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Flora and Fauna Assessment

682A Coleridge Road Bateau Bay

15th August 2023

EXECUTIVE SUMMARY

Fraser Ecological Consulting has been contracted by Red Bus Services Pty Ltd (c/o Progressive Property Solutions) to prepare an impact assessment of the proposed re-zoning development on the terrestrial ecology located at 682A Coleridge Road Bateau Bay in the Central Coast Council local government area.

This update addresses Central Coast Council's '*Review of BCD comments and current ecological information memo*' dated 23rd May 2023.

This assessment has been conducted in accordance with Commonwealth and State legislation.

Commonwealth legislation (*Environment Protection and Biodiversity Conservation (EPBC) Act 1999*) requires that actions judged to significantly impact upon matters of National Environmental Significance are to be assessed via a formal referral process. This assessment report determines whether a referral to be made to the Department of the Environment, Water, Heritage and the Arts for further assessment is required.

State legislation (*Environmental Planning and Assessment Act 1979*) requires that actions judged to significantly impact upon threatened species, populations or ecological communities, or their habitats listed under the *Biodiversity Conservation Act (2016)* trigger the preparation of a Species Impact Statement. This assessment report applies considerations under Section 5A of the EPA Act (1979) and determines whether a significant impact is likely to occur and, correspondingly, whether a Species Impact Statement is required.

The site comprises of predominantly cleared/ hard surface areas for the existing bus depot operations. There are 'parkland' type landscaped areas comprising of remnant native trees with a maintained exotic lawn understorey for the western portion (entrance) of the site.

The north-eastern and eastern boundaries of the site contains remnant native vegetation that has been mapped by Council as 'Coastal Sand Wallum Heath' (CC_DHo06i) according to the classification system of Bell (2019). This same vegetation community is consistent with the BIONET Vegetation Classification system for Plant Community Type (PCT) No. 1703 '*Wallum Banksia- Monotoca scoparia Heath on Coastal Sands of the Central Coast and lower North Coast*'. It is not listed as a Threatened Ecological Community. Due to the lack of native resilience (absence of native soil seed bank/ ability to regenerate itself), the vegetation considered to be in poor condition. It has connectivity to Wyrrabalong National Park.

These same areas of mapped remnant vegetation (PCT 1703) incorporate the APZ component of proposed Lots 13-23 and are in poor condition (or absent of any native vegetation), however, these same areas overlap the following NSW DPIE mapping:

- Sensitive Biodiversity Land Values Map (SBV)
- Important Areas for Swift Parrot (IASP)

In respect of matters required to be considered under the EP&A Act and relating to the species / provisions of the BC Act, three (3) threatened fauna species Little Bent-winged Bat (*Miniopterus australis*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*) – all of which are highly mobile insectivorous microchiropteran bat species. These bat species were recorded foraging around the dam on site, however, important breeding habitat that are critical to the life cycle of local populations of these species are absent.

Hollow-bearing branches (less than 10cm) trees observed within the study area (within the 'parkland' landscaped areas). However, no significant habitat trees of notable or potential importance to threatened fauna were identified.

Impact to SBV and IASP mapped areas can be avoided and mitigated by an 88b instrument (RDA) and 88e positive covenant (VMP for APZ management) created on the titles of the eastern boundary of the subject site for future subdivision proposals.

Assessments of significance were undertaken for Swift Parrot (*Lathamus discolor*), Grey- headed Flying-fox (*Pteropus poliocephalus*), Little Bent-winged Bat (*Miniopterus australis*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*) were undertaken as a precautionary measure.

Important breeding habitat that are critical to the life cycle of local populations to all of these subject threatened species are absent from the site. The major conclusion arising from this Flora and Fauna Impact Assessment is that the proposed works are unlikely to result in a significant impact on any listed species or communities providing that the applicant actively implements the recommendations from this assessment. Therefore, in accordance with the EPA Act (1979), BC Act (2016), EPBC Act (1999) and FM Act (1994), a Biodiversity Development Assessment Report (BDAR) is unlikely to be required.

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Licensing

When conducting flora and fauna surveys, consultants are required to possess licences to ensure that works are completed in an appropriate manner. Fraser Ecological Consulting is licensed under s.132c and s.91 of the NSW National Parks and Wildlife Act (1974) from the NSW Office of Environment & Heritage. This allows Alex Fraser to undertake scientific investigations, collect specimens of protected flora and fauna across NSW in service and non-service areas and undertake bushland restoration works in EECs. This licence requires that all survey results are reported to the NSW NPWS for inclusion into the Atlas of NSW Wildlife.

Alex Fraser also holds an Animal Research Authority under the Animal Research Act (1995), as administered by NSW Agriculture. Surveys are approved and supervised by an Animal Care and Ethics Committee, applying the standards as detailed in the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes (NHMRC 1997).

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1. Introduction

1.1. Introduction

Fraser Ecological Consulting has been contracted by Red Bus Services to prepare an impact assessment of the proposed rezoning on the terrestrial ecology located at 682A Coleridge Road Bateau Bay in the Central Coast Council local government area.

This update addresses Central Coast Council's '*Review of BCD comments and current ecological information memo*' dated 23rd May 2023.

This terrestrial ecological assessment:

- Identifies key flora and fauna habitats within the subject site;
- Reviews literature and databases relevant to the subject site;
- Describes the methodology and results of the survey;
- Addresses potential impacts on flora and fauna and their habitats resulting from the proposed development;
- Proposes appropriate mitigation measures; and
- Provides an assessment of the likelihood of significant impacts on threatened species and populations, and endangered ecological communities, according to Section 5A of the NSW EPA Act, BC ACT, Commonwealth EPBC Act. This was done to determine the need for an SIS or an application under the EPBC Act.

Activities specifically related to the preparation of this report included:

- Identification of weed and indigenous native species recorded from the subject site
- Assessment of impacts of the proposed development
- Outlining the applicant's responsibilities including weed control and environmental safeguards before, during and post construction.

1.1 Terminology

This report uses the following terminology:

- Study area is defined as the red boundary on the aerial photograph see (Figure 1-3)
- Subject site defined as the area subject to the removal/modification of vegetation for the proposed development (Figure 1-3);
- APZ abbreviates Asset Protection Zone;

- BC Act abbreviates the Biodiversity Conservation Act 2016;
- EPBC Act abbreviates the Environment Protection and Biodiversity Conservation Act 1999;
- EP&A Act abbreviates the Environmental Planning and Assessment Act 1979;
- DPIE abbreviates Department of Planning, Industry and Environment (NSW);
- IASP abbreviates Important Area for Swift Parrot;
- LGA abbreviates Local Government Area;
- Threatened species refers to those flora and fauna species listed as vulnerable, endangered or critically endangered under the BC Act or EPBC Act
- NOW abbreviates NSW Office of Water;
- EEC abbreviates Endangered Ecological Community;
- SBV abbreviates Sensitive Biodiversity Values Map;
- TEC abbreviates Threatened Ecological Community; and
- BOSET Report abbreviates Biodiversity Offset Scheme (BOS) Entry Threshold Map

1.2 Site characteristics

The study site is located approximately 13 km north-east of the Gosford City centre CBD situated in the Central Coast Council LGA (Figure 1 -3).

The site is identified as Lot 3 DP 716082, 682a Coleridge Road Bateau Bay (Figure 3). It is currently the site for an existing bus depot. Contains existing cleared areas and hard stand services. There are large areas of maintain the lawn and planted trees. A dam is also present on site.

The locality is characterised by existing residential development.

The site adjoins Wyrrabalong National Park to the north and east of the subject site.

The Red Bus Company wishes to pursue a rezoning of the land to R2 Low Density Residential in keeping with the surrounding properties to the north and south.

The site is located on the eastern side of The Entrance Road on the corner of Coleridge Road at Bateau Bay. It has an irregular shape and slopes from the eastern rear boundary down to the front boundary.

The site contains:

- Administration Building with associated amenities and visitor car parking
- Caretaker's residence, granny flat and swimming pool
- Employee and Bus parking areas
- Internal road system
- Several workshops and storage facilities
- Driver amenities
- Dam
- Landscape and retaining structures
- Stormwater infrastructure

The Company wishes to pursue an amendment to the following planning controls that affect the property:

- Land Use Zone= R2 Low Density Residential
- Lot Size Map = 450m^2

The land is located within an existing residential area. The eastern boundary of the property adjoins the Wyrrabalong National Park and the Sandhills Water Reservoir. The southern boundary adjoins land zoned R2 Low Density Residential and RE 1 Public Recreation. The western boundary adjoins The Entrance road and Coleridge Road and for property is zoned R2 Low Density Residential (two of these properties are owned by the company). The northern boundary adjoins land zoned R2 Low Density residential and B1 Neighbourhood Centre.

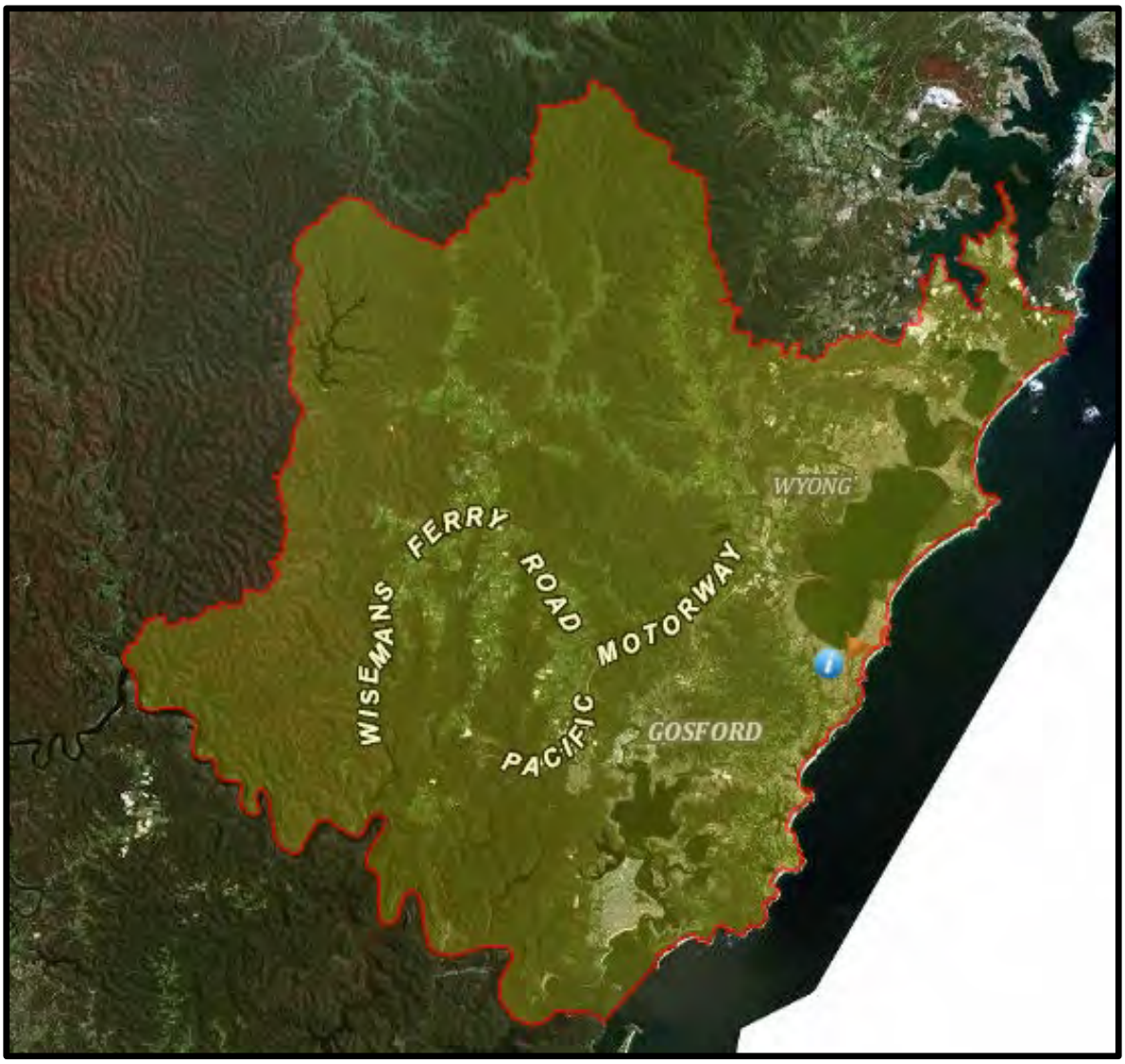

Figure 1: Site in context to the LGA (Aerial Source: SIX Maps.com)

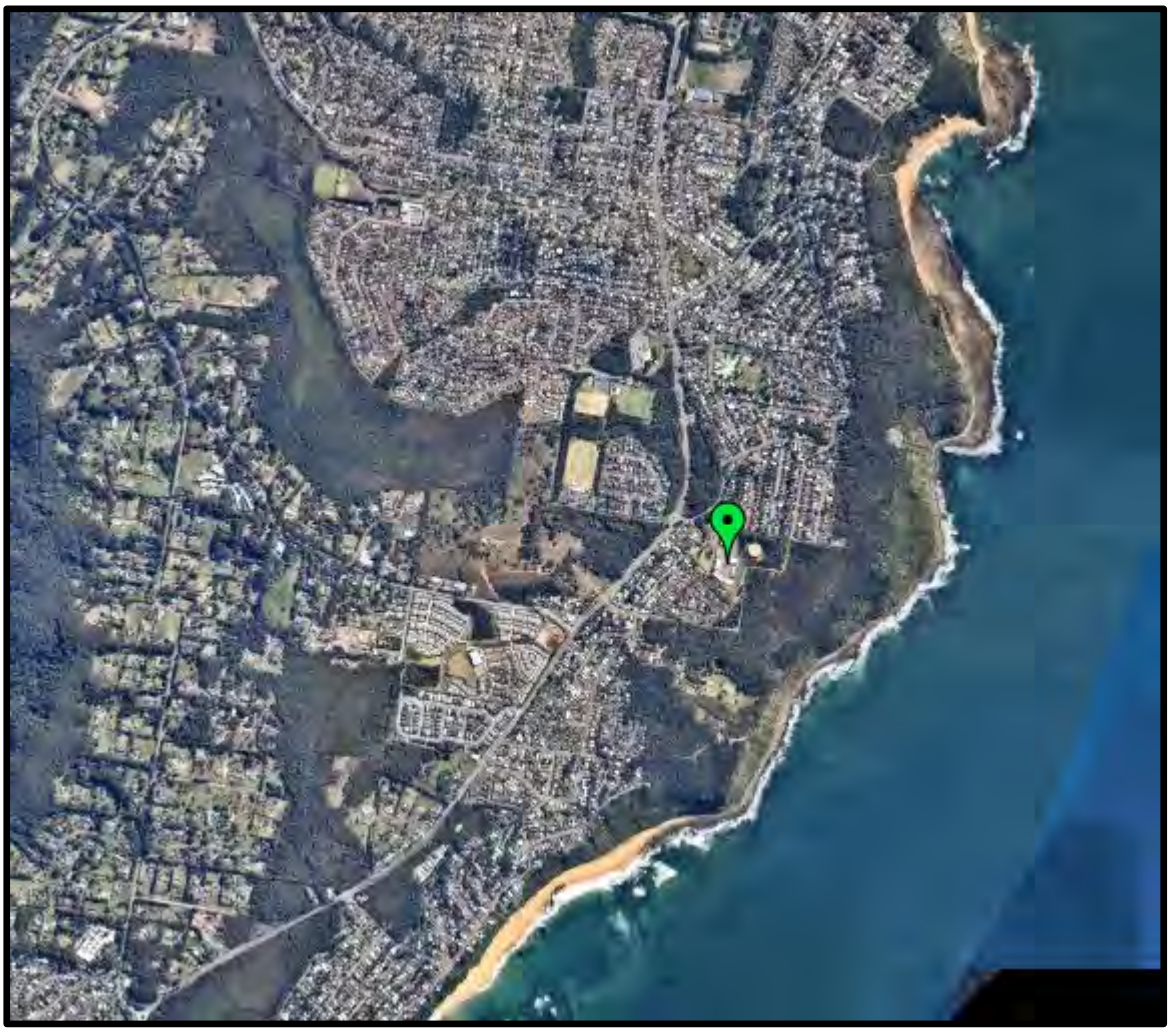

Figure 2: Map of site in context of the local catchment (Aerial Source: Nearmap.com)

Figure 3: Aerial map of property boundaries shown in red (Source: Nearmap.com)

1.3 Soils and Geology

The site is located within the 'Disturbed Soils Landscape' No. 9131er (Figure 4) as defined by Hazerton and Tile (1990). The 'Norah Head' and 'Watagan' soil landscapes occur immediately adjacent to the site. The soil landscape influences the types of vegetation historically located in the area.

Figure 4: Soil landscape mapping of the locality (Source:www.espade.com)

2. Statutory Framework

The criteria used to assess likely impacts upon threatened species, populations or endangered ecological communities vary between Commonwealth and State jurisdictions. The following describes the legislative requirements for each level.

2.1. Commonwealth

The *Environment Protection and Biodiversity Conservation Act (1999)* (EPBC Act) is a nationally applicable Act that is administered by the Department of the Environment, Water, Heritage and the Arts. This Act requires approval for actions that are likely to have a significant impact on matters of National Environmental Significance (NES).

There are seven matters of NES that are triggers for Commonwealth assessment and approval. These are:

1. World Heritage properties;
2. National Heritage places;
3. Ramsar wetlands of international importance;
4. Nationally threatened species and communities;
5. Migratory species;
6. Nuclear actions; and
7. Commonwealth marine environment.

Threatened species and ecological communities are listed under Part 13, Division 1, Subdivision A of the EPBC Act 1999. Migratory species are listed under part 13, Division2, Subdivision A of the Act.

The Department of the Environment and Water Resources identifies the following:

"*Under the EPBC Act a person must not take an action that has, will have or is likely to have significant impact on any of these matter of NES without approval from the Commonwealth Environment Minister. There are penalties for taking such an action without approval.*

In general, an action that may need approval under the Act will involve some physical interaction with the environment, such as clearing native vegetation, building a new road, discharging pollutants into the environment, or offshore seismic survey.

If, following a referral, it is determined that that an action is likely to have a significant impact, and approval is therefore required, the action is called a 'controlled action'. The proposal will then undergo a formal assessment and approval process, and cannot proceed unless approval is granted.

If it is determined that an action is not likely to have a significant impact, then the action is not a controlled action. Approval under the EPBC Act is not required and the action may proceed, subject to obtaining any other necessary permits or approvals."

2.2. State

Local Government Act 1993

The Act sets out the responsibilities of Councils including public land management, activity approvals, corporate and operation planning, orders and enforcement powers, setting rates and charges (LGSA 2009). Section 7(e) of the Act requires Councils, Councillors and Council employees to have regard to the principles of ecologically sustainable development in carrying out their responsibilities. The Charter (Section 8) also requires Councils to properly manage, develop, protect, restore, enhance and conserve the environment of the area for which it is responsible, in a manner that is consistent with and promotes the principles of ecologically sustainable development. Under this Act, Councils are required to have Plans of Management for all Council owned land.

Water Management Act 2000

Under Part 3 (Approvals], Division 1, Section 91 (2), a controlled activity approval confers a rights on its holder to carry out a specified controlled activity at a specified location in, on or under waterfront land. Waterfont land is defined as:

a) the bed of any river or lake, and any land lying between the bed of the river or lake and in a line drawn parallel to, and the prescribed distance inland of:

- in the case of non-tidal waters, the highest bank or shore above the river or lake, and
- in the case of tidal waters, the mean high water mark of the river or lake, and

b) if the regulations so provide, the bed of the coastal waters of the State, and any land lying between the shoreline of the coastal waters and a line drawn parallel to, and the prescribed distance inland of, the mean high water mark of the coastal waters, where the prescribed distance is 40 metres of (if the regulations prescribe a lesser distance, either generally or in relation to a particular location or class of locations) that lesser distance.

Under the WM Act, a controlled activity is defined as:

a) the erection of a building or the carrying out of work (within the meaning of the EPA&A Act), or

b) the removal of material (whither or not extractive material) or vegetation from land, whether by way of excavation or other wise, or

c) the deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise, or

d) the carrying out of any other activity that affects the quantity of or flow of water in a waters sources.

A controlled activity approval will not be granted unless the Minister is satisfied that adequate arrangements are in force to ensure that minimal harm will be done to any waterfront land as a s consequence of carrying out the proposed controlled activity.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

This document provides information regarding the new Biodiversity and Conservation SEPP, which is part of the NSW SEPP consolidation project. On 2 December, the Minister for Planning and Public Spaces Rob Stokes announced 9 key principles and themes for the NSW planning system. State environmental planning policies (SEPPs) will be consolidated to align with the focus areas.

The State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP) consolidates, transfers and repeals provisions of the following 11 SEPPs (or deemed SEPPs):

1. SEPP (Vegetation in Non-Rural Areas) 2017 (Vegetation SEPP)
2. SEPP (Koala Habitat Protection) 2020 (Koala SEPP 2020)
3. SEPP (Koala Habitat Protection) 2021 (Koala SEPP 2021)
4. Murray Regional Environmental Plan No 2—Riverine Land (Murray REP)
5. SEPP No 19—Bushland in Urban Areas (SEPP 19)
6. SEPP No 50—Canal Estate Development (SEPP 50)
7. SEPP (Sydney Drinking Water Catchment) 2011 (Sydney Drinking Water SEPP)
8. Sydney Regional Environmental Plan No 20 – Hawkesbury – Nepean River (No 2 – 1997) (Hawkesbury–Nepean River SREP)
9. Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 (Sydney Harbour Catchment SREP)
10. Greater Metropolitan Regional Environmental Plan No 2 – Georges River Catchment (Georges River REP)
11. Willandra Lakes Regional Environmental Plan No 1 – World Heritage Property (Willandra Lakes REP).

These changes are part of a broader administrative consolidation of SEPPs. Planning Circular PS– 21-007 gives an overview of all changes made as part of the SEPP consolidation initiative.

Biodiversity Conservation Act 2016

The BC Act sets out the biodiversity assessment requirement for any development or activity that requires assessment or approval under the EP&A Act. The main elements of the Act:

- New Biodiversity Offsets Scheme (BOS)
- New assessment methodology - Biodiversity Assessment Method (BAM)
- Establishment of a Biodiversity Conservation Fund (collects and directs spending of offset monies throughout the state)
- Expansion of Biodiversity Certification for large rezoning proposal and masterplan 'green field' type developments (streamlined assessment at strategic planning stage)

It also consolidates:

- existing wildlife licensing requirements
- nominations of areas of outstanding biodiversity values
- updated criteria for listing threatened species and communities
- biodiversity offsets scheme
- Biocertification (large scale master planning development)
- Biodiversity stewardship agreements (where offset credits are created)

Note: The BOS area clearing threshold in this Act is also applied within the new SEPP and LLS Act. If the amount of native vegetation clearing application is below the threshold it is optional if the applicant wants to submit a Biodiversity Assessment Report (BAR). In relation to Council DAs assessments, Part 4 local development requires application of the BAM to determine whether an offset obligation if it either:

1) Exceeds the BOS threshold (also referred to as 'area trigger')
2) Located in an area of '*Sensitive Biodiversity Values*'

The Act sets outs the Biodiversity Assessment Methodology (BAM) which directs the methodology to be undertaken by accredited assessors (consultants) to produce a Biodiversity Assessment Report (BAR) submitted with a development application. The BAM sets out a detailed, complex and quantitative assessment methodology for producing the assessment report (BAR).

The methodology sets a framework for decision makers (Council assessment officers) to determine whether or not the proposal will have **'Serious and Irreversible Impact (SAII)**' for certain threatened species and communities (referred to as 'candidate entities').

For local developments, the new regulations make the new Offset Scheme **mandatory** for applications assessed under part of the Act that exceed the BOS thresholds. Under the Act, and offsets calculator will be used by accredited and appropriately trained assessors.

The Asset Protection Zone of the Eastern boundary of the site overlaps the SBV map provided in Figure 5 (below). However, the vegetation structure already complies with the APZ requirements, therefore, no additional vegetation removal is likely to be required other than weed removal.

This report complies with Section7.3 of the BC Act which refers to requirement of a test of significance for determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats (where required).

Figure 5: NSW Sensitive Biodiversity Values Land Map - affected areas shown in red (accessed August 2023)

3. Methodology

This chapter presents the methods used in conducting the ecological survey and assessment of the conservation importance of the study area.

3.1 Existing records

Records of threatened flora and fauna species and populations, listed in the schedule of the BC and EPBC Acts, were obtained and reviewed to document known locations threatened and regionally significant fauna within the locality.

The source of these records was the NSW DPIE (BIONET) and the Department of Environment, Water, Heritage and the Arts online Protected Matters Search Tool database (Appendix E) for an area covering approximately 10km radius of the subject site (searches updated 18th March 2022).

3.2. Literature review

A literature review was carried out. Of particular importance were those containing records of species, populations and communities of conservation significance. This background information informed the impact assessment.

3.3 Desktop survey

A desktop survey was performed to ensure all relevant documentation is considered when preparing the plan. Documents and other information resources utilised include:

- Aerial photographs (Google Maps, NearMaps & DPI Land Information)
- Soil Landscapes of the Sydney 1:100,000 Sheet (Hazerton and Tile 1990)
- E-spade Online Soil Mapping Tool (NSW DPI)
- Topographic maps & Aerial photographs
- Vegetation Mapping of the area (Bell 2004), The natural vegetation of the Gosford Local Government Area, Central Coast, New South Wales Unpublished report to Gosford City Council, East Coast Flora Survey and the Lower Hunter Central Coast Extant Vegetation Community Map (Lower Hunter and Central Coast Regional Environmental Management Strategy 2003).
- NW Statewide PCT Mapping
- Proposed re-zoning and allotment layout – Barry Hunt and Associates (Appendix A)
- Central Coast Council's '*Review of BCD comments and current ecological information memo*' dated 23rd May 2023

3.4 Field Surveys

A visual inspection was undertaken November to December 2021 and March 2022, June 2023 and August 2023 to identify and evaluate the current vegetation community occurring on the subject site, undertake targeted surveys, identify any threatened flora and fauna species and assess the current nature and extent of fauna habitats.

3.4.1 Vegetation surveys

Features of the vegetation including floristics, structure, extent, type and projective foliage cover, presence of weed species and other significant features were noted and recorded). All flora recorded were predominantly identified to family, genus and species level with confirmation according to *Field Guide to the Native Plants of Sydney* (Robinson, 2003), *Weeds of the south-east: an identification guide for Australia* (Richardson, 2006*), Tree & Shrubs in Rainforest of New South Wales and Southern QLD* (Williams et al 1984), *Native Plants of the Sydney District* (Fairly and Moore 2000) and the Botanic Gardens Trust (2009) *PlantNET* flora database.

3.4.2 Fauna surveys

It is not always possible to determine with certainty all the fauna that utilise habitats in the subject site. This is because of the likely seasonal occurrences of some fauna species, the occasional occurrence of vagrant species, and because some species are difficult to detect because of their timid or cryptic behaviour. Therefore, fauna investigations comprised an assessment of fauna habitats present on site and an indication of their potential to support native wildlife populations and, in particular, threatened species.

In addition to habitat assessment, targeted fauna surveys that complied with NSW Office of Environment & Heritage Survey requirements (draft 2004) were employed to ascertain impacts of the proposed development on threatened fauna. These requirements can be viewed at*:*

http://www.environment.nsw.gov.au/resources/threatenedspecies/09213amphibians.pdf

http://www.environment.nsw.gov.au/resources/nature/TBSAGuidelinesDraft.pdf

Other survey guidelines that were adhered to include:

- Survey guidelines for Australia's threatened birds (DEWHA 2010)
- Survey guidelines for Australia's threatened fish (DEWHA 2011)
- Survey guidelines for Australia's threatened frogs (DEWHA 2010)
- Survey guidelines for Australia's threatened mammals (DEWHA 2011)
- Survey guidelines for Australia's threatened bats (DEWHA. 2010)
- Survey guidelines for Australia's threatened reptiles (DEWHA 2011)
- Matters of National Environmental Significance (Commonwealth of Australia 2013)

- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities 2004 (working draft), Department of Environment and Conservation (DEC)
- 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)

We have also undertaken surveys in accordance with the **Central Coast Flora and Fauna Survey Guidelines (2019)** as per Figure 6 (below). The area of impact is below 0.5ha, and therefore, the survey effort undertaken as part of this assessment complies with the guidelines.

All fauna surveys were undertaken by fauna specialist ecologist Corey Mead (Treehouse Ecology). His CV is attached in the appendices.

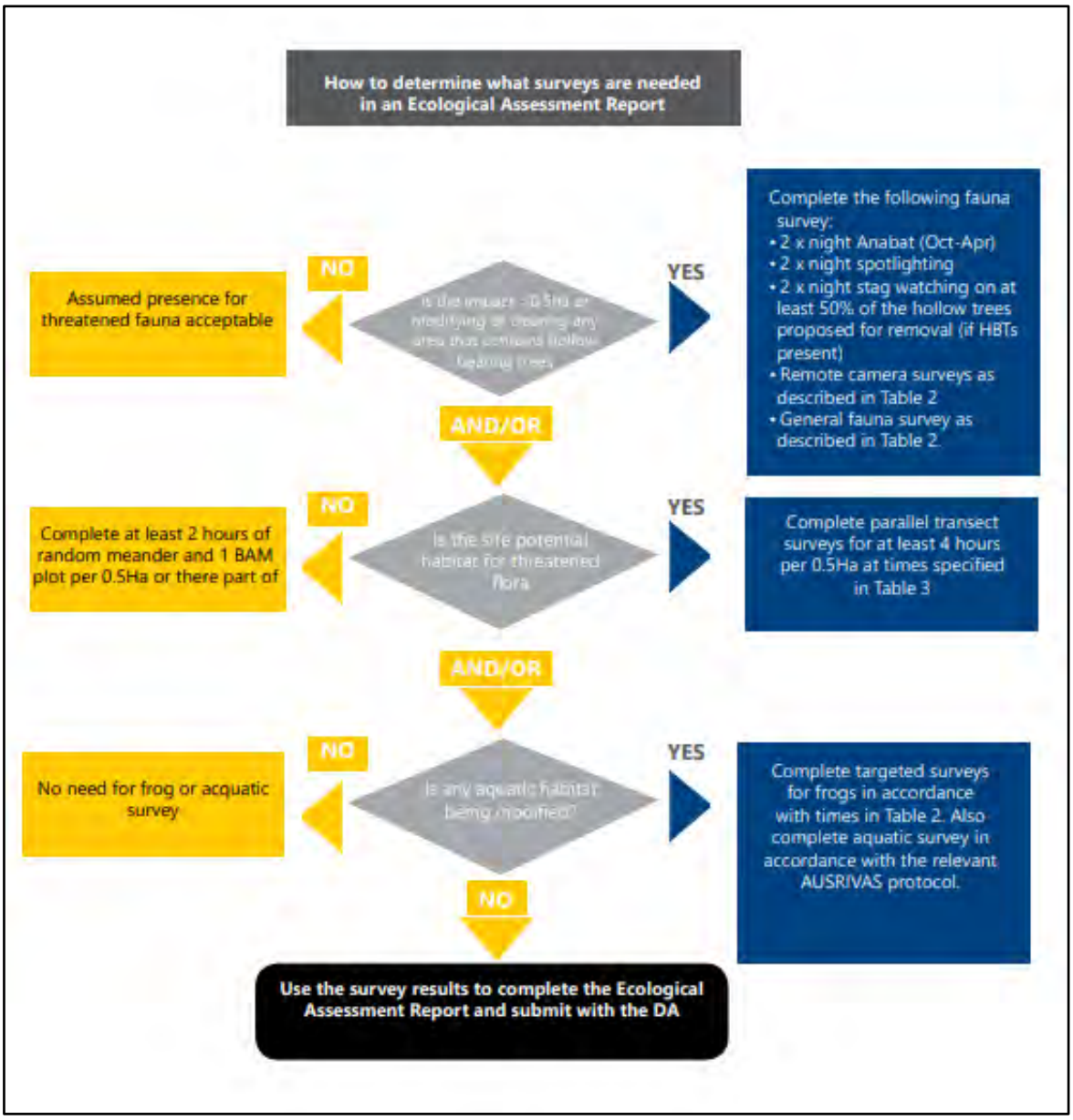

Figure 6: Page 26 of the Central Coast Flora and Fauna Survey Guidelines (2019)

Targeted surveys

Site survey effort accounting for techniques deployed, duration, and weather conditions are outlined in Table 1 and are depicted on Figure 7. All targeted surveys were taken by fauna ecologist Corey Mead (Treehouse Ecology).

Diurnal birds

Four (4) diurnal bird census points were undertaken within the study area. 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. 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

The study area was not considered to provide any suitable important habitat for threatened nocturnal birds.

Arboreal and terrestrial mammals

Specially constructed denning (nesting) tubes in accordance to findings from Rueegger et al (2012) and approved by Dr Ross Goldingay (expert ecologist) were deployed to target presence of Eastern Pygmy Possum, particularly nesting females.

The tubes (approx. 80mm diameter x 240mm long) are bamboo sections with both ends covered and sealed. A 33mm drill hole on the side at one end permits access and Velcro tape stuck down the internal cylinder allows the animal to climb down to the base. Cut lines around the outer surface of the tube permit small mammals to climb up the outside. Denning tubes are placed vertically in shrub trees (preferably flowering banksias). If no animals are found residing within the tube after a prolonged survey period (generally 6 weeks) use may then instead also be identified from bedding material present. Pygmy Possums use fine bedding material such as Isopogon and Banksia ericifolia by comparison to Feather-tail Gliders and Antechinus which use eucalypt leaves.

Surveillance cameras were also placed targeting terrestrial mammals. A bait cannister containing the standard bait mixture was placed in front of every camera. Every second camera was supplemented with sardines and jellymeat cat food smeared around nearby trees to target Spotted-tailed Quoll.

Bats

Active recording was undertaken during stag-watching and throughout the nocturnal survey undertaken on the 30/9/21. Passive recording was undertaken for 18 consecutive nights at the dam in the centre of the site.

Amphibians

The study area was not considered to provide any suitable important habitat for threatened amphibians.

Reptiles

The study area was not considered to provide any suitable important habitat for threatened nocturnal reptiles.

Invertebrates

The study area was not considered to provide any suitable important habitat for threatened invertebrates.

Habitat trees

Hollow-bearing trees were identified and recorded within the development footprint on a Bad Elf GPS unit during surveys. All 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.

A summary of hollow-bearing tree results is provided in Section 4.2.

Flora Survey Limitations

At the time of the survey the weather conditions had been favourable for plant growth and production of features required for the identification of most species. It is probable that the vast majority of species have been recorded and that issues including conservation significance of the flora, condition and viability of bushland and likely impact on native vegetation have been satisfactorily assessed.

Sufficient plant material was present to identify key subject species.

Generally due to the number of person hours spent on flora surveys that have been conducted and the methods used for detection of species, it is likely that an adequate intensity of survey has been carried out to verify the presence of threatened flora within the study area (refer to Council's optimal survey periods table provided on the following pages and State government requirements).

Fauna survey limitations

The surveys are limited to being snap shot investigations and so present a view of the fauna that were active during the time of the surveys. The data produced by the surveys is intended to be indicative of the types of species that could occur and not an absolute census of all vertebrate species of the site.

Several species are cryptic and difficult to detect or migratory and not all surveys in the ecological consulting industry are always conducted at the appropriate time of year. However, it was considered that surveys conducted provided a sufficient window period to determine what threatened species are likely to occur on-site (refer to Council's optimal survey periods table provided on the following pages and State government requirements).

Appendix A

Required survey times for threatened flora species

Main or peak flowering

Sporadic or minor flowering

Flowering times of many species vary significantly from year to year depending on weather conditions and some species (particularly orchids) may not flower at all in unfavourable seasons. The recommended flowering times should be used as a guide only. If it is crucial to determine presence/absence of a particular cryptic flora species at a site, local flowering at a known nearby reference population should be confirmed before conducting surveys regardless of the stated recommended range of suitable survey times.

Species		Status		Flowering times												Targeted Surveys during flowering season Y – essential D – desirable N – not required	Notes
				J	F	M	A	M	J	J	A	S	O	N	D		
Scientific Name	**Common Name(s)**	**BC***	**EPBC***														
Acacia bynoeana	Bynoe's Wattle	E	V	■	■	■						■	■	■	■	Y	
Acacia pubescens	Downy Wattle	V	V								■	■	■				
Ancistrachne maidenii		V	-	■	■										■		
Angophora inopina	Charmhaven Apple, Scrub Apple	V	V	■											■	N	
Astrotricha crassifolia	Thick-leaf Star-hair	V	V									■	■	■			
Caladenia porphyrea	Magenta Orchid	E	E								■	■	■			Y	
Caladenia tessellata	Thick lip Spider Orchid, Tessellated Spider Orchid, Daddy Long Legs	E	V									■	■			Y	
Callistemon linearifolius	Netted Bottlebrush	V	-	■								■	■	■	■	N	
Chamaesyce psammogeton	Sand Spurge, Coastal Spurge	E	-	■								■	■	■	■	N	
Corunastylis insignis (Genoplesium insigne)	Wyong midge orchid 1	E	CE									■	■			Y	
Corunastylis sp. Charmhaven	Wyong midge orchid 2	CE		■	■	■								■	■	Y	Peak flowering may follow spring or summer rain
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	■	■									■	■	Y	Mainly flowers mid-summer
Cynanchum elegans	White Flowered Wax Plant	E	E	■	■	■	■	■			■	■	■	■	■	D	Peak flowering in November
Darwinia glaucophylla	A shrub	V	-								■	■	■	■			
Diuris bracteata		E	Ex								■	■				Y	Peak flowering in September, dry sclerophyll woodland
Diuris praecox	Newcastle Doubletail, Rough Doubletail	V	V							■	■	■				Y	
Epacris purpurascens var. purpuras-cens	An Epacris	V	-								■	■	■				
Eucalyptus camfieldii	Camfield's Stringybark, Heartleaved Stringybark	V	V	■	■	■	■	■	■	■	■	■	■	■	■	N	Flowering irregular and can occur throughout the year, although mainly late spring to early summer.
Eucalyptus oblonga in Bateau Bay, Forresters Beach and Tumbi Umbi	Narrow-leaved Stringybark	EP	-	■	■	■	■	■	■	■	■	■	■	■	■	N	
Eucalyptus parramattensis subsp. *Parramattensis* in Wyong and Lake Macquarie LGAs	Parramatta Red Gum	EP	-	■	■	■	■	■			■	■	■	■	■	N	

Species		Status		Flowering times												Targeted Surveys during flowering season Y – essential D – desirable N – not required	Notes
				J	F	M	A	M	J	J	A	S	O	N	D		
Scientific Name	**Common Name(s)**	**BC***	**EPBC***														
Eucalyptus parramattensis subsp. *decadens*	Drooping Red Gum, Earp's Gum, Earp's Dirty Gum	V	V	■							■	■	■	■	■	N	
Grevillea parviflora subsp. *Parviflora*	Small-flower Grevillea	V	V	■	■					■	■	■	■	■	■	D	Sporadic flowering in January to February
Grevillea shiressii		V	V	■	■					■	■	■	■	■	■	D	
Hibbertia puberula	A Hibbertia	E	-										■	■		D	
Hibbertia procumbens	Spreading Guinea Flower	E	-										■	■	■	Y	Flowers in summer
Maundia triglochinoides	Maundia	V	-	■										■	■	N	
Melaleuca biconvexa	Biconvex Paperbark	V	V										■	■		N	Flowers over just 3 to 4 weeks
Melaleuca groveana	Grove's Paperbark	V	-									■	■	■		N	
Microtis angusii	Angus's Onion Orchid	E	E								■	■	■			Y	Sporadic flowering July to August and No-vember
Pultenaea maritima	Coast Headland Pea	V	-	■	■	■					■	■	■	■	■	D	
Prostanthera askania	Tranquility Mintbush	E	E									■	■	■	■	D	
Prostanthera junonis	Somersby Mintbush	E	E										■	■	■	Y	
Rhizanthella slateri	Eastern Underground Orchid	V	E										■	■		Y	Difficult or impossible to detect even, when flowering.
Rutidosis heterogama	Heath Wrinklewort	V	V	■	■	■	■	■	■	■	■	■	■	■	■	D	Can flower sporadically throughout the year when climatic conditions are favourable. Not essential to be flowering when surveys are conducted (for experienced surveyors), but it is easier to detect.
Senecio spathulatus	Coast Groundsel	E	-	■	■	■	■	■	■	■	■	■	■	■	■	Y	
Senna acclinis	Rainforest Senna	E	-	■									■	■	■	Y	
Streblus pendulinus	Siah's Backbone	-	E	■	■	■	■									N	
Syzygium paniculatum	Magenta Lilly Pilly, Brush Cherry	E	V	■	■									■	■	N	
Tetratheca juncea	Black-eyed Susan	V	V	■							■	■	■	■	■	Y	Can be detected August and November to January. Full extent of population can only be detected during peak flowering mid-Septem-ber to mid-October.
Tetratheca glandulosa	Glandular Pink-bell	V	V								■	■	■	■	■	Y	
Thelymitra adorata	Wyong Sun Orchid	CE	-									■	■			Y	Not all plants flower every year
Wilsonia backhousei	A sub-shrub	V	-	■								■	■	■	■	Y	

*CE= Critically Endangered, E=Endangered, V=Vulnerable, Ex=Presumed Extinct, EP=Endangered Population

Table 1: Fauna survey effort (Treehouse Ecology)

Table 1: Fauna survey effort (Treehouse Ecology)

Fauna	Date	Weather conditions	Survey technique(s)	Time effort (24hr)
Diurnal birds	30/9/21	4/8 cloud, light NE wind, no rain, temp 19-18°C	Census x2 / diurnal opportunistic	1hrs 15min 1645 - 1800
	12/10/21	8/8 cloud, no wind, light rain, temp 16°C	Census x2 / diurnal opportunistic	1hr 1820 - 1920
Nocturnal birds	30/9/21	3/8 cloud, no wind, no rain, temp 17°C	Spotlighting	2hrs 15min 1800 - 2015
Arboreal mammals	30/9/21	3/8 cloud, no wind, no rain, temp 17°C	Spotlighting	2hrs 15min 1800 - 2015
			Stag-watching (HT1 & 2)	Commenced @ 1745
	12/10/21	8/8 cloud, no wind, light rain, temp 16°C	Stag-watching (HT3 & 4)	Commenced @ 1845
	12/10-28/11/21	mostly fine	Eastern Pygmy Possum – denning tubes x5	235 tube nights
Terrestrial mammals	30/9/21	3/8 cloud, no wind, no rain, temp 17°C	Spotlighting	2hrs 15min 1800 - 2015
	12/10-29/10/21	mostly fine	Surveillance camera x2	34 camera nights
Bats	30/9/21	3/8 cloud, no wind, no rain, temp 17°C	Spotlighting / Active ultrasonic monitoring	2hrs 15min 1800 - 2015
	29/10-16/11/21	mostly fine	Ultrasonic microbat recording (Passive monitoring)	18 nights recording
Reptiles	30/9/21	4/8 cloud, light NE wind, no rain, temp 19-18°C	Diurnal opportunistic / habitat searches	1hrs 15min 1645 - 1800
	12/10/21	8/8 cloud, no wind, light rain, temp 16°C	Diurnal opportunistic / habitat searches	1hr 1820 - 1920

Fauna	Date	Weather conditions	Survey technique(s)	Time effort (24hr)
	12/10-29/10/21	mostly fine	Surveillance camera x2	34 camera nights
Amphibians	30/9/21	3/8 cloud, no wind, no rain, temp 17^{o}C	Spotlighting / call identification	2hrs 15min 1800 - 2015
	12/10/21	8/8 cloud, no wind, light rain, temp 16^{o}C	Call identification	Commenced @ 1845-1920

Figure 7 : Fauna survey effort undertaken by Treehouse Ecology

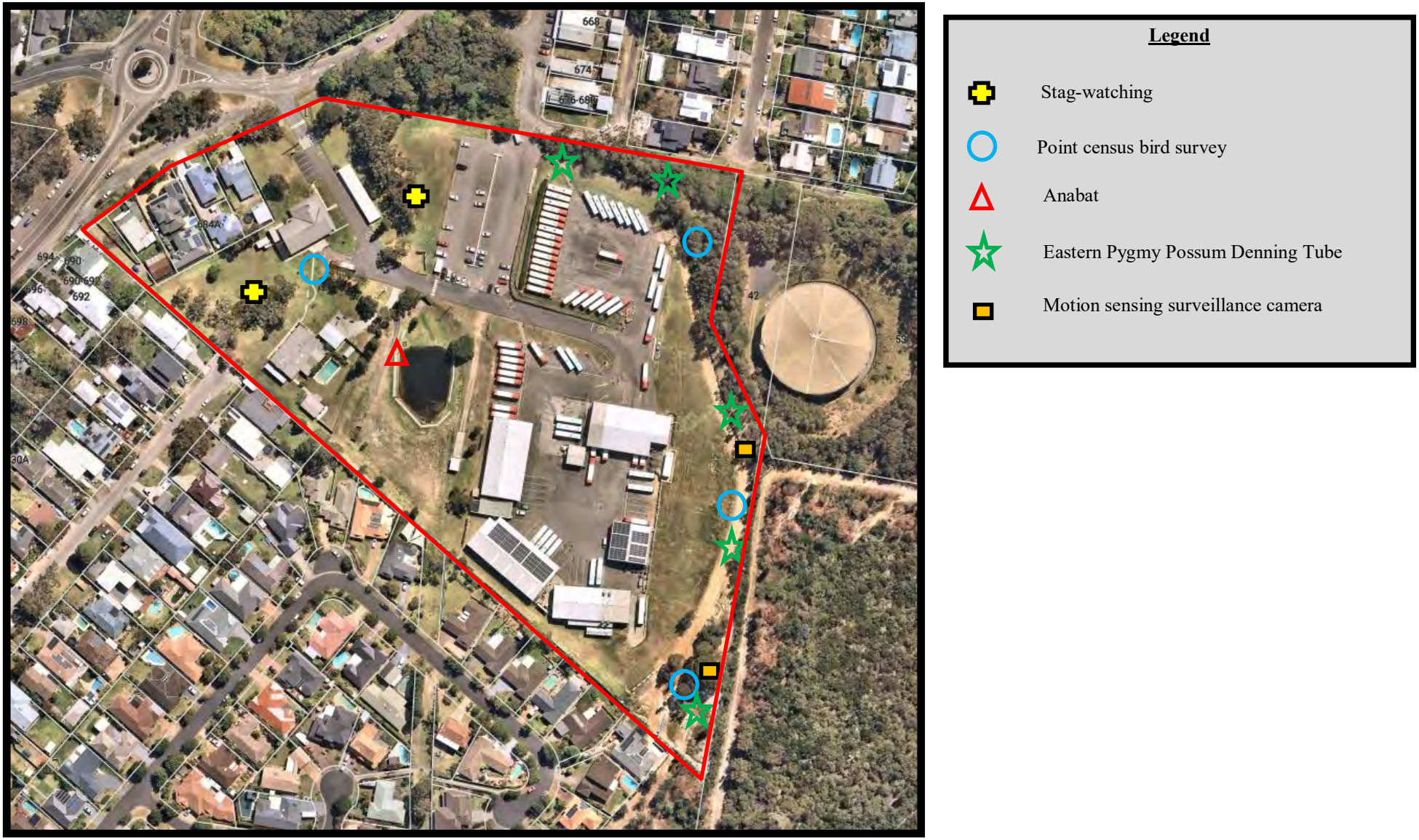

Figure 7: Location of targeted fauna surveys

3.5 Assessment of conservation value

Conservation value parameters

The conservation value of flora and fauna habitats on the subject site was determined by reference to the following criteria:

- Representativeness - whether the vegetation communities of the site are unique, typical or common in the bioregion. In addition the criteria takes into account whether or not such vegetation units are presently held in conservation reserves;
- the presence of threatened or regionally significant species on the site;
- the extent of human influence on the natural environment of the site and the condition of habitats (e.g. the presence of weeds, fire frequency, etc.);
- the uniqueness of the natural values of the site;
- the amount of native vegetation to be cleared or modified by the proposed development in relation to what remnant vegetation will remain in the locality; and
- the relative importance of the site as a corridor for the movement of wildlife.

3.6 Significant Assessments

Significance assessments were carried out for threatened species, populations or communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* that were known or predicted to occur in the project locality (10 kilometres from the study area) and that had a moderate to high likelihood of occurring within the study site based on suitable habitat or observation in the field.

For species, populations and communities listed under the *Biodiversity Conservation Act 2016* significance assessments were completed in accordance with threatened species assessment guidelines.

For species or communities listed under the *Environment Protection and Biodiversity Conservation Act 1999*, significance assessments were completed in accordance with the EPBC Act Policy Statement 1.1 Significant Impact Guidelines (Department of the Environment and Heritage 2019).

4. Results

4.1. Vegetation

The site comprises of predominantly cleared/ hard surface areas in the existing bus depot operations. There are areas of planted and remnant native trees with maintained exotic lawn understory for the western portion (entrance to the site).

The north-eastern and eastern boundary of the site contains some remnant native vegetation that has been mapped by Council as Coastal Sand Wallum Heath (CC_DHo06i) according to the classification system of Bell (2019) - refer to Figure 9. The same vegetation community is consistent with the Bionet Vegetation Classification system for Plant Community Type (PCT) No. 1703 '*Wallum Banksia- Monotoca scoparia heath on coastal sands of the Central Coast and lower North Coast*'.

For ease of reference we have classed vegetation condition into three 'vegetation zones' depicted in Figure 8. The vegetation zones have been described below.

Vegetation Zone 1: remnant trees with mowed understorey

The western portion of the property includes remnant native trees with an introduced lawn that is maintained and regularly mowed. It represents a 'parkland' type landscaped garden. There is no native shrub or groundcover species present.

The canopy species recorded in this area include:

- *Angophora costata* (Smooth-barked Apple)
- *Eucalyptus robusta* (Swamp Mahogany)
- *Melaleuca quinquenervia* (Broad-leaved Paperbark)
- *Araucaria heterophylla* (Norfolk Island pine) – planted
- *Banksia integrifolia* (Coastal Banksia)
- *Glochidion ferdinandi* (Cheese Tree)

Due to the lack of native resilience (absence of native soil seed bank/ ability to regenerate) and lack of connectivity, the vegetation considered to be in poor condition.

In order to meet Council's request for information (May 2023) on species (provided as % cover) abundances we have provided the following additional information:

- *Angophora costata x 30 trees*
- *Melaleuca quinquernervia x 25 trees*
- *Glochdion ferdinandi x 2 trees*
- *E.robusta x 3 trees*
- *E.botryoides x 1 trees*
- *E. pilularus x 1 tree*
- *E. haemastoma x 1 tree*

- *Agonis flexuosa x 2 trees (introduced species)*
- *Pinus radiata x 1 tree (introduced species)*
- *Callistemon linearis x 24 trees (introduced species)*
- *Magnolia x 1 tree (introduced species)*
- *Ficus spp. X 2 trees (planted species)*
- *Banksia integrifolia x 2 trees (planted species)*
- *Norfolk Island Pines x 4 trees (planted species)*
- *Leptospermum petersonii x 1 tree (planted species)*

Photograph 1: isolated native trees within Vegetation Zone 1

Vegetation Zone 2: Remnant Coastal Sand Wallum Heath

The north-eastern of the site contains some intact remnant native vegetation that has been mapped by Council as Coastal Sand Wallum Heath (CC_DHo06i) according to the classification system of Bell (2019). The same vegetation community is consistent with the bio net vegetation classification system for plant community type (PCT) No. 1703 '*Wallum Banksia- Monotoca scoparia heath on coastal sands of the Central Coast and lower North Coast*'. The full PCT report, and vegetation mapping has been provided on the following pages.

This area vegetation occurs on the northern side of the existing road access to Sandhills Water Reservoir along the northern boundary of the site (road reserve of Bard Lane).

Whilst it does contain some weed invasion from edge affects it is generally in good condition and the following species were recorded:

- *Banksia integrifolia*
- *Leptospermum laevigatum*
- *Kunzea ambigua*
- *Westringia fruticosus*
- *Hakea salicifolia*
- *Casuarina glauca*
- *Acacia longifolia var. sopharae*
- *Acacia longifolia var. longifolia*
- *Pittosporum undulatum*
- *Guoia semiglauca*

Introduced weed species recorded in this area include:

- *Chrysanthemoides monilifera ssp. monilifera* (Bitou Bush)
- *Ochna serrulata* (Mickey Mouse Plant)
- *Lantana camara* (Lantana)
- *Asaparagus aethiopicus* (Asparagus Fern)
- *Senna pendula var. glabrata* (Cassia)
- *Erythrina × sykesii* (Coral Tree)
- *Nephrolepis cordfolia* (Fishbone Fern)
- *Strelitzia nicolai* (Giant Strelitzia)
- *Ehrarta erecta (Panic Veldt Grass)*

This vegetation zone is considered to be in poor condition due to the high weed invasion.

Note: The removal of weeds would assist in making the vegetation comply with APZ requirements long the eastern boundary.

Photograph 2: Vegetation Zone 2 - North-east corner of the property within the Bard Lane unformed road that accesses into Sand Hills water reservoir along the northern boundary of the subject site that will be unaffected by the proposed development

Figure A: location of Photograph 2 (above) in relation to the NSW SBV mapping (purple polygon)

Vegetation Zone 3: Remnant Coastal Sand Wallum Heath

The eastern boundary of the site contains highly degraded remnant native vegetation that has been mapped by Council as Coastal Sand Wallum Heath (CC_DHo06i) according to the classification system of Bell (2019). The same vegetation community is consistent with the bio net vegetation classification system for plant community type (PCT) No. 1703 '*Wallum Banksia- Monotoca scoparia heath on coastal sands of the Central Coast and lower North Coast*'. The full PCT report, and vegetation mapping has been provided on the following pages.

This area vegetation is limited to native *Casuarina glauca* trees that do not contain native understorey species.

Introduced weed species recorded in this area include:

- *Chrysanthemoides monilifera ssp. monilifera* (Bitou Bush)
- *Ochna serrulata* (Mickey Mouse Plant)
- *Lantana camara* (Lantana)
- *Asaparagus aethiopicus* (Asparagus Fern)
- *Senna pendula var. glabrata* (Cassia)
- *Erythrina × sykesii* (Coral Tree)

This vegetation zone is considered to be in poor condition due to the high weed invasion.

Note: The removal of weeds would assist in making the vegetation comply with APZ. Majority of the mapped APZ area contains little or no vegetation.

In order to meet Council's request for information (May 2023) on species (provided as % cover) abundances we have provided the following additional information:

- Locally native *Leptospermum laevigatum* recorded at 20m tall (average) at approximately 12-15% cover (>50 plants)
- Locally native *Monotoca scoparia* recorded at 1m tall (average) at approximately 3-5% cover (>30 plants)
- Locally native *Acacia longifolia var. sopharae* at 2m tall (average) at approximately 5-15% cover (>100 plants)
- Locally native *Dianella caerulea* at 0.2m tall (average) at approximately 3% cover (30 plants)
- Locally native *E.botryoides* at 10m tall (average) at approximately 3% cover (3 plants)
- Locally native *Banksia integrifolia* at 20m tall (average) at approximately 10-15% cover (>20 plants)
- Locally native *Casuarina glauca* 100-150mmm DBH recorded at 5-10m tall/ (average) at approximately 30-60% cover (>100 plants)
- Locally native *Cupaniopsis anacardioides* recorded at 1m tall (average) at approximately 1% cover (<10 plants)
- Locally native *Sarcopetalum harveyanum* recorded at 0.5m tall (average) at approximately 0.5% cover (<5 plants)

- Locally native *Breynia oblongifolia* recorded at 1m tall (average) at approximately 2% cover (>30 plants)
- Locally native *Hibbertia scandens* recorded at 0.2m tall (average) at approximately 0.5% cover (>10 plants) – south-eastern corner of the property
- Locally native *Pimelia linifolia* recorded at 2-5m tall (average) at approximately 2-5% cover (>30 plants) – south-eastern corner of the property
- Locally native *Kunzea ambigua* recorded 2-5% cover (>30 plants) – south-eastern corner of the property
- Introduced environmental weed Bitou Bush *Chrysanthemoides monilifera* recorded at 2m tall (average) at approximately 12-15% cover (>50 plants)
- Introduced environmental weed *Lantana camara* recorded at 2-5m tall (average) at approximately 10-50% cover (>50 plants)
- Introduced environmental weed Coral Tree *Erythrina crista-galli* recorded at 5-10m tall (average) at approximately 10-15% cover (>50 plants)
- Introduced environmental weed Fishbone Fern *Nephrolepis cordifolia* recorded at 0.5m tall (average) at approximately 5% cover (>50 plants)
- Introduced environmental weed Buffalo Grass *Stenophorum secundatum* recorded at 0.1m tall (average) at approximately 10-50% cover (1000 plants)
- Introduced environmental weed Kikuyu *Pennisetum clandestinum* recorded at 0.1m tall (average) at approximately 10-50% cover (1000 plants)
- Introduced environmental weed *Acetosa sagittata* recorded at 0.5 m tall (average) at approximately 5% cover (>20 plants)
- Introduced environmental weed *Verbena bonariensis* recorded at 0.5 m tall (average) at approximately 5% cover (>20 plants)

BioNet Vegetation Classification - Community Profile Report

Plant Community Type ID (PCT ID): 1703

PCT Name: Wallum Banksia-Monotoca scoparia heath on coastal sands of the Central Coast and lower North Coast

Classification Confidence Level: 2-High

Vegetation Description: Banksia/Melaleuca Tall Dense Shrubland with a distinct low shrub layer. The ground stratum is sparse and comprises graminoid species.| Confined to coastal headlands from Maitland Bay to Forresters Beach. It occurs on sandstone geologies at elevations below 100m.

Variation and Natural Disturbance:

Vegetation Formation: Heathlands;

Vegetation Class: Coastal Headland Heaths;

IBRA Bioregion(s): NSW North Coast; Sydney Basin;

IBRA Sub-region(s): Hunter; Karuah Manning; Macleay Hastings; Pittwater; Wyong;

LGA: CESSNOCK; GOSFORD; GREAT LAKES; GREATER TAREE; LAKE MACQUARIE; NEWCASTLE; PITTWATER; PORT MACQUARIE-HASTINGS; PORT STEPHENS; WYONG;

Lithology: Not Assessed

Landform Pattern: Not Assessed

Landform Element: Not Assessed

Emergent species: None

Upper Stratum Species:

Mid Stratum Species: Banksia aemula; Monotoca scoparia; Phyllota phylicoides; Melaleuca nodosa; Leptospermum trinervium; Brachyloma daphnoides; Boronia pinnata; Leptospermum polygalifolium; Leptospermum semibaccatum; Ricinocarpos pinifolius; Amperea xiphoclada;

Ground Stratum Species: Caustis recurvata; Hypolaena fastigiata; Lomandra glauca;

Diagnostic Species:

(Species Name:Group Score, Group Frequency,Non Group Score, Non Group Frequency; Fidelity Class)

Banksia aemula: 4, 97%, 3, 2%; positive
Melaleuca nodosa: 3, 43%, 3, 11%; positive
Leptospermum trinervium: 3, 43%, 2, 14%; positive
Leptospermum polygalifolium: 2, 43%, 2, 16%; positive
Leptospermum semibaccatum: 3, 39%, 1, 0%; positive
Monotoca scoparia: 2, 68%, 2, 11%; positive
Phyllota phylicoides: 2, 43%, 2, 3%; positive
Brachyloma daphnoides: 2, 43%, 1, 8%; positive
Boronia pinnata: 2, 41%, 2, 1%; positive
Ricinocarpos pinifolius: 2, 89%, 1, 4%; uninformative
Amperea xiphoclada: 1, 48%, 1, 3%; uninformative
Caustis recurvata: 2, 68%, 1, 1%; positive
Hypolaena fastigiata: 2, 57%, 2, 2%; positive
Lomandra glauca: 2, 48%, 2, 13%; uninformative

Fire Regime:

TEC Assessed: No associated TEC

TEC List: Not Assessed

Associated TEC Comments:

PCT Percent Cleared: 62.00

PCT Definition Status: Approved

Figure 8: Vegetation Zones Map

Figure 8: Vegetation Zone Map

Figure 9: Central Coast Council vegetation mapping (Bell 2019) accessed 15 March 2022

Figure 9: Central Coast Council vegetation mapping (Bell 2019) accessed 15 March 2022

4.2 NSW State Vegetation Type Map (Department of Planning and Environment 2022) Update

The State Vegetation Type Map (SVTM) is a regional-scale map of NSW Plant Community Types. This map represents the current extent of each Plant Community Type, Vegetation Class and Vegetation Formation, across all tenures in NSW. Further, a SVTM map of pre-clearing is also available separately here. This map is updated periodically as part of the Integrated BioNet Vegetation Data program to improve quality and alignment to the NSW vegetation classification hierarchy.

It is accessed via the following link:

https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map

This release represents the first state-wide vegetation coverage using the NSW vegetation classification hierarchy, including the revised eastern NSW PCT classification C1.1. The "M1" in the version release number (C1.1.M1), represents the first map release against PCT master list version C1.1

This coverage supersedes pre-release versions (v1.1 and v1.1.1) and 7 individual prior regional coverages including: Sydney Metropolitan Area Mapping, SVTM Border Rivers Gwydir – Namoi, SVTM Central West – Lachlan, SVTM Riverina – Murray, SVTM Western, SVTM Central Tablelands, and SVTM Upper Hunter.

Limitations on Use: This mapping data may be used as a guide to the occurrence and distribution of Plant Community Types, Vegetation Classes, and Vegetation Formations, before and after clearing.

Users of these maps should note the following issues which will be address in future SVTM versions:

- PCT attribution errors – corrected as better information becomes available Spatial errors or omissions (eg, gaps and slithers or mapping linework inaccuracies)
- Eastern NSW PCT classification topologies differ from central and western NSW classification topologies
- Some PCTs mapped as part of earlier regional coverages have since been discontinued
- Some PCTs approved in BioNet have not been mapped due to technical issues
- Spatial and data gaps and discontinuities may occur at the edges of former regional coverages.
- Pre-clearing coverage for central NSW is not currently available

Since the last revision of the Flora and Fauna report, the New South Wales Statewide PCT mapping has been produced. We have provided a table on the following page (Table 2) that shows the latest PCT mapping descriptions and corresponding Figure 10.

This table shows the relevance of the broadscale mapping to ground truth observations. It also provides general species and abundances in these various areas of the site as requested in Council's '*Review of BCD comments and current ecological information memo*' dated 23rd May 2023.

Table 2: PCT Descriptions and ground-truthing observations

Table 2: PCT Descriptions and ground-truthing observations

PCT name	Descriptive attributes (BIONET Vegetation Classification)	Ground-truthing surveys Species recorded, abundance and PCT condition on site	Species abundance
PCT 3582 Hunter Coast Lowland Apple-Bloodwood Forest Vegetation Formation: Dry Sclerophyll Forests (Shrubby sub-formation) Vegetation Class: Sydney Coastal Dry Sclerophyll Forests Not consistent with a Threatened Ecological Community (TEC) on the subject site	A tall to very tall dry shrubby sclerophyll open forest found at low elevation on exposed aspects on clay enriched Permo-Triassic and Carboniferous sandstones between Gosford and Bulahdelah on the central, Hunter and lower North Coast. The tree canopy almost always includes a high cover of Angophora costata and Corymbia gummifera, commonly with one or more species of stringybark eucalypts of which Eucalyptus capitellata and Eucalyptus globoidea are most frequent. These may be occasionally accompanied or replaced by Eucalyptus piperita and rarely Eucalyptus racemosa in the Kincumber area near Gosford. The mid-stratum consists of a sparse cover of small trees that commonly includes Allocasuarina littoralis. The sparse to mid-dense shrub layer very frequently includes Banksia spinulosa, Persoonia levis, Xanthorrhoea latifolia and less frequently Leptospermum trinervium. The ground layer is composed of a variable cover of grasses that almost always includes Entolasia stricta and Themeda triandra. Other common species are graminoids and climbers including Dianella caerulea, Xanthorrhoea latifolia and Billardiera scandens. This PCT is extensively distributed at lower elevations on either side of Lake Macquarie, on toeslopes of the Sugarloaf Range and is common in the Medowie area north to Bulahdelah. North from this district it is replaced by dry forest PCT 3573. A north-western outlier also occurs on Permian coal measures at Stratford near Gloucester. This PCT is found at elevations of between 5-150 metres asl, in coastal rainfall zones of between 970-1380 mm per annum. This community has a moderately strong floristic overlap with PCT 3581, grades into PCT 3432 with increasing elevation or better soils and into PCT 3583 with decreasing elevation.	Is mapped along the eastern boundary of the site. It occurs very condition vegetation that is dominated by an understorey of introduced environmental weed species including *Lantana camara* and Coral Tree. It is in very poor condition and areas along the eastern boundary dominated by regrowth *Allocasuarina littoralis* (Black She Oak). This PCT does not occur on-site. Defer to legacy PCT mapping and vegetation zone map provided earlier in Section 4.1.	n/a

PCT name	Descriptive attributes (BIONET Vegetation Classification)	Ground-truthing surveys Species recorded, abundance and PCT condition on site	Species abundance
PCT 3244 Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest Vegetation Formation: Wet Sclerophyll Forests (Grassy sub-formation) Vegetation Class: Northern Hinterland Wet Sclerophyll Forests Not consistent with a Threatened Ecological Community (TEC) on the subject site	A tall to very tall sclerophyll open forest with a mid-stratum of dry and soft-leaved shrubs or small trees and a ground cover of grasses and graminoids on lower slopes in the escarpment foothills of the lower North Coast. The canopy includes a diverse mix of trees, which very frequently includes Corymbia maculata, and a suite of other eucalypts which individually occur occasionally or rarely. Collectively, mahoganies and ironbarks are almost always present and grey gums are common. The more frequent mahoganies, ironbarks and grey gums are Eucalyptus siderophloia, Eucalyptus acmenoides, Eucalyptus umbra and Eucalyptus punctata, with Eucalyptus propinqua, Eucalyptus carnea, Eucalyptus paniculata and Eucalyptus canaliculata less regularly present. The mid-stratum is layered and almost always includes one or more Acacia species of varying stature, of which the most frequent are Acacia implexa and Acacia ulicifolia. Taller species in the mid-stratum very frequently include Allocasuarina torulosa, while shorter species very frequently include Persoonia linearis, commonly with Breynia oblongifolia and a Leucopogon (Leucopogon juniperinus or Leucopogon lanceolatus). The mid-dense ground layer typically includes graminoids, twiners, forbs and a hardy fern. Imperata cylindrica is almost always present and very frequent species include Lobelia purpurascens, Dianella caerulea, Desmodium rhytidophyllum, Entolasia stricta, Lomandra longifolia, Themeda triandra and Hardenbergia violacea. This PCT primarily occurs between the Watagan Ranges and Taree, with scattered occurrences further north to the Macleay Valley. It occurs on low-elevation, wet coastal foothills, where mean annual rainfall typically exceeds 1000 mm and elevation is below 260 metres asl. This PCT primarily occurs on sediments, with its southern occurrences often associated with clay rich Narrabeen or Permian sediments, however it is also known from acid volcanics. It is floristically and spatially related to PCT 3433 which tends to occur in drier parts of the Central and Hunter Coast and includes Eucalyptus fibrosa rather than ironbarks with a more coastal distribution. It is also floristically related to PCT 3249, which has an overlapping distribution north of Taree, however differs in that Corymbia intermedia is common and Corymbia maculata is rare in its canopy.	A very small patch is marked along the eastern boundary. Ground truth in surveys reveal that this is incorrectly marked as all that is present here is thickets of regrowth *Allocasuarina littoralis* (Black She Oak). This PCT does not occur on-site. Defer to former legacy PCT mapping and vegetation zone map provided earlier in Section 4.1.	n/a

PCT name	Descriptive attributes (BIONET Vegetation Classification)	Ground-truthing surveys Species recorded, abundance and PCT condition on site	Species abundance
PCT 4020 Coastal Creekflat Layered Grass-Sedge Swamp Forest Vegetation Formation: Forested Wetlands Vegetation Class: Coastal Floodplain Wetlands Not consistent with a Threatened Ecological Community (TEC) on the subject site	A tall to very tall sclerophyll open forest with a sub-canopy of Melaleuca trees and a dense ground layer of sedges and grasses found on low-lying coastal silty alluvial soils between the Shoalhaven and the mid North Coast. The tree canopy is variable, however commonly includes Eucalyptus robusta, and may be accompanied or replaced by Eucalyptus tereticornis or Eucalyptus amplifolia, or rarely Angophora floribunda, Eucalyptus resinifera and in the Shoalhaven, Eucalyptus longifolia. Sometimes a sparse cover of tall Melaleuca species is included amongst the eucalypt canopy. The mid-stratum is characterised by a mid-dense cover of smaller trees that almost always includes a patchy cover of Melaleuca linariifolia, occasionally or rarely with other Melaleuca species depending on location. North of the Hawkesbury River these may include Melaleuca quinquenervia or Melaleuca sieberi, while in the Shoalhaven it may include Melaleuca ericifolia, Melaleuca decora or Melaleuca biconvexa. The climber Parsonsia straminea is commonly recorded on the trunks of the sub-canopy trees. Other small trees that are occasionally recorded include a sparse cover of Glochidion ferdinandi and Callistemon salignus or soft-leaved small shrubs such as Breynia oblongifolia. The ground layer is mid-dense to dense and very frequently includes clumps of the tall sedge Gahnia clarkei, graminoid Lomandra longifolia, together with grasses Entolasia marginata, Imperata cylindrica and Oplismenus imbecillis. Other common grasses include Microlaena stipoides and a patchy cover of Hemarthria uncinata, very frequently with small forbs including Centella asiatica and Lobelia purpurascens. This PCT is widespread across coastal lowlands, however is restricted to alluvial flats at elevations below 30 metres asl that are likely to be subject to periodic inundation from floodwaters. It occurs on soils which are clay-rich rather than sandy loams, and in wet areas where rainfall generally exceeds 1000 mm of rainfall per annum. This community only weakly overlaps floristically with other PCTs in NSW. It does however, have extensive spatial overlap with other coastal alluvial forests including PCT 4042, which occurs in drier less frequently inundated alluviums, and has a low frequency of Eucalyptus robusta; and PCT 4021, which includes a higher proportion of sclerophyll shrubs on sandy loams. Small areas of PCT 4020 are included in coastal reserves, however it is more extensive on private lands, some of which has been subject to past clearing.	Is mapped along the northern boundary of the site. Some mapped areas within the subject site incorrectly marked as this vegetation community. Ground truth in surveys show that these areas have an introduced mowed grass understorey with scattered planted *Angophora costata* trees. This PCT does not occur on-site. Defer to legacy PCT mapping and vegetation zone map provided earlier in Section 4.1.	n/a

PCT name	Descriptive attributes (BIONET Vegetation Classification)	Ground-truthing surveys Species recorded, abundance and PCT condition on site	Species abundance
Non classified areas	These areas dominate the site. It includes planted or remnant trees with a mowed/ maintained understorey.	*Angophora costata x 30 trees* *Melaleuca quinquernervia x 25 trees* *Glochdion ferdinandi x 2 trees* *E.robusta x 3 trees* *E.botryoides x 1 trees* *E. pilularus x 1 tree* *E. haemastoma x 1 tree* *Agonis flexuosa x 2 trees (introduced species)* *Pinus radiata x 1 tree (introduced species)* *Callistemon linearis x 24 trees (introduced species)* *Magnolia x 1 tree (introduced species)* *Ficus spp. X 2 trees (planted species)* *Banksia integrifolia x 2 trees (planted species)* *Norfolk Island Pines x 4 trees (planted species)* *Leptospermum petersonii x 1 tree (planted species)*	

Figure 10: NSW Statewide PCT Map

Figure 10: NSW Statewide PCT Map

4.2 Fauna species and habitat

The predominantly cleared nature of the site generally contains very limited or insignificant fauna habitat features despite the presence of some hollows branches in trees located within the western portion of the property.

Full list of fauna recorded on site provided Table 3.

In respect of matters required to be considered under the EP&A Act and relating to the species / provisions of the BC Act, three (3) threatened fauna species Little Bent-winged Bat (*Miniopterus australis*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*). These bat species were recorded foraging on site, however, important breeding habitat that are critical to the life cycle of local populations of this species are absent.

Most notable habitat features present within the study area include:

- Small hollows (<10cm) - refer to table below
- Seeding Allocasuarina
- Diverse seasonal flowering opportunities for nectivorous species.
- Winter flowering trees
- Open water dams and small fringing reeds

Hollow-bearing trees observed within the study area described in Table 4.

No significant habitat trees of notable or potential importance to threatened fauna were identified.

Table 3: Fauna recorded during survey

Table 3: Fauna recorded within the study area

Common name	Scientific name	Method observed	
BIRDS		Spring 2021	
Australian Brush-turkey	*Alectura lathami*	Q	
Australian Magpie	*Cracticus tibicen*	O	
Australian Raven	*Corvus coronoides*	W	
Australian Wood Duck	*Chenonetta jubata*	OW	
Bar-Shouldered Dove	*Geopelia humeralis*	Q	
Channel-billed Cuckoo	*Scythrops novaehollandiae*	OW	
Common Koel	*Eudynamys scolopacea*	W	
Common Myna *	*Sturnus tristis*	OW	
Eastern Rosella	*Platycercus eximius*	W	
Galah	*Eolophus roseicapillus*	W	
Grey Butcherbird	*Cracticus torquatus*	OW	
Laughing Kookaburra	*Dacelo novaeguineae*	O	
Lewin's Honeyeater	*Meliphaga lewinii*	W	
Little Wattlebird	*Anthochaera chrysoptera*	OW	
Masked Lapwing	*Vanellus miles*	OW	
New Holland Honeyeater	*Phylidonyris novaehollandiae*	OW	
Noisy Miner	*Manorina melanocephala*	OW	
Pied Currawong	*Strepera graculina*	W	
Purple Swamphen	*Porphyrio porphyrio*	OW	
Rainbow Lorikeet	*Trichoglossus haematodus*	OW	
Spotted Pardalote	*Pardalotus punctatus*	W	
Superb Fairy-wren	*Malurus cyaneus*	OW	
Welcome Swallow	*Hirundo neoxena*	O	
White-browed Scrubwren	*Sericornis frontalis*	Q	
White-cheeked Honeyeater	*Phylidonyris niger*	OW	
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	W	
MAMMALS			
Black Rat *	*Rattus rattus*	Q	
Cat (domestic)*	*Felis catus*	O	
Common Ringtail Possum	*Pseudocheirus peregrinus*	O	
Dog (domestic)*	*Canis lupus familiaris*	Q	
Eastern Broad-nosed Bat	*Scotorepens orion*	U[PO]	

Common name	Scientific name	Method observed	
Eastern Freetail-bat	*Mormopterus ridei*	U[PO]	
European Red Fox *	*Vulpes vulpes*	Q	
Gould's Wattled Bat	*Chalinolobus gouldii*	U	
Large Bent-winged Bat [TS]	*Miniopterus orianae oceanensis*	U	
Long-eared Bat	*Nyctophilus sp.*	U	
Little Bent-winged Bat [TS]	*Miniopterus australis*	U	
Rabbit *	*Oryctolagus cuniculus*	O Q	
Swamp Wallaby	*Wallabia bicolor*	Q	
White-striped Mastiff-bat	*Austronomus australis*	U	
Yellow-bellied Sheathtail-bat [TS]	*Saccolaimus flaviventris*	U	
AMPHIBIANS			
Dwarf Tree Frog	*Litoria fallax*	W	
Peron's Tree Frog	*Litoria peronii*	W	
Striped Marsh Frog	*Limnodynastes peronii*	W	
FISH			
Short-finned Eel	*Anguilla australis*	O	

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

Table 4: Habitat tree data

Tree No	Tree Survey No.	Common Name	DBH (cm)	Spread (m)	Height (m)	Vigour (%)	Hollows & Other Habitat Features Recorded
HT1	4055	Smooth-barked Apple	57	12	17	75	1x 5-10cm branch (Rainbow Lorikeets)
HT2	4058	Smooth-barked Apple	45	9	13	85	1x 0-5cm branch
HT3	6599	Swamp Mahogany	37	9	10	80	1x 5-10cm trunk (wear)
HT4	6610	Broad-leaved Paperbark	60	10	11	90	1x 0-5cm trunk

The location of hollow bearing trees are provided in Figure 11 on the following pages.

A full description of the fauna habitat characteristics occurring on site are provided in Table 5.

Table 5: Observed fauna habitat

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
VALUE:	Surface foraging ✓	Sub-surface foraging ✓	Denning/burrowing ✓	
WATER RETENTION:	Well Drained ✓	Damp / Moist	Water logged	Swamp / Soak
ROCK HABITAT				
No rock habitat features present				
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						
TREE HOLLOWS:	Large		Medium		Small ✓	
TREE HOLLOW TYPES	Branch ✓	Trunk ✓	Broken Trunk	Basal Cavities	Stags	
GROUND HOLLOWS:	Large		Medium		Small	
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			

Figure 11: Hollow-bearing tree map

Legend

Hollow-bearing tree

Figure 11: Location of hollow bearing trees (HBT)

4.3 State Environmental Planning Policy (Koala Habitat Protection) 2021

The site is located in the Central Coast Local Government Area, which is listed under Schedule 1 of State Environmental Planning Policy (Koala Habitat Protection) 2020 now repealed by the State Environmental Planning Policy (Biodiversity and Conservation) 2021.

The likelihood of the site to be 'potential koala habitat' or 'core koala habitat' as defined under the SEPP was assessed.

The subject property does not form part of an approved Koala plan of management.

Koala habitat was assessed by inspecting all feed trees to identify indicative scratches on the trunk and droppings around the base of potential feed tree species (Table 6).

No Koalas were observed during the fauna survey and there was no evidence (scats or scratches) of previous Koala habitation in the area. The study area is also not considered to be 'Core Koala Habitat' as defined by State Environmental Planning Policy (Koala Habitat Protection) 2019.

We have provided a list below of all 'main koala feed trees' and 'secondary/ supplementary' tree species for the Central Coast Koala Management area identified in the NSW Koala Recovery Plan 2008 (https://www.environment.nsw.gov.au/topics/animals-and-plants/native-animals/native-animal-facts/koala/koala-habitat).

As no Koalas or evidence of Koalas were detected within the study area no further assessment under this Policy is required.

Eucalyptus robusta (Swamp Mahogany) is a Koala feed tree species that occurs on-site as planted or remnant specimens in the parkland type landscape near the entrance to the site. However, none of these trees displayed evidence of Koala usage.

Main koala food trees	
Primary food tree species	
Parramatta red gum *E. parramattensis*	Swamp mahogany *E. robusta*
Forest red gum *E. tereticornis*	Tallowwood *E. microcorys*
Ribbon gum *E. viminalis*	Cabbage gum *E. amplifolia*
Secondary food tree species	
Broad-leaved sally *E. camphora*	Swamp gum *E. ovata*
Fuzzy box *E. conica*	Brittle gum *E. praecox*
Yertchuk *E. consideniana*	White-topped box *E. quadrangulata*
Dwyer's red gum *E. dwyeri*	Red mahogany *E. resinifera*
Slaty red gum *E. glaucina*	Rudder's box *E. rudderi*
Bundy *E. goniocalyx*	Large-fruited red mahogany *E. scias*
Craven grey box *E. largeana*	Grey gum *E. punctata*
Maiden's gum *E. maidenii*	Monkey gum *E. cypellocarpa*
Brittle gum *E. michaeliana*	Woollybutt *E. longifolia*
Western grey box *E. microcarpa*	Blue box *E. baueriana*
Grey box *E. moluccana*	Coast grey box *E. bosistoana*
E. notabilis	

Stringybarks/supplementary species	
Blue-leaved stringybark *E. agglomerate*	*E. oblonga*
Thin-leaved stringybark *E. eugenioides*	*E. ralla*
White stringybark *E. globoidea*	*E. tenella*
Yellow stringybark *E. muelleriana*	Privet-leaved stringybark *E. ligustrina*
Red stringybark *E. cannonii*	Brown stringybark *E. capitellata*
E. prominula	Heart-leaved stringybark *E. camfieldii*
Narrow-leaved stringybark *E. sparsifolia*	*E. bensonii*
E. imitans	*E. blaxlandii*

Table 6: State Environmental Planning Policy (Koala Habitat Protection) 2021 [NSW]

Schedule 2 Koala use tree species

Central Coast koala management area

Scientific name	Common name(s)
Allocasuarina littoralis	Black She-oak
Allocasuarina torulosa	Forest Oak
Angophora bakeri	Narrow-leaved Apple
Angophora costata	Smooth-barked Apple
Angophora floribunda	Rough-barked Apple
Casuarina glauca	Swamp Oak
Corymbia eximia	Yellow Bloodwood
Corymbia gummifera	Red Bloodwood
Corymbia maculata	Spotted Gum
Eucalyptus acmenoides	White Mahogany
Eucalyptus agglomerata	Blue-leaved Stringybark
Eucalyptus albens	White Box
Eucalyptus amplifolia	Cabbage Gum
Eucalyptus beyeriana	Beyer's Ironbark
Eucalyptus blakelyi	Blakely's Red Gum
Eucalyptus bosistoana	Coast Grey Box
Eucalyptus botryoides	Bangalay
Eucalyptus camaldulensis	River Red Gum
Eucalyptus camfieldii	Camfield's Stringybark
Eucalyptus canaliculata	Large-fruited Grey Gum
Eucalyptus capitellata	Brown Stringybark
Eucalyptus carnea	Thick-leaved Mahogany
Eucalyptus consideniana	Yertchuk
Eucalyptus crebra	Narrow-leaved Ironbark
Eucalyptus cypellocarpa	Monkey Gum
Eucalyptus deanei	Mountain Blue Gum
Eucalyptus eugenioides	Narrow-leaved Stringybark
Eucalyptus fibrosa	Broad-leaved Red Ironbark
Eucalyptus glaucina	Slaty Red Gum
Eucalyptus globoidea	White Stringybark

State Environmental Planning Policy (Koala Habitat Protection) 2021 [NSW]
Schedule 2 Koala use tree species

Scientific name	Common name(s)
Eucalyptus grandis	Flooded Gum
Eucalyptus haemastoma	Broad-leaved Scribbly Gum
Eucalyptus imitans	Eucalyptus imitans
Eucalyptus largeana	Craven Grey Box
Eucalyptus longifolia	Woollybutt
Eucalyptus macrorhyncha	Red Stringybark
Eucalyptus melliodora	Yellow Box
Eucalyptus michaeliana	Brittle Gum
Eucalyptus microcorys	Tallowwood
Eucalyptus moluccana	Grey Box
Eucalyptus oblonga	Stringybark
Eucalyptus paniculata	Grey Ironbark
Eucalyptus parramattensis	Parramatta Red Gum
Eucalyptus pilularis	Blackbutt
Eucalyptus piperita	Sydney Peppermint
Eucalyptus propinqua	Small-fruited Grey Gum
Eucalyptus punctata	Grey Gum
Eucalyptus quadrangulata	White-topped Box
Eucalyptus racemosa	Narrow-leaved Scribbly Gum
Eucalyptus resinifera	Red Mahogany
Eucalyptus robusta	Swamp Mahogany
Eucalyptus saligna	Sydney Blue Gum
Eucalyptus scias	Large-fruited Red Mahogany
Eucalyptus sclerophylla	Hard-leaved Scribbly Gum
Eucalyptus siderophloia	Grey Ironbark
Eucalyptus sideroxylon	Mugga Ironbark
Eucalyptus sieberi	Silvertop Ash
Eucalyptus signata	Scribbly Gum
Eucalyptus sparsifolia	Narrow-leaved Stringybark
Eucalyptus squamosa	Scaly Bark
Eucalyptus tereticornis	Forest Red Gum
Eucalyptus umbra	Bastard White Mahogany
Eucalyptus viminalis	Ribbon Gum
Melaleuca quinquenervia	Broad-leaved Paperbark
Syncarpia glomulifera	Turpentine

4.4 Threatened ecological communities

Ten endangered ecological communities were identified from desktop review to occur within the locality of the study area (Table 7).

All impacts to EECs have been avoided.

None occur on-site.

Table 7: Endangered Ecological Communities considered in this assessment

Table 7: Endangered Ecological Communities considered in assessment

Name	BC Act	EPBC Act	Habitat Requirements	Comments
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC	V	Geology / Soils: Estuarine mud flats. Topography: Intertidal zone on the shores of estuaries and lagoons. Characteristic Species: Sarcocornia quinqueflora, Sporobolus virginicus, Juncus krausii and Baumea juncea.	No suitable habitat present.
Coastal Upland Swamp in the Sydney Basin Bioregion	EEC	EEC	Geology / Soils: Periodically waterlogged acidic soils on Hawkesbury Sandstone. Topography: Impermeable sandstone plateaus in the headwater valleys of streams and on sandstone benches with abundant moisture seepage. Characteristic Species: Highly diverse and variable, includes scrubs, heaths, sedgelands and fernlands.	No suitable habitat present.
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC	-	Geology / Soils: Silts, muds or humic loams. Topography: Depressions, flats, drainage lines, backswamps, lagoons and lakes associated with coastal floodplains. Characteristic Species: Composition is variable and dependent on water regime. May include amphibious grasses and sedges, emergent floating herbs and emergent tall sedges and floating and submerged aquatic herbs.	No suitable habitat present.
Kincumber Scribbly Gum Forest in the Sydney Basin Bioregion	CEEC	-	Geology / Soils: Terrigal Formation of the Narrabeen Group. Soils are characterised by Yellow Podzolic Soils and Yellow Earths of the Erina Soil Landscape. Topography: Footslopes, gently inclined crests and ridges. Characteristic Species: Eucalyptus racemosa, Angophora costata, Corymbia gummifera, Syncarpia glomulifera, Eucalyptus piperita and Allocasuarina littoralis.	No suitable habitat present.
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	CE	Geology / Soils: Sand dunes and on soils derived from underlying rocks Topography: Located near the seaoin coastal dunes, headland or riparian habitats. Characteristic Species: Comprises the Cupaniopsis anacardioides - Acmena spp. alliance of Floyd (1990).	No suitable habitat present.

Name	BC Act	EPBC Act	Habitat Requirements	Comments
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	E	CE	Geology / Soils: High nutrient geological substrates, notably basalts and fine-grained sedimentary rocks. Topography: Coastal plains and plateaux, footslopes and foothills up to 600m ASL and within the Sydney basin below 350m ALS Characteristic Species: Principally encompasses the following groupings of Floyd (1990): Argyrodendron trifoliatum alliance (suballiances 1, 5 & 6); Dendrocnide excelsa - Ficus spp. alliance (suballiances 14 & 15); and Drypetes australasica – Araucaria cunninghamii alliance (suballiances 21 & 22).	No suitable habitat present.
Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion	E	-	Geology / Soils: Shale-derived soils from Narrabeen series geology Topography: Undulating to rolling hills. Characteristic Species: Corymbia maculata and Eucalyptus paniculata.	No suitable habitat present.
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	Geology / Soils: Silts, clay-loams and sandy loams. Topography: Periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. Characteristic Species: Eucalypt canopy with species belonging to the genus Angophora or the sections Exsertaria or Transversaria of the genus Eucalyptus. Has low abundance of E. robusta, Casuarina and Melaleuca species and a groundcover of soft-leaved forbs and grasses.	No suitable habitat present.
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	Geology / Soils: Waterlogged or periodically inundated grey-black clay-loams and sandy loams, where the groundwater is saline or sub- saline. Topography: Flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Characteristic Species: Casuarina glauca.	Suitable habitat present. Observed during surveys.
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	Geology / Soils: Waterlogged or periodically inundated humic clay loams and sandy loams. Topography: Alluvial flats and drainage lines associated with coastal floodplains. Characteristic Species: Eucalyptus robusta, E. longifolia, E. botryoides, Melaleuca quinquenervia and M. ericifolia.	Suitable habitat present. Observed during surveys.

Name	BC Act	EPBC Act	Habitat Requirements	Comments
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	E	-	Geology / Soils: Generally on the Warriewood and Tuggerah Soil Landscapes. Topography: Freshwater swamps in swales and depressions on sand dunes and low nutrient sand plain sites in coastal areas. Characteristic Species: Eleocharis sphacelata, Baumea juncea, B. rubiginosa, B. articulata, Gahnia sieberiana, Ludwigia peploides and Persicaria sp.	No suitable habitat present.
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	E	-	Geology / Soils: Found on a range of substrates including old sand dunes above cliffs and on basalt headlands, and less frequently on sandstone. Topography: Sea cliffs and coastal headlands. Characteristic Species: Themeda australis.	No suitable habitat present.
Umina Coastal Sandplain Woodland in the Sydney Basin Bioregion	E	-	Geology / Soils: Holocene sediments of coastal sand. Iron podzols on the Woy Woy Soil Landscape. Topography: Sand plains on the Woy Woy Peninsula at Umina and Pearl Beach. Characteristic Species: Eucalyptus botryoides and Angophora floribunda with a diverse understorey of sclerophyllous shrubs.	No suitable habitat present.

Key to BC Act and EP&BC Act Status

Ext = Extinct - P. Ext = Presumed Extinct - CE = Critically Endangered – E = Endangered - V = Vulnerable Species

4.5 Endangered populations

Two threatened populations were identified from the desktop review to occur within the locality of the site:

- *Eucalyptus oblonga* (Narrow-leaved Stringybark) population at Bateau Bay; and
- *Eucalyptus parramattensis* subsp. *parramattensis* population in the Wyong and Lake Macquarie LGAs

No endangered populations were identified nor were the habitats which were identified within the study area considered to be suitable for the aforementioned populations.

4.6 Threatened Flora

A search of the Bionet Atlas of NSW Wildlife (DPE 2023) was undertaken to identify records of threatened flora species located within 10 km of the site. This allowed for a specific search for threatened flora to be undertaken to determine if any threatened flora species are present within the subject site. Details on threatened flora species as listed in Schedules 1 and 2 are provided in Table 9 (below).

No threatened species of plant were recorded in the study area during this investigation, despite eight (8) threatened flora species having been identified as a result of the database searches within the locality.

Table 8: Threatened flora species identified in the TBDC and BIONET database searches

Table 8: Threatened flora surveys identified in the TBDC and BIONET database searches

Common name	Scientific name	BC Act status	SAII Entity	Targeted surveys conducted	Ideal survey period (TBDC)	Relevant guidelines	Habitat Constraints (from BAM- C)	Habitat requirements	Justification for exclusion	Biodiversity risk weighting	Sensitivity to gain class	No. of BIONET records in the locality (accessed 4/3/23)	Further consideration required?
Sand Spurge	*Chamaesyce psammogeton*	*E*	No	Yes	All year round			*Results 1-5 of 5* *Habitat Order* *Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (Spinifex sericeus) and Prickly Couch (Zoysia macrantha) 1* *Flowering recorded in spring and summer. 2* *Sand Spurge seeds float, so some dispersal between beaches may occur. 3* *Longevity of the species is approximately 5 – 30 years with a primary juvenile period of less than 1 year. 4* *Plant growth occurs in spring and summer.*	*This species was not recorded during targeted surveys* *Suitable habitat is absent*		High	10	No
	Diuris praecox	*V*	No	Yes	August Survey season differs based on location. Survey Newcastle area and north of Newcastle early Aug. Survey remainder of distribution any time during Aug. Recommend checking a local reference population before surveying to identify flowering times.			*Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. 1* *Exists as subterranean tubers most of the year. It produces leaves and flowering stems in winter.*	*This species was not recorded during targeted surveys* *Suitable habitat is absent*		High	114	No
Camfield's Stringybark	*Eucalyptus camfieldii*	*V*	No	Yes	All year round Identifiable throughout year by epicormic growth or juvenile foliage. Juvenile foliage isn't representative of E. camfieldii in the northern populations.			*Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. 1* *Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. 2* *Associated species frequently include stunted species of E. oblonga Narrow-leaved Stringybark, E. capitellata Brown Stringybark and E. haemastoma Scribbly Gum. 3* *Population sizes are difficult to estimate because its extensive lignotubers may be 20 m across. A number of stems arise from these lignotubers giving the impression of individual plants. 4* *Flowering period is irregular, flowers recorded throughout the year. 5* *Poor response to too frequent fires.*	*This species was not recorded during targeted surveys* *Suitable habitat is absent*		High	30	No
Biconvex Paperbark	*Melaleuca biconvexa*	*V*	No	Yes	All year round			*Habitat Order* *Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. 1* *Flowering occurs over just 3-4 weeks in September and October. 2* *Resprouts following fire.*	*This species was not recorded during targeted surveys*		High	83	No

Common name	Scientific name	BC Act status	SAII Entity	Targeted surveys conducted	Ideal survey period (TBDC)	Relevant guidelines	Habitat Constraints (from BAM- C)	Habitat requirements	Justification for exclusion	Biodiversity risk weighting	Sensitivity to gain class	No. of BIONET records in the locality (accessed 4/3/23)	Further consideration required?
Coast Headland Pea	*Pultenaea maritima*	*V*	No	Yes	All year round			*The species occurs in grasslands, shrublands and heath on exposed coastal headlands and adjoining low coastal heath. 1* *Found on clay or sandy loam or clay loam over sandstone at altitude 5–30 m . 2* *Associated with Banksia integrifolia and Themeda australis. 3* *Flowers from (June) August to March; fruit occurs from January to March.*	*This species was not recorded during targeted surveys* *Suitable habitat is absent*		High	10	No
Coast Groundsel	*Senecio spathulatus*	*E*	No	Yes	Survey: Flowers sporadically throughout the year. Check local reference sites for flowering period. Survey when flowering as species is more obvious and identifiable, as easily confused with with S. pinnatifolius var pinnatifoloius. Strongly recommend expert report to discount presence or absence if flowering is not observed.		*Headlands within 500 m of the coast*	*Coast Groundsel grows on frontal dunes.*	*This species was not recorded during targeted surveys* *Suitable habitat is absent*		High	4	No
	Syzygium paniculatum	*E*	No		April – May Survey: Use fruit to identify. Naturally occurring plants generally produce low numbers of fruit, while cultivated individuals and offspring generally produce high numbers of fruit. Samples need to be verified by RBG to detect hybridisation. Recruitment strategy: Apomictic clonal species with extremely low genetic diversity across its whole distribution.			*On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest.1* *On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.*	*This species was not recorded during targeted surveys*		High	17	No
Narrow-leafed Wilsonia	*Wilsonia backhousei*	*V*	No	*Yes*	All year round		*Beaches and rock platforms adjacent to beaches, or anywhere saline|Waterbodies Margins of salt marshes and lakes on the coast*	*This is a species of the margins of salt marshes and lakes. 1* *Flowering occurs in spring and summer.*	*This species was not recorded during targeted surveys* *Suitable habitat is absent*		Moderate	1	No
Tall Knotweed	*Persicaria elatior*	*V*	*No*	*Yes*		*No*	*Semi-permanent/ephemeral wet areas* *or within 50 m|Swamps* *or within 50 m|Waterbodies including Wetlands, or within 50 m*	*This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.*	*This species was not recorded during targeted surveys*	Very High -3	High Sensitivity to Potential Gain	0	No
Tranquility Mintbush	*Prostanthera askania*	*E*	*No*	*Yes*	*September-November*			*Occurs adjacent to, but not immediately in, drainage lines on flat to moderately steep slopes formed on*	*This species was not recorded during targeted surveys*	2	High Sensitivity to Potential Gain	50	No

Common name	Scientific name	BC Act status	SAII Entity	Targeted surveys conducted	Ideal survey period (TBDC)	Relevant guidelines	Habitat Constraints (from BAM- C)	Habitat requirements	Justification for exclusion	Biodiversity risk weighting	Sensitivity to gain class	No. of BIONET records in the locality (accessed 4/3/23)	Further consideration required?
								Narrabeen sandstone and alluvial soils derived from it.1 *Occurs in moist sclerophyll forest and warm temperate rainforest communities, and the ecotone between them. These communities are generally tall forests with a mesic understorey; Sydney Blue Gum Eucalyptus saligna and Turpentine Syncarpia glomulifera are usually present, though canopy species present can be highly variable. 2* *Ecological knowledge about this species is very limited. 3* *The species is likely to be fire-sensitive given the moist forest habitats it occupies, however, its fire ecology is currently unknown. 4* *May be a colonising species that takes advantage of increased light following natural canopy-cover disturbance. May be out competed by invading weed species such as Lantana. 5* *Appears in some locations to propagate vegetatively by 'stem-layering' where prostrate branches take root where they remain in contact with the soil. This characteristic and the species' tendency at many sites to form dense clumps make accurate counting of individual plants within populations difficult. 6* *Flowering usually occurs in spring, however, it is known that the timing of both flowering and fruiting can be variable.*	*Suitable habitat is absent*				
Eucalyptus oblonga	*Eucalyptus oblonga population at Bateau Bay, Forresters Beach and Tumbi Umbi in the Wyong local government area*	*E1*	*No*	*Yes*	*All year*			*Normally found on in dry open forest with infertile sandy soils on sandstone. The population at Bateau Bay occurs on coastal sands.*	*This species was not recorded during targeted surveys* *Suitable habitat is absent*	2	High Sensitivity to Potential Gain	18	No
Scrub Turpentine	*Rhodamnia rubescens*	*CE*	*Yes*	*Yes*	*All year*			*Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. 1* *This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.*	*This species was not recorded during targeted surveys* *Suitable habitat is absent*	2	High Sensitivity to Potential Gain	57	No
Native Guava	*Rhodomyrtus psidioides*	*E4*	*Yes*		*All year*			*Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. 1* *This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.*	*This species was not recorded during targeted surveys* *Suitable habitat is absent*	2	High Sensitivity to Potential Gain	3	No

BC Act listings:

CE = Critically Endangered Species
E= Endangered
V =Vulnerable
E1= Endangered population
E4= Presumed extinct

4.7 Threatened fauna

Seventy-three (73) threatened fauna species were identified as a result of the database searches as occurring or having potential to occur within the locality of the study area (Table 9).

In respect of matters required to be considered under the EP&A Act and relating to the species / provisions of the BC Act, three (3) threatened fauna species Little Bent-winged Bat (*Miniopterus australis*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*). These bat species were recorded foraging on site, however, important breeding habitat that are critical to the life cycle of local populations of this species are absent.

BC Act – A search of the *Atlas of NSW Wildlife* (DPIE, 2022) provided a list of threatened fauna species previously recorded within a 10km radius of the development footprint.

These species are listed in Table 9 and are considered for potential habitat within the development footprint. Strictly estuarine and oceanic threatened species found within 10km have not been included as no marine / aquatic habitats occur within the development footprint.

Table 9: Threatened fauna species likely to occur in the locality

Table 9: Threatened fauna species considered and their habitat requirements

Common Name Scientific Name	BC Act	EP&BC Act	Preferred Habitat
Wallum Froglet *Crinia tinnula*	V	-	Found in acidic paperbark swamps and wallum countrywith dense groundcover. Breeds in temporary and permanent pools and pondsof high acidity.
Red-crowned Toadlet *Pseudophryne australis*	V	-	Prefers sandstone areas, breeds in grass and debris beside non-perennial creeksor gutters. Shelters under logs and rocks in non -breeding periods.
Green and Golden Bell Frog*Litoria aurea*	E	V	Breeding habitat consists ofshallow (<1m) ponds or slowly moving waterways which undergo disturbance regimes such as fluctuating water flow or inflow of salinewater with both areas of open water and dense lowvegetation.
Stephens' Banded Snake *Hoplocephalus stephensii*	V	-	A nocturnal and partly arboreal species that inhabitsopen and closed forest communities sheltering underbark, in hollows and under exfoliating slabs of granite.
Wompoo Fruit-Dove *Ptilinopus magnificus*	V	-	Inhabits large undisturbed patches of lowland, adjacenthighland rainforest and moist eucalypt forests feeding onfruit.
Superb Fruit-Dove *Ptilinopus superbus*	V	-	Rainforests, adjacent mangroves, eucalypt forests,scrublands with native fruits.
Black-necked Stork *Ephippiorhynchus asiaticus*	E		Prefers shallow, permanent,freshwater terrestrial wetlands, and surrounding marginal vegetation.

Common Name Scientific Name	BC Act	EP&BC Act	Preferred Habitat
Australasian Bittern *Botaurus poiciloptilus*	E	E	Inhabits shallow freshwater or brackish wetlands with tall dense beds of reeds, sedges or rush species and swamp edges.
Black Bittern *Ixobrychus flavicollis*	V	-	Prefers permanent freshwater wetlands with tall, dense vegetation.
Square-tailed Kite *Lophoictinia isura*	V		Utilises coastal and sub- coastal open forest, woodland or lightly timbered habitats.
Little Eagle *Hieraaetus morphnoides*	V		Inhabits a variety of habitats including woodland open forest, partially cleared areas, along watercourses and around wetlands.
Eastern Osprey *Pandion cristatus*	V	-	Utilises waterbodies including coastal waters, inlets, lakes, estuaries and offshore islands with a dead tree for perching and feeding.
Bush Stone- curlew Burhinus grallarius	E	-	Open woodland, pasture areas.
Gang-gang Cockatoo Callocephalon fimbriatum	V		Prefers wetter forests and woodlands from sea level to > 2000m on Divide, timbered foothills and valleys, timbered watercourses, coastal scrubs, farmland and suburban gardens.
Glossy Black-Cockatoo Calyptorhynchus lathami	V		Open forests with Allocasuarina species and hollows for nesting.
Swift Parrot Lathamus discolor	E	E	Inhabits eucalypt forests and woodlands with winter flowering eucalypts.
Little Lorikeet Glossopsitta pusilla	V		Inhabits forests and woodlands feeding mostly on nectar and pollen particularly in profusely-flowering eucalypts.
Barking Owl Ninox connivens	V		Inhabits principally woodlands but also open forests and partially cleared land and utilises hollows for nesting.
Powerful Owl Ninox strenua	V		Mature forests containing large hollows for breeding & densely vegetated gullies for roosting.

Common Name Scientific Name	BC Act	EP&BC Act	Preferred Habitat
Masked Owl Tyto novaehollandiae	V		Open forest & woodlands with cleared areas for hunting and hollow trees or dense vegetation for roosting.
Sooty Owl Tyto tenebricosa	V	-	Tall, dense, wet forests containing trees with very large hollows for roosting and breeding.
Regent Honeyeater Anthochaera phrygia	CE	E	Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts.
Varied Sittella Daphoenositta chrysoptera	V		Prefers open eucalypt woodlands and forests, mallee, inland acacia, coastal tee-tree scrubs, parks and gardens.
Spotted-tailed Quoll Dasyurus maculatus	V	E	Inhabits a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub- alpine zone to the coastline. Shelters in hollow-bearing trees, fallen logs, small caves and rock crevices.
Koala Phascolarctos cinereus	V	V	Inhabits both wet & dry eucalypt forest on high nutrient soils containing preferred feed trees.
Eastern Pygmy-possum Cercartetus nanus	V	-	Found in a variety of habitats from rainforest through open forest to heath. Feeds on insects but also gathers pollen from banksias, eucalypts and bottlebrushes. Nests in banksias and myrtaceous shrubs.
Yellow-bellied Glider Petaurus australis	V		Inhabits tall mature eucalypt forests with high nectar producing species and shelters in large hollow bearing trees.
Squirrel Glider Petaurus norfolcensis	V		Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and coastal forest with heath understorey. Shelters in tree hollows.

Common Name Scientific Name	BC Act	EP&BC Act	Preferred Habitat
Grey-headed Flying-fox Pteropus poliocephalus	V	V	Found in a variety of habitats including rainforest, mangroves, paperbark swamp, wet and dry open forest and cultivated areas. Forms camps commonly found in gullies and in vegetation with a dense canopy.
Yellow-bellied Sheathtail-bat Saccolaimus flaviventris	V	-	Inhabits wet and dry sclerophyll forest, open woodland, shrubland, mallee, grassland and desert. Roosts in tree hollows.
Eastern Coastal Freetail-bat Micronomus norfolkensis	V		Inhabits eucalypt forest and woodland on the coastal side of the Great Dividing Range. Roosts in tree hollows, under bark and in various man- made structures.
Eastern Cave Bat Vespadelus troughtoni	V	V	Warm-temperate to subtropical dry sclerophyll forest and woodland. Roosts in caves, tunnels and tree hollows in colonies.
Eastern False Pipistrelle Falsistrellus tasmaniensis	V		Inhabits wet sclerophyll forest, open forest, rainforest and coastal mallee. Roosts mostly in roosts in hollow trunks of eucalypts but also in caves and man-made structures.
Large Bentwing- bat Orianae australis	V		Inhabits rainforest, vine thicket, wet and dry melaleuca swamps and coastal forests. Roosts in caves, man-made structures such as abandoned mines and buildings and occasionally banana trees and tree hollows.
Eastern Bentwing-bat Miniopterus schreibersii oceanensis	V		Inhabits rainforest, wet and dry sclerophyll forest, open woodland, Melaleuca forests and open grassland. Roosts in caves and man-made structures.
Southern Myotis Myotis macropus	V		Roosts in caves, mines, tunnels, buildings, tree hollows and under bridges. Forages over open water.

Common Name Scientific Name	BC Act	EP&BC Act	Preferred Habitat
Greater Broad-nosed Bat Scoteanax rueppellii	V		Inhabits moist gullies in mature coastal forest, rainforest, open woodland, Melaleuca swamp woodland, wet and dry sclerophyll forest, cleared areas with remnant trees and tree-lined creeks in open areas. Roosts in tree hollows, cracks and fissures in trunks and dead branches, under exfoliating bark, and in man-made structures.
Giant Dragonfly Petalura gigantea	E	-	Inhabits permanent swamps and bogs with some free water and open vegetation.
CE = Critically Endangered Species Ext. = Presumed Extinct Species V = Vulnerable Species E = Endangered Species			

Table 9a: Threatened fauna considered in assessment

The DPIE NSW Threatened Biodiversity Profile Search at: https://www.environment.nsw.gov.au/threatenedspeciesapp/, and

The DAWE 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.

Threatened fauna species habitat assessment

Common name	*Scientific name*	*BC Act*		*EPBC Act*		Recorded on site	If not recorded on site				Considered in test of significance (Appendix D)
		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	x	-	-	x	x
Giant Burrowing Frog	*Heleioporus australiacus*	V	-	V	✓	x	x	-	-	x	x
Red-crowned Toadlet	*Pseudophryne australis*	V	✓	-	-	x	marginal	✓	x	unlikely	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	x	-	-	x	x
Mahony's Toadlet	*Uperoleia mahonyi*	E	-	-	✓	x	x	-	-	x	x
Broad-headed Snake	*Hoplocephalus bungaroides*	E	-	V	✓	x	x	-	-	x	x
Freckled Duck	*Stictonetta naevosa*	V	✓	-	-	x	x	-	-	x	x
Wompoo Fruit-dove	*Ptilinopus magnificus*	V	✓	-	-	x	x	-	-	x	x
Superb Fruit-dove	*Ptilinopus superbus*	V	✓	-	-	x	x	-	-	x	x
White-throated Needletail	*Hirundapus caudacutus*	-	✓	V	✓	x	✓	✓	✓	✓	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

Common name	*Scientific name*	*BC Act*		*EPBC Act*		Recorded on site	If not recorded on site				Considered in test of significance (Appendix D)
		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	
White-bellied Sea Eagle	*Haliaeetus leucogaster*	V	✓	-	-	x	Sub-optimal	✓	✓	✓	x
Square-tailed Kite	*Lophoictinia isura*	V	✓	-	-	x	✓	✓	✓	✓	x
Eastern Osprey	*Pandion cristatus*	V	✓	-	-	x	x	-	-	x	x
Grey Falcon	*Falco hypoleucos*	V	-	V	✓	x	x	-	-	x	x
Bush Stone-curlew	*Burhinus grallarius*	E	✓	-	-	x	✓	x	x	Not likely	x
Australian Painted Snipe	*Rostratula australis*	E	-	E	✓	x	x	-	-	x	x
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V	✓	-	-	x	x	-	-	x	x
Little Lorikeet	*Glossopsitta pusilla*	V	✓	-	-	x	✓	✓	x	✓	x
Swift Parrot	*Lathamus discolour*	E	✓	E	✓	x	✓	✓	x	✓	✓
Barking Owl	*Ninox connivens*	V	✓	-	-	x	marginal	x	x	Not likely	x
Powerful Owl	*Ninox strenua*	V	✓	-	-	x	marginal	✓	✓	✓	x
Masked Owl	*Tyto novaehollandiae*	V	✓	-	-	x	marginal	✓	x	unlikely	x
Sooty Owl	*Tyto tenebricosa*	V	✓	-	-	x	x	-	-	x	x
Regent Honeyeater	*Xanthomyza Phrygia*	E4A	✓	CE	✓	x	✓	x	x	Not likely	x
Painted Honeyeater	*Grantiella picta*	V	-	V	✓	x	x	-	-	x	x
Varied Sittella	*Daphoenositta chrysoptera*	V	✓	-	-	x	Sub-optimal	x	x	unlikely	✓
Spotted-tailed Quoll	*Dasyurus maculatus*	V	✓	E	✓	x	marginal	x	x	Not likely	x
Koala	*Phascolarctos cinereus*	V	✓	V	✓	x	marginal	x	x	Not likely	x
Eastern Pygmy Possum	*Cercatetus nanus*	V	✓	-	-	x	✓	✓	x	unlikely	x
Yellow-bellied Glider	*Petaurus australis*	V	✓	-	-	x	marginal	x	✓	unlikely	x
Squirrel Glider	*Petaurus norfolcensis*	V	✓	-	-	x	✓	✓	✓	low	x
Greater Glider	*Petauroides volans*	-	✓	V	✓	x	marginal	x	x	Not likely	n/a
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	If not recorded on site				Considered in test of significance (Appendix D)
		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	
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	-	V	✓	x	x	-	-	x	x
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	✓	V	✓	x	✓	✓	✓	✓	✓
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	V	✓	-	-	x	✓	x	✓	low	✓
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	-	V	✓	x	x	-	-	x	x
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	✓	-		x	✓	x	✓	low	✓
Southern Myotis	*Myotis macropus*	V	✓	-	-	x	✓	x	✓	unlikely	✓
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	-	-	-	✓	-	-	-	-	✓
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V	✓	-	-	x	✓	✓	✓	✓	✓
Little Bent-winged Bat	*Miniopterus australis*	V	✓	-	-	✓	-	-	-	-	✓
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	V	✓	-	-	✓	-	-	-	-	✓
Eastern Cave Bat	*Vespadelus troughtoni*	V	✓	-	-	x	x	-	-	x	x
New Holland Mouse	*Pseudomys novaehollandiae*	-	-	V	✓	x	✓	x	x	unlikely	n/a
Giant Dragonfly	*Petalura gigantean*	E	✓	-		x	x	-	-	x	x
Australian Greyling	*Prototroctes maraena*	P2, S19 – (*FM Act*)		V		x	x	-	-	x	x
		V	Vulnerable								
		E / E1	Endangered								
		E4A / CE	Critically endangered								

Potential to occur

Unlikely	Represents a low margin to occur, but not enough to 100% rule it out. A test of significance is required.
Not likely	Means no real chance of occurring, despite there being potential habitat. A test of significance is not applied to these species.

Table 11 :Migratory Species considered to have suitable habitat within the study area

Table 11: Migratory Species considered to have suitable habitat within the study area

An assessment of potential habitat within the study area for nationally *protected* migratory fauna species recorded within 10km on the *EPBC Act* Protected Matters Tool.

Protected migratory bird 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.	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
Fork-tailed Swift (Apus pacificus)	Aerial: over open country, from semi-arid deserts to coasts, islands; sometimes over forests, cities. Breeds Siberia, Himalayas, east to Japan south east Asia. Summer migrant to east Australia. Mass movements associated with late summer low pressure systems into east Australia. Otherwise uncommon.	✓	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	-	-

Common name *Scientific name*	Preferred habitat *Migratory breeding*	Suitable habitat present	Recorded on site	Comments
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	-	-
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	-	-
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	-	-

4.9 Swift Parrot Important Area Mapping (DPIE 2020)

The site is mapped on the NSW DPIE 'Important Area' mapping for Swift Parrot reproduced in Figure 12.

This area covers eastern boundary of the site.

Notes on Important Area habitat maps for a threatened species (DPIE 2022a):

For a small number of species, the habitat constraint information in the Threatened Biodiversity Data Collection (TBDC) refers to an important habitat map (Biodiversity Assessment Method (BAM) section 5.1.3).

Important habitat maps identify areas that are considered essential to support critical life stages of the species, e.g. breeding areas or locations important for foraging/over-wintering for migratory species. These species are dual credit species assessed for species (important habitat map) and ecosystem credits (all other areas the species is likely to occur).

Very few dual credit species have important habitat maps. The approach is restricted to species that are highly mobile and difficult to reliably detect by survey, and for which DPIE holds extensive, long-term data sets that indicate the importance of areas in the landscape.

Under the BAM 22020, no further survey is required if the subject land is on an important habitat map for a species unless the species profile in the TBDC states otherwise. The species is considered present and the part of the subject land that is within the important habitat map forms the species polygon used to generate species credits (BAM section 5.2.5 Box 2). Any remaining habitat on the subject land, e.g. foraging, unmapped locations used by these species is assessed for ecosystem credits. Species credits can only be created at biodiversity stewardship sites that are within the important habitat map for the species.

If the species is at risk of a serious and irreversible impact (SAII), the area mapped as important habitat is the area identified as a potential SAII and section 9.1 of the BAM will need to be addressed.

This assessment has not been conducted in accordance with the biodiversity assessment methodology (BAM) as this is not a Biodiversity Assessment Report (BDAR). However, we have noted the fact that the site (eastern boundary) does form part of the Swift Parrot Important Areas map (Figure 12).

As these areas do not require any more native vegetation removal to achieve APZ requirements (other than weed removal) we have not considered the impacts to migratory Swift Parrot populations any further.

The mapped Swift Parrot important areas in the proposal need to be avoided and protected through restriction-to-user (88b instrument). These areas should also be subject to a vegetation management plan to improve the biodiversity values. Avoid areas through restriction-to-user and VMP areas should be reflected in the DCP.

Figure 12: Important Area mapping for Swift Parrot (Source: https://webmap.environment.nsw.gov.au/Html5Viewer291/index.html?viewer=BAM_ImportantAreasaccessed 17 March 2022)

Planning, Industry & Environment

BAM Important Areas

Legend

- Swift Parrot Important Areas
- Migratory Shorebird Important Areas
- Regent Honeyeater Important Areas
- Plains-wanderer Important Areas

0 0.2 0.3 0.7

Kilometres

Map Created 9:11 PM 14/8/2023

5. Assessment of Ecological Impacts

This chapter evaluates if the proposed development will significantly impact on ecological processes and the conservation value of the subject site and neighbouring bushland areas, especially with respect to threatened biota and migratory fauna species, and their habitats, and on the ecological integrity of the landscape. It also recommends ways in which impacts can be minimised or avoided.

The site is mostly cleared of native vegetation and contains scattered trees that provides limited arboreal connectivity between adjacent vegetation. Given the limited impact of the proposal on remnant canopy vegetation, it is considered the proposal is unlikely to significantly impact on connectivity or movement corridors.

Impacts to Ecological Communities

The vegetation communities occurring on-site are not part of an endangered ecological community.

Impacts to Native Flora and Vegetation Communities

The site comprises of predominantly cleared/ hard surface areas in the existing bus depot operations. There are 'parkland type' landscaped areas comprising of remnant native trees with a maintained exotic lawn understorey for the western portion (entrance to the site).

The north-eastern and eastern boundary of the site contains remnant native vegetation that has been mapped by Council as 'Coastal Sand Wallum Heath' (CC_DHo06i) according to the classification system of Bell (2019). This same vegetation community is consistent with the BIONET Vegetation Classification system for Plant Community Type (PCT) No. 1703 '*Wallum Banksia- Monotoca scoparia Heath on Coastal Sands of the Central Coast and lower North Coast*'. Due to the lack of native resilience (absence of native soil seed bank/ ability to regenerate itself), the vegetation considered to be in poor condition.

Impact to SBV and IASP mapped areas can be avoided by an 88b instrument (RDA) and 88e positive covenant (VMP for APZ management) on the titles of affected proposed Lots.

Impacts to Fauna and Fauna Habitat

In respect of matters required to be considered under the EP&A Act and relating to the species / provisions of the BC Act, three (3) threatened fauna species Little Bent-winged Bat (*Miniopterus australis*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*) – all of which are highly mobile insectivorous microchiropteran bat species. These bat species were recorded foraging around the dam on site, however, important breeding habitat that are critical to the life cycle of local populations of these species are absent.

Hollow-bearing branches (less than 10cm) trees observed within the study area (within the 'parkland' type landscaped garden areas). However, no significant habitat trees of notable or potential importance to threatened fauna were identified.

The proposed development is not likely to have a significant impact on native fauna species.

The habitat proposed for removal on-site is considered to provide minimal fauna habitat value. It is not likely that these species will be significantly impacted by the proposed development.

Overall loss of terrestrial flora and fauna habitat

Biodiversity is the diversity and richness of living things. This includes the variety of plant communities and animal habitats, and the number of different species. Most natural areas support a complex mixture of different species and plant communities. Biodiversity in disturbed areas is generally lower than in more pristine areas. An awareness on native biodiversity emphasis the conservation of the variety of native life, rather just rare or threatened species.

There are three important principles associated with ESD. These are:

- maintenance of native biodiversity
- erring on the side of caution when assessing and taking risks with the biological environment; and
- passing on to future generations a natural environment that is at least as good and enjoyable as our own.
- many species of forest flora and fauna are threatened both nationally and within NSW. This is largely a result of the clearing of this native habitat.

The proposed development is unlikely to result in the loss of biodiversity at a local, regional, state or national level. This is because of the small area of bushland to be removed from the site, the highly degraded or modified habitat area to be developed, the unlikelihood of the status of threatened or regionally significant species being significantly placed at risk, and the broader distribution of other fauna and flora species.

The proposal will have a minor interruption of upper canopy connectivity but this would not significantly impact upon the movement of wildlife and genetic exchange and dispersal of plant pollen in the local ecosystem.

Impacts on migratory species

Under the EPBC Act, a migratory species is significantly impacted on if a proposal will or is likely to:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycle), destroy or isolate an area of important habitat of the migratory species; or
- result in invasive species that are harmful to the migratory species becoming established in an area of important habitat of the migratory species; or
- seriously disrupt the life cycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

Significant habitat for migratory species does not exist on site.

No species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were recorded on site. Threatened flora and fauna previous recorded within 10km of the site (OEH 2019) and have the potential to occur site have been considered in the table provided in Appendix C and D.

This report complies with Section 7.3 of the BC Act which refers to requirement of a test of significance for determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats.

The proposal will **not** have a significant impact upon the local population of threatened species that may use the site a marginal foraging area.

Key threatening processes

Key Threatening Process under the *Biodiversity Conservation Act 2016* (NSW National Parks and Wildlife Service 2003) that are likely to further increase within the study area are:

- Clearing of native vegetation.
- Invasion of native plant communities by exotic perennial grasses.
- Removal of Dead Wood.
- Infection of native plants by *Phytophthora cinnamomi* - key threatening process listing. The proposal has potential to introduce or spread *Phytophthora cinnamomi* within the development area and into adjacent bushland. Mitigations measures are to be implemented to prevent spread of *Phytophthora cinnamomi*. Mitigation measures have been put in place to reduce the chance of infection of *Phytophthora cinnamomi* into the study area.
- Human Caused Climate Change.
- Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae

6. Significance Assessments (' five part tests')

This report complies with Section 7.3 of the BC Act which refers to requirement of a test of significance for determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats (Appendix D).

Assessments of significance were undertaken for Swift Parrot (*Lathamus discolor*), Grey- headed Flying-fox (*Pteropus poliocephalus*), Little Bent-winged Bat (*Miniopterus australis*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*).

Important breeding habitat that are critical to the life cycle of local populations of this species are absent.

It was concluded that the proposed development is unlikely to have a significant impact upon the local population of these species.

7. Conclusion

The site comprises of predominantly cleared/ hard surface areas in the existing bus depot operations. There are 'parkland type' landscaped areas comprising of remnant native trees with a maintained exotic lawn understorey for the western portion (entrance to the site).

The north-eastern and eastern boundary of the site contains remnant native vegetation that has been mapped by Council as 'Coastal Sand Wallum Heath' (CC_DHo06i) according to the classification system of Bell (2019). This same vegetation community is consistent with the BIONET Vegetation Classification system for Plant Community Type (PCT) No. 1703 'Wallum Banksia- Monotoca scoparia Heath on Coastal Sands of the Central Coast and lower North Coast'. Due to the lack of native resilience (absence of native soil seed bank/ ability to regenerate itself), the vegetation considered to be in poor condition.

These same areas of mapped remnant vegetation incorporate the APZ component of proposed Lots 13-23 and are in poor condition (or absent of any native vegetation), however, these same areas overlap the following NSW DPIE mapping:

- Sensitive Biodiversity Land Values Map (SBV)
- Important Areas for Swift Parrot (IASP)

In respect of matters required to be considered under the EP&A Act and relating to the species / provisions of the BC Act, three (3) threatened fauna species Little Bent-winged Bat (*Miniopterus australis*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*) – all of which are highly mobile insectivorous microchiropteran bat species. These bat species were recorded foraging around the dam on site, however, important breeding habitat that are critical to the life cycle of local populations of these species are absent.

Hollow-bearing branches (less than 10cm) trees observed within the study area (within the 'parkland' landscaped areas). However, no significant habitat trees of notable or potential importance to threatened fauna were identified.

Impact to SBV mapped areas can be avoided by an 88b instrument (RDA) and 88e instrument - positive covenant (e.g. VMP for APZ management) created on the titles of proposed Lots 13-23.

Assessments of significance were undertaken for Swift Parrot (*Lathamus discolor*), Grey- headed Flying-fox (*Pteropus poliocephalus*), Little Bent-winged Bat (*Miniopterus australis*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*).

Important breeding habitat that are critical to the life cycle of local populations of these species are absent.

The proposed works are unlikely to result in a significant impact upon species, populations and communities listed under the *Biodiversity Conservation Act 2016* and a Species Impact Statement is not required.

Significance assessments in accordance with section 5A of the Environmental Planning and Assessment Act 1979 and EPBC Act - Principal Significant Impact Guidelines 1.1. Matters of National Environmental Significance (Department of the Environment and Heritage 2005) determined that the project was unlikely to result in a significant impact to any threatened biodiversity listed under the *Biodiversity Conservation Act 2016* or *Environment Protection and Biodiversity Conservation Act 1999*.

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APPENDIX A: PROPOSED ZONING MASTER PLAN

LOW / MEDIUM DENSITY (1.97ha)

MEDIUM DENSITY (2.67ha)

'APZ' ~ PROPOSED ASSETT PROTECTION ZONE

'RC' ~ PROPOSED RIGHT OF CARRIAGEWAY

'ES' ~ PROPOSED EASEMENT FOR SERVICES

'A' ~ EASEMENT FOR ACCESS & DRAINAGE VARIABLE WIDTH (VIDE X821409)

'B' ~ EASEMENT TO DRAIN WATER 3 WIDE (VIDE T486712)

'C' ~ EASEMENT FOR ELECTRICITY AND OTHER PURPOSES 3.3m WIDE (DP 1226094)

'D' ~ EASEMENT FOR ELECTRICITY PURPOSES 10m WIDE (DP 627187)

DIAL 1100 BEFORE YOU DIG

IMPORTANT NOTES:

1. THIS PLAN HAS BEEN PREPARED FOR THE CLIENT LISTED ON THIS PLAN ONLY, FOR THE PURPOSE OF SHOWING PHYSICAL FEATURES OF THE LAND TO ASSIST IN DESIGNING THE FUTURE DEVELOPMENT DESCRIBED HEREON AS THE PROJECT AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.

2. UTILITY SERVICES SHOWN HEREON HAVE BEEN LOCATED WHERE POSSIBLE BY FIELD SURVEY. IF NOT ABLE TO BE LOCATED, KNOWN SERVICES HAVE BEEN SHOWN FROM THE RECORDS OF RELEVANT AUTHORITIES OR SERVICE PROVIDERS WHERE AVAILABLE.

PRIOR TO EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT AUTHORITY SHOULD BE CONTACTED FOR CONFIRMATION OF LOCATION OF SERVICES.
****** DIAL BEFORE YOU DIG (CALL 1100) ******

3. THE BOUNDARIES SHOWN HEREON ARE APPROXIMATE ONLY AND WERE DETERMINED FROM EXISTING TITLE DIMENSIONS. AS SUCH THESE DIMENSION COULD BE OUT OF DATE AND INCORRECT BY MODERN STANDARDS. THIS PLAN SHOULD NOT BE USED FOR BUILDING TO BOUNDARY OR FOR PRESCRIBED SETBACKS WITHOUT FURTHER SURVEY INVESTIGATION OF THE BOUNDARIES.

4. FOR ANY CONSTRUCTION ACTIVITIES PROPOSED IN CLOSE PROXIMITY TO THE BOUNDARIES OR PRESCRIBED SETBACKS, IT IS RECOMMENDED THAT THOSE BOUNDARIES BE MARKED TO AVOID THE POSSIBILITY OF ENCROACHMENT.

	AMENDMENTS	DATE
E	PEDESTRIAN ACCESS	7/12/22
D	LOW/MEDIUM DENSITY ZONING	14/10/22
C	AMENDED PROPOSED LOTS	12/10/22
B	PRELIMINARY SERVICING LAYOUT	31/1/22
A	ORIGINAL ISSUE	2/11/21

REGISTERED SURVEYOR

DRAWN KDM DATE 2/11/21

SURVEYED RD DATE 23/10/20

Barry Hunt Associates
REGISTERED SURVEYORS AND
LAND DEVELOPMENT CONSULTANTS
SUITE 4, 1 BOUNTY CL., TUGGERAH 2259
P.O. BOX 4144, BAY VILLAGE, 2261
PHONE (02) 43539644 FAX (02) 43533855
Email ~admin@surveyors.com.au

LOCALITY : 682A & 688 THE ENTRANCE RD, BATEAU BAY, L.G.A. CENTRAL COAST

PLAN : CONCEPT SUBDIVISION LAYOUT

LOT 3, 64 DP 716082, 22600 AREA 5.26ha 572m²

CLIENT : THE ENTRANCE RED BUS SERVICE PTY LTD

DATUM AUSTRALIAN HEIGHT DATUM SCALE 1:750(A1)

PROJECT : PROPOSED DEVELOPMENT

CAD REF: 55283DSUB SHEET 1 OF 1

APPENDIX B: PHOTOGRAPHS OF THE SITE

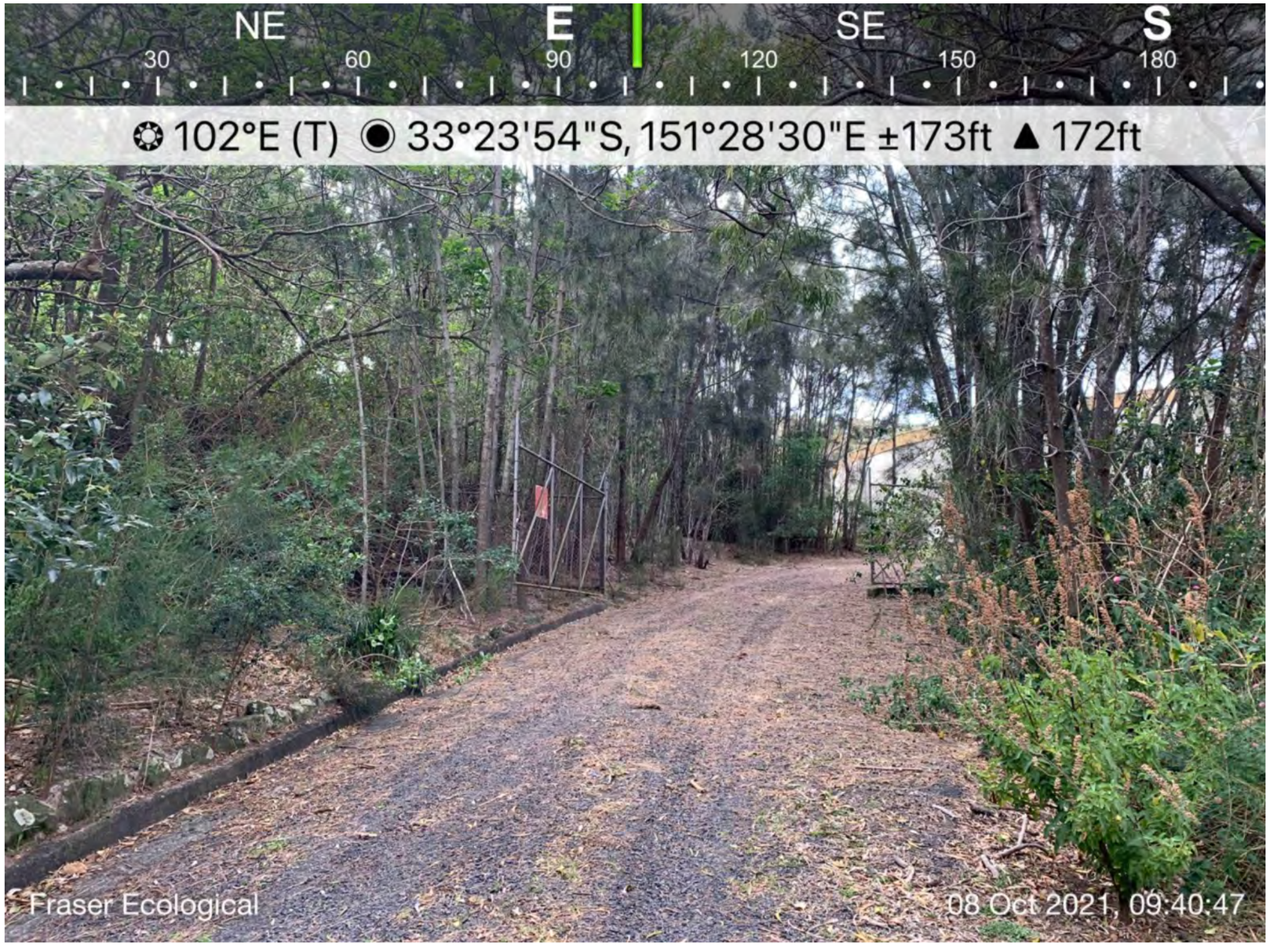
Photograph 1:

Photograph 2:

Photograph 3:

Photograph 4:

Photograph 5:

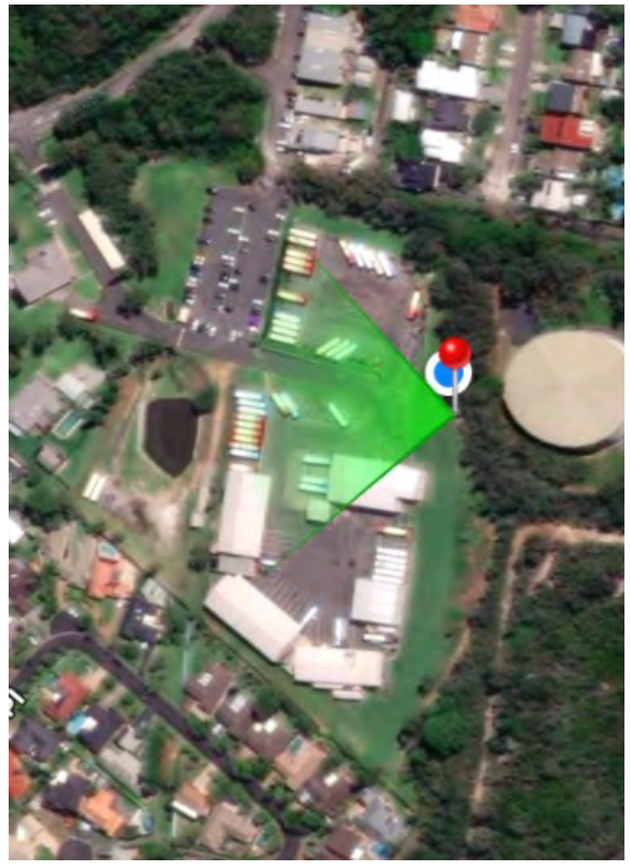


Photograph 6:

Photograph 7:

Photograph 8:

Photograph 9:



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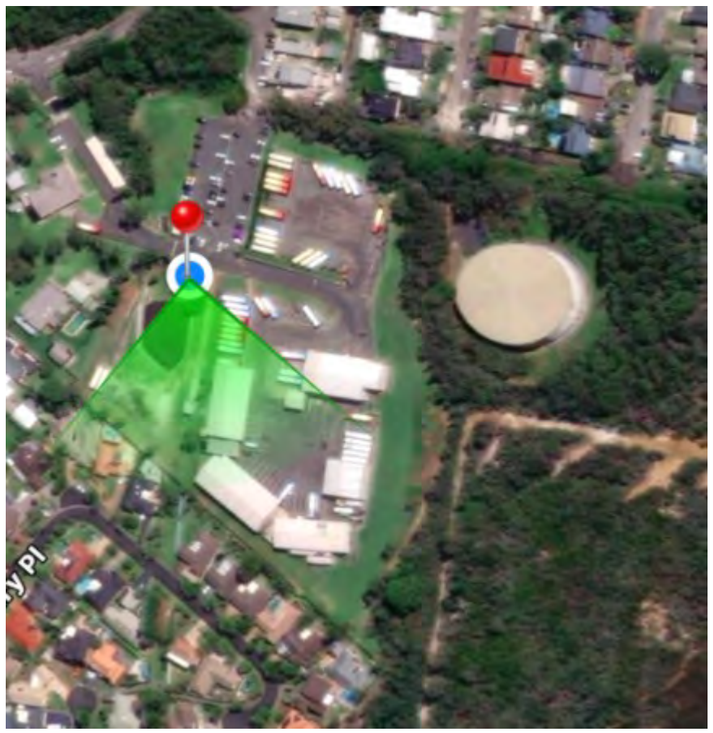

Photograph 9:


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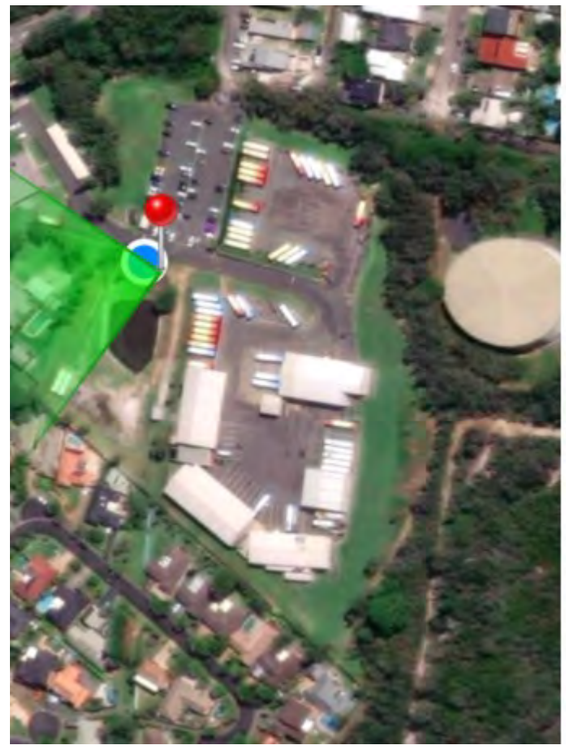
260°W (T)
33°23'52"S, 151°28'29"E ±13ft
167ft
Fraser Ecological
08 Oct 2021, 10:00:27

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287°W (T) 33°23'52"S, 151°28'27"E ±13ft 152ft


Coleridge Rd

APPENDIX C: EPBC PROTECTED MATTERS SEARCH TOOL DATABASE RESULTS

Australian Government

Department of Agriculture, Water and the Environment

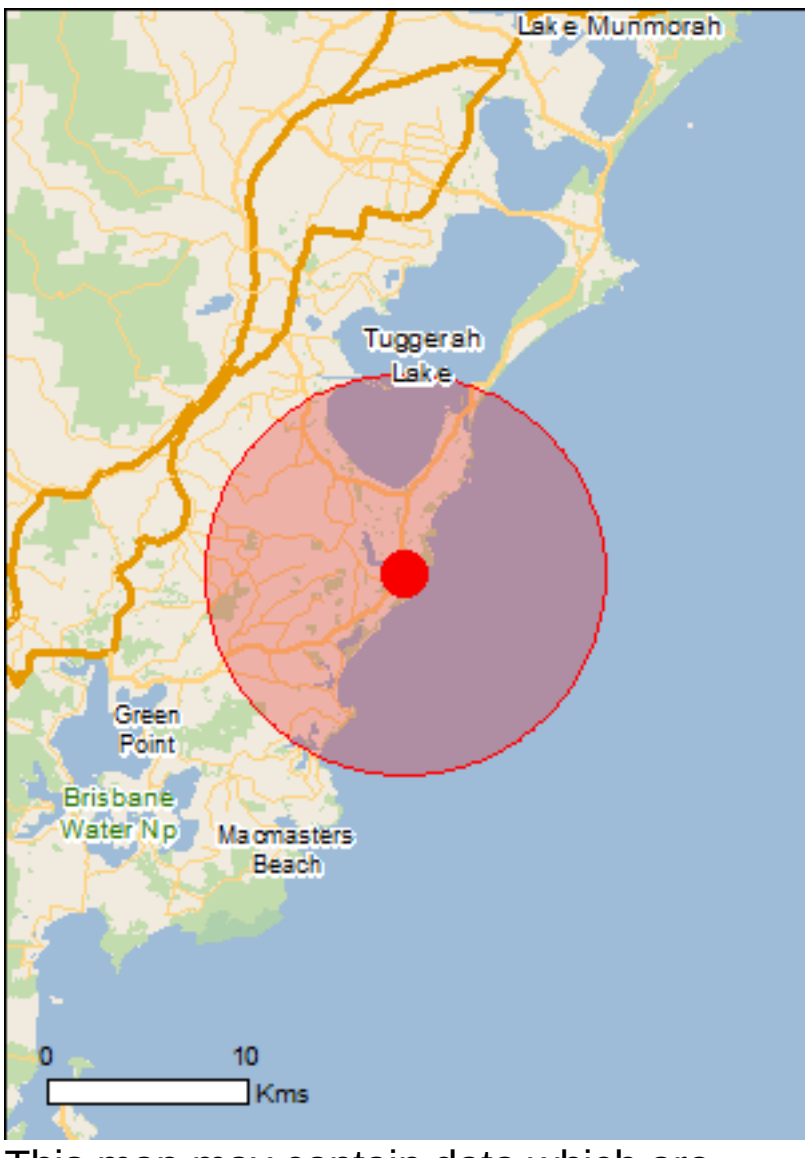
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

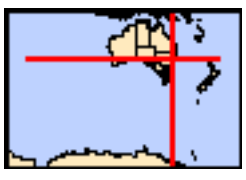
Report created: 12/10/21 09:27:31



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	91
Listed Migratory Species:	77

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	3
Commonwealth Heritage Places:	None
Listed Marine Species:	96
Whales and Other Cetaceans:	16
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	5
Regional Forest Agreements:	1
Invasive Species:	49
Nationally Important Wetlands:	4
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
Temperate East

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
		area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known to occur within area
[Diomedea antipodensis](#) Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea antipodensis gibsoni](#) Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea epomophora](#) Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea exulans](#) Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea sanfordi](#) Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
[Falco hypoleucos](#) Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
[Fregetta grallaria grallaria](#) White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
[Grantiella picta](#) Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
[Hirundapus caudacutus](#) White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
[Lathamus discolor](#) Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
[Limosa lapponica baueri](#) Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
[Macronectes giganteus](#) Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
[Macronectes halli](#) Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
[Pachyptila turtur subantarctica](#) Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
[Phoebetria fusca](#) Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
[Pterodroma leucoptera leucoptera](#) Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis cucullatus cucullatus Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur

Name	Status	Type of Presence within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat likely to occur within area
Uperoleia mahonyi Mahony's Toadlet [89189]	Endangered	Species or species habitat may occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat known to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Acacia bynoeana Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area
Acacia pubescens Downy Wattle, Hairy Stemmed Wattle [18800]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Acacia terminalis subsp. terminalis MS Sunshine Wattle (Sydney region) [88882]	Endangered	Species or species habitat may occur within area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area
Corunastylis insignis Wyong Midge Orchid 1, Variable Midge Orchid 1 [84692]	Critically Endangered	Species or species habitat likely to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Diuris praecox Newcastle Doubletail [55086]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus camfieldii Camfield's Stringybark [15460]	Vulnerable	Species or species habitat known to occur within area
Genoplesium baueri Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528]	Endangered	Species or species habitat likely to occur within area
Grevillea parviflora subsp. parviflora Small-flower Grevillea [64910]	Vulnerable	Species or species habitat likely to occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat known to occur within area
Melaleuca deanei Deane's Melaleuca [5818]	Vulnerable	Species or species habitat may occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area
Persoonia hirsuta Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat may occur within area
Prostanthera askania Tranquillity Mintbush, Tranquility Mintbush [64958]	Endangered	Species or species habitat known to occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat known to occur within area
Rutidosis heterogama Heath Wrinklewort [13132]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
[Syzygium paniculatum](#) Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area
[Tetratheca juncea](#) Black-eyed Susan [21407]	Vulnerable	Species or species habitat known to occur within area
[Thelymitra adorata](#) Wyong Sun Orchid [84724]	Critically Endangered	Species or species habitat likely to occur within area
[Thesium australe](#) Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
[Hoplocephalus bungaroides](#) Broad-headed Snake [1182]	Vulnerable	Species or species habitat may occur within area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
[Carcharias taurus (east coast population)](#) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
[Rhincodon typus](#) Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
[Anous stolidus](#) Common Noddy [825]		Species or species habitat likely to occur within area
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Ardenna carneipes](#) Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Breeding known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or

APPENDIX D: ASSESSMENTS OF SIGNIFICANCE

EPBC Assessment of Significance (Swift Parrot)

Under the *Environment Protection and Biodiversity Conservation Act 1999*, an action is likely to have a significant impact on a vulnerable species if it affects an important population of the species. Under the Principle Significant Impact Guidelines (Department of the Environment and Heritage 2006) an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations identified in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity
- populations that are near the limit of the species range.

The animals that may use the site are not considered to be part of an important population.

Will the action lead to a long-term decrease in the size of an important population of a species?

Swift Parrot (*Lathamus discolor*) utilising the study area would not constitute an important population. The proposal will modify approximately 0.2ha of foraging habitat for this species in the form of isolated trees within 100m of mapped Important Habitat for these (Vegetation Zone 1). Modification of this small area represents a small loss of the local extent of similar habitat.

No Swift Parrot roost sites are known from the mainland of Australia for this migratory Tasmanian species that are to be affected by the proposal. Swift parrots may utilise native tree specimens within Vegetation Zone 1 within the study area and may forage for lerps within Eucalypts as a seasonal foraging resource during their migratory influx to the south-east mainland of Australia. The proposal is unlikely to lead to a long-term decrease in the size of the local population.

Will the action reduce the area of occupancy of an important population?

Swift Parrot utilising the site would not be part of an important population. The proposed development will modify 0.2ha of habitat from within the study area, which contains suitable foraging habitat (lerps on eucalypts) for this species. The Swift Parrot is a highly mobile species that migrates from Tasmania to the south-east mainland of Australia. Therefore, the local population would not be

restricted to habitat resources within the site only.

Will the action fragment an existing important population into two or more populations?

Swift Parrots using the site for foraging purposes would not be part of an important population. The proposal to remove/modify a small area 0.2ha of habitat for Swift Parrots is unlikely to fragment an existing population into two or more populations. This species is not dependent upon the vegetation within the study area.

Will the action adversely affect habitat critical to the survival of a species?

No critical habitat has been listed for Swift Parrot under the *Environment Protection and Biodiversity Conservation Act 1999*. Known Swift Parrot roost are from known only from Tasmania, these may however be considered critical to the survival of local populations.

Will the action disrupt the breeding cycle of an important population?

No breeding sites of Swift Parrots were identified within the study area during the site surveys, this species breeds in Tasmania therefore it is considered that the action is unlikely to disrupt the breeding cycle of an important population.

Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The study area contains suitable foraging resources for the Swift Parrot. The action is unlikely to significantly decrease the availability of foraging habitat in the locality. The large foraging home range of this species allows offsite foraging resources to be accessed and isolation of habitat would not result from the development.

It is unlikely that the development would isolate and decrease the availability of quality habitat to the extent that the species is likely to decline.

Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat?

It is highly unlikely that invasive species (such as introduced predators) that are harmful to the Swift Parrot would become more established as a result of the action.

Will the action introduce disease that may cause the species to decline?

The proposal would not increase the likelihood of a disease becoming established or proliferating in the local population that would result in a decline of the species.

Will the action interfere with the recovery of the species?

A recovery plan has been prepared for the Swift Parrot; the proposal is consistent with the recovery objectives of the recovery plan. Therefore it is considered that the proposal is unlikely to interfere within the recovery of the Swift Parrot.

Conclusion

The Swift Parrot is unlikely to be significantly affected by the proposal.

EPBC Assessment of Significance (Grey- headed Flying-fox)

Under the *Environment Protection and Biodiversity Conservation Act 1999*, an action is likely to have a significant impact on a vulnerable species if it affects an important population of the species. Under the Principle Significant Impact Guidelines (Department of the Environment and Heritage 2006) an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations identified in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity
- populations that are near the limit of the species range.

The animals that may use the site are not considered to be part of an important population.

Will the action lead to a long-term decrease in the size of an important population of a species?

Grey-headed Flying-fox utilising the study area would not constitute an important population. The proposal will modify approximately 0.2ha of foraging habitat for this species. Modification of this small area represents a small loss of the local extent of similar habitat. Clearing of this small area of vegetation for the proposal represents a small loss of the local extent of similar habitat. No Grey- headed Flying-fox camps will be affected by the proposal. As such, the proposal is unlikely to lead to a long-term decrease in the size of the local population.

Will the action reduce the area of occupancy of an important population?

Grey-headed Flying-fox utilising the site would not be part of an important population. Proposed development within the study area will modify approximately 0.2ha of suitable foraging habitat for this species. The Grey-headed Flying-fox is a highly mobile and it may travel up to 50 km each night to forage. Therefore, the local population would not be restricted to habitat resources within the site only.

Will the action fragment an existing important population into two or more populations?

Grey-headed Flying-foxes using the site for foraging purposes would not be part

of an important population.

Will the action adversely affect habitat critical to the survival of a species?

No critical habitat has been listed for Grey-headed Flying-fox under the *Environment Protection and Biodiversity Conservation Act 1999*. Known Grey- headed Flying-fox camps may however be considered critical to the survival of local populations. No camps were identified within or near the study area.

Will the action disrupt the breeding cycle of an important population?

Grey-headed Flying-foxes using the study area would not be part of an important population.

Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The study area contains suitable foraging resources for Grey-headed Flying-fox. The action is unlikely to significantly decrease the availability of foraging habitat in the locality. The proposal will modify approximately 0.2ha of foraging habitat for this species. Modification of this small area represents a small loss of the local extent of similar habitat. The large home range of this species allows offsite foraging resources to be accessed and isolation of habitat would not result from the development.

It is unlikely that the development would isolate and decrease the availability of quality habitat to the extent that the species is likely to decline.

Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat?

It is highly unlikely that invasive species (such as introduced predators) that are harmful to the Grey-headed Flying-fox would become more established as a result of the action.

Will the action introduce disease that may cause the species to decline?

The proposal would not increase the likelihood of a disease becoming established or proliferating in the local population that would result in a decline of the species.

Will the action interfere with the recovery of the species?

No recovery or threat abatement plans have been prepared for this species. Therefore it is considered that the proposal is unlikely to interfere within the recovery of the Grey-headed Flying-fox.

Conclusion

The Grey-headed Flying-fox is unlikely to be significantly affected by the proposal.

BC Act Assessments of Significance

Council is required to consider the impact upon threatened species from any development or activity via the process of a 5 part test of significance in accordance with Section 7.3 of the *Biodiversity Conservation Act 2016*. The significance of the assessment is then used to determine the need for a more detailed Biodiversity Development Assessment Report (BDAR).

The '5 part-test of significance' is as follows.

a) In the case of a threatened species, whether the action proposed 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,

Detailed flora investigations of the study area, together with habitat assessments and targeted surveys, have resulted in the identification of potential habitat for a variety of threatened species.

An assessment of these species is as follows:

***Lathamus discolor* (Swift Parrot)**

This species feeds mainly on nectar from eucalypt flowers, particularly Blue Gum (*Eucalyptus globulus*). On the mainland, the Swift Parrot congregates where winter flowering species such as Red Ironbark (*Eucalyptus sideroxylon*), White Box (*Eucalyptus albens*), Yellow Gum (*Eucalyptus leucoxylon*) and Swamp Gum (*Eucalyptus ovata*) are present (Saunders and Heinsohn 2008). The Swift Parrot is a migratory species that breeds in Tasmania and its offshore islands in summer (Swift Parrot Recovery Team 2001). In late March almost the entire population migrates to mainland Australia (Swift Parrot Recovery Team 2001). It is considered that the *Eucalyptus saligna* (Blue Gum) specimens within the study area provide a potential foraging resource for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Miniopterus australis* (Little Bent-wing Bat)**

The Little Bentwing-bat forages below the canopy within open forests and woodlands, feeding on small insects. The Little Bent-wing bat roosts in caves, tunnels, tree hollows and occasionally within old buildings. It is considered that the proposed development is unlikely to disrupt the life cycle of the Little Bentwing-bat species within the local area such that a viable local population will be placed at risk of extinction.

***Miniopterus schreibersii* (Eastern Bent-wing Bat)**

The Eastern Bentwing-bat is confined to areas where there are caves with potential temperature, humidity and physical dimensions to permit breeding. This species occupies a range of habitats, mainly near the coast and utilises caves, old mines, stormwater channels, under bridges and occasionally buildings for roosting. It is considered that the study area provides potential foraging habitat for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Mormopterus norfolkensis* (Eastern Freetail-bat)**

The Eastern Freetail-bat forages above and within the canopy of open forests and woodlands, feeding on small insects. The Eastern Freetail-bat is thought to roost predominantly in tree hollows and occasionally in buildings. It is considered that the study area provides potential foraging habitat for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt the life cycle of this species such that a viable local population would be placed at risk of extinction.

***Pteropus poliocephalus* (Grey-headed Flying-fox)**

The Grey-headed Flying-fox is found in a variety of habitats including rainforest, mangroves, paperbark swamps, wet and dry sclerophyll forests and cultivated areas (Churchill 2008). Grey-headed Flying Foxes congregate in large camps of up to 200,000 individuals, depending on availability of surrounding blossoming plants, from early until late summer (Churchill 2008). Camps are commonly formed in gullies, typically not far from water and in vegetation with a dense canopy. Roost sites are an important resource where mating, birth and rearing of young occurs as well as providing refuge (Strahan 1995) These bats eat the fruit or blossoms of more than 80 species of plants. Their major food source is eucalypt blossom and native fruits from a variety of tree species. Native figs (*Ficus spp*) account for a large percentage of the fruit eaten. They are also known to rain orchids of cultivated fruit. The Grey headed Flying-fox has a nightly feeding range of 20 to 50km from their camp (Churchill 2008).

The proposed development will retain the majority of foraging habitat for this highly mobile species. As such it is considered that the proposal is unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

***Saccolaimus flaviventris* (Yellow-bellied Sheathtail Bat)**

The Yellow-bellied Sheathtail-bat inhabits open country, mallee, eucalypt forests, rainforests, heathland and water bodies. The Yellow-bellied Sheathtail-bat roosts in tree hollows and has been found inhabiting the abandoned nests of Sugar Gliders. It is considered that the study area provides potential foraging habitat for this species. Despite the presence of potential habitat, this species was not recorded during the fauna survey. It is considered that the proposal is unlikely to disrupt

the life cycle of this species such that a viable local population would be placed at risk of extinction.

b) In the case of a critically endangered or endangered ecological community, whether the action proposed:

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

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

No endangered ecological communities were recorded from the subject site nor are any threatened communities likely to be impacted upon as a result of the proposal.

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

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

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

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

i.) The proposal would affect 0.2ha area of potential habitat.

ii.) The proposal will not result in fragmentation of habitat or isolate habitats for threatened species. All threatened fauna species which are potentially to be impacted upon are highly mobile and capable of flight across large distances and would not utilise the habitats within the subject site exclusively.

Therefore, it is considered that known habitat for a threatened species within the local area and the region are unlikely to become isolated or fragmented as a result of the proposal.

iii.) The proposal is unlikely to create an important impact on the long-term survival of threatened species in the locality and is not considered to be significant.

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 Study Area is not listed as an area of outstanding biodiversity value.

e) "Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process".

The proposal is likely to entail or perpetuate the following key threatening process under the *BC Act* within the site.

- Clearing of native vegetation.
- Removal of four hollow-bearing trees
- Infection of native plants by *Phytophthora cinnamomi*.
- Human Caused Climate Change.

Conclusion

The impact to habitats for threatened species, endangered populations & endangered ecological communities from the locality is not considered to be significant.

APPENDIX E: QUALIFICATIONS & EXPERIENCE OF AUTHOR

Alexander Fraser

alohafraser@gmail.com | 0423238193 | 665 The Scenic Rd Macmasters Beach, NSW 2251

Key skills

- 12+ years private ecological consulting (Fraser Ecological Consulting)
- 15 + years local government ecological assessment for DAs (Hornsby Shire Council – current employer)
- 10 + years Land & Environment Court expert witness experience
- 2 years state government ecological assessment (NSW OEH)
- High level botanical field identification skills, plot surveys and project management
- Fauna survey and field assistant experience
- Biodiversity Assessment Reporting (BDAR) preparation and Stewardship Site (BSAR) under the NSW BOS Credit Scheme

Qualifications

Bachelor Environmental Science (Honours) Southern Cross University

Certificate 3 Natural Area Restoration

Certificate 3 Vertebrate Animal Pest Control (NSW DPI, Orange)

NPWS Scientific Licence - S10445

Animal Ethics Authority - 11/4299

Accredited under the Biodiversity Assessment Methodology - BAM (Accreditation No. BAAS18156)

Practising member of NSW Ecological Consultants Association (ECA)

Summary

Alex Fraser (Principal Ecologist, Fraser Ecological) has extensive experience in DA related ecological assessment as both an assessor (Hornsby Shire Council) and private consultancy (Fraser Ecological) which actively and currently involve a wide array projects. Fraser Ecological is based locally on the Central Coast, however, project experience extends to South Coast, Blue Mountains, Mid-north Coast and mainly in the Sydney Basin Bioregion.

Previous work roles include ecological consulting for Parsons Brinckerhoff (large infrastructure), NPWS threatened species unit (biodiversity surveys), former NSW Department of Climate Change/ OEH (SIS DGRs and major projects assessment) and Hornsby Shire Council (DA assessment officer) have focussed primarily on ecological survey, development assessment, project management and policy development for consent authorities.

Alex offers high level botanical ID and field survey skills which includes targeted surveys and BAM plot surveys. Fraser Ecological has extensive experience in the preparation of over 15 BDARs under the new BC Act 2016 BOS credit trading scheme. Alex has experience dealing with consent authorities including Council, Crown Lands, Metropolitan Land Council, RFS, Biodiversity Conservation Trust and Department of Planning for major projects including SSDI proposals.

Fraser Ecological has established a wide network of ecological specialists including the Royal Botanic Gardens and Australian Museum as well academic institutions for expert advice when required. Alex is a current member of the North Sydney Regional Land Managers Group that includes staff from Central Coast Council, Northern Beaches, Ku-ring-gai Council, Hornsby Council (HSC), NPWS and Crown Lands) as project manager developing the Natural Area Recreation Strategy for HSC. Current main role at Council is development assessment and review of Flora and Fauna Reports and Biodiversity Assessment Reports.

Fraser Ecological has been engaged by various Councils (Central Coast, Ku-ring-gai, Liverpool City, Blacktown City Council, Hornsby Shire Council and Hawkesbury City Council) to undertake biodiversity assessments for major civil works projects. He is continuously providing biodiversity assessments for private clients for a range od development proposals across coastal and western NSW. We have also undertaken threatened flora and fauna species survey and monitoring for the NSW OEH Save our Species grants.

Key skills:

- Targeted flora and fauna surveys
- BAM plots in accordance with the BAM
- Ecological monitoring & Opportunity and Constraints mapping
- Preparation of BDARs, BAM calculator and credit reporting
- Retirement of credits for approved projects via BCT and brokers
- Establishment of stewardship sites and other offset packages
- Expert witness reporting and attendance in the LAEC
- Compliance investigations and auditing
- Preparation of Vegetation Management Plans
- Preparation of Nestbox Monitoring Plans

CERTIFICATE OF ACCREDITATION AS A BIODIVERSITY ASSESSMENT METHOD ASSESSOR under the *Biodiversity Conservation Act 2016* (NSW)

BAM Assessor		
Alexander Fraser		
Accreditation number	**Accreditation date (Date of issue)**	**Expiry Date of**
BAAS18156	17 October 2021	17 October 2024

The person named above is accredited under section 6.10 of the *Biodiversity Conservation Act 2016* (NSW) (**BC Act**) as a Biodiversity Assessment Method Assessor to apply the Biodiversity Assessment Method in connection with the preparation of biodiversity stewardship site assessment reports, biodiversity development assessment reports and biodiversity certification assessment reports pursuant to Part 6 of the BC Act.

The accreditation is in force until and including the Expiry Date. The accreditation is subject to the conditions set out in the *Accreditation Scheme for the Application of the Biodiversity Assessment Method*, under the BC Act, and the conditions specified on the reverse of this certificate.

LUCIAN MCELWAIN

Manager Ecosytem Programs
Department of Planning, Industry & Environment

NOTES

- DPIE maintains a register of Accredited Biodiversity Assessment Method (BAM) Assessors accessible from the DPIE website.
- The BAM Assessor's accreditation expires on the Expiry Date unless renewed in accordance with the *Accreditation Scheme for the Application of the Biodiversity Assessment Method*. It is the BAM Assessor's responsibility to monitor the Expiry Date of their accreditation, and apply for any renewal with sufficient time for the application to be processed prior to the Expiry Date.
- Words and expressions used in this accreditation instrument and which are also used in the Act have the same meaning.

SUMMARY OF CONDITIONS UNDER SCHEME

The following are conditions of all accreditations granted under the Scheme:

1. an accredited person must prepare Biodiversity Assessment Reports (and conduct surveys and other activities in connection with the preparation of such reports) in accordance with:
   a. the Biodiversity Assessment Method Manual,
   b. the Credit Calculator Operational Manual,
   c. Accredited Person Code of Conduct.
   d. this Scheme,
   e. any guidance materials published by the Department of Planning, Industry and Environment in connection with preparation of Biodiversity Assessment Reports or the application of the BAM
   f. any accreditation requirements notified by the Department of Planning, Industry and Environment to the accredited assessor from time to time.
2. an accredited person must maintain a detailed and up to date working knowledge of, and comply with, all relevant legislation.
3. an accredited person must maintain records of surveys and assessments, including field data sheets and targeted flora and fauna surveys, undertaken and used as part of the preparation of a Biodiversity Assessment Report, for at least ten years after certification of the relevant Biodiversity Assessment Report.
4. all records required kept by an accredited person must be in legible form, or in a form that can be readily be reduced to a legible form.
5. an accredited person must provide to the Department of Planning, Industry and Environment any information related to biodiversity assessment reports required to be provided by all accredited persons, or by a group of accredited persons, by way of a notice specified on a website maintained by it, in the form and within the time frames required in that notice.
6. an accredited person must comply with any scientific licence conditions relating to survey records.
7. an accredited person must possess, or operate under, an appropriate scientific licence as required for the type work, they are completing in the Biodiversity Offsets Scheme.

Note. Information that the Environment Agency Head (EAH) may require to be provided may include information collected during the application of the BAM such as site specific survey data.

Note. In addition to the conditions above, accredited persons must comply with obligations under the BC Act and regulations, including Part 6 Division 3 of the BC Act. Failure to comply with any of the conditions above may result in the EAH exercising the power to vary, suspend or cancel that accreditation under Part 5 of this Scheme.

ECA

ECOLOGICAL CONSULTANTS ASSOCIATION of NSW Inc

2023 PRACTISING MEMBER

COREY MEAD

FAUNA ECOLOGIST

Address: 3 Rysdyk Pde, Wamberal NSW 2260
ACN: 644 302 796
Mob: 0401 557 882
Email: corey@treehouseecology.com.au
Website: www.treehouseecology.com.au

Brighton Downs Qld – Night Parrot re-discovery 2013

With over 15 years' experience in undertaking fauna surveys and preparing habitat and impact assessment reports for threatened biodiversity and 25 years' working generally with wildlife, I feel fortunate to do what I do. From finding rare animals in remote parts of Australia to appreciating locally common species, I love the challenges of working out both habitat values and outcomes for clients. In more recent years I have gained valuable insights from working alongside several industry recognised experts, yet still feel most comfortable connecting on my own. My current interest is enhancing / relocating natural large hollows and complete trunk sections or excavating hollows in living trees for forest owls and cockatoos to avoid and minimise impacts.

EDUCATION / QUALIFICATIONS

- Southern Cross University – B App. Sc 1994
- BAM Accredited Assessor (BAAS.19050)
- Accredited Biobanking Assessor (No.231)
- NSW NPWS – Introduction to Arcview GIS
- Frog, Reptile & Bat Survey, ID & Mgt Training – NSW Forestry
- Anabat Techniques Training – Titley Scientific – Smiths Lake
- Report Writing – Pollack Learning Alliance
- Tree climbing techniques and chainsaw operation
- Risk Assessment Training (Taronga Zoo)
- Australian bat Lyssavirus vaccinations
- NSW RFS – Firefighters Certificate
- Cert III – Building & Carpentry (nest boxes)
- First Aid Certificate (St John's Ambulance Service)
- Class C vehicle, Boat & Divers Licences

SKILLS / EXPERIENCE

- Report writing (BDAR / BCAR / BSSAR / KAR / and other fauna related assessment, monitoring and management reports)
- Maintain ecological report templates, content and formatting
- Remote and independent terrestrial vertebrate surveys
- Threatened fauna target surveys & assessment
- BAM-C fauna data and credit assessment
- Fauna support for Land & Environment Court cases
- Microbat ultrasonic call identification & active monitoring
- AnalookW, Anapocket, Insight & CFC Read bat analysis software
- Kaleidoscope Pro song-meter clustering & classifier analysis
- Prepare song classifiers for threatened owls, frogs & gliders
- Radio-tracking Surveys
- Owl roost and nest locations
- Coordinate the relocation of large owl hollow sections and entire 9 tonne trees containing large hollows with cranes and climbers
- Tree climbing and chainsaw qualified
- Project Ecologist during habitat clearance
- Habitat tree assessment / Audits
- Construct and supply long-life nest boxes
- Advanced animal captive management
- Fire trail audits & bushfire risk analysis
- Advanced venomous snake handling & training for zoo staff
- Education/training program development
- Sub-1m GPS data collection, transfer and management
- Scientific License & Animal Ethics License

EMPLOYMENT HISTORY

- May 2011 – Recent – Senior Fauna Ecologist – Travers Bushfire & Ecology
- Oct 2007 – May 2011 – Fauna Ecologist – Travers Bushfire & Ecology
- Jan 2006 – Oct 2007 – Field Tech / Fauna Ecologist – Conacher Travers Environmental Consultants
- Feb 2003 – Jan 2006 – Head Reptile Keeper – Australian Reptile Park
- Jan 2003 – Sept 2005 – Visitor Services Officer – National Parks & Wildlife Service
- Dec 2002 – Jan 2003 – Marine Turtle Project Officer – National Park & Wildlife Service
- Aug 2000 – Feb 2003 – Venom Room Attendant – Australian Reptile Park
- Apr 1997 – Sept 2000 – Environmental Education Officer – Australian Reptile Park

COREY MEAD

FAUNA ECOLOGIST

PHONE REFEREES

- John Travers - Director *Travers Bushfire & Ecology* - 0418 630 048
- Elizabeth Ashby - Director *Keystone Ecology* - 0418 680 566
- Rochelle Lawson - Senior Ecologist Central Coast Council - 0429 124 316

FIELDWORK WITH SPECIALISTS

- Dr Steve Phillips in the application of Koala grid based surveys (Glenning Valley).
- John Young on owl nest/roost searches (Lake Macquarie, Spring Farm, Chain Valley Bay) and rare birds through remote Queensland
- Gerry Swan on Heath Monitor ecology (Beacon Hill and Belrose)
- Prof Michael Mahony on Giant Burrowing Frog target surveys (Belrose)
- Dr Ross Goldingay on Yellow-bellied Glider target surveys, monitoring and seasonal habitat resources (Cattai)
- Dr Ross Goldingay on Eastern Pygmy Possum target surveys and detailed habitat assessments (Belrose)
- Ross Wellington on Green-thighed Frog, Giant Barred Frog and Stuttering Frog habitat assessments (Mardi)
- Dr Richard Noske on assessment of Varied Sittella (Spring Farm)

SIGNIFICANT CAREER ACHIEVEMENTS

- Prepared the *Guideline for the Relocation of Large Tree Hollows* for Central Coast Council and cited by the BCT
- Assisted John Young in the re-discovery of the Night Parrot recording the first call and breeding location in over 100 years in 2013.
- Provided the only then capture of *Pseudechis weigeli* brown snake in remote Kimberley's for Discovery Channel documentary in 2002.
- Provided Western Diamondback Rattlesnake handling assistance for Steve Irwin.
- Assisted Malcolm Douglas in breeding and management of Saltwater Crocodiles
- Captures of *Morelia carinata* python in remote WA providing new understanding of the species ecology.
- Article on Australian Snakes for Outdoor Magazine Australia.
- Developed and implemented a Wildlife Education Program for schools across Australia.
- Developed a Fire Trail Auditing system for Gosford City Council Natural Areas.
- Collation of state-wide Marine Turtle records for NSW National Parks & Wildlife Service and development of awareness programs.
- Developed a comprehensive staff training program at the Australian Reptile Park.
- Venomous Snake Handling Training for Dreamworld and Currumbin Sanctuary zoo staff.
- Undertaken independent travel with fauna experience through the Americas and Africa.

NOTABLE PROJECTS

Surveys and BDAR at a 223 ha site (183 ha vegetated) at Mardi for a 244 lot residential subdivision in 2019. Twenty threatened fauna species were recorded. Eight breeding locations were recorded for Green-thighed Frog (known to only call on one or two nights in the year) and subsequent detailed habitat mapping of the floodplain contours to identify all breeding potential and PCT overlays for species polygons calculations. Eighteen frog species were recorded. Despite specialist advice to assume presence, target surveys ruled out Green and Golden Bell Frog, Stuttering Frog and Giant Barred Frog from the extensive floodplain and moist forest creeks from detailed surveys combined with song-meters and preparation of recogniser files, saving over $6,000,000 in species credits.

Squirrel Glider target trapping and radio-tracking surveys were undertaken at Morrisett Country Club in 2012 as part of ecological constraints investigations. The radio-transmitter collars were found to be faulty after capturing the first male so a makeshift collar was constructed from cable-tie, tape and an old working bandicoot transmitter. This animal was recaptured and the collar was replaced when the new batch arrived. Den sites, road crossing points and foraging areas were mapped to guide appropriate course expansion and design.

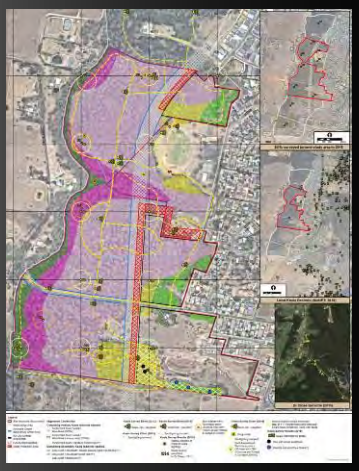
Subdivision site at Duffy's Forest recorded presence of a female **Rosenberg's Goanna** in 2011. Extensive previous surveys of this site by other consultants, which included SIS and Land and Environment Court proceedings, all failed to identify the importance of the subject plateau for the species. By applying knowledge from keeping goannas as Head Keeper of Reptiles (Aust. Reptile Park) I undertook detailed habitat assessment of the plateau and demonstrated it to be a critical breeding area. Nesting mounds were not otherwise present in the adjacent and extensive National Park. Surveillance cameras placed on burrows also identified a suspected important winter burrow for the local female. Winter burrows are central to core home ranges.

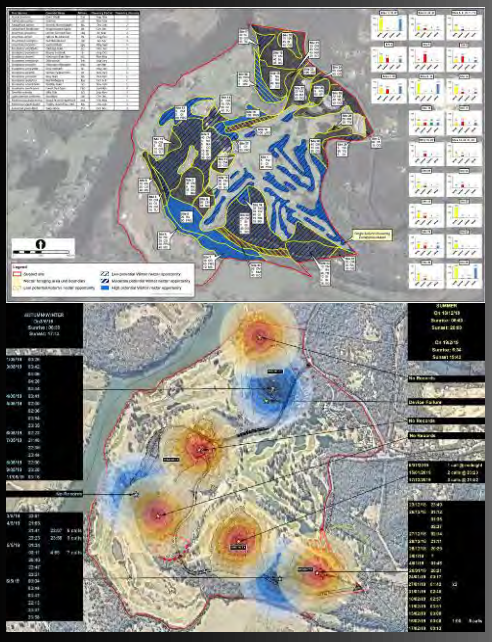
Rosenberg's goanna target surveys and habitat assessments have also been applied to large sites at Belrose, Beacon Hill and Narraweena. Burrows were searched for recent tracks indicating activity and these were inspected for presence using an industrial endoscope with a camera / video screen. The adjacent image is of a juvenile in the burrow as well as a plateau habitat assessment of the site and the adjacent Garigal National Park. This showed the local extent of high, moderate and low quality habitats.

Constraints level surveys for the Aboriginal Lands Council at North Hawkes Nest recorded a relatively concentrated population area of **Spotted-tailed Quoll**. Photos of trapped quolls and surveillance camera images of characteristic markings gave an estimate of the number of individuals utilising the 110 ha study area. Some threatened fauna also recorded included **New Holland Mouse**, **Long-nosed Potoroo** and **Glossy Black-Cockatoo**.

Analysis of important roosting and nesting habitat areas for **Bush Stone-curlew** within a holiday estate at Kingscliff, Northern NSW. This was to determine connectivity impacts and appropriate mitigation measures for a proposed residential subdivision on adjacent lands. Localised wetland surveys also recorded **Beach Stone-curlew**, **Black-necked Stork**, **Black Bittern**, **Eastern Curlew** and **Pied Oystercatcher** amongst others.

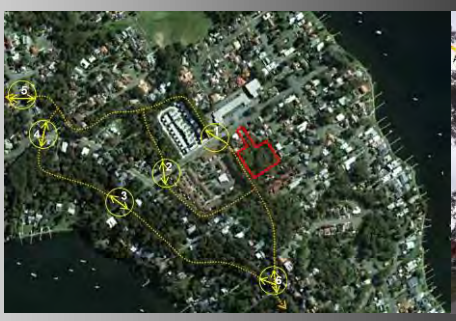
The Georges River Koala population occurs in areas of low soil fertility, subsequently this region has a low carrying capacity to support Koala activity. They can be extra difficult to locate with females occupying a home range of approx 50ha and males up to 100 ha. Target grid based Koala surveys were undertaken to review the extents of use and activity levels within a 58 ha rezoning site at Appin containing just over 50 ha of forest and woodland vegetation. SAT points recorded varying activity ratings assisting in determining habitat use areas. It was also suspected that the recognised primary feed tree Forest Red Gum in other locations within the state and located within much of the proposed development footprint, were of lesser local value compared to Grey Gums and Blue-leaved Stringybark. Therefore SATs also recorded additional data on scratches on these trees (which may last longer than scats). This more long-term data was able to support regional findings by Koala experts *Biolink* and demonstrate how the proposed 34.9 ha of conserved areas were of greater value to Koalas and how activity had increased in the site between 2015 and 2018.

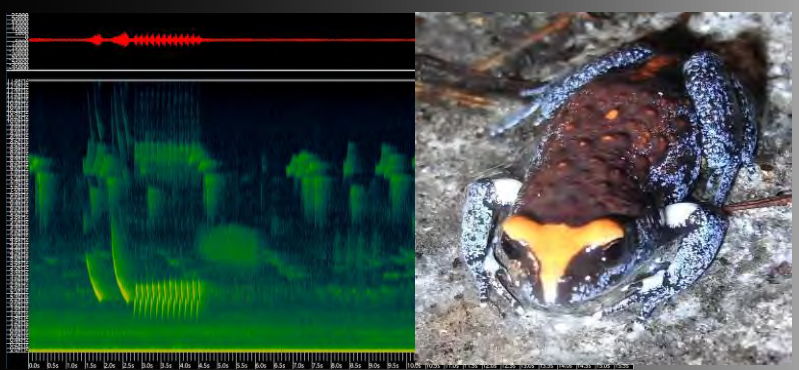




Preparation of a Yellow-bellied Glider Habitat Assessment and Monitoring report under the guidance of glider expert Dr Ross Goldingay for a revised masterplan development at Cattai. The site contains up to 100 ha of available remnant dry open forest habitat with additional narrow canopy corridors between golf course fairways. Initial species monitoring included observations of YBG foraging movements and preferences of sap, manna, honeydew, invertebrates and nectar. Sap feed trees were identified however local floristics were considered most important for consideration of habitat retention. The habitat assessment incorporated a detailed analysis of seasonal flowering trees species within sub-communities across the entire area to ascertain any unique areas of retention value. Following this and request by The Hills Shire Council, seasonal monitoring of the site use by glider family groups was undertaken by use of long-deployment song-meters. External 12V 17Ah deep cycle batteries were allied with SM4 devices to permit a nocturnal recording schedule over a 3 month period. A Yellow-bellied Glider recognizer file (advanced classifier) was constructed from recorded vocalisations. This was applied to clustered recordings within Kaleidoscope Pro V5.1.9 software to identify all recorded calls in the period. Song-meter locations over the two recording periods (summer & autumn) and trends of site use were summarised on the adjacent lower image.

Historical Squirrel Glider records on the Coal Point peninsula at Lake Macquarie prompted council to request an analysis of glider connectivity and impacts from a proposed residential development at Carey Bay. Glider movement options through the residential landscape at road crossing points were identified and the viability of these were considered based on gliding ratios.





Red-crowned Toadlet breeding locations have been identified from habitat and tadpole searches across numerous sites on the Central Coast and northern Sydney. These are typically allied with the more selective and periodic breeding of Giant Burrowing Frog target surveys using song-meters and constructed recogniser files on Kaleidoscope Pro software. Four Giant Burrowing Frog breeding locations at Belrose, Beacon Hill and Narraweena have be found using this method.

LARGE HOLLOW / TRUNK SECTION RELOCATIONS

My mission is to provide services to relocate large hollows and trunk sections in order to avoid impacts on large hollow dependent species...and bring back the birds! *TreeHouse Ecology* does not support the relocation of hollows occupied by rare or threatened species. Often however, large hollows are not found to be occupied by such animals during surveys for development. For example, Masked Owl males will use a number of satellite roosting hollows to defend the core nesting area occupied by the female during breeding, and more at other times of the year. So such hollows in proposed development landscapes may have been previously occupied or are an opportunity for future use. As a tree climbing ecologist with now many years of owl roost and nest experience, I can first provide assistance to projects by analysing the termite mud in the base of hollows for evidence of historical use. Where large hollows are cleared for removal, these may in fact be an otherwise limited natural resource in the locality, therefore relocation is a potentially important opportunity to enhance remaining conservation and stewardship areas and minimise indirect impacts on large hollow-dependent fauna…

Above, middle & far below: A Barn Owl roost tree was proposed for removal for subdivision road access at Wadalba in 2016.

Given (1) the apparent quality of two large hollows within this tree (one at approximately 28m high); (2) that a Powerful Owl breeding pair were already known in the locality; and (3) that similar large hollows were otherwise absent in the adjacent conservation corridor, I suggested to council to relocate the hollow. Owl expert John Young further suggested relocating the entire tree. This way the height of the hollow in the crown could be maintained. Following the previous success of relocating a large hollow section into the corridor (next page), this was a new opportunity to develop the process again at a much larger scale. A large ironbark with two trunks growing side-by-side was selected within the corridor as the recipient tree. A 65 tonne crane secured the hollow tree trunk whilst the base of the tree was cut. After lowering the trunk section it was left for a few months whilst the cambium dried. During this time excavations of termite material allowed for the shaping of 4 large hollows of varying aspects and entry. The base was treated against termites and the entire external surface was sprayed with lanolin oil for protection from drying and cracking. Two franna cranes then carried the trunk section along road and fire trail access to the recipient tree and the larger crane lifted it vertically and slewed it into place. Heavy duty steel cable with turnbuckles used at the local TreeTops Adventure Park was used to secure the trees together. Powerful Owl was recorded inspecting the hollows for nesting during the follow up surveillance camera monitoring (image of Bingo provided by Central Coast Council below).





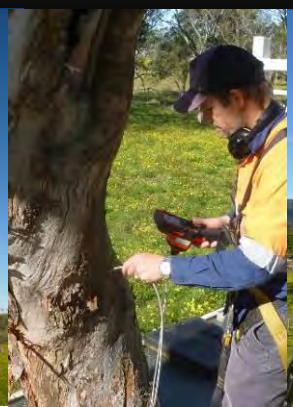
Above: During pre-clearance surveys I found Powerful Owl nesting in an approved development area at Wadalba in June 2011. Despite suitable nesting opportunities in this footprint, the previous ecologists failed to identify this potential and allocate appropriate seasonal survey. Adjacent conservation areas were also established prior to knowing owl nesting locations and were themselves deficient in such quality large hollows. I recommended and co-ordinated the relocation of this 3m hollow section. Whilst working at *Travers bushfire & ecology* this was my first attempt to co-ordinate cranes and tree climbers and design a strong attachment method to support the heavy weight of a large hollow in a recipient tree without compromising its health or public safety. Metal strapping is held off the cambium of the living tree by pine blocks and permits ongoing natural growth. Following this success, as well as the relocation of an entire 9 tonne trunk section (previous page), Central Coast Council requested I prepare the *Guideline for the Relocation of Large Tree Hollows (2016).*

Middle: In early 2020 I was requested by *Central Coast Council* to provide advice on hollows located within the approved trunk water main route linking the Mardi Water Treatment Plant to the Hunter Water Corporations trunk line at Warnervale. A 40m tall Spotted Gum was identified as an expected Masked Owl tree given the presence of a known local breeding pair.




An inspection hole was cut in the side wall of the 5m+ deep hollow section during pre-clearing climbing inspections. Termite mud was inspected and found deep traces of terrestrial mammal bones, confirming it as a historic *Tyto* owl tree and expected periodic Masked Owl roost. Given the quality deep mid hollow as well as additional large hollows at the crown, the 9 tonne tree was recommended for relocation. The tree is currently being prepared for placement in the adjacent reserve.

Below: Whilst undertaking surveys for a Stage 2 development at Kembla Grange in February 2017 I recorded a Greater Broad-nosed Bat roosting colony within a large hollow located within the already approved Stage 1 development area. Based on the threatened status of this species and also supported by the Conditions of Consent the hollow section was relocated into the adjacent reserve. A high powered cordless drill and long auger bit was used in an elevated work platform to prepare inspection holes for a videoscope probe with rotational camera head. When bats were absent the tree was secured with a Hiab (truck-mounted crane) for the cut and then lowering / transport / lifting. The section was fitted onto a pre-cut limb to take the weight, then strapped to mimic the previous height angle and aspect.


OWL HOLLOW INSPECTIONS / SURVEILLANCE

Rosenberg's Goanna | Eastern Pygmy Possum | Large Bent-winged Bat | Monocled Cobra | New Holland Mouse | Squirrel Glider tracking | Large-footed Myotis | Little Bent-winged Bat | Green and Golden Bell Frog

TREEHOUSE nestboxes

SUPPLY / INSTALLATION / MONITORING

COREY MEAD

FAUNA ECOLOGIST

THREATENED FAUNA SPECIES RECORDED

Presumed Extinct (NSW)

- Night Parrot n/a

Critically Endangered Species (NSW)

- Regent Honeyeater **
- Beach Stone-curlew **

Endangered Species (NSW)

- Green and Golden Bell Frog *
- Giant Barred Frog *
- Mahony's Toadlet *
- Stuttering Frog *
- Loggerhead Turtle *
- Leatherback Turtle *
- Dugong n/a
- Grey Falcon
- Southern Giant Petrel n/a
- Black-necked Stork
- Pied Oystercatcher *
- Plains Wanderer **
- Bush Stone-curlew *
- Swift Parrot **
- Black-striped Wallaby
- Cumberland Plain Land Snail *
- Maroubra Woodland Snail *

Vulnerable Species (NSW)

- Wallum Froglet *
- Red-crowned Toadlet *
- Giant Burrowing Frog *
- Green Turtle *
- Flatback Turtle
- Hawksbill Turtle n/a
- Stimson's Python *
- Western Blue-tongue Lizard
- Rosenberg's Goanna
- Osprey **
- Little Eagle **
- White-bellied Sea Eagle **
- Black-breasted Buzzard **
- Spotted Harrier
- Square-tailed Kite **
- Magpie Goose
- Black Bittern
- Sooty Oystercatcher *
- Greater Sand Plover **
- Lesser Sand Plover **
- Bar-tailed Godwit **
- Red-tailed Black-Cockatoo **
- Glossy Black-Cockatoo **
- Gang-gang Cockatoo **
- Major Mitchell's Cockatoo **
- Swift Parrot **
- Little Lorikeet
- Wompoo Fruit-dove
- Superb Fruit-dove
- Rose-crowned Fruit-dove
- Painted Honeyeater
- Black-chinned Honeyeater
- Grey-crowned Babbler
- Hall's Babbler
- Powerful Owl **
- Barking Owl **
- Masked Owl **
- Sooty Owl **
- Marbled Frogmouth
- Speckled Warbler
- Brown Treecreeper
- White-fronted Chat
- Varied Sittella
- Hooded Robin
- Scarlet Robin
- Flame Robin
- White-eared Monarch *
- Diamond Firetail
- Spotted-tailed Quoll
- Long-nosed Potoroo *
- Brush-tailed Phascogale *
- Eastern Pygmy Possum *
- Koala **
- Squirrel Glider *
- Yellow-bellied Glider
- Grey-headed Flying-fox **
- Yellow-bellied Sheathtail-bat
- Large-footed Myotis *
- Little Bent-winged Bat **
- Large Bent-winged Bat **
- Greater Broad-nosed Bat
- Eastern Cave Bat *
- Eastern Coastal Free-tailed Bat
- Eastern False Pipistrelle
- Eastern Long-eared Bat
- Large-eared Pied Bat *
- Hoary Wattled Bat
- Golden-tipped Bat

EPBC Listed & Migratory Protected Species (not otherwise listed above)

- New Holland Mouse
- Greater Glider
- White-throated Needletail
- Fork-tailed Swift
- Rainbow Bee-eater
- Black-faced Monarch
- Spectacled Monarch
- Satin Flycatcher
- Rufous Fantail

* species credit species
** dual credit species