paddocks; seepage below dams; irrigated areas; scrub or open woodland from sea-level to alpine bogs over 2,000m; samphire on saltmarshes; mangrove fringes. *Breeds Japan. Regular summer migrant to Australia. Some overwinter.*	x	-	-
Common Sandpiper (*Actitis hypoleucos*)	The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags.	x	-	-
Ruddy Turnstone (*Arenaria interpres*)	Found on coastal regions with exposed rock coast lines or coral reefs. It also lives near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. It can, however, be found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral. It has occasionally been sighted in estuaries, harbours, bays and coastal lagoons, among low saltmarsh or on exposed beds of seagrass, around sewage ponds and on mudflats.	x	-	-
Little Curlew (*Numenius minutus*)	Feeds in short, dry grassland and sedgeland, including dry floodplains and blacksoil plains, which have scattered, shallow freshwater pools or areas seasonally inundated. Open woodlands with a grassy or burnt understorey, dry saltmarshes, coastal swamps, mudflats or sandflats of estuaries or beaches on sheltered coasts, mown lawns, gardens, recreational areas, ovals, racecourses and verges of roads and airstrips are also used. When resting, congregates around pools, river beds and water-filled tidal channels, and shallow water at edges of billabongs. Prefers pools with bare dry mud and they do not use pools if they are totally dry, flooded or heavily vegetated. *Breeds in Russia.*	x	-	-
Eastern Curlew (*Numenius madagascariensis*)	Primarily coastal especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. Often recorded among saltmarsh and on mudflats fringed by mangroves and also in coastal saltworks and sewage farms. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	x	-	-
Whimbrel (*Numenius phaeopus*)	Found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats. It is occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms. Infrequently recorded using saline or brackish lakes near coastal areas. It also used saltflats with saltmarsh, or saline grasslands with standing water left after high spring-tides, and in similar habitats in sewage farms and saltfields. There are a small number of inland records from saline lakes and canegrass swamps. It has also been recorded in coastal dunes and on a football field.	x	-	-
Bar-tailed Godwit (*Limosa lapponica*)	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh.	x	-	-

Common name *Scientific name*	Preferred habitat *Migratory breeding*	Suitable habitat present	Recorded on site	Comments
Black-tailed Godwit (*Limosa limosa*)	Primarily coastal habitat environment. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit; occasionally recorded on rocky coasts or coral islets. The use of habitat often depends on the stage of the tide. It is also found in shallow and sparsely vegetated, near-coastal, wetlands; such as saltmarsh, saltflats, river pools, swamps, lagoons and floodplains. There are a few inland records, around shallow, freshwater and saline lakes, swamps, dams and bore-overflows. They also use lagoons in sewage farms and saltworks	x	-	-
Common Greenshank (*Tringa nebularia*)	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. 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.*	x	-	-
Grey-tailed Tattler (*Tringa brevipes*)	Often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide. It has been found around shores of rock, shingle, gravel or shells and also on intertidal mudflats in embayments, estuaries and coastal lagoons, especially fringed with mangroves. It is less often on open flat sandy beaches or sandbanks, especially around accumulated seaweed or isolated clumps of dead coral. It is occasionally found around near-coastal wetlands, such as lagoons and lakes and ponds in sewage farms and saltworks. Inland records for the species are rare with sightings on river banks and the edges of rock pools	x	-	-

Appendix B – Test of Significance

Section 7.2 of the *BC Act* requires a determination as to whether a development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. Henceforth this is referred to as the 'test of significance'.
For the purposes of this part, development or an activity is likely to significantly affect threatened species if:

(a) it is likely to significantly affect threatened species or ecological communities, or their habitats, according to the test in Section 7.3, or
(b) the development exceeds the biodiversity offsets scheme threshold if the biodiversity offsets scheme applies to the impacts of the development on biodiversity values, or
(c) it is carried out in a declared area of outstanding biodiversity value.

Section 7.3 of the *BC Act* provides the terms of the test for determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats.

The following test of significance relies on the biodiversity assessment provided in this report and should be read making reference to the relevant discussion on each threatened species or their habitats, endangered population and ecological community.

Flora investigations and fauna habitat assessments of the study area have resulted in the identification of suitable habitat for the following threatened species and populations with varying potential to occur. Species recorded or with a considered potential to occur have been noted. The potential for any direct or indirect impacts on these species has also been considered and noted.

Threatened fauna

Common name	BC Act	Potential to occur	Potential Impact
White-bellied Sea Eagle	V	recorded	None anticipated
Glossy Black-Cockatoo	V	recorded	None anticipated
Eastern Coastal Free-tailed Bat	V	recorded	None anticipated
Greater Broad-nosed Bat	V	recorded	None anticipated
Large Bent-winged Bat	V	recorded	None anticipated
White-throated Needletail	-	✓	None anticipated
Square-tailed Kite	V	✓	Direct impact on low potential foraging
Little Lorikeet	V	✓	Direct impact on low potential foraging
Barking Owl	V	✓	None anticipated
Powerful Owl	V	✓	Indirect – on suitable foraging habitat
Masked Owl	V	✓	Indirect – on suitable foraging habitat
Varied Sittella	V	✓	Indirect – on suitable foraging habitat
Squirrel Glider	V	✓	Indirect – on suitable foraging habitat
Grey-headed Flying-fox	V	✓	Indirect – on suitable foraging habitat

Common name	BC Act	Potential to occur	Potential Impact
Yellow-bellied Sheathtail-bat	V	✓	None anticipated
Eastern False Pipistrelle	V	✓	None anticipated
Southern Myotis	V	✓	None anticipated
Eastern Cave Bat	V	✓	None anticipated
Little Bent-winged Bat	V	✓	None anticipated
Wallum Froglet	V	low	Indirect – on dispersal & shelter habitat
Little Eagle	V	low	Indirect – on low potential foraging habitat
Dusky Woodswallow	V	low	Indirect – on low potential foraging habitat
Spotted-tailed Quoll	V	unlikely	Indirect – on unlikely potential foraging habitat
Koala	E	unlikely	Indirect – on unlikely potential habitat
Large-eared Pied Bat	V	unlikely	None anticipated
Eastern Chestnut Mouse	V	unlikely	Indirect – on unlikely potential habitat

***BC ACT 2016* - SECTION 7.3 – TEST OF SIGNIFICANCE**

Test for determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats. The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

a) In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The direct and indirect impacts of the proposal are considered within Section 4.
With consideration to the relative direct and indirect impacts on all threatened species with varying potential to occur, it is considered that the proposal is unlikely to disrupt the life cycle for any of these listed species such that a viable local population would be placed at risk of extinction. Species recorded present during survey, previously recorded nearby or with high potential to occur and requiring further discussion given potential impacts are further discussed in detail below.

Summary of threatened species recorded

White-bellied Sea-Eagle (*Haliaeetus leucogaster)*
The White-bellied Sea-Eagle is mostly recorded in coastal lowlands, but can occupy habitats up to 1400 m above sea level on the Northern Tablelands of NSW. It also extends inland along some of the larger waterways, especially in eastern Australia. Habitats occupied are characterised by the presence of large areas of open water (larger rivers, freshwater swamps, lakes, billabongs, reservoirs, but also saltmarsh and sewage ponds). They also occur at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves. Birds have been recorded in (or flying over) a variety of terrestrial habitats including coastal dunes, tidal flats, grassland, heathland, woodland, forest (including rainforest) and even urban areas.
A White-bellied Sea Eagle was observed in flight over the study area during survey. The subject site does not provide any likely habitat of value and use by this species.

Glossy Black-Cockatoo *(Calyptorhynchus lathami)*
The Glossy Black-Cockatoo inhabits mountain forests, coastal woodland, open forest and trees bordering watercourses where there are substantial stands of *Allocasuarina*. They feed almost exclusively on the fruit of *Allocasuarina* species (*Lindsey* 1992). They choose trees with larger cone crops but show no sign of selecting trees on the basis of cone size – concentrating foraging in trees with a high ratio of total seed weight to cone weight. (Clout 1989). They breed in hollow trees or stumps usually in Eucalypts.
Glossy Black-Cockatoo was recorded by evidence of foraging from chewed cones located within 50m to the north of the subject site. Three individuals were also recorded by observation and call flying north late in the day on 10/10/22, during adjacent site work. There are no large hollows suitable for nesting or any seeding Allocasuarina trees suitable for foraging within the subject site itself. Such habitat does exist in already approved for development areas to the adjacent south within Stages 6-9 of the Warnervale Town Centre.

Eastern Coastal Free-tailed Bat *(Micronomus norfolkensis)*
The Eastern Coastal Free-tailed Bat forages above the canopy of open forests and woodlands and in clearings at forest edges, feeding on small insects (Allison, Hoye & Law 2008). This species is thought to roost predominantly in tree hollows but also under loose bark and occasionally in houses and outbuildings (Allison, Hoye & Law 2008). Until recent findings of a roost within mangroves, all known natural roosts had occurred within hollow spouts of large mature eucalypts. The species is often found close to dams and waterholes. The Eastern Coastal Free-tailed Bat species will utilize paddock trees and isolated remnant vegetation when in proximity to larger forest remnants (Allison, Hoye & Law 2008).
This species was recorded foraging over the subject site during nocturnal surveys. The subject site does not support any likely roosting habitat (tree hollows) and is not unique in the locality for foraging potential, nor is it likely to support any notable quality foraging values by comparison to other areas of local habitat.

Greater Broad-nosed Bat *(Scoteanax rueppellii)*
The Greater Broad-nosed Bat inhabits a variety of habitats including moist gullies in mature coastal forest, rainforest, open woodland, *Melaleuca* swamp woodland, wet and dry sclerophyll forests, cleared paddocks with remnant trees and tree lined creeks in open areas (Churchill 2008). The Greater Broad-nosed Bat predominantly forages within open forest, woodlands, along vegetated creeklines and small river systems (Hoye and Richards 1995). This species roost in tree hollows, cracks and fissures in trunks and dead branches, under exfoliating bark as well as the roof of old buildings (Chuchill 2008, Hoye & Richards 1995).
This species was recorded foraging over the subject site during nocturnal surveys. The subject site does not support any likely roosting habitat (tree hollows) and is not unique in

the locality for foraging potential, nor is it likely to support any notable quality foraging values by comparison to other areas of local habitat.

Large Bent-winged Bat *(Miniopterus orianae oceanensis)*
The Large Bent-winged Bat forages above and below the canopy within open forests and woodlands, feeding on small flying insects, predominantly moths (Dwyer 1995). The Large Bent-winged Bat is known to roost in a range of habitats including stormwater channels, under bridges, occasionally in buildings, old mines and, in particular, caves (Dwyer 1995). Caves are an important resource for this species, particularly for breeding where maternity caves must have suitable temperature, humidity and physical dimensions to permit breeding (Dwyer 1995). Roost sites in tree hollows have not been reported within the literature reviewed.

This species was recorded foraging over the subject site during nocturnal surveys. The subject site does not support any likely roosting habitat and is not unique in the locality for foraging potential, nor is it likely to support any notable quality foraging values by comparison to other areas of local habitat.

b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

i. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Not applicable, TECs do not occur at the site.

ii. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Not applicable, TECs do not occur at the site.

c) In relation to the habitat of threatened species or ecological community:

It is considered that the habitat attributes of the development footprint provide known or potential habitat for Wallum Froglet, White-bellied Sea Eagle, Little Eagle, Square-tailed Kite, Glossy Black-Cockatoo, Little Lorikeet, Barking Owl, Powerful Owl, Masked Owl, Varied Sittella, Dusky Woodswallow, Spotted-tailed Quoll, Koala, Squirrel Glider, Grey-headed Flying-fox, Yellow-bellied Sheathtail-bat, Eastern Coastal Free-tailed Bat, Large-eared Pied Bat, ,Eastern False Pipistrelle, Southern Myotis, Greater Broad-nosed Bat, Eastern Cave Bat, Little Bent-winged Bat, Large Bent-winged Bat and Eastern Chestnut Mouse.

i. The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

The development footprint has an area of 588.97m^2, which regrowth native vegetation in the road reserve, connected to an area of native vegetation that is in better condition, however, will be removed as part of the Stage 10 development. The proposed development will remove 588.97m^2 of remnant native vegetation that provides habitat for the aforementioned species.

ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

The development footprint is along the southern edge of Hakone Road. All areas to the immediate south of this vegetation providing current connectivity values has been certified for removal. The removal of a narrow run of roadside vegetation remaining will itself be in a highly fragmented state and will not be contributing to any important local connective values. Therefore, it is considered that known habitat for a threatened species, population or ecological community within the local area and region is unlikely to become isolated or fragmented as a result of the proposal.

iii. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality

In respect to threatened fauna species recorded or with potential to occur the proposed area of impact is not likely of high quality, of any breeding importance or central to the home range requirements of any species such that behaviour or ecology of these species will be significantly altered in any way.

Threatened flora have not been recorded at the site during the surveys undertaken for this assessment or previous assessments. The site comprises a small section of the road reserve that has undergone previous clearing and its contribution to the habitat of threatened flora is limited. Vegetation clearing to the south of the site is already approved as part of the Biodiversity Certification, further limiting the habitat value of the site. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population and ecological communities in the locality is considered to be minimal.

d) Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The development footprint is not within any declared area of outstanding biodiversity value. Therefore the proposal will not have any adverse effects on any declared area of outstanding biodiversity value (either directly or indirectly).

e) Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

A key threatening process is defined as a process that threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities. The current list of key threatening processes, and whether the proposed activity is recognised as a threatening process, is shown below.

Listed key threatening process (as described in the final determination of the Scientific Committee to list the threatening process)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	**Possible**	**Unlikely**
Aggressive exclusion of birds by Noisy Miners (*Manorina melanocephala*)			✓
Alteration of habitat following subsidence due to longwall mining			✓
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands			✓
Anthropogenic Climate Change			✓
Bushrock removal			✓

Listed key threatening process (as described in the final determination of the Scientific Committee to list the threatening process)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	**Possible**	**Unlikely**
Clearing of native vegetation	✓		
Competition and habitat degradation by feral goats			✓
Competition and grazing by the feral European Rabbit (*Oryctolagus cuniculus*)			✓
Competition from feral honeybees			✓
Death or injury to marine species following capture in shark control programs on ocean beaches			✓
Entanglement in, or ingestion of anthropogenic debris in marine and estuarine environments			✓
Forest Eucalypt dieback associated with over-abundant psyllids and bell miners			✓
High frequency fire resulting in the disruption of life-cycle processes in plants and animals and loss of vegetation structure and composition			✓
Herbivory and environmental degradation caused by feral deer			✓
Importation of red imported fire ants into NSW			✓
Infection by *Psittacine circoviral* (beak and feather) disease affecting endangered psittacine species and populations			✓
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis			✓
Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae		✓	
Infection of native plants by *Phytophthora cinnamomi*		✓	
Introduction of the large earth bumblebee (*Bombus terrestris*)			✓
Invasion and establishment of exotic vines and scramblers			✓
Invasion and establishment of Scotch Broom (*Cytisus scoparius*)			✓
Invasion and establishment of the Cane Toad (*Bufo marinus*)			✓
Invasion, establishment and spread of *Lantana camara*			✓
Invasion of native plant communities by bitou bush & boneseed *Chrysanthemoides monilifera*			✓
Invasion of native plant communities by exotic perennial grasses			✓
Invasion of native plant communities by African Olive (*Olea europaea* subsp. *cuspidata*)			✓
Invasion of the Yellow Crazy Ant (*Anoplolepis gracilipes*)			✓
Loss of Hollow-bearing trees			✓
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants			✓
Loss and/or degradation of sites used for hill-topping by butterflies			✓
Predation and hybridisation by feral dogs (*Canis lupus familiaris*)			✓
Predation by the European Red Fox (*Vulpes vulpes*)			✓
Predation by the Feral Cat (*Felis catus*)			✓
Predation by Gambusia holbrooki Girard, 1859 (plague minnow or mosquito fish)			✓
Predation by the Ship Rat (*Rattus rattus*) on Lord Howe Island			✓
Predation, habitat degradation, competition & disease transmission from Feral pigs (*Sus scofa*)			✓

Listed key threatening process (as described in the final determination of the Scientific Committee to list the threatening process)	Is the development or activity proposed of a class of development or activity that is recognised as a threatening process?		
	Likely	**Possible**	**Unlikely**
Removal of dead wood and dead trees			✓

The above key threatening processes have been considered in reference to the proposal. It was considered that the proposal may contribute to a small degree to a number these processes as described below. It was not considered that the proposal will have a large or significant impact on any of the following key threatening processes. Some mitigation measures have been listed under each process to minimise or reduce such impacts upon those processes.

Summary of "likely" or "possible" Key Threatening Processes
This section identifies what mitigation measures can be implemented to address threatening processes.

Clearing of native vegetation
The proposal is of a class of development recognised as a threatening process. It is generally recommended that all sites should aim to achieve a maintain or improve outcome on the quality and quantity of native vegetation cover through protection and restoration measures. The vegetation management process is to be undertaken in accordance with the conditions of consent and any required vegetation and tree management plans for the proposed development. The removal of native vegetation on the development footprint is not likely to significantly affect the biodiversity of the local area due to the extent of better quality natural vegetation within the local area and the small area of vegetation to be removed.

Infection of native plants by Phytophthora cinnamomi
The proposal may temporarily increase the risk of fungal infection on site as it may be spread via vehicular movement and relocation of soil and vegetation. Consequently standard *Phytophthora cinnamomi* protocol applies to the cleaning of all plant, equipment, hand tools and work boots prior to delivery onsite to ensure that there is no loose soil or vegetation material caught under or on the equipment and within the tread of vehicle tyres or tracks. Any equipment found to contain soil or vegetation material from offsite is to be cleaned in a quarantined work area or wash station and treated with anti-fungal pesticides prior to commencing work.

Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae
'Myrtle Rust' may be spread via machinery, animals and humans as well as by environmental factors such as wind. The presence of machinery and construction works is likely to slightly increase the potential for spread of this key threatening process. Similar protocols as to *Phytophthora cinnamomi* should be applied.

Appendix C – Flora Species List

Scientific name	Common name
Trees	
Allocasuarina littoralis	Black She-oak
Angophora costata	Sydney Red Gum
Shrubs	
Acacia longifolia	
Daviesia squarrosa	
Dillwynia retorta	
Hibbertia aspera	Rough Guinea Flower
Hibbertia obtusifolia	Hoary Guinea Flower
Melaleuca nodosa	
Pimelea linifolia	Slender Rice Flower
Groundcover	
Andropogon virginicus	Whiskey Grass*
Aristida vagans	Threeawn Speargrass
Cheilanthes sieberi	Rock Fern
Dianella caerulea	Blue Flax-lily
Dianella spp.	
Entolasia stricta	Wiry Panic
Gonocarpus teucrioides	Germander Raspwort
Imperata cylindrica	Blady Grass
Lepidosperma laterale	Variable Sword-sedge
Lomandra confertifolia	Matrush
Lomandra multiflora	
Lomandra obliqua	
Pratia purpurascens	
Rytidosperma spp.	
Themeda australis	
Tricoryne elatior	Yellow Autumn-lily
Vines	
Cassytha glabella	
Hardenbergia violacea	False Sarsaparilla

* Exotic species

Appendix D – Fauna Species List

Common name	Scientific name	Method observed
BIRDS		**Sept-Oct 2022**
Australian Hobby	*Falco longipennis*	O
Australian Magpie	*Gymnorhina tibicen*	OW
Australian Owlet-nightjar	*Aegotheles cristatus*	W
Australian Raven	*Corvus coronoides*	OW
Bassian Thrush	*Zoothera lunulata*	W
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	OW
Brown-headed Honeyeater	*Melithreptus validirostris*	OW
Buff-banded Rail	*Galfrallus philippensis*	Q
Common Myna *	*Sturnus tristis*	OW
Eastern Rosella	*Platycercus eximius*	OW
Eastern Whipbird	*Psophodes olivaceus*	W
Eastern Yellow Robin	*Eopsaltria australis*	W
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	W
Glossy Black-Cockatoo TS	*Calyptorhynchus lathami*	OW
Grey Fantail	*Rhipidura albiscapa*	OW
Grey Shrike-thrush	*Colluricincla harmonica*	W
Laughing Kookaburra	*Dacelo novaeguineae*	OW
Little Corella	*Cacatua sanguinea*	OW
Little Wattlebird	*Anthochaera chrysoptera*	OW
Masked Lapwing	*Vanellus miles*	W
Mistletoebird	*Dicaeum hirundinaceum*	W
Nankeen Kestrel	*Falco cenchroides*	O
Noisy Miner	*Manorina melanocephala*	OW
Pacific Black Duck	*Anas superciliosa*	O
Rainbow Lorikeet	*Trichoglossus haematodus*	W
Spotted Pardalote	*Pardalotus punctatus*	W
Variegated Fairy-wren	*Malurus lamberti*	OW
White-bellied Sea-Eagle TS	*Haliaeetus leucogaster*	OW
White-cheeked Honeyeater	*Phylidonyris niger*	OW
White-throated Gerygone	*Gerygone olivacea*	W
White-throated Treecreeper	*Cormobates leucophaea*	W
Yellow Thornbill	*Acanthiza nana*	OW
Yellow-faced Honeyeater	*Caligavis chrysops*	OW
MAMMALS		
Black Rat *	*Rattus rattus*	Q
Common Brushtail Possum	*Trichosurus vulpecula*	Q
Common Ringtail Possum	*Pseudocheirus peregrinus*	E
Eastern Coastal Free-tailed BatTS	*Micronomus norfolkensis*	U
Eastern Forest Bat	*Vespadelus pumilus*	U
Eastern Freetail-bat	*Mormopterus ridei*	U
Eastern Grey Kangaroo	*Macropus giganteus*	O
European Red Fox *	*Vulpes vulpes*	Q

Common name	Scientific name	Method observed
Gould's Wattled Bat	*Chalinolobus gouldii*	U
Greater Broad-nosed Bat [TS]	*Scoteanax rueppellii*	U
Horse *	*Equus caballus*	O
Large Bent-winged Bat [TS]	*Miniopterus orianae oceanensis*	U
Little Bent-winged Bat [TS]	*Miniopterus australis*	U
Little Forest Bat	*Vespadelus vulturnus*	U
Sugar Glider	*Petaurus breviceps*	Q
Swamp Wallaby	*Wallabia bicolor*	Q
White-striped Mastiff-bat	*Austronomus australis*	U
AMPHIBIANS		
Broad-palmed Frog	*Litoria latopalmata*	W
Common Eastern Froglet	*Crinia signifera*	W
Dusky Toadlet	*Uperoleia fusca*	W
Dwarf Tree Frog	*Litoria fallax*	W
Peron's Tree Frog	*Litoria peronii*	W
Striped Marsh Frog	*Limnodynastes peronii*	W
Spotted Marsh Frog	*Limnodynastes tasmaniensis*	W

Note: * indicates introduced species
[TS] indicates threatened species
[MS] indicates Migratory species

All species listed are identified to a high level of certainty unless otherwise noted as:

[PR] indicates species identified to a 'probable' level of certainty – more likely than not
[PO] indicates species identified to a 'possible' level of certainty – low-moderate level of confidence

E - Nest / roost	H - Hair / feathers / skin	P - Scat	W - Heard call
F - Tracks / scratchings	K - Dead	Q - Camera	X - In scat
FB - Burrow	O - Observed	T - Trapped / netted	Y - Bone / teeth / shell
G - Crushed cones	OW - Observed & heard call	U - Ultrasound recording	Z - In raptor / owl pellet

Appendix E – Fauna habitat summary

TOPOGRAPHY				
Flat ✓	Gentle	Moderate	Steep	Drop-offs
VEGETATION STRUCTURE				
Closed Forest	Open Forest ✓	Woodland	Heath	Grassland ✓
DISTURBANCE HISTORY				
Fire	Under-scrubbing ✓	Cut and fill works ✓		
Tree clearing ✓	Grazing			
SOIL LANDSCAPE				
DEPTH:	Deep ✓	Moderate	Shallow	Skeletal
TYPE:	Clay ✓	Loam ✓	Sand	Organic
WATER RETENTION:	Well Drained ✓	Damp / Moist	Water logged	Swamp / Soak
ROCK HABITAT				
None				
FEED RESOURCES				
FLOWERING TREES:	Eucalypts ✓	Corymbias ✓	Melaleucas ✓	
	Banksias	Acacias ✓		
SEEDING TREES:	Allocasuarinas ✓	Conifers		
WINTER FLOWERING EUCALYPTS:	*C. maculata*	*E. crebra*	*E. globoidea*	*E. sideroxylon*
	E. squamosa	*E. grandis*	*E. multicaulis*	*E. scias*
	E. robusta	*E. tereticornis*	*E. agglomerata*	*E. siderophloia*
FLOWERING PERIODS:	Autumn	Winter	Spring ✓	Summer ✓
OTHER:	Mistletoe	Figs / Fruit	Sap / Manna	Termites
FOLIAGE PROTECTION				
UPPER STRATA:	Dense	Moderate ✓	Sparse ✓	
MID STRATA:	Dense	Moderate ✓	Sparse ✓	
PLANT / SHRUB LAYER:	Dense	Moderate	Sparse ✓	
GROUNDCOVERS:	Dense	Moderate	Sparse ✓	
HOLLOWS / LOGS				
None				
VEGETATION DEBRIS				
FALLEN TREES:	Large	Medium	Small	
FALLEN BRANCHES:	Large	Medium	Small	
LITTER:	Deep	Moderate ✓	Shallow ✓	
HUMUS:	Deep	Moderate	Shallow ✓	
DRAINAGE CATCHMENT				
WATER BODIES	Wetland(s) ✓	Soak(s)	Dam(s)	Drainage line(s) ✓
	Creek(s)	River(s)		
RATE OF FLOW:	Still ✓	Slow	Rapid	
CONSISTENCY:	Permanent	Perennial	Ephemeral ✓	
RUNOFF SOURCE:	Urban / Industrial ✓	Parkland	Grazing	Natural
RIPARIAN HABITAT:	High quality	Moderate quality	Low quality ✓	Poor quality
ARTIFICIAL HABITAT				
STRUCTURES:	Sheds	Infrastructure	Equipment	
SUB-SURFACE	Pipe / culvert(s)	Tunnel(s)	Shaft(s)	
FOREIGN MATERIALS:	Sheet	Pile / refuse		

Appendix F – EPBC Significant Impact Criteria

Under the *EPBC Act* an action will require approval from the Australian Government Environment Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance. The following significant impact criteria were sourced from the *EPBC Act* Policy Statement 1.1 (May 2006):

CRITICALLY ENDANGERED AND ENDANGERED SPECIES

Significant impact criteria

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of a population;
- Reduce the area of occupancy of the species;
- Fragment an existing population into two or more populations;
- Adversely affect habitat critical to the survival of a species;
- Disrupt the breeding cycle of a population;
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;
- Introduce disease that may cause the species to decline; or
- Interfere with the recovery of the species.

>> What is a population of a species?

A 'population of a species' is defined under the *EPBC Act* as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to:

- a geographically distinct regional population, or collection of local populations; or
- a population, or collection of local populations, that occurs within a particular bioregion.

>> What is habitat critical to the survival of a species or ecological community?

'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal;
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- To maintain genetic diversity and long term evolutionary development; or
- For the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the *EPBC Act.*

VULNERABLE SPECIES

Significant impact criteria

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of an important population of a species;
- reduce the area of occupancy of an important population;
- fragment an existing important population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of an important population;
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;
- introduce disease that may cause the species to decline; or
- interfere substantially with the recovery of the species.

>> What is an important population of a species?

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- Key source populations either for breeding or dispersal;
- Populations that are necessary for maintaining genetic diversity; and/or
- Populations that are near the limit of the species range.

CRITICALLY ENDANGERED AND ENDANGERED ECOLOGICAL COMMUNITIES

Significant impact criteria

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- Reduce the extent of an ecological community;
- Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;
- Adversely affect habitat critical to the survival of an ecological community;
- Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;
- Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;
- Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
  - assisting invasive species, that are harmful to the listed ecological community, to become established; or
  - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community; or
- Interfere with the recovery of an ecological community.

MIGRATORY SPECIES

Significant impact criteria

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;
- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

>> What is important habitat for a migratory species?

An area of 'important habitat' for a migratory species is:

a) Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or

b) Habitat that is of critical importance to the species at particular life-cycle stages; and/or

c) Habitat utilised by a migratory species which is at the limit of the species range; and/or

d) Habitat within an area where the species is declining.

>> What is an ecologically significant proportion?

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an 'ecologically significant proportion' of the population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species specific behavioural patterns (for example, site fidelity and dispersal rates).

>> What is the population of a migratory species?

'Population', in relation to migratory species, means the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries including Australia.