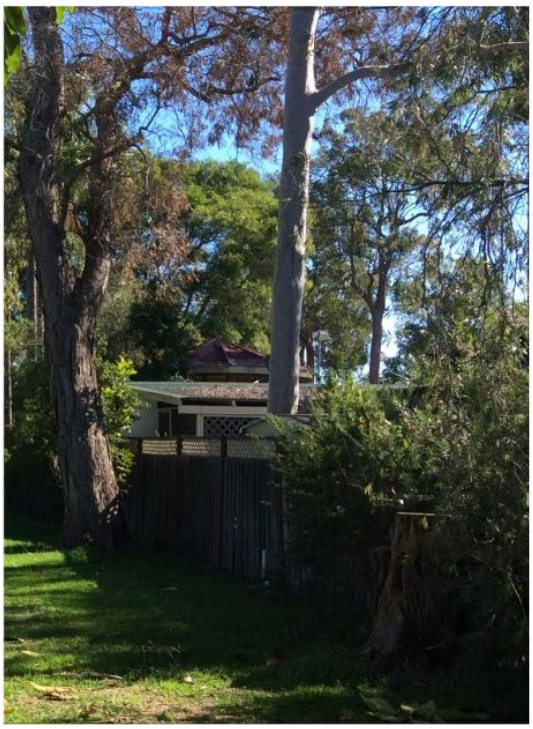
Biodiversity Development Assessment Report

HASTINGS RIVER DRIVE UPGRADE WORKS

September 2021

Project Number: 18-765



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I, Brendon True (BAAS18155), certify that this Biodiversity Development Assessment Report has been prepared on the basis of the requirements of, and information provided under, the Biodiversity Assessment Method 2017 as of 29 September 2021. The transitional arrangements have been applied. The associated case (00015484) within the BAM Calculator has been submitted as of 29 September 2021, including revision 1 relating to the Subject Land, and revision 5 relating to the Development Footprint.

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ACRONYMS AND ABBREVIATIONS

AWS	Automatic weather station
BAM	Biodiversity Assessment Method
BAM-C	BAM Calculator
BC Act	Biodiversity Conservation Act 2016
BCD	Biodiversity Conservation Division
BDAR	Biodiversity Development Assessment Report
Biosecurity Act	Biosecurity Act 2015
BOM	Australian Bureau of Meteorology
BOS	Biodiversity Offset Scheme
Cwth	Commonwealth
DECCW	Refer to BCD
DAWE	Department of Agriculture, Water and the Environment, formally DoEE
DPIE	(NSW) Department of Planning, Industry and Environment
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
ha	hectares
km	kilometres
LGA	Local Government Areas
m	Metres
MNES	Matters of National environmental significance under the *EPBC Ac*t (c.f.)
NSW	New South Wales
OEH	Formally Office of Environment and Heritage, now BCD
PMHC	Port Macquarie-Hastings Council
SEPP	*State Environmental Planning Policy* (NSW)
TEC	Threatened Ecological Community

EXECUTIVE SUMMARY

Port Macquarie-Hastings Council (PMHC) proposes to upgrade a section of Hastings River Drive and is seeking approval to construct the Hamilton Green Masterplan (the proposal). The proposed Hastings River Drive upgrade works are located approximately two kilometres (km) west of Port Macquarie, between Boundary Street to the north-west and Hughes Place to the south-east, within the Port Macquarie-Hastings Local Government Area (LGA). Hamilton Green is located on the westbound side of Hastings River Drive adjacent to the proposed road upgrade works. The proposal would develop around 2.23 ha including 0.28 ha of native vegetation. This Biodiversity Development Assessment Report (BDAR) has been prepared by NGH Pty Ltd for AT&L Pty Ltd on behalf of the proponent, PMHC.

The aim of this BDAR is to address the biodiversity matters raised in the Secretary's Environmental Assessment Requirements (SEARs) and to address the requirements of the *Biodiversity Conservation Act 2016* (BC Act). This BDAR forms part of an Environmental Impact Statement (EIS) prepared under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Biodiversity Assessment Methodology (BAM) is the required assessment methodology for developments that trigger the NSW Biodiversity Offsets Scheme (BOS), under the BC Act. This report follows the field work methodologies and assessment required by the BAM.

Comprehensive mapping and field surveys were completed in accordance with the requirements of the BAM. Much of the development site has been cleared of native vegetation, and purposed for Hastings River Drive, Hamilton Green, residences, and associated infrastructure. Around 0.32 ha of native vegetation occurs in the development site comprised of *PCT 1064 - Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion* (PCT 1064) in two condition classes. PCT 1064 is associated with *Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* (Swamp Sclerophyll Forest), an Endangered Ecology Community (EEC) listed under the BC Act. Given this association, the nature of PCT 1064 within the development site was compared to the NSW Scientific Committee's Final Determination for the EEC. This process found that PCT 1064 within the development site has a strong affinity to and represents Swamp Sclerophyll Forest. PCT 1064 does not represent a federally listed community.

Consideration has been given to avoiding and minimising impacts to native vegetation throughout each phase of the proposal. Site design options have been assessed against key environmental, social, and economic criteria. Areas of native vegetation have been avoided where practical by the development footprint. Mitigation and management measures would be put in place to adequately address impacts associated with the proposal, both direct and indirect. Assessment of impacts has taken into account the impacts of the summer 2019/2020 bushfires in the region, with loss of habitat noted about 1 km south-west of the development site.

For biodiversity impacts that are unavoidable, the proposal would require the removal of:

- 0.28 ha of PCT 1064 - Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion

The removal of this native vegetation generated the following ecosystem credits

- PCT 1064 - Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion - **7 credits**

One ecosystem and species credit species, Koala *Phascolarctos cinereus* listed as Vulnerable under the BC Act, was detected during the site surveys through the presence of 10 fresh scats. Given this and the high

number of records of Koala within 10 km of the development site on BioNet, Koala were assessed as contributing to both ecosystem and species credits given the potential for breeding Koala to be present. The BAM Calculator required that a further thirty-five candidate species credit species be considered. Of these, all but seven (two fauna and five flora) were excluded from assessment on the basis that the development site either lacks suitable habitat (be it breeding and/or forage) or what habitat is present is degraded to the extent that it is unlikely to support the candidate species. The five flora candidate species were all surveyed for during a suitable season and none were observed, therefore, confirmed absent and have not generated any species credits.

The two fauna species, Southern Myotis *Myotis macropus* and Wallum Froglet *Crinia tinnula*, were unable to be surveyed for during the appropriate survey period and assumed present within suitable habitat.

The removal of suitable habitat relating to threatened species credit species generated the following species credits.

- Koala *Phascolarctos cinereus* – **7 credits**
- Wallum Froglet *Crinia tinnula* – **1 credit**
- Southern Myotis *Myotis macropus* – **7 credit**

The retirement of the credits generated will be carried out in accordance with the BOS. With the retirement of credits and effective implementation of the mitigation measures, the proposal would be consistent with the requirements of the BAM.

1 INTRODUCTION

Port Macquarie-Hastings Council (PMHC) proposes to upgrade a section of Hastings River Drive and is seeking approval to construct the Hamilton Green Masterplan (the proposal). The proposed Hastings River Drive upgrade works are located approximately two-kilometres (km) west of Port Macquarie, between Boundary Street to the north-west and Hughes Place to the south-east, within the Port Macquarie-Hastings Local Government Area (LGA). Hamilton Green is located on the westbound side of Hastings River Drive adjacent to the proposed road upgrade works.

This Biodiversity Development Assessment Report (BDAR) assesses the impacts of the proposal according to the NSW Biodiversity Assessment Methodology (BAM) as required by the Secretary's Environmental Assessment Requirements (SEARs) for the proposal. NGH l has prepared this report on behalf of PMHC.

The following terms are used in this document:

- **Development footprint** – The area of land that is directly impacted on by the proposal. The development footprint is approximately 2.23 ha.
- **Development site** – The area of land that is subject to a proposed development. The development site is approximately 2.9 ha. The development site is the area surveyed for this assessment.
- **Subject land** – All the land the has had the BAM applied for this assessment, synonymous with the development site and inclusive of areas of potential indirect, prescribed, and uncertain impacts.
- **Buffer area** – All land within 1500 m of the outside edge of the boundary of the development footprint.

1.1 THE PROPOSAL

The proposal would involve the upgrade and widening of approximately 600 m of Hastings River Drive to provide a four-lane dual carriageway between the existing roundabout at Hughes Place and the Boundary Street traffic signals. Due to the upgrade of the road to a four-lane carriageway, a solid median strip would be installed between the different directions of traffic, inhibiting those land owners and users between Hibbard Drive and Hughes Place from exiting onto Hastings River Drive in both directions. A roundabout would be constructed at the Hibbard Drive/ Hastings River Drive intersection, and a new access and internal road design would be provided for Hamilton Green, including access off the proposed roundabout, construction of new carparks and internal access routes in Hamilton Green. The installation of the new roundabout at Hibbard Drive would allow cars to redirect in their preferred direction of travel. Additionally, the installation of the roundabout would allow for ease of access for cars entering/exiting the Hamilton Green complex. The proposal would include new street lighting, cycle and parking lanes and concrete footpaths in both directions.

Key features of the proposal include:

- Widening and upgrading a 600 m section of Hastings River Drive between Boundary Street and Hughes Place
    - Provision of two lanes each direction on Hastings River Drive with a 60km/hr posted speed limit, separated by a solid median strip
    - New pavement along the extent of the proposal
- Upgrading the intersection of Hibbard Drive/ Hastings River Drive from a T-intersection to a roundabout with two lanes
    - Provision of two lanes in each direction on Hastings River Drive on both the eastern and western extent of the roundabout

  - Provision of one lane in each direction from Hibbard Drive
  - Provision of one lane in each direction from Hamilton Green
- Construction at Hamilton Green of a new access road at Hastings River Drive and internal layout upgrade including internal roads (both with a posted speed of 10km/hr), and provide formalised car parking spaces at Hamilton Green
- Removal of the existing pedestrian bridge across the open swale in Hamilton Green (located between Hastings River Drive and the Port Macquarie Hastings Bridge Association building) and removal of the pedestrian crossing provided on the southern side of the vehicular crossing of the swale
- Drainage works:
  - Upgrade the existing under capacity pit and pipe network where possible along Hastings River Drive
  - Formalise existing swale on northern side of Hastings River Drive (40 metres east of the proposed roundabout) into a kerb and gutter with pit and pipe network
  - Retain existing tri-pipe crossing Hastings River Drive (at location of proposed roundabout) and extend culvert to drain towards existing open channel (through Hamilton Green)
- Provision of a 2.5 metre parking lane on both sides of Hastings River Drive
- Retain the existing bus stop eastbound on Hastings River Drive just west of Hibbard Drive (temporarily relocate during works in this area)
- Provision of a 2.5 metre wide shared path along the northern and southern sides of Hastings River Drive between Boundary Street and Hughes Place to connect to existing footpaths east and west of the proposal
- Provision of pedestrian refuges at each of the four legs of the roundabout at Hibbard Drive, as well as an additional mid-block pedestrian refuge adjacent to the Port Home Zone access
- Utility adjustments and property acquisitions along the extent of works on both sides of Hastings River Drive.

1.2 THE DEVELOPMENT SITE

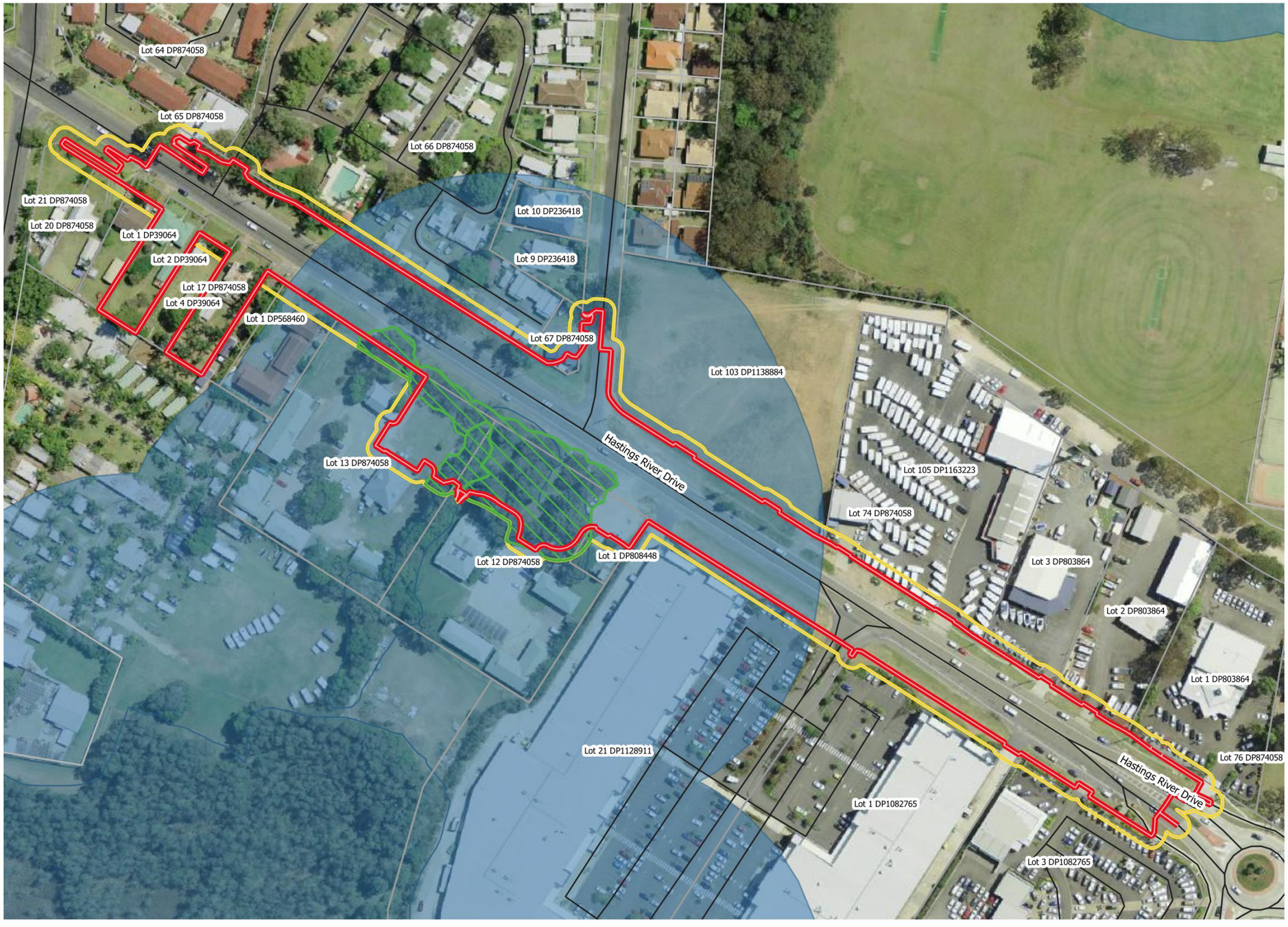
1.2.1 Site location

The development site is located along a 600 metre stretch of Hastings River Drive between Boundary Street and Hughes Place, within the Port Macquarie-Hastings LGA (Figure 1-1).

1.2.2 Site description

Hastings River Drive is a regional road (GG56) providing a critical east-west link between the Port Macquarie town centre to the east and Pacific Highway to the west. It has a posted speed limit of 60 kilometres per hour. The development site encompasses a 600 metre stretch of Hastings River Drive, associated road reserve and a portion of the complex known as Hamilton Green to the south. Surrounding land use includes residences, commercial complexes, recreational spaces, and coastal wetlands.

The proposal is located within the NSW North Coast Bioregion with the remaining native vegetation on the development site comprising a swamp forest characterised by the presence of Broad-leaved Paperbark *Melaleuca quinquenervia* and Swamp Oak *Casuarina glauca*.

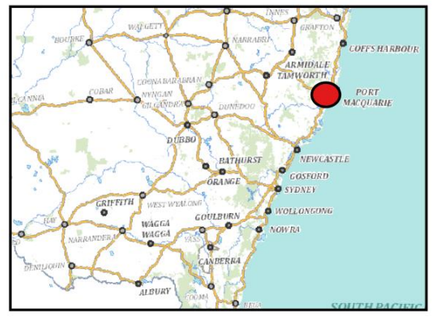


Hastings River Drive
Site Map

LGA PORT MACQUARIE-HASTINGS COUNCIL
IBRA BIOREGION NSW NORTH COAST
IBRA SUBREGION MACLEAY HASTINGS

Legend

- Subject Land
- Development Footprint
- Swamp Sclerophyll Forest EEC
- Lot Boundary
- Roads
- Coastal Wetlands



Ref: 18-765 hastings-NGH-6221-2TJWTP2
Site Map
Author: sarah.d
Date created: 31.03.2021
Datum: GDA94 / MGA zone 56

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NGH

Figure 1-1 Site map

1.3 STUDY AIMS

This BDAR has been prepared by NGH for AT&L on behalf of PMHC. The aim of this BDAR is to address the requirements of the BAM, as required in the Secretary's Environmental Assessment Requirements (SEARs) and summarised below.

1.4 SOURCE OF INFORMATION USED IN THE ASSESSMENT

The following information sources were used in the development of this BDAR:

- Proposal layers, construction methodology and concept designs provided by AT&L.
- Australian Government's Species Profiles and Threats (SPRAT) database http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

  NSW Threatened Species Profiles http://www.environment.nsw.gov.au/threatenedspeciesapp/ and www.environment.nsw.gov.au/AtlasApp/UI_Modules/

- Commonwealth Department of Agriculture, Water and the Environment Protected Matters Search Tool

  Accessed online at http://environment.gov.au/epbc/protected-matters-search-tool

- Australia's IBRA Bioregions and sub-bioregions. http://environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps
- Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 3
- NSW OEH's Biodiversity Assessment Method (BAM) calculator (http://www.environment.nsw.gov.au/bbccapp/ui/mynews.aspx)
- NSW OEH's BioNet threatened biodiversity database

  Accessed online via login at http://www.bionet.nsw.gov.au/

- OEH BioNet Vegetation Classification Database (DPIE 2020)

  Accessed online via login at http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx

- Office of Environment and Heritage (OEH) (2017). Biodiversity Assessment Method
- NSW Government SEED Mapping

  https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU

- NSW Biodiversity Values Map https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap

2 LANDSCAPE FEATURES

2.1 IBRA BIOREGIONS AND SUBREGION

The development site falls within the NSW North Coast IBRA Bioregion and the Macleay Hastings Subregion.

The NSW North Coast covers northern NSW from the shoreline to the Great Escarpment. The climate trends from sub-tropical on the coast with hot summers, through sub-humid climate on the slopes to a temperate climate in the uplands. The topography typically follows a sequence from coastal sand barrier, through low foothills and ranges, to the steep slopes and ranges of the escarpment itself. It contains Devonian and Permian bedrocks that are part of the New England Fold Belt as well as small bodies of granite and three centres of Tertiary basalt eruption. The soil and vegetation patterns in the bioregion are very complex because of the different substrates, the topographic variation and the climatic differences encountered across and along the bioregion. In general, only the most fertile soils (normally from basalts) support rainforests, but exceptions to this are found in numerous protected pockets where plant nutrients have accumulated through organic cycling in litter.

On the basalts the soils are typically red, friable loams or clay loams with high fertility, good structure, and excellent water-holding capacity. On granites and most of the quartz rich sedimentary rocks, shallow yellow earths are found on hillcrests, yellow and brown texture contrast profiles are found on the slopes, and organic loams or sandy loams are found on the alluvial plains. In the coastal dunes, deep siliceous sands and very well developed podsols can be found.

The Macleay Hastings Subregion is characterised by complex patterns of ridges and valleys running to the Great Escarpment, strong structural control along fault lines. Coastal beach, dune and lagoon barrier systems reach their maximum development at Myall Lakes. Soils are typically red brown structured loams on basalt though other are poorly known.

Vegetation communities include:

- Wet sclerophyll forest with white mahogany, small-fruited grey gum, Sydney blue gum, blackbutt, tallowwood and brush box;
- White gum, blackbutt, forest red gum and grey box on dry open flats;
- Dense Antarctic beech on Barrington tops and patches of mixed cool temperate and warm temperate rainforest on Comboyne Plateau on basalt;
- Coastal complex of banksia, paperbark, smooth-barked apple, and blackbutt with numerous shrubs and areas of heath and swamp on dunes;
- Mangroves in estuaries.

2.2 NSW LANDSCAPE REGIONS AND AREA

The development site is in Manning-Macleay Coastal Alluvium Plain Mitchell Landscape. This was entered into the BAM Calculator for the proposal.

2.3 NATIVE VEGETATION

As determined by aerial imagery and GIS Mapping, approximately 270 ha of native vegetation occurs in the surrounding 1500 m buffer area. This vegetation in the landscape surrounding the development

site is predominantly swamp forest/forested wetland characterised by the presence of Broad-leaved Paperbark and Swamp Oak.

2.4 CLEARED AREAS

Within the 1500 m buffer around the development site, substantial urban areas has been cleared of native vegetation or subjected to modification and dominance of non-native flora species. Cleared areas within the development site are characterised by Hastings River Drive and its footprint.

Figure 2-1 Example of cleared areas in the development site

2.5 RIVERS AND STREAMS

The development site is located within the Hastings River Catchment, about 410 m south from the Hastings River. No named waterways are within the development site; however, one ephemeral drainage line is present that is associated with a culvert underneath Hastings River Drive allowing floodwater from the wetland areas to the south to drain north or in turn flow from the drainage line into the wetland (Figure 2-2). This drainage line terminates at a drain around 300 m north along Hibbard Drive.

Figure 2-2 Ephemeral drainage line positioned north-south in the development site

2.6 WETLANDS

The State Environmental Planning Policy (Coastal Management) 2018 (SEPP Coastal Management) aims to promote and integrated and co-ordinated approach to land use planning in the coastal zone. Sections of the proposal are located within an area identified as a 'Coastal Wetland' and 'Proximity area for Coastal Wetland' (Figure 2-3). Additionally, under SEPP Coastal Management, the entire proposal is within the 'Coastal Environment Area' and a small section to the west is within the 'Coastal Use Area'. Clause 10(2) of the Coastal Management SEPP defines developments within "coastal wetlands" that are designated development under Part 4 of the EP&A Act, and Division 1 of the SEPP Coastal Management applies to development on certain land within coastal wetlands and in proximity to coastal wetlands.

Clause 11 states that development consent must also not be granted for works on land mapped as "proximity area for coastal wetlands" unless it can be shown that the proposal will not significantly impact on:

(a) the biophysical, hydrological, or ecological integrity of the adjacent coastal wetland or littoral rainforest, or

(b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.

Following the site surveys, it was observed that no wetlands are contained within the development site however the significance of the potential indirect, uncertain, and prescribed impacts to adjacent wetlands have been incorporated into the BDAR. .

Figure 2-3 Forested Wetland adjacent to development site

An EPBC Protected Matters search completed on 8 July 2020 did not identify any wetlands of international importance, however, one wetland of national importance, Limeburners Creek Nature Reserve, was identified. Limewaters Creek Nature Reserve is over 8 km to the north of the development site across Hastings River.

2.7 CONNECTIVITY FEATURES

Given the location of the development site within an urban environment, substantial amounts of the buffer area has been cleared of native locally indigenous wooded vegetation and is highly fragmented. Nevertheless, some connectivity is present as the development site is situated at the northern edge of a larger patch of vegetation that surrounds Port Macquarie Airport then extends south and west. This greater patch would facilitate movement of fauna through the greater landscape. However, connectivity through the development site itself and is poor due to Hastings River Drive separating the aforementioned patch of vegetation from small parkland remnants to the north. Connectivity in an east-west direction is limited to sparse roadside plantings and maintained lawn areas.

2.8 AREAS OF GEOLOGICAL SIGNIFICANCE

No karsts, caves, crevices or cliffs or other areas of geological significance occur in or adjacent to the development site.

2.9 AREAS OF OUTSTANDING BIODIVERSITY VALUE

No Areas of Outstanding Biodiversity Value occur within the development site, however, bushland in the centre of the development site is mapped as high value on the NSW Biodiversity Values Map under the Biodiversity Conservation Regulation 2017 (DPIE 2020b) (Figure 2-4). The potential impact to an area of high biodiversity value is acting as the trigger for this BDAR.

Figure 2-4 Areas listed as high biodiversity value on the Biodiversity Values Map

2.10 SITE CONTEXT COMPONENTS

Method applied

The proposal conforms to the definition of a *site-based development* under the BAM. The site-based development assessment methodology has been used in this BAM assessment.

Percent Native Vegetation Cover

The 1500m buffer area around the development site comprises an area of 892 ha. As determined by GIS mapping from aerial imagery, approximately 270 ha of native vegetation occurs in the 1500 m buffer area (Figure 2-5).

The Percent Native Vegetation Cover within the 1500 m buffer area surrounding the development site prior to the development was calculated to be 30.3%. This was entered into the BAM calculator for the assessment.

2019/2020 Bushfire Impacts

The 2019/20 bushfire season has decimated many areas of native vegetation across the east coast of Australia and caused significant impacts to wildlife, including threatened species. An extent of 5.3 million ha of land representing 6.7% of NSW has been impacted by bushfires affecting over 60 threatened fauna species (DPIE 2020b). Scientists and government agencies have been working to understand how the fires have affected the environment and to determine where management intervention is needed.

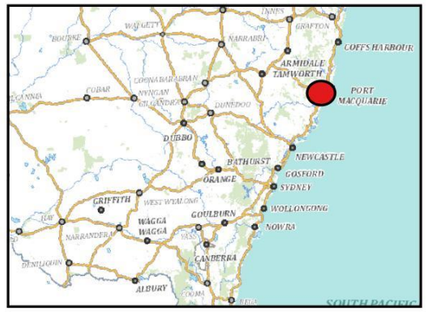
In accordance with the *Guideline for applying the Biodiversity Assessment Method at severely burnt sites* (State of NSW & DPIE 2020), consultation with the consent authority is not required in relation to this impact as the vegetation within and/or surrounding the subject land was largely unaffected by fire impacts during this time, however, considerations to impacts from bushfires within the Port Macquarie area and more broadly across the state was considered during this assessment.

Hastings River Drive
Location Map

LGA PORT MACQUARIE-HASTINGS COUNCIL
IBRA BIOREGION NSW NORTH COAST
IBRA SUBREGION MACLEAY HASTINGS

Legend

- Development Footprint
- Development Site
- Native Vegetation Buffer
- Native Vegetation
- Wetlands
- Waterways
- Roads



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Author: sarah.d
Date created: 10.09.2020
Datum: GDA94 / MGA zone 56

0 0.5 1 km

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Figure 2-5 Location map

3 NATIVE VEGETATION

3.1 NATIVE VEGETATION EXTENT

0.32 ha of native vegetation occurs within the development site comprised of modified Swamp Forest and non-locally indigenous natives however NSW native street plantings also occur.

Paddock trees are defined as:

- a tree or a group of up to three trees less than 50 m apart from each other, and
- over an exotic groundcover, and
- more than 50 m away from any other living tree greater than 20 cm DBH, and
- on category 2 land surrounded by category 1 land (as defined by the BAM, 2017).*

No paddock trees occur within the development site.

*The regulatory land mapping has not been yet been published under the new *Local Land Service Act 2016* (LLS Act). During the transitional period, land categories are to be determined in accordance with the definitions of regulated land in the LLS Act. In this case, the paddock trees are located on land with native vegetation present since January 1990, surrounded by land that has been cleared of native vegetation since January 1990.

3.2 PLANT COMMUNITY TYPES (PCTS)

3.2.1 Methods to assess PCTs

Review of existing information

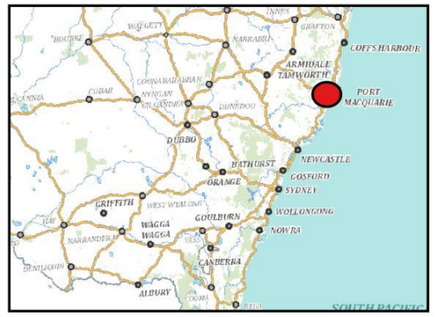
A search was undertaken of the DPIE BioNet Vegetation Classification Tool database and the NSW SEED Mapping Portal to assess existing vegetation mapping information within the development site. Relevant mapping of the development site included;

- Port Macquarie Hastings LGA Vegetation – VIS_ID 4205; and
- Port Macquarie Hastings LGA EEC - VIS_ID 4206.

This identified *Map Unit 71: Swamp Oak – Mixed eucalypt Coastal Floodplain Wetland* may occur within, and surrounding, the development site. *Map Unit 71: Swamp Oak – Mixed eucalypt Coastal Floodplain Wetland* is commensurate with the following PCTs summarised in Table 3-1.

Hastings River Drive
Native Vegetation Extent in the Development Site

Legend
- Development Footprint
- Development Site
- Non-native Vegetation
- Native Vegetation
- Roads



Ref: 18-765 hastings \ Native Vegetation Extent in the Development Site
Author: sarah.d
Date created: 11.09.2020
Datum: GDA94 / MGA zone 56

0 50 100 m

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Figure 3-1 Native vegetation extent within the development

Table 3-1 Mapped PCTs within the development site

Mapped PCTs	Present within the Development Site
PCT 1064 - Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Present
PCT 1230 - Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion	Absent
PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Absent
PCT 1717 - Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Absent

Floristic surveys

Detailed floristic surveys were undertaken on 21 May 2019 by two ecologists from NGH. A vegetation integrity plots, of 20 m by 50 m, was established in each native vegetation zone. Data was collected on the composition, structure, and function of the vegetation. Data was collected utilising the methodology presented in the BAM 2017 by persons trained in the BAM and under the direction of persons accredited under the BAM.

3.2.2 Limitations

Vegetation integrity plot surveys were undertaken during May 2019. Therefore, the flora species recorded are reflective of this timeframe. it is possible that not all plant species were detected that may be present at the development site due to seasonal and climatic constraints. In particular, inconspicuous or geophytic species which flower outside the surveyed period may not have been recorded.

Climatic conditions may influence the species present at any one time. Preceding weather conditions may also have the effect of limiting habitat suitability within the development site for candidate species credit species where aspects such as rainfall is a key limiting factor.

Survey for candidate species requiring confirmation of presence or absence was not undertaken other than for those flora that could be surveyed for during May. This is stated explicitly in this assessment and measures identified to address this limitation; i.e. assumption of occurrence of the species. This is the case for Southern Myotis *Myotis macropus* and Wallum Froglet *Crinia tinnula*.

3.2.3 PCTs identified on the development site

A description of the PCT 1064 is provided in Table 3-2.

Table 3-2 Description of PCT 1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion within the development site.

Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	
Vegetation formation	Forested Wetland
Vegetation class	Coastal Swamp Forests

Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion			
Vegetation type	PCT ID	1064	
	Common Community Name	Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	
Approximate extent within the development site	0.42.ha of this PCT occurs in the development site. This is comprised of; 0.27 ha as canopy with maintained understory 0.045 ha as vegetation associated with a drainage line 0.12 ha of planted NSW native species have been attributed to this PCT for the purposes of establishing a species polygon for Koala (see Section 3.3.1 below)		
Species relied upon for PCT identification	Species name	Relative abundance	
	Broad-leaved Paperbark *Melaleuca quinquenervia*	30%	
	Flax-leaved Paperbark *Melaleuca linariifolia*	1%	
	Swamp Oak *Casuarina glauca*	8%	
	Swamp Water Fern *Blechnum indicum*	<1%	
	Tall Saw-sedge *Gahnia clarkei*	2.5%	
	Common Silkpod *Parsonsia straminea*	5%	
Justification of evidence used to identify the PCT	PCT 1064 was identified with a dominance of Broad-leaved Paperbark and Swamp Oak, as well as characteristic groundcovers and scramblers. Three further PCTs were considered that have similar characteristics to PCT 1064. These are: *PCT 1230 - Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion* *PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion* *PCT 1717 - Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast* While the three PCTs above have similar characteristics to PCT 1064, PCT 1064 was considered the best match based on the prevalence of Broad-leaved Paperbark over Swamp Oak, and the absence of Swamp Mahogany from the development site.		
TEC Status	Listed as *Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* (Swamp Sclerophyll Forest EEC) under the BC Act. Not listed under the EPBC Act		
Estimate of percent cleared within NSW	75%		

Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	
Examples	 Figure 3-2 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion maintained (above) and riparian (below). 

Hastings River Drive PCTs

Figure 3-3 PCTs and TECs at the development site

3.3 VEGETATION INTEGRITY ASSESSMENT

3.3.1 Vegetation zones and survey effort

Detailed floristic plots have been used to assist the delineation of zones. One PCT was identified in the development site. This PCT was considered in terms of whether it should be further stratified into zones on the basis of current condition state / management or other environmental variables. PCT 1064 was stratified into two zones, on the basis of maintenance regime, or lack thereof (Table 3-2).

To stratify the subject land, a third zone was added for planted/landscaped non locally indigenous or non NSW native vegetation and a fourth zone was added for turfed and maintained roadside areas.

Two plots were undertaken throughout the two native vegetation zones in the development site. The number of floristic plots undertaken in each zone was in line with the minimum plots required per zone area as specified in the BAM (2017).

NOTE: due to the presence of Koala (scat) being detected within an area that contains non-locally indigenous native planted species (a locally occurring PCT could not be assigned) on the southern side of Hastings River Drive, to facilitate the inclusion of these areas into a species polygon for Koala, these areas have been incorporated into Zone 2: PCT 1064 – Maintained. This has taken place with guidance from DPIE to allow for accurate consideration of impacts to Koala. Only known Koala feed trees, such as Narrow-leaved Black Peppermint *Eucalyptus nicholii*, have been incorporated into Zone 1. Trees that are not NSW Koala feed trees or are exotic trees have been included in Zone 3.

Table 3-3 Vegetation zones at the development site

Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (# plots)	Patch size (ha)	Example
1	**1064**	**Maintained** Vegetation that contains the dominant native canopy species of Zone 1, however, the groundcover is maintained through mowing. Note: as stated in Section 3.3.1 above, this Zone includes non-locally native street trees such as Narrow-leaved Black Peppermint to allow accurate assessment of impacts to Koala.	0.42	1	>100, significant connectivity to the south	
2	**1064**	**Drainage** Vegetation associated with a drainage line situated north south through the development site.	0.045	1	>100, significant connectivity to the south	

Zone ID	PCT ID	Condition	Zone area (ha)	Survey effort (# plots)	Patch size (ha)	Example
3	**N/A**	**Planted Vegetation** Sections of the development site that line Hastings River Drive contain predominantly mown grass with sparse plantings. The groundcover is predominantly exotic, with the plantings comprised of some species native to NSW but not locally native. Other planted species include non-native species such as Umbrella Tree *Schefflera actinophylla* and Camphor laurel *Cinnamomum camphora.*	0.2 ha	NA	N/A	
4	**N/A**	**Maintained Lawn** Large portions of the vegetation on either side of Hastings River Drive is comprised of turfed areas that are mown regularly.	0.84 ha	NA	N/A	

Figure 3-4 Vegetation zones at the development site

3.3.2 Vegetation integrity assessment results

Fifty-four plant species were identified within the two vegetation integrity survey plots, comprised of 31 native species and 23 exotic species. The results of the plot field data can be found in Appendix A.

The plot data from the vegetation integrity survey plots was entered into the BAM Calculator by an accredited assessor. The results of the vegetation integrity assessment are provided in Table 3-4.

Table 3-4 Current vegetation integrity scores for each vegetation zone within the development site

PCT	Zone	Zone ID	Composition score	Structure score	Function score	Vegetation Integrity Score
1064	1	1064_Maintained	54.4	65.8	30.2	47.6
1064	2	1064_Drainage	60.6	33.4	31.9	40.1

4 THREATENED SPECIES

4.1 ECOSYSTEM CREDIT SPECIES

The following ecosystem credit species were returned by the calculator as being associated with the PCTs present on the development site:

Table 4-1 Ecosystem credit species predicted by the BAM-C

Common Name	Associated PCT	NSW Listing Status	EPBC Listing Status
Fauna			
Anthochaera phrygia (Regent Honeyeater)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Critically Endangered	Critically Endangered
Botaurus poiciloptilus (Australasian Bittern)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Endangered	Endangered
Calyptorhynchus lathami (Glossy Black-cockatoo)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Chalinolobus nigrogriseus (Hoary Wattled Bat)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Climacteris picumnus victoriae (Brown Treecreeper (eastern subspecies))	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Coracina lineata (Barred Cuckoo-shrike)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Daphoenositta chrysoptera (Varied Sittella)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Dasyurus maculatus maculatus (Spot-tailed Quoll)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Endangered	Endangered
Ephippiorhynchus asiaticus (Black-necked Stork)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Endangered	Not listed
Glossopsitta pusilla (Little Lorikeet)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Haliaeetus leucogaster (White-bellied Sea Eagle)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Migratory

Common Name	Associated PCT	NSW Listing Status	EPBC Listing Status
Hieraaetus morphnoides (Little Eagle)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Hirundapus caudacutus (White-throated Needletail)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Not listed	Vulnerable
Ixobrychus flavicollis (Black Bittern)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Lathamus discolor (Swift Parrot)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Critically Endangered	Critically Endangered
Miniopterus australis (Little Bent-winged Bat)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Miniopterus schreibersii oceanensis (Eastern Bent Wing Bat)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Mormopterus norfolkensis (Eastern Freetail-bat)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Ninox connivens (Barking Owl)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Ninox strenua (Powerful Owl)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Oxyura australis (Blue-billed Duck)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Pandion cristatus (Eastern Osprey)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Pteropus poliocephalus (Grey-headed Flying-fox)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Vulnerable
Ptilinopus superbus (Superb Fruit Dove)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed
Saccolaimus flaviventris (Yellow-bellied Sheathtail-Bat)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed

Common Name	Associated PCT	NSW Listing Status	EPBC Listing Status
Stictonetta naevosa (Freckled Duck)	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Vulnerable	Not listed

4.1.1 Species excluded from the assessment

No ecosystem credit species were excluded from the assessment; all are assumed to occur and contribute to ecosystem credits.

4.2 SPECIES CREDIT SPECIES

4.2.1 Species credit species to be assessed

The BAM Calculator predicted the following thirty-six species credit species to occur at the development site (Table 4-2). Note that habitat constraints and geographic restrictions have been sourced from the BAM-C and/or Threatened Biodiversity Data Collection (DPIE 2020c). Assessment of habitat constraints present, or likely present, at the development site and geographic limitations was undertaken to determine which species should be excluded from further assessment and which would remain candidate species to be considered.

Note: between 27 October 2020 and the date of BAM-C finalisation (08/04/21), no threatened entities were listed on the schedules of the BC Act that required consideration. No additional species were added between the date of finalisation and the date of printing reports (24/08/2021).

Table 4-2 Candidate species credit species predicted to occur by the BAM-C

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Acronychia littoralis (Scented Acronychia)	Occurs in transition zones between littoral rainforest and swamp sclerophyll forest; between littoral and coastal cypress pine communities; and margins of littoral forest. The species mainly occurs within 2km from the coast on sandy soil.	High	Endangered	Endangered	Poor quality habitat present in the form of swamp sclerophyll forest.	Excluded	Habitat degraded.
Alexfloydia repens (Floyd's Grass)	Floyd's Grass occurs only on the NSW mid north coast from Coffs Harbour to Scotts Head. It is currently known from two disjunct areas: a northern population centred around Sawtell and a southern population along Warrell Creek. Most Floyd's Grass is found on floodplain alluvial deposits between 1m and 2m above the mean tide level, although there are two atypical headland occurrences (at Coffs Harbour and Sawtell).	High	Endangered	Not listed	Development site not within geographic restrictions.	Excluded	No suitable habitat.
Allocasuarina defungens (Dwarf Heath Casuarina)	Found only in NSW from the Nabiac area, north-west of Forster, to Byron Bay on the NSW north coast. Dwarf Heath Casuarina grows mainly in tall heath on sand but can also occur on clay soils and sandstone. The species also extends onto exposed nearby-coastal hills or headlands adjacent to sandplains. Within 15 km from the coast.	High	Endangered	Endangered	Associated vegetation type present.	Included	Potential habitat present
Anthochaera phrygia (Regent Honeyeater)	Dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak. Large numbers of mature trees, high canopy cover and abundance of mistletoes. Particularly along creek flats, river valleys, and foothills.	High	Critically Endangered	Critically Endangered	Outside mapped important areas (DPIE)	Excluded	Development site not mapped as an important habitat area

Argynnis hyperbius (Laced Fritillary)	Found in open swampy coastal habitat. Eggs are laid singly on a leaf of the caterpillar's food plant, the Arrowhead Violet (*Viola betonicifolia*)	High	Endangered	Critically Endangered	Arrowhead Violet not present.	Excluded	No suitable habitat. Food source not present
Asperula asthenes (Trailing Woodruff)	This small herb occurs only in NSW and occurs in damp sites, often along riverbanks. It is found in scattered locations from Bulahdelah north to near Kempsey, with several records from the Port Stephens/Wallis Lakes area.	High	Vulnerable	Vulnerable	Associated vegetation type present but degraded.	Excluded	Potential habitat degraded
Callistemon linearifolius (Netted Bottle Brush)	Grows in dry sclerophyll forest on the coast and adjacent ranges.	High	Vulnerable	Not listed	Associated vegetation type present.	Excluded	No suitable habitat.
Calyptorhynchus lathami (Glossy Black-cockatoo (Breeding)	In spring and summer, tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, lower altitudes in drier, more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages. Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground	High	Vulnerable	Not listed	No suitable hollow-bearing trees present in development site.	Excluded	No suitable breeding habitat.
Carternonis leucotis (White-eared Monarch)	In NSW, White-eared Monarchs occurs in rainforest, especially drier types, such as littoral rainforest, as well as wet and dry sclerophyll forests, swamp forest and regrowth forest.	High	Vulnerable	Not listed	Habitat may be present, although degraded.	Excluded	Species is a vagrant
Cercartetus nanus (Eastern Pygmy Possum)	Range from rainforest through sclerophyll forest and woodland to heath. Woodland and heath preferred with an abundance of nectar producing species. Feeds on nectar from banksias, eucalypts, and bottlebrushes.	High	Vulnerable	Not listed	Limited foraging habitat available.	Excluded	Potential habitat degraded
Crinia tinnula (Wallum Froglet)	Inhabits a wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgelands and wet heathlands. They can also be found along drainage	Moderate	Vulnerable	Not listed	Ephemeral drainage line in Zone 2	Included	Marginal potential habitat

	lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests.						present in Zone 2.
Dendrobium melaleucaphilum (Spider Orchid)	Grows frequently on *Melaleuca styphelioides*, less commonly on rainforest trees or on rocks in coastal districts.	High	Endangered	Not listed	Associated vegetation type present.	Excluded	Habitat degraded and no suitable *Melaleuca* present.
Eucalyptus seeana (*Eucalyptus seeana* population in the Greater Taree local government area)	Occurs as scattered individuals in woodlands and open forests on low, often swampy, sandy soils.	High	Endangered	Not listed	Outside geographic range	Excluded	Development site is outside geographic restrictions of the population.
Haliaeetus leucogaster (White-bellied Sea-eagle (Breeding))	Large areas of open water including larger rivers, swamps, lakes, and the sea. Coastal dunes, tidal flats, grassland, heathland, woodland, and forest. Breeding habitat mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands, and coastlines.	High	Vulnerable	Not listed	Development site within 1 km of foraging habitat .	Excluded	Optimal breeding habitat requirements not present.
Hieraaetus morphnoides (Little Eagle (Breeding))	Open eucalypt forest, woodland, or open woodland, and Sheoak or Acacia woodlands and riparian woodlands in interior NSW, where they nest in tall living trees within a remnant patch. Nest trees - live (occasionally dead) large old trees within vegetation.	Moderate	Vulnerable	Not listed	Suitable trees may be present.	Excluded	Optimal breeding habitat requirements not present.
Hoplocephalus bitorquatus (Pale-headed Snake)	Can spend weeks at a time hidden in tree hollows. Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest.	Moderate	Endangered	Not listed	Marginal habitat present (Zone 2) but sub-optimal and degarded.	Excluded	Associated PCT has no suitable habitat for this species.

	Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees. Frogs are main prey.						
Lathamus discolor (Swift Parrot)	Mapped Important Areas	Moderate	Endangered	Critically Endangered	Development site not within mapped important areas.	Excluded	Not within mapped important areas
Lindernia alsinoides (Noah's False Chickweed)	Recorded in coastal areas from Buladelah to Coopernook and with occurrences further north at Shannon Creek west of Coutts Crossing and also at Bungawalbyn. Grows in swamp forests and wetlands along coastal and hinterland creek.	High	Endangered	Not listed	Associated vegetation type present.	Excluded	Habitat degraded.
Litoria aurea (Green and Golden Bell Frog)	Inhabits marshes, dams, and stream-sides, particularly those containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (Gambusia holbrooki), have a grassy area nearby and diurnal sheltering sites available. Semi-permanent/ephemeral wet areas within 1 km of swamps. Within 1 km of a waterbody.	High	Endangered	Vulnerable	Development site within habitat constraints.	Excluded	Associated PCT has no suitable habitat for this species.
Litoria brevipalmata (Green-thighed Frog)	Occur in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. It prefers wetter forests in the south of its range but extends into drier forests.	Moderate	Vulnerable	Not listed	Preferred habitat not present.	Excluded	Associated PCT has no suitable habitat for this species.
Maundia triglochinoides	Swamps or shallow freshwater on clay.	High	Vulnerable	Not listed	Swamps not present. No permanent standing water.	Excluded	No suitable habitat.
Melaleuca biconvexa (Biconvex Paperbark)	Generally, grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	High	Vulnerable	Vulnerable	Associated vegetation type present.	Included	Potential habitat present.

Miniopterus australis (Little Bent-winged Bat (Breeding)	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests, and banksia scrub. Generally well-timbered areas. Roost in caves, tunnels, abandoned mines, stormwater drains, culverts, bridges, and buildings during the day. Breed in caves, tunnels, mines, or culverts.	Very High	Vulnerable	Not listed	No breeding habitat.	Excluded	Breeding habitat not present.
Miniopterus orianae oceanensis (Large Bent Wing Bat (Breeding)	Caves are primary roosting habitat, but also use derelict mines, stormwater tunnels, buildings, and other man-made structures. Breed in central maternity caves. Hunt in forested areas, catching moths and other flying insects above canopy.	Very High	Vulnerable	Not listed	No breeding habitat.	Excluded	Breeding habitat not present.
Myotis macropus (Southern Myotis)	Generally, roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	High	Vulnerable	Not listed	Development site is within 500 m of foraging habitat to the south.	Included	Potential habitat present.
Ninox connivens (Barking Owl (Breeding)	Woodland and open forest, including fragmented remnants and partly cleared farmland. Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground.	High	Vulnerable	Not listed	No suitable hollow bearing trees present.	Excluded	No suitable breeding habitat.
Oberonia titania Red-flowered (King of the Fairies)	Red-flowered King of the Fairies occurs in littoral and subtropical rainforest and paperbark swamps, but it can also occur in eucalypt-forested gorges and in mangroves.	Moderate	Vulnerable	Not listed	Associated vegetation type present. Trees present to grow on.	Excluded	Potential habitat degraded.
Ocybadistes knightorum (Black Grass-dart Butterfly)	The species is highly constrained to short distances up slope from the coast, just above the king tide mark. Larval food source restricted to *Alexfloydia repens* (Floyd's grass). Apart from dispersing individuals, in most cases they are within 100m of the breeding site, of which 90% are within 20m of the breeding site. The species prefers rich peat	Moderate	Endangered	Not listed	Larval food source not present.	Excluded	Habitat constraints not present.

	swamps, though Floyd's grass can be encouraged to establish outside of this habitat.						
Pandion cristatus (Eastern Osprey (Breeding))	Living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting.	Moderate	Vulnerable	Not listed	Breeding habitat components present.	Included	Habitat components present.
Petauroides volans (Greater Glider)	Hollow-bearing trees	High	Not listed	Vulnerable	Suitable hollow-bearing trees not present.	Excluded	Habitat constraints not present
Petaurus norfolcensis (Squirrel Glider)	Mature or old-growth Box, Box-Ironbark woodlands, and River Red Gum Forest. Mixed species stands with a shrub or Acacia mid-storey. Requires abundant tree hollows. Large HBTs, <50 m apart.	High	Vulnerable	Not listed	Within geographic range. Not likely to inhabit a forested wetland.	Excluded	No suitable habitat.
*Phaius australis (*Southern Swamp Orchid)	Swampy grassland or swampy forest including rainforest, eucalypt, or paperbark forest, mostly in coastal areas.	Moderate	Endangered	Endangered	Associated vegetation type present.	Excluded	Habitat degraded.
Phascogale tapoatafa (Brush-tailed Phascogale)	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs, or leaf litter. Also inhabit heath, swamps, rainforest, and wet sclerophyll forest. Forages preferentially in rough-barked trees of 25 cm DBH or greater. Nest and shelter in tree hollows with entrances 2.5 – 4 cm wide and use many hollows over short time span.	High	Vulnerable	Not listed	Swamp vegetation present.	Excluded	Habitat degraded.
Phascolarctos cinereus (Koala (Breeding))	Eucalypt forest and woodlands. Riparian/refuge habitat during dry periods.	High	Vulnerable	Vulnerable	Habitat present	Included	Potential habitat present.
Planigale maculata (Common Planigale)	Inhabit rainforest, eucalypt forest, heathland, marshland, grassland, and rocky areas where there is surface cover, and usually close to water. Habitat includes hollow logs, under bark, rocks, cracks in soil, grass tussocks or building debris.	High	Vulnerable	Not listed	Within geographic distribution.	Excluded	Habitat degraded.

Potorous tridactylus (Long-nosed Potoroo)	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. Habitat constraint: Dense shrub layer or alternatively high canopy cover exceeding 70%.	High	Vulnerable	Vulnerable	Habitat constraints not present	Excluded	Habitat constraints not present.
Pteropus poliocephalus (Grey-headed Flying-fox (Breeding))	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps, urban gardens, and fruit crops. Camps < 20 km of food source, close to water, in vegetation with dense canopy, often in gullies.	High	Vulnerable	Vulnerable	No breeding camps present.	Excluded	No breeding habitat present.
Syzygium paniculatum (Magenta Lilly Pilly)	Found in rainforest on sandy soils or stabilised Quaternary sand dunes at low altitudes in coastal areas. Rainforests are often remnant stands of littoral or gallery rainforest.	Moderate	Endangered	Endangered	Associated vegetation type present.	Included	Potential habitat present.

4.2.2 Inclusions based on habitat features

A Bionet search was undertaken on 9 September 2020 to determine if any further threatened species are considered likely to occur on the development site.

Given that the development is within and comprises a highly modified landscape offering few habitat features that may be utilised to complete the life cycle of a threatened species, no further threatened species have been included in this assessment.

4.2.3 Exclusions based on habitat quality

Under Section 6.4.1.17 of the BAM, a species credit species can be considered unlikely to occur on a development site (or within specific vegetation zones) if following field assessment, it is determined that the habitat is substantially degraded such that the species is unlikely to utilise the development site (or specific vegetation zones). These species are identified in Table 4-2.

4.2.4 Candidate species requiring confirmation of presence or absence

The species listed in Table 4-3. are those that are considered to have habitats present at the development site. Two of these species are assumed to be present on the site. Surveys have been conducted for the remaining species. The results are summarised in Table 4-3. Details of the survey methodologies and results are provided for each surveyed species are provided below.

Table 4-3 Summary of species credit species requiring confirmation of presence or absence

Species credit species	Biodiversity risk rating	Survey period	Assumed to occur/survey/expert report	Present on site?	Species polygon area or count
FAUNA					
Phascolarctos cinereus Koala	2.00	Any	Surveyed May 2019	Yes, scats detected.	0.4
Myotis macropus Southern Myotis	2.00	Oct-Mar	Not surveyed for during recommended survey period.	Yes, assumed to occur	0.28
Crinia tinnula Wallum Froglet	1.50	Any	Surveys could not be undertaken in suitable conditions. Assumed to occur	Yes, assumed to occur.	0.04
FLORA					
Allocasuarina defungens Dwarf Heath Casuarina	2.00	Any	Surveyed May 2019	No	NA
Melaleuca biconvexa Biconvex Paperbark	2	Any	Surveyed May 2019	No	NA
Syzygium paniculatum Magenta Lilly Pilly	2	Any	Surveyed May 2019	No	NA

4.2.5 Candidate species survey and results

Threatened Flora (Dwarf Heath Casuarina, Biconvex Paperbark and Magenta Lilly Pilly)

Zone 1 and 2 were searched for the above species. None were detected.

Threatened fauna

No specific targeted surveys were conduction for threatened fauna. This is large part due to the timing of the site visit (May) and general lack of habitat present. A fauna habitat assessment was conducted, which identified Koala scat below a Narrow-leaved Black Peppermint on the northern side of Hastings River Drive. As mentioned, this species and other NSW feed trees located within the development site, have been included into Zone 2, to allow accurate assessment of impacts to Koala. This has been carried out under guidance from DPIE. The species polygon for Koala includes Zone 1 and 2.

Southern Myotis and Wallum froglet have been assumed present within the development site. The species polygon for Southern Myotis includes Zone 1 and 2 (minus planted areas on the northern side of Hastings River Drive), whereas Wallum froglet includes only Zone 1.

4.3 ADDITIONAL HABITAT FEATURES RELEVANT TO PRESCRIBED BIODIVERSITY IMPACTS

4.3.1 Occurrences of karst, caves, crevices and cliffs

As verified by the field inspection, there are no occurrences of karst, caves, crevices, or cliffs in the development site.

4.3.2 Occurrences of rock

As verified by the field inspection, there are no occurrences of surface rock in the development site.

4.3.3 Occurrences of human made structures and non-native vegetation

As verified by the field inspection, there are numerous humans made structures within the development site in the form of numerous buildings. Landscape plantings along Hastings River Drive and within Hamilton Green constitute non-native vegetation.

4.3.4 Hydrological processes that sustain and interact with the rivers, streams and wetlands

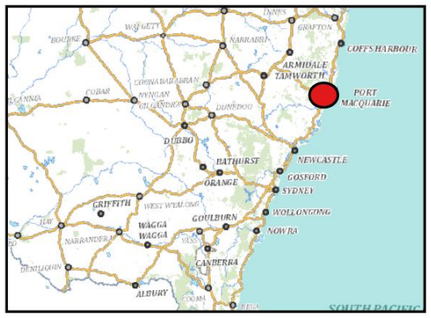
One ephemeral drainage line occurs within the development site. It is likely that this drainage line interacts with a wetland to the south of the development site.

Hastings River Drive Targeted Surveys and Threatened Species - Wallum Froglet and Southern Myotis

Figure 4-1 Species polygons and targeted survey locations – Southern Myotis and Wallum Froglet

Hastings River Drive
Koala Scat and Species Polygon

Legend
- Development Footprint
- Development Site
- Roads
- Koala Scat
- Koala Species Polygon
- Targeted Flora surveys and Fauna Habitat Assessment



Data Attribution
© NGH 2021
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© AT&L, 2020

Ref: 18-765 hastings-NGH-6221-2TJWTP2 \
Koala Scat and Species Polygon
Author: sarah.d
Date created: 31.03.2021
Datum: GDA94 / MGA zone 56

0 50 100 m

NGH

Figure 4-2 Species polygons and targeted survey locations – Koala

5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC protected matters report was undertaken on 8 July 2020 (10 km buffer of the development site) to identify Matters of National Environmental Significance (MNES) that have the potential to occur within the development site (Appendix C). Relevant to Biodiversity these include:

- Wetlands of national Importance – 1;
- Threatened Ecological Communities – 4;
- Threatened fauna species – 56;
- Threatened flora species – 14; and
- Migratory species – 66.

The potential for these MNES to occur at the development site are discussed below.

5.1 WETLANDS OF INTERNATIONAL IMPORTANCE

No wetlands of international importance were returned from the protected matters report; however, one wetland of national importance was returned, that of Limeburners Creek Nature Reserve. Limeburners Creek Nature Reserve is located over seven km to the north of the development site across the Hastings River. It is unlikely that the development site interacts with this wetland.

5.2 THREATENED ECOLOGICAL COMMUNITIES

Four TECs were returned from the protected matters report. Only one of these TECs has characteristics present in the development site.

The presence of Swamp Oak indicates the potential for the federally listed endangered community, *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community* to occur.

As assessment was undertaken to determine if PCT 1064 meets the key diagnostic characteristics and minimum condition thresholds of the EPBC Act listed community. For PCT 1064 to be considered part of the listed community, the dominant canopy tree must be Swamp Oak. Although Swamp Oak is present within the development site and in greater degree in Zone 2, it is never the dominant tree and is forming part of a sclerophyllous forest.

No federally listed TECs are considered to occur in the development site.

5.3 THREATENED SPECIES

Seventy threatened species were returned from the protected matters report. Of these, one species is considered to have high potential to utilise the habitats at the development site. Though not sighted, several scats of Koala were observed on the northern side of Hastings River Drive below a Narrow-leaved Black Peppermint which is a Koala feed tree native to the NSW New England Tablelands. Further known feed trees are present within Zone 1 in the form of three Forest Red Gum *Eucalyptus tereticornis* and planted Spotted Gum.

No other federally listed threatened species are considered likely to utilise the development site.

5.4 MIGRATORY SPECIES

Sixty-six listed migratory species were returned from the protected matters report. None of these species are considered to have the potential to occur at the development site (Appendix D).

6 STATE ENVIRONMENTAL PLANNING POLICY KOALA HABITAT PROTECTION (2021)

State Environmental Planning Policy – (Koala Habitat Protection) 2021 (Koala Habitat Protection SEPP) encourages the conservation and management of natural vegetation that provides habitat for Koalas. Koalas are listed under the BC Act as a vulnerable species. The Koala Habitat Protection SEPP applies to each local government area listed in Schedule 1. The study area is located within the Port Macquarie Hastings LGA, which is listed in Schedule 1. Activities assessed under Part 4 of the EP&A Act, as is the case for the proposal, are subject to the Koala Habitat Protection SEPP.

Key to the application of the Koala Habitat Protection SEPP is determining “core Koala habitat”. Core Koala habitat means:

(a) an area of land which has been assessed by a suitably qualified and experienced person in accordance with the Guideline as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or

(b) an area of land which has been assessed by a suitably qualified and experienced person in accordance with the Koala Habitat Protection Guideline (Guideline) as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.

Given that Koala were detected (via scat) within the subject land, the subject land is considered to represent core Koala habitat. Given this, and that the subject land has no approved Koala Plan of Management, Council must take into account a Koala Assessment Report (KAR) for the proposal. A KAR must address seven planning principles in accordance with the Guideline. In lieu of preparation of a KAR, this BDAR, which includes measures specific to mitigating impacts to Koala, and accompanying Vegetation Management Plan, is considered to satisfy the requirement of a KAR in regard to assessment of habitat values for Koala, avoidance of such values, mitigation of potential impacts and lastly, offsetting of residual impacts in accordance with the BAM.

7 AVOID AND MINIMISE IMPACTS

7.1 AVOIDING AND MINIMISING IMPACTS ON NATIVE VEGETATION AND HABITAT

7.1.1 Site selection – consideration of alternative locations/routes

The 'do nothing' option must always be considered in any evaluation of options. It represents the status quo situation; avoiding all development impacts but similarly not realising the potential benefits.

The direct consequence of not proceeding with the Proposal would be to forgo the benefits outlined in Section 1.1 This would entail:

- Missing the opportunity to upgrade the last section of Hastings River Drive to be converted to a four-lane carriageway, which provides the main route between Port Macquarie and the airport.
- Not addressing safety concerns, with 10 traffic incidents occurring along the section of Hastings Drive since 2013, including two serious injury incidents in 2015 and 2017 (NSW Government - Transport for NSW, 2019).
- Missing the opportunity to upgrade Hamilton Green to meet the objectives of the Hamilton Green Management Plan (Milne Home & Jamison, 2004).
- Not contributing to the Port Macquarie-Hastings Bike Plan (Port Macquarie Hastings, 2015) to provide cycling infrastructure.

Hastings River Drive and Hamilton Green in their current forms (the "no action" option) would not meet the current or projected growth in the area, and therefore was not considered in the assessment of options.

Given the nature of the proposal, its goals could not be achieved by choosing a different site location. Efforts have been made through the detailed design process to avoid native vegetation as much as practicable.

7.1.2 Proposal components – consideration of alternate modes or technologies

Standard construction methods and materials are proposed to be used.

7.1.3 Proposal planning phase – detailed design

As mentioned, avoiding and minimising native vegetation removal has been incorporated into the detailed design process.

The final development footprint is detailed in Figure 7-1.

Figure 7-1 Final project footprint

7.2 AVOIDING AND MINIMISING PRESCRIBED BIODIVERSITY IMPACTS

The BC Regulation (clause 6.1) identifies actions prescribed as impacts to be assessed under the biodiversity offsets scheme:

- Impacts of development on the habitat of threatened species associated with non-native vegetation.
- Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range.
- Impacts of development on movement of threatened species that maintains their life cycle.
- Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities.
- Impacts of vehicle strikes on threatened species or on animals that are part of a TEC.

How these prescribed impacts have been avoided and minimised by the proposal is detailed below.

7.2.1 Impacts of development on the habitat of threatened species associated with non-native vegetation.

Koala scats were found on the northern side of Hastings River Drive beneath planted vegetation that has been deemed not to represent a PCT within the subregion but are native to NSW. While this vegetation is unlikely to be able to support Koala in the long term, the proposal would remove this small amount (0.17 ha) of foraging habitat for Koala. As the priority within the development site was to reduce impacts to native vegetation, areas of open planted vegetation and cleared land within the development site were utilised to form part of the development footprint and have not been avoided by the proposal. In the context of available resources in the general landscape, particularly to the south where Swamp Mahogany *Eucalyptus robusta* (a primary food tree on the NSW North Coast) are likely to be present in number, the removal of vegetation in Zone 3 would have minimal impact on residing Koala only.

The removal of non-native vegetation for the proposal is no considered to impact Southern Myotis or Wallum Froglet which are assumed to occur.

7.2.2 Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

The development site is not a known migratory path for threatened species and does not contain a contiguously vegetated corridor for movement. Connectivity across the development site and through the adjacent landscape is poor given the urban context of the proposal. Dense vegetation that is most likely to be used for movement is limited to Zone 1 and 2 which is connected to bushland/wetlands to the south, itself having been impacted substantially by the 2019-2020 bushfire season (DPIE 2020b). Any mobile threatened fauna attempting to traverse northerly or southerly through Zone 1 and 2 such as Koala encounter Hastings River Drive and cleared areas which present a significant hindrance to movement and a known key threat (vehicle strike). Foreseeably, Koala may traverse north-south through the development site utilising a route through currently present through Zones 1 and 2. Once across Hastings River Drive, access to potential foraging resources for Koala located within Stuart Park is already limited by fencing associated with development at the corner of Hastings River Dive and Hibbard Drive. Meaning that access is only available either by traversing further north on Hibbard Drive or east to Wood St. Traversal between these two areas of habitat would still be possible with the proposal constructed.

East-west movement is limited to the road reserve and sparse landscape/roadside plantings. Southern Myotis are highly mobile and would not be impeded by the removal of vegetation required for the proposal. Wallum Froglet are unlikely to be utilise the development site for dispersal.

Despite the limited connectivity present, the proposal has been sited to avoid wooded areas and minimise vegetation removal as much as possible through the use of existing cleared areas and infrastructure such as carparks. Given the limited removal of vegetation within the development site, the proposal is not considered to introduce a barrier to movement of threatened fauna or significantly isolate intact patches of habitat, however, it would increase the impediment and mortality risk that Hasting's River Drive poses to Koala.

7.2.3 Impacts of development on movement of threatened species that maintains their life cycle.

The development site is not a known migratory path for threatened species and does not present a clear corridor for movement due to barriers such as Hastings River Drive, cleared areas, residences, and commercial buildings. Further afield, Hastings River to the north serves as an impassable barrier. Native vegetation to the north, east and west of the development site is highly limited and disjunct given the urbanised landscape. Zones 1 and 2 are connected to and occur on the edge of a large patch of bushland/wetlands to the south.

Given the context outlined above, the likelihood of threatened fauna such as Koala utilising the development site as a means of movement to maintain their life cycle is low. Particularly given that there are no significant areas of habitat to the north, east or west that might require the use of the development site to access. This does not discount its use for general traversal and forage outside of breeding times.

The proposal has been sited to avoid wooded areas and minimise vegetation removal as much as possible through the use of existing cleared areas and infrastructure such as carparks. Given the small amount of vegetation removal proposed, proposal is considered unlikely to reduce the bioregional persistence of any threatened species via impeding movement that maintains their life cycle.

7.2.4 Impacts of development on water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities

The most prominent aquatic feature present within the development site is an ephemeral drainage line that runs north-south through Zone 2. This drainage line is fed by surface water and potentially from the nearby wetland outside the development site to the south. This drainage line was dry at the time of survey but is likely to have some limited flow during rainy periods. This process is contributing to the subsistence of Swamp Sclerophyll Forest within the development site and the potential for Wallum Froglet to occur during suitable conditions.

During rainy periods, this drainage line would interact with the SEPP wetland to the south that is likely to contain threatened species habitat and TECs. Contextually, this drainage line would play little role in sustaining the wetland given the small amount of water the drainage line would provide in relation to the size of the wetland. Additionally, there would be many more sources of water for the wetland that are likely to be more influential.

Direct impact to much of the drainage line has been avoided and construction of a new culvert would maintain the present process that is evident. There is a risk of reduced water quality arising from construction, this will be mitigated using standard control measures.

7.2.5 Impacts of vehicle strikes on threatened species or on animals that are a part of a TEC

The proposal would not directly increase impacts of vehicle strikes on threatened species. The development site is currently surrounded by busy roads that threatened species such as Koala would already be navigating. However, the distance between either side of Hastings River Drive would increase by about 94m at the widest point of the development footprint. Also, an increase in vehicle traffic may increase vehicle strikes on Koala outside of the buffer area during construction disturbance. Site management to enforce and reduce site speed limits, as well as exclusion fencing, would minimise impacts of vehicle strikes within the development site during construction. Nevertheless, an increase in Koala vehicle strike during operation of the proposal may occur.

8 IMPACTS UNABLE TO BE AVOIDED

8.1 DIRECT IMPACTS

The construction and operational phases of the proposal have the potential to impact biodiversity values at the site that cannot be avoided. This would occur through direct impacts, such as habitat clearance and ongoing existence of infrastructure. These are summarised in Table 8-1

Table 8-1 Potential impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
Direct impacts					
Habitat clearance for permanent and temporary construction facilities	0.36 ha (Zone 1 0.04 ha (Zone 2)	Regular	Construction	• Swamp Sclerophyll Forest • Koala • Wallum Froglet • Southern Myotis	• Direct loss of native flora and fauna habitat • Potential over-clearing of habitat outside proposed development footprint • Injury and mortality of fauna during clearing of fauna habitat and habitat trees • Disturbance to ground habitat values such as fallen logs
Displacement of resident fauna	Unknown	Regular	Construction, operation	• Koala • Wallum Froglet • Southern Myotis	• Direct loss of native fauna • Decline in local fauna populations
Injury or death of fauna	Unknown	Regular	Construction	• Koala • Wallum Froglet • Southern Myotis	• Direct loss of native fauna • Decline in local fauna populations

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
Removal of habitat features e.g. HBTs	3 HBTs	Regular	Construction	• Koala • Wallum Froglet • Southern Myotis	• Direct loss of native fauna habitat • Injury and mortality of fauna during clearing of habitat features

8.1.1 Changes in vegetation integrity scores

Approximately 0.28 ha of native vegetation (excluding NSW native planted trees) would be removed by the proposal. The changes in vegetation integrity scores as a result of vegetation clearing are documented for each vegetation zone in Table 8-2.

Table 8-2 Current and future vegetation integrity scores for each vegetation zone within the development site

Zone ID	PCT/Zone	EEC and/or threatened species habitat?	Area Impacted (ha)	Current vegetation Integrity Score	Future vegetation Integrity Score
1	PCT1064_Maintained	Swamp Sclerophyll Forest Southern Myotis (assumed) Koala (scats found)	0.24	**47.6**	**0**
2	PCT1064_Drainage	Swamp Sclerophyll Forest Southern Myotis (assumed) Wallum Froglet (assumed) Koala (scats found)	0.04	**40.1**	**0**

8.1.2 Loss of species credit species habitat or individuals

The loss of species credit species habitat or individuals as a result of clearing is documented in Table 8-3.

Table 8-3 Summary of species credit species loss at the development site

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost
Koala *Phascolarctos cinereus* – scats found	2.00	0.36 ha in Zone 1 (includes planted feed trees) 0.04 ha in Zone 2
Crinia tinnula Wallum Froglet - assumed	2.00	0.04 in Zone 2
Myotis macropus Southern Myotis – assumed	2.00	0.24 ha in Zone 1 (excludes planted vegetation on the northern side of Hastings River Drive) 0.04 ha in Zone 2

8.1.3 Loss of hollow-bearing trees

Three hollow-bearing trees would be removed for the proposal. The trees are not considered to represent breeding habitat for any species credit species predicted to occur by the BAM-C.

8.2 INDIRECT IMPACTS

Indirect impacts of the proposal include soil and water contamination, creation of barriers to fauna movement, or the generation of excessive dust, light, or noise. Table 8-4 details the type, frequency, intensity, duration, and consequence of the direct and indirect impacts of the proposal.

Table 8-4 Potential impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Indirect impacts (those listed below are included in the BAM)					
Inadvertent impacts on adjacent habitat or vegetation	Unknown	Rare	Construction Phase: Short-term	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	• Minor direct loss of native flora and fauna habitat • Low potential for injury and mortality of fauna during clearing of fauna habitat and habitat trees • Minor disturbance to stags, fallen timber, and bush rock • Increased edge effects The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence
Reduced viability of adjacent habitat due to edge effects	Unknown	Constant	Operational Phase: Long-term	• PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion • Wallum Froglet • Southern Myotis • Koala	• Loss of connectivity between PCT 1064 within the development site and surrounds • Degradation of Swamp Sclerophyll Forest EEC The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence
Reduced viability of adjacent habitat due to noise, dust, heat or light spill	Unknown	Rare	Operational Phase: Short-term	• Wallum Froglet • Southern Myotis	• May alter fauna activities and/or movements; • Loss of foraging habitat The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Indirect impacts (those listed below are included in the BAM)					
Transport of weeds and pathogens from the site to adjacent vegetation	Unknown	Irregular	Construction & Operational Phase: Long-term	PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	• Minor loss of native flora and fauna habitat • Swamp Sclerophyll Forest EEC through weed encroachment The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence
Increased risk of starvation, exposure and loss of shade or shelter	Unknown	Rare	Construction & Operational Phase: Long-term	• Wallum Froglet • Southern Myotis • Koala	• Loss of foraging habitat
Loss of breeding habitats	3 HBTs Removal of portion of drainage line	Constant	Construction Phase: Long-Term	• Southern Myotis • Wallum Froglet	• Loss of potential breeding habitat including three HBTs; • Loss of portion of ephemeral waterway; • Loss of vegetation close to water; and • Increased pressure and competition for remaining HBT resources from native and exotic hollow dependent fauna
Earthworks and mobilisation of sediments	Unknown	Regular	Construction	• PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion • Wallum Froglet • Wetlands to the south of the development site.	• Erosion and sedimentation and/or pollution of soils, dams and downstream habitats. • Potential loss of ground cover resulting in unstable ground surfaces and sedimentation of adjacent waterways.

8.3 PRESCRIBED IMPACTS

The following prescribed biodiversity impacts are relevant to the proposal:

- Impacts of development on the habitat of threatened species associated with non-native vegetation.
- Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range.
- Impacts of development on movement of threatened species that maintains their life cycle.
- Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities.
- Impacts of vehicle strikes on threatened species or on animals that are part of a TEC.

These are discussed in detail below, and the necessary information required by Section 9.2 of the BAM is provided.

8.3.1 Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation

Koala scats were found within the development site under planted vegetation. The non-locally indigenous native vegetation provides infrequent foraging habitat on the edge of what would be a much larger home range.

As the priority within the development site was to reduce impacts to native vegetation, areas of planted vegetation and cleared land in the development site were utilised to form part of the development footprint and have not been avoided by the proposal. In the context of available resources in the general landscape, particularly to the south where Swamp Mahogany (a primary food tree on the North Coast) are likely to be present in number, the removal of planted Koala feed trees would have minimal impact on residing Koala only.

8.3.2 Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

As discussed in Section 7.2.3, the development site is not a known migratory path for threatened species and does not form part of a vital movement corridor of mobile threatened species such as Koala. Nevertheless, as indicated by BioNet sightings data, Koala certainly use this stretch of Hastings River Drive to access areas of habitat across their range, predominantly to the north (Stuart Park) and south of the development site. The removal of native vegetation and widening of Hastings River Drive proposed would not introduce an impenetrable barrier to movement but it would further fragment the areas of habitat mentioned, albeit marginally. The removal of native vegetation and increase in road width proposed would increase the crossing distance (kerb to kerb) of Hastings River Drive by around 20 m. At the location of Zone 1 and 2, about 64 m of further built land (predominantly carpark and vehicle access, but also roadway) would be introduced. Furthermore, a Vegetation Management Plan (VMP) is being developed for the proposal that includes provision to erect Koala proof fencing on the norther boundary of a Conservation Area (Lot: 12 Plan No: DP0874058 and Lot: 13 Plan No: DP0874058) that seeks to prevent access to the subject land from the south into heart of the proposal with the aim of restricting Koala-human interaction. Despite this, access to and passage through the subject land would still be possible from the east, west and north. Whilst connectivity of habitat would be decreased, no isolation of patches of intact habitat would result as during operation, Koala seeking to access habitat both north and south of the subject land would still be able to do so. Nevertheless, further impediment (crossing distance, increased traffic volumes) would be added to the movement of Koala across the affected stretch of Hastings River Drive for the operational phase of the proposal. The mitigation measures outlined in Table 9-1, such as signage and vehicle calming devices, are

proposed to alleviate this impact during construction and operation of the proposal by aiding Koala traversal in a north-south direction. More robust measures, such as Koala stiles what at the time of writing are proposed for Oxley Highway, have not been considered due to the practical limitations in this instance. Such measures are being implemented by PMHC to reduce the impact of Koala road strike at the strategic LGA scale.

8.3.3 Impacts of development on the movement of threatened species that maintains their life cycle

The development site is not a known migratory path for threatened species and does not present a clear corridor for movement due to barriers such as Hastings River Drive, cleared areas, residences, and commercial buildings. Native vegetation to the north, east and west of the development site is highly limited and disjunct given the urbanised landscape. Zone 1 and 2 is connected to and occur on the edge of a large patch of bushland/wetlands to the south, which have been impacted heavily by the 2019/2020 fire season.

Given the context outlined above, the likelihood of threatened fauna such as Koala utilising the development site as a means of movement to maintain their life cycle is low as there are no significant areas of habitat to the north, east or west that might require the use of the development site to access. Nevertheless, the proposal would still remove some native vegetation, the value of which has increased in light of the 2019/2020 bushfire season. The proposal intends to increase the disconnects in areas of habitat retained within and surrounding the subject land to the north and south during operation of the proposal. However, no patches of intact habitat would be isolated. Given this effect is minute, a discernible impact to the movement of threatened fauna that maintains their life cycle is not envisaged.

8.3.4 Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities

The drainage line within Zone 2 is contributing to the subsistence of Swamp Sclerophyll Forest EEC within the development site and may provide habitat for Wallum Froglet during favourable conditions. Not all of this drainage line has been avoided such that 0.04 ha would be directly impacted via widening of Hastings River Drive, extension of the existing triple pipe culvert and construction of a swale south of said culvert extension. Although these actions and construction of the proposal broadly would involve a range of activities that would disturb soils and potentially impact surface water quality via uncontrolled erosion and sediment, stormwater discharge and accidental spills, appropriate controls would be constructed and implemented via an Erosion and Sedimentation Control Plan to minimise the risk of dirty water entering the drainage line or associated vegetation during construction.

The intent of the culvert extension and section of formalised swale adjoining south is to drain south through the existing drainage line associated with Swamp Sclerophyll Forest EEC and Wallum Froglet habitat. The process of stormwater draining south through this drainage line is already in place and undoubtedly this water would contain pollutants common to the urban environment such as automotive fuels and lubricants. By virtue of the proposal creating more road pavement and impermeable surfaces, despite the vegetated swale proposed, less infiltration and increased overland flows containing pollutants, particularly during rain events, is likely to result. Swamp Sclerophyll Forest EEC, and the habitat for threatened species this community provides, is known to be affected by changes hydrology. Whether the changes likely to result from the proposal are marked enough to be detrimental to the Swamp Sclerophyll Forest EEC within Zone 2 and adjoining the subject land to the south is unclear. The long-term mitigation of potential impacts centres on the effective implementation of the VMP prepared for the proposal. The VMP aims to protect and enhance the remaining portion of Zone 2 within the subject land and south to the southern boundary of Lot: 12 Plan No: DP0874058 and Lot: 13 Plan No: DP0874058 through management actions such as erosion control and planting. Such actions seek to bolster the viability of the patch of Swamp Sclerophyll Forest EEC affected by the proposal in

the long-term. Monitoring is the component of the VMP that is best placed to discern any detrimental change resulting from the proposal. In which case, further measures may be introduced to ensure the hydrological impacts of the proposal do not decrease the long-term viability of the neighbouring EEC and threatened species habitat.

8.3.5 Impacts of vehicle strikes on threatened species or on animals that are part of a TEC

The proposal is considered unlikely to directly increase impacts of vehicle strikes on threatened species during construction as site management to enforce and reduce site speed limits would minimise impacts of vehicle strikes within the subject land. The development site is surrounded by roads that threatened species would currently be crossing. However, given the proposed increase in road width and foreseeable increase in traffic volume for the operational phase of the proposal, an increase in vehicle strikes on threatened species within the subject land and surrounds may result. Koala are arguably the most susceptible to such a threat. From 2000-2017, evidence suggests two Koala vehicle strikes have occurred on Hastings River Drive within the subject land (PMHC 2018). This is comparatively lower than other nearby, more significant roadways in the LGA such as Oxley Highway. This suggests that the current configuration of Hastings River Drive poses less of a threat, and/or that there is less draw for Koala to cross Hastings River Drive at this location, i.e. less habitat that requires Hastings River Drive to access. The proposal would take away one drawcard for Koala to access the subject land by removing highly attractive Narrow-leaved Black Peppermint on the northern side of Hastings River Drive. However, the habitat present within Stuart Park is still likely to cause Koala to access the subject land. Erection of fencing on the northern edge of the Conservation Area proposed in the VMP would reduce access to the proposal from the south directly into a proposed carpark, however, preventing access from the north, east and west is not considered practical in this instance. The mitigation measures outlined in Table 9-1, such as signage and vehicle calming devices, are proposed to alleviate the increased risk of vehicle strike to Koala during construction and operation of the proposal. These measures have not been developed to include more significant safeguards such as extensive Koala fencing or Koala grids due to the practical limitations of doing so within the subject land. Such measures are being implemented by PMHC to reduce the impact of Koala road strike at the strategic LGA scale.

An adaptive management strategy is proposed such that if Koala vehicle strike during construction is observed, the mitigation measures detailed in Table 9-1 should be reviewed and further safeguards or amendment of current safeguards undertaken. The VMP would also monitor vehicle strike for a period of 5 years post construction. Similarly, if strike rates are observed that are above the 2000-2017 rates, mitigation measures for the proposal should be reviewed.

8.4 IMPACTS TO BIODIVERSITY VALUES THAT ARE UNCERTAIN

Impacts to biodiversity values, such as the removal of foraging habitat or HBTs, are readily quantifiable. However, impacts such as vehicle strikes, are uncertain.

8.5 IMPACTS TO MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

8.5.1 Threatened Ecological Communities

No federally listed communities are considered to occur with the development site.

8.5.2 Threatened Species

The EPBC Act Referral Guidelines for the Koala (DoE 2014) documents the 'Koala habitat assessment tool' to assist proponents in determining if a proposal may impact on habitat critical to the survival of the Koala. The tool is utilised in Table 8-5 as it applies to the proposal. Impact areas that score five or more using this tool contain habitat critical to the survival of the Koala. The assessment in Table 8-5 resulted in a score of 6, and so habitat within the development site and surrounds may be critical to the survival of the Koala. According, an Assessment of Significance (AoS) was completed to determine the severity of this impact. The AoS concluded that are significant impact to Koala is unlikely and as such referral to the Federal Minister of the Environment is not recommended.

Table 8-5 Koala habitat assessment tool for coastal areas (DoE 2014)

Attribute	Score	Coastal	Applicable to the proposal?
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 2 years.	X Scats recorded within development site
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 5 years.	
	0 (low)	None of the above.	
Vegetation composition	+2 (high)	Has forest or woodland with 2 or more known koala food tree species, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	
	+1 (medium)	Has forest or woodland with only 1 species of known koala food tree present.	X
	0 (low)	None of the above.	
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 500 ha.	X Significant areas of contiguous habitat to the south
	+1 (medium)	Area is part of a **contiguous landscape** < 500 ha, but ≥ 300 ha.	
	0	None of the above.	X

Attribute	Score	Coastal	Applicable to the proposal?
	(low)		
Key existing threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. Areas which score 0 for koala occurrence and have no dog or vehicle threat present	
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, **OR** Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.	X Know occurrence in the area of vehicle strikes and dogs attacks on occasion
	0 (low)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, **OR** Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.	
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	X Study area is not considered a habitat refuge nor does it provide important connectivity to large areas surrounding a habitat refuge.
Total	**6**	**Decision: Habitat may be critical to the survival of the Koala—assessment of significance required**	

8.5.3 Migratory Species

Based on a habitat assessment, no federally listed migratory species are considered likely to occur on the development site.

No referral is considered necessary to the DAWE for migratory species.

8.6 ASSUMPTIONS AND PREDICTIONS

The floristic plots are based on a single visit survey. Floristic surveys were undertaken during early Autumn 2019 so it is possible that not all plant species were detected that may be present at the site due to seasonal and climatic constraints. In particular, inconspicuous or geophytic species which flower outside the surveyed period may not have been recorded.

The calculation of hollow-bearings trees, in particular the size and number of hollows, was made from ground level. It is possible that some hollows are present that were not visible from ground level, which may result in underestimates of the number of hollows. However, it was noted where it was considered likely that hollows were present but not visible from ground level.

9 MITIGATING AND MANAGING IMPACTS

9.1 MITIGATION MEASURES

A general summary of the key measures required to mitigate the impacts of the proposal are provided below. Mitigation measures proposed to manage impacts, including proposed techniques, timing, frequency, responsibility for implementing each measure, risk of failure, and an analysis of the consequences of any residual impacts are provided in Table 8 1.

9.1.1 Direct Impacts from the clearing of native vegetation and habitats

1. Time works to avoid critical life cycle events as far as practicable;
2. Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler;
3. Relocate habitat features (fallen timber, hollow logs) into retained vegetation patches; and
4. Fencing to exclude Koala during construction.

9.1.2 Indirect impacts

1. Clearing protocols that identify vegetation to be retained, prevent inadvertent damage, and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed;
2. Adaptive dust monitoring programs to control air quality;
3. Temporary fencing to protect significant environmental features such as retained Swamp Sclerophyll Forest and to exclude Koala;
4. Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas; and
5. Staff training and site briefing to communicate environmental features to be protected and measures to be implemented.

9.1.3 Prescribed impacts

1. Sediment barriers and spill management protocols to control the quality of water runoff from the site into the receiving environment;
2. Install specific traffic control measures to mitigate Koala vehicle strike and dog attack as follows:
    - Enforce speed limits and install signage during construction.
    - Provide escape poles within the road reserve for temporary refuge in the case of dog attack.
    - Installation of flashing warning signage.
    - Installation of traffic calming device.
    - Installation of lighting
    - Installation of operational fencing to restrict the movements of Koala into unsafe areas
3. Clearly survey and mark environmental no-go areas during construction to prevent clearing within unauthorised areas and where threatened species habitat occurs;
4. Fencing or other suitable barrier to protect trees to be retained within the development footprint as applicable;
5. Fencing to deter fauna including Koala and threatened amphibians from entering the development site during construction. Fence would be monitored regularly;
6. Pre-clearing surveys to be conducted the night prior for amphibians and the day before for terrestrial species;

7. Use of non-barbed wire fencing for temporary fencing to reduce chance of injuring/killing microbats; and
8. Staff training and site briefing to communicate environmental features to be protected and measures to be implemented.

Table 9-1 Mitigation measures proposed to avoid and minimise impacts on native vegetation and habitat

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Direct Impacts from the clearing of native vegetation and habitats						
Time works to avoid critical life cycle events	• Clearing is divided to be conducted outside spring-summer • If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure no impacts to fauna would occur	Construction	Regular	Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted.
Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler	• Pre-clearing checklist • Tree clearing procedure	Construction	Regular	Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted
Relocate habitat features (fallen timber, hollow logs) from within the development site	• Tree-clearing procedure including relocation of habitat features to adjacent area for habitat enhancement	Construction	Regular	Contractor	Low	None

Develop and implement a Vegetation Management Plan (VMP) to rehabilitate the remaining stands of PCT 1064 on Lot: 12 Plan	• VMP to include details of management actions such as:
	  ○ Protection of retained areas
	  ○ Weed control
		Construction and ongoing for 5 years	Regular	PMHC	Low	Degradation of retained Swamp Sclerophyll Forest

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
No: DP0874058 and Lot: 13 Plan No: DP0874058	○ Rehabilitation of disturbed areas ○ Enhancement of retained areas • Monitoring and reporting requirements of management outcomes • Performance Targets • Roles and responsibilities • Adaptive management strategy					
Indirect impacts on native vegetation and habitat						
Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	• Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing • No stockpiling or storage within dripline of any mature trees • In areas to clear adjacent to areas to be retained, chainsaws would be used rather than heavy machinery to minimise risk of unauthorised disturbance; and • Strict weed protocol must be observed at all times.	Construction	Regular	Contractor	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	• Construction Environmental Management Plan will include measures to avoid noise encroachment on adjacent habitats such as avoiding night works as much as possible.	Construction	Regular	Contractor	Low	None
Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	• Avoid night works; and • Direct lights away from vegetation.	Construction/Operation	Regular	Contractor	Low	None
Adaptive dust monitoring programs to control air quality	• Daily monitoring of dust generated by construction activities; and • Construction would cease if dust observed being blown from site until control measures were implemented; and • All activities relating to the proposal would be undertaken with the objective of preventing visible dust emissions from the development site.	Construction	Regularly	Contractor	Moderate	Sedimentation entering drainage line and wetland to the south.
Temporary fencing to protect significant environmental features such as riparian zones and exclude Koala from the development site during construction	• Prior to construction commencing, exclusion fencing, and signage would be installed around habitat to be retained	Construction	Regularly	Contractor	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts

Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	• A Weed Management procedure would be developed for the proposal to prevent and minimise the spread of weeds. This would include:
	  ○ Management protocol for declared priority weeds under the *Biosecurity Act 2015* during and after construction;
	  ○ Weed hygiene protocol in relation to plant, machinery, and fill;
	• Any occurrences of pathogens such as Myrtle Rust and Phytophthora would be monitored, treated, and reported; and
	• The weed management procedure would be incorporated into the Biodiversity Management Plan.
		Construction, Operation	Regular	Contractor	Moderate	Weed encroachment

Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	• Site induction; and • Toolbox talks.	Construction	Regular	Contractor	Moderate	Impacts to native vegetation or threatened species if Staff training not followed
Prescribed biodiversity impacts						
instigating clearing protocols including pre-	• Pre-clearing checklist • Tree clearing procedure	Construction	Regular	Contractor	Moderate	Species not detected during pre-clearing

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events for rocks, human made structures and non-native vegetation	• Staged habitat removal • Unexpected threatened species finds procedure • Pre-clearing surveys to detect terrestrial and amphibious fauna, and HBTs					surveys may be impacted.
sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	• An erosion and sediment control plan would be prepared in conjunction with the final design and implemented • Spill management procedures would be implemented. • Install temporary erosion, sediment and water quality controls, including silt fences, and stormwater diversion drains	Construction	Regular	Contractor	Moderate	Indirect impacts may occur to surrounding vegetation and habitat if erosion and sedimentation control plan not implemented.
staff training and site briefing to communicate environmental features to be protected and measures to be implemented	• Awareness training during site inductions regarding enforcing site speed limits • Site speed limits to be enforced to minimise fauna strike	Construction and Operation	Regular	Contractor	Moderate	Fauna strikes from vehicles, inadvertent removal of native vegetation and habitat.
fencing or other measures to control	• Development site to be fenced entirely during construction	Construction and Operation	Regular	Contractor	Moderate	Fauna strikes from vehicles, inadvertent

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
animal and vehicle interactions	including sediment fencing to a height of 400 mm to act as a frog barrier • Fencing must not include barbed wire. • Fencing to be monitored regularly, and after rainfall events. • Pre-clearing surveys to detect fauna within the development site. Any individuals encountered would be relocated out of harm's way to the wetland to the south of the development site.					removal of native vegetation and habitat.
Mitigate any increase in the likelihood of vehicle strike to Koala	• Install specific traffic control measures to mitigate Koala vehicle strike and dog attack as follows: • Enforce speed limits and install signage during construction. • Provide escape poles within the road reserve for temporary refuge in the case of dog attack. • Installation of flashing warning signage. • Installation of traffic calming device. • Installation of lighting	Construction and Operation	Regular	Contractor	Moderate	Koala vehicle strike rates increase resulting in a reduction in local population .

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	• No roadside plantings to within 2m of the finished road edge to retain present visibility of Koalas. • At minimum, Koala proof exclusion fencing should be constructed around the northern edge of the Conservation Area identified in the VMP (Lot: 12 Plan No: DP0874058 and Lot: 13 Plan No: DP0874058 specifically). Focus must be on ensuring that traversal from areas of habitat to the south of the proposal onto Hastings River Drive in a northerly direction is inhibited.					

9.2 ADAPTIVE MANAGEMENT STRATEGY

Construction management plans, primarily the biodiversity management sub-plan, would have measure for the adaptive management of flora and fauna constraints. This would include measures to adapt to the proposal's interaction with native fauna and flora during construction. The project ecologist would be able to identify if any mitigation measure employed is not having the desired effect and recommend changes in strategy. This could include increased monitoring of fencing or change in felling approach to protect resident fauna.

10 SERIOUS AND IRREVERSIBLE IMPACTS (SAII)

The principles used to determine if a development will have serious and irreversible impacts, include impacts that:

- Will cause a further decline of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline, or
- Will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size, or
- Impact on the habitat of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very limited geographic distribution, or
- Impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

10.1 POTENTIAL SERIOUS AND IRREVERSIBLE IMPACT ENTITIES

10.1.1 Threatened ecological communities

No threatened ecological community listed as a potential SAII entity in the *Guidance to assist a decision-maker to determine a serious and irreversible impact* (OEH 2017c) would be impacted by the proposal.

10.1.2 Threatened species

There are no SAII candidate species recorded at the development site.

10.1.3 Additional potential entities

No further species were considered to be potential SAII entities.

11 REQUIREMENT TO OFFSET

11.1 IMPACTS REQUIRING AN OFFSET

11.1.1 Ecosystem credits

An offset is required for all impacts of development on PCTs that are associated with:

a) a vegetation zone that has a vegetation integrity score ≥15 where the PCT is representative of an endangered or critically endangered ecological community, or

b) a vegetation zone that has a vegetation integrity score of ≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or

c) a vegetation zone that has a vegetation integrity score ≥20 where the PCT is not representative of a TEC or associated with threatened species habitat.

The PCTs and vegetation zones requiring offset, and the ecosystem credits required, are documented in Table 11-1 and mapped on Figure 11-1. Note that the area of planted non-locally native vegetation that was included in Zone 1 for the purposes of assessing impacts to Koala, has been removed from the calculation of ecosystem credits below. This is to allow for an accurate calculation of ecosystem credits by not including vegetation that does not align to PCT 1064 as part of the ecosystem credit calculation.

Table 11-1 PCTs and vegetation zones that require offsets

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score	Ecosystem credits required
1	1064	Maintained	0.24	47.6	6
2	1064	Drainage	0.04	40.1	1

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix F.

11.1.2 Species credits

An offset is required for the threatened species impacted by the development that require species credits. These species and the species credits required are documented in Table 11-2.

Table 11-2 Species credit species that require offsets

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost	Species credits required
Phascolarctos cinereus Koala - scats found	2.00	Zone 1: 0.36 ha (includes planted feed trees on northern side of Hastings River Drive Zone 2: 0.04 ha	10
Crinia tinnula Wallum Froglet - assumed	2.00	Zone 2: 0.04 ha	1
Myotis macropus Southern Myotis – assumed	2.00	Zone 1: 0.24 ha Zone 2: 0.04 ha	7

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix F.

11.1.3 Offsets required under the EPBC Act

No species listed on the EPBC Act have been identified as having the potential to be significantly impacted by the development. As such, the proposal is not considered to require offsets in accordance with the EPBC Offsets Policy.

11.2 IMPACTS NOT REQUIRING AN OFFSET

There are no impacts to PCTs that do not require an offset as all PCT zones meet the thresholds identified in Section 10.1.1.

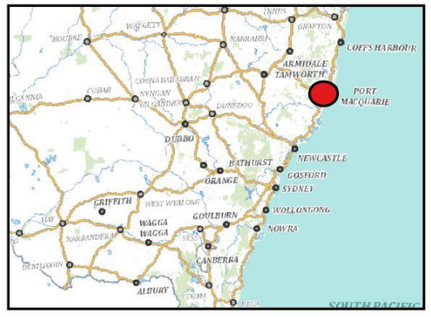
11.3 AREAS NOT REQUIRING ASSESSMENT

Zones 3 and 4 are not required to assessed as they are not considered to represent a locally occurring PCT. All other areas of the development site have been assessed in this report.

Areas not requiring assessment mapped on Figure 11-1.

Hastings River Drive
Impacts Requiring Offset

Legend
- Development Footprint
- Development Site
- Not Requiring Assessment
- Requires Offset
- Roads



Ref: 18-765 hastings \ Impacts Requiring Offset
Author: sarah.d
Date created: 11.09.2020
Datum: GDA94 / MGA zone 56

0 50 100 m

NGH

Figure 11-1 Impacts requiring offset, not requiring offset and not requiring assessment

11.4 SUMMARY OF OFFSET CREDITS REQUIRED

The following credit requirement is generated for the proposal.

Ecosystem Credits	**Offset credits required**
PCT 1064: Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	7
TOTAL:	**7**
Species Credits	**Offset Credits required**
Phascolarctos cinereus Koala	10
Crinia tinnula Wallum Froglet	1
Myotis macropus Southern Myotis	7
TOTAL:	**18**

12 CONCLUSION

NGH has prepared this BDAR for AT&L on behalf of PMHC for proposed upgrades to Hastings River Drive between Boundary Street and Hughes Place, Port Macquarie, NSW. The purpose of this BDAR is to satisfy the assessment requirements of the BOS and BAM as set out under the BC Act for the proposal and to address the biodiversity matters raised in the SEARs. In this BDAR, biodiversity impacts have been assessed through:

- Comprehensive mapping and assessment completed in accordance with the BAM;
- The identification of one threatened species and two assumed threatened species within the development site and adjacent vegetation the impacts to which have been adequately assessed;
- Mitigation measures which have been outlined to reduce the impacts to biodiversity;
- The generation of 7 Ecosystem Credits for impacts to PCT 1064: *Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion*;
- The generation of 10 species credits for Koala whose scats were found within the development site;
- The generation of one species credit for Wallum Froglet which is assumed to occur;
- The generation of seven species credits for Southern Myotis which is assumed to occur.

The retirement of these credits will be carried out in accordance with the NSW Biodiversity Offsets Scheme, and will be achieved by either:

- Retiring credits under the Biodiversity Offsets Scheme based on the like-for-like rules, or
- Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or
- Funding a biodiversity action that benefits the threaten entity(ies) impacted by the development.

13 REFERENCE LIST

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Appendix A SURVEY DATA

A.1 PLOT DATA

Plot 1

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	3
	Shrub (SG)	2
	Forb (FG)	8
	Grass & grasslike (GG)	5
	Fern (EG)	0
	Other (OG)	2
	TOTAL	20

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	31.5
	Shrub (SG)	6
	Forb (FG)	4.6
	Grass & grasslike (GG)	36.2
	Fern (EG)	0
	Other (OG)	0.2
	TOTAL Native	78.5
	TOTAL 'HTE'	25.7

BAM Attributes (1 x 1m Plots)			
	Tape length	% cover	Average %
Litter Cover	5m	40%	42.40%
	15m	50%	
	25m	60%	
	35m	60%	
	45m	2%	
Bare ground cover	5m	5%	2%
	15m	1%	
	25m	1%	
	35m	1%	
	45m	1%	
Cryptogam cover	5m	0%	0%
	15m	0%	
	25m	0%	
	35m	0%	
	45m	0%	
Rock Cover	5m	0%	0%
	15m	0%	
	25m	0%	

	35m	0%	
	45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80		1	
50-79		5	1
30-49		8	
20-29		4	
10-19		2	
5-9			
<5			N/A
Length of logs (m)			

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Melaleuca quinquenervia	Broad-leaved Paperbark	Myrtaceae	30			Tree (TG)	No		
Melaleuca linariifolia	Flax-leaved Paperbark	Myrtaceae	1	1		Shrub (SG)	No		
Casuarina glauca	Swamp Oak	Casuarinaceae	1	2		Tree (TG)	No		
Lantana camara	Lantana	Verbenaceae	0.1	1	*		HTE		
Ficus obliqua	Small-leaved Fig	Moraceae	0.5	1		Tree (TG)	No		
Inga edulis	Ice cream bean	Fabaceae (Mimosoideae)	10		*		No		
Melastoma affine	Blue Tongue	Melastomataceae	5			Shrub (SG)	No		
Parsonsia straminea	Common Silkpod	Apocynaceae	0.1	1		Other (OG)	No		
Microlaena stipoides	Weeping Grass	Poaceae	15			Grass & grasslike (GG)	No		

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Poa affinis		Poaceae	0.1	10		Grass & grasslike (GG)	No		
Paspalum dilatatum	Paspalum	Poaceae	0.5	20	*		HTE		
Soliva sessilis	Bindyi	Asteraceae	0.1	50	*		No		
Desmodium varians	Slender Tick-trefoil	Fabaceae (Faboideae)	0.1	20		Other (OG)	No		
Trifolium repens	White Clover	Fabaceae (Faboideae)	0.1	20	*		No		
Plantago lanceolata	Lamb's Tongues	Plantaginaceae	0.1	10	*		No		
Hydrocotyle laxiflora	Stinking Pennywort	Apiaceae	0.1	5		Forb (FG)	No		
Sonchus oleraceus	Common Sowthistle	Asteraceae	0.1	5	*		No		
Dichondra repens	Kidney Weed	Convolvulaceae	3	1000		Forb (FG)	No		
Taraxacum officinale	Dandelion	Asteraceae	0.1	1	*		No		
Stenotaphrum secundatum	Buffalo Grass	Poaceae	25		*		HTE		
Cynodon dactylon	Common Couch	Poaceae	20			Grass & grasslike (GG)	No		
Oplismenus aemulus		Poaceae	0.1	5		Grass & grasslike (GG)	No		
Commelina cyanea	Native Wandering Jew	Commelinaceae	0.1	5		Forb (FG)	No		
Sporobolus africanus	Parramatta Grass	Poaceae	0.1	10	*		No		
Pratia purpurascens	Whiteroot	Lobeliaceae	0.1	5		Forb (FG)	No		
Oxalis spp.		Oxalidaceae	0.1	5		Forb (FG)	No		
Eriochloa procera	Spring Grass	Poaceae	1	100		Grass & grasslike (GG)	No		
Centella asiatica	Indian Pennywort	Apiaceae	1	500		Forb (FG)	No		
Alternanthera denticulata	Lesser Joyweed	Amaranthaceae	0.1	1		Forb (FG)	No		
Leontodon taraxacoides subsp. taraxacoides	Lesser Hawkbit	Asteraceae	0.1	1	*		No		

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Cinnamomum camphora	Camphor Laurel	Lauraceae	0.1	1	*		HTE		
Cotula australis	Common Cotula	Asteraceae	0.1	50		Forb (FG)	No		

Plot 2

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	3
	Shrub (SG)	2
	Forb (FG)	7
	Grass & grasslike (GG)	4
	Fern (EG)	3
	Other (OG)	3
	TOTAL	22

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	27
	Shrub (SG)	0.2
	Forb (FG)	1.1
	Grass & grasslike (GG)	7
	Fern (EG)	1.6
	Other (OG)	10.2
	TOTAL Native	47.1
	TOTAL 'HTE'	42.2

BAM Attributes (1 x 1m Plots)			
	Tape length	% cover	Average %
Litter Cover	5m	99%	99.00%
	15m	99%	
	25m	99%	
	35m	99%	
	45m	99%	
Bare ground cover	5m	1%	1%
	15m	1%	
	25m	1%	
	35m	1%	
	45m	1%	
Cryptogam cover	5m	0%	0%
	15m	0%	
	25m	0%	
	35m	0%	
	45m	0%	
Rock Cover	5m	0%	0%
	15m	0%	

		25m	0%	
		35m	0%	
		45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79		1	
30-49		7	
20-29		11	
10-19		I	
5-9			
<5			N/A
Length of logs (m)		3	

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Senna pendula var. glabrata		Fabaceae (Caesalpinioideae)	5		*		No		
Cinnamomum camphora	Camphor Laurel	Lauraceae	40		*		HTE		
Ipomoea cairica		Convolvulaceae	1		*		HTE		
Casuarina glauca	Swamp Oak	Casuarinaceae	2			Tree (TG)	No		
Melaleuca quinquenervia	Broad-leaved Paperbark	Myrtaceae	15			Tree (TG)	No		
Parsonsia straminea	Common Silkpod	Apocynaceae	10			Other (OG)	No		
Gahnia clarkei	Tall Saw-sedge	Cyperaceae	1			Grass & grasslike (GG)	No		
Setaria parviflora		Poaceae	1		*		No		

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Oplismenus aemulus		Poaceae	0.5	100		Grass & grasslike (GG)	No		
Sporobolus africanus	Parramatta Grass	Poaceae	0.2	20	*		No		
Blechnum indicum	Swamp Water Fern	Blechnaceae	0.5	50		Fern (EG)	No		
Pteridium esculentum	Bracken	Dennstaedtiaceae	0.1	10		Fern (EG)	No		
Gleichnia dicarpa	Pouched Coral Fern	Gleicheniaceae	1			Fern (EG)	No		
Asparagus aethiopicus	Asparagus Fern	Asparagaceae	1		*		HTE		
Ageratina adenophora	Crofton Weed	Asteraceae	0.1	10	*		HTE		
Microlaena stipoides	Weeping Grass	Poaceae	5			Grass & grasslike (GG)	No		
Plantago lanceolata	Lamb's Tongues	Plantaginaceae	0.1	20	*		No		
Glochidion ferdinandi	Cheese Tree	Phyllanthaceae	10			Tree (TG)	No		
Verbena bonariensis	Purpletop	Verbenaceae	0.5	20	*		No		
Centella asiatica	Indian Pennywort	Apiaceae	0.1	20		Forb (FG)	No		
Dichondra repens	Kidney Weed	Convolvulaceae	0.1	20		Forb (FG)	No		
Cotula australis	Common Cotula	Asteraceae	0.1	20		Forb (FG)	No		
Oxalis perennans		Oxalidaceae	0.5	200		Forb (FG)	No		
Solanum mauritianum	Wild Tobacco Bush	Solanaceae	1		*		No		
Entolasia marginata	Bordered Panic	Poaceae	0.5	20		Grass & grasslike (GG)	No		
Conyza bonariensis	Flaxleaf Fleabane	Asteraceae	0.1	2	*		No		
Melastoma affine	Blue Tongue	Melastomataceae	0.1	3		Shrub (SG)	No		
Calochlaena dubia	Rainbow Fern	Dicksoniaceae	0.1	1		Other (OG)	No		
Rumex obtusifolius	Broadleaf Dock	Polygonaceae	0.1	20	*		No		
Paspalum mandiocanum	Broadleaf Paspalum	Poaceae	0.1	50	*		No		
Pratia purpurascens	Whiteroot	Lobeliaceae	0.1	3		Forb (FG)	No		

Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Cestrum parqui	Green Cestrum	Solanaceae	0.1	50	*		HTE		
Trifolium repens	White Clover	Fabaceae (Faboideae)	0.1	2	*		No		
Cyathea cooperi	Straw Treefern	Cyatheaceae	0.1	2		Other (OG)	No		P
Acacia longifolia		Fabaceae (Mimosoideae)	0.1	10		Shrub (SG)	No		
Alternanthera denticulata	Lesser Joyweed	Amaranthaceae	0.1	20		Forb (FG)	No		
Viola hederacea	Ivy-leaved Violet	Violaceae	0.1	1		Forb (FG)	No		

A.2 PLOT PHOTOS

Plot 1 – PCT 1064 Zone 1 Maintained	**Plot 1 – PCT 1064 Zone 1 Maintained**
	
Plot 2 - PCT 1064 Zone 2 Drainage Line	**Plot 2 - PCT 1064 Zone 2 Drainage Line**
	

A.3 FAUNA SURVEY RESULTS

Common Name	Species	BC Act Status	EPBC Act Status
Noisy Miner	*Manorina melanocephala*		
Noisy Friarbird	*Philemon corniculatus*		
Little Wattlebird	*Anthochaera chrysoptera*		
Rainbow Lorikeet	*Trichoglossus moluccanus*		
Yellow Thornbill	*Acanthiza nana*		
White-throated Pigeon	*Columba vitiensis*		
Satin Bowerbird	*Ptilonorhynchus violaceus*		
Laughing Kookaburra	*Dacelo novaeguineae*		
Australian Magpie	*Cracticus tibicen*		
Common Eastern Froglet	*Crinia signifera*		
Koala (10 scats)	*Phascolarctos cinereus*	Vulnerable	Vulnerable

Appendix B PERSONNEL

Name	Title	Qualifications	Role
Mitch Palmer	Senior Ecologist (Technical Lead)	• BAM Accredited Assessor (BAAS17051) • B.Science (Geology and Geography)	Fieldwork, Review, and approval of BDAR
Brendon True	Ecologist/Botanist	• BAM accredited assessor (BAAS18155) • B. Science (Ecology and Biodiversity) Masters Conservation Biology	Fieldwork, Lead author BDAR
Sarah Downey	Environmental Consultant	• B Env Sc & Mgt (Hons)	GIS Mapping

Appendix C EPBC ACT PROTECTED MATTERS SEARCH

Australian Government
Department of the Environment and Energy

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.

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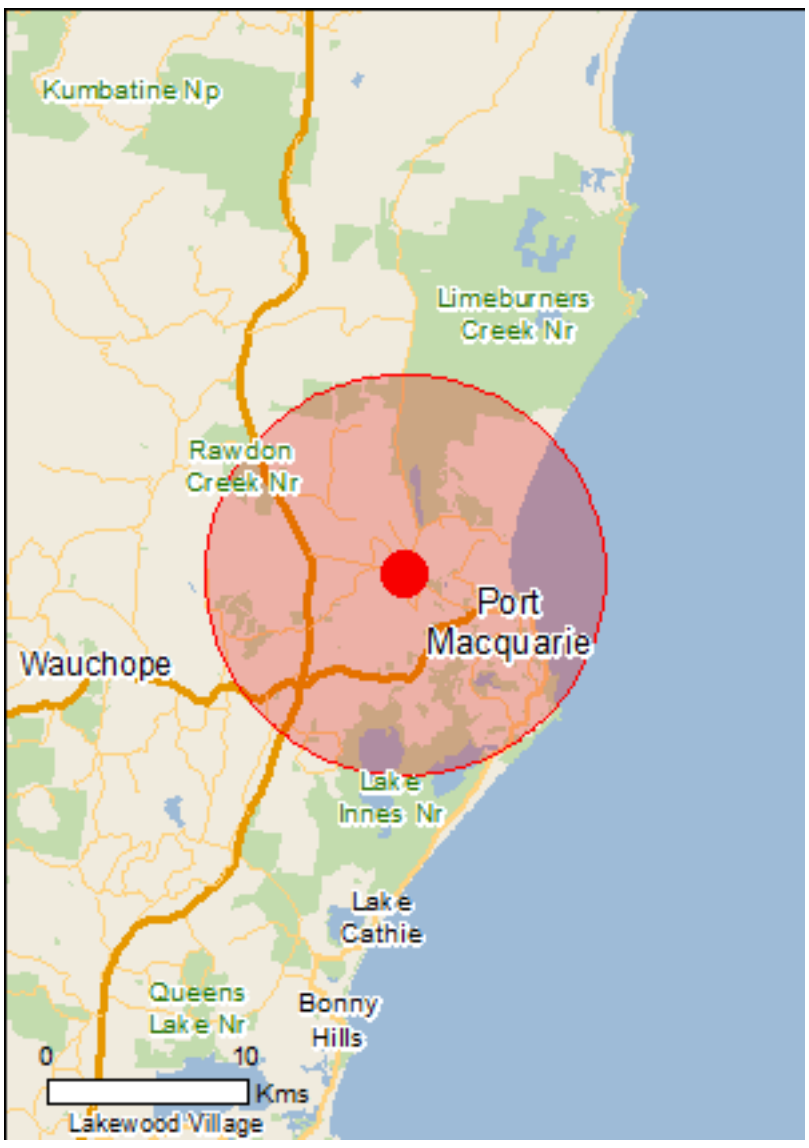

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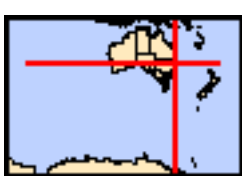

Summary

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:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	74
Listed Migratory Species:	67

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:	6
Commonwealth Heritage Places:	None
Listed Marine Species:	90
Whales and Other Cetaceans:	12
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:	7
Regional Forest Agreements:	1
Invasive Species:	37
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

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
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	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
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting 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

Name	Status	Type of Presence
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to 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 may 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 Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may 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
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	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
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	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may 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 Hooded Plover (eastern), 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
Frogs		
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat known to occur within area
Insects		
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat likely to occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may 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

Name	Status	Type of Presence
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 may 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 likely to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Acronychia littoralis Scented Acronychia [8582]	Endangered	Species or species habitat known to occur within area
Allocasuarina defungens Dwarf Heath Casuarina [21924]	Endangered	Species or species habitat known to occur within area
Allocasuarina thalassoscopica [21927]	Endangered	Species or species habitat known to occur within area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat likely to occur within area
Asperula asthenes Trailing Woodruff [14004]	Vulnerable	Species or species habitat known 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 known to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat known to occur within area
Parsonsia dorrigoensis Milky Silkpod [64684]	Endangered	Species or species habitat likely to occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Phaius australis		
Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Syzygium paniculatum		
Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat may occur within area
Thesium australe		
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to 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
Coeranoscincus reticulatus		
Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat may 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	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Breeding likely 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
Ardenna grisea		
Sooty Shearwater [82651]		Species or species habitat likely to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species

Name	Threatened	Type of Presence
		habitat may 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 likely 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]		Species or species habitat may 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	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may 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
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
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
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		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 melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting may occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur

Name	Threatened	Type of Presence
		within area
Pandion haliaetus		
Osprey [952]		Breeding known to occur within area
Pluvialis fulva		
Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola		
Grey Plover [865]		Roosting known to occur within area
Tringa brevipes		
Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Xenus cinereus		
Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Postal Corporation
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Bank of Australia
Commonwealth Land - Defence Service Homes Corporation
Commonwealth Land - Telstra Corporation Limited

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
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
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres		
Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
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 melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting 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 gibsoni Gibson's Albatross [64466]	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 likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting may occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known 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 Bar-tailed Godwit [844]		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
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat likely to occur

Name	Threatened	Type of Presence within area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat known to occur within area
[Rostratula benghalensis (sensu lato)](#) Painted Snipe [889]	Endangered*	Species or species habitat known to occur within area
[Sterna albifrons](#) Little Tern [813]		Species or species habitat may 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	Species or species habitat may occur within area
[Thalassarche eremita](#) Chatham Albatross [64457]	Endangered	Species or species habitat may 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 sp. nov.](#) Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
[Thalassarche steadi](#) White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Thinornis rubricollis rubricollis](#) Hooded Plover (eastern) [66726]	Vulnerable*	Species or species habitat known to occur within area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
[Xenus cinereus](#) Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
[Acentronura tentaculata](#) Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
[Festucalex cinctus](#) Girdled Pipefish [66214]		Species or species habitat may occur within area
[Filicampus tigris](#) Tiger Pipefish [66217]		Species or species habitat may occur within area
[Heraldia nocturna](#) Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat likely to occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Solegnathus dunckeri Duncker's Pipehorse [66271]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
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	Species or species habitat known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area

Name	Status	Type of Presence
Tursiops aduncus		
Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str.		
Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
LNE Special Management Zone No1	NSW
Lake Innes	NSW
Limeburners Creek	NSW
Macquarie	NSW
Rawdon Creek	NSW
Sea Acres	NSW
Woregore	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis		
European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata		
Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus		
Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Limeburners Creek Nature Reserve	NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-31.42035 152.86728

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix D EPBC ACT HABITAT ASSESSMENT

The tables in this appendix present the habitat evaluation for threatened species, ecological communities and endangered populations listed for the locality identified as potentially occurring in the area according to the Commonwealth EPBC *Protected Matters Search Tool*[1].

The likelihood of occurrence is based on presence of habitat, proximity of nearest records and mobility of the species (where relevant). The assessment of potential impact is based on the nature of the proposal, the ecology of the species and its likelihood of occurrence. The following classifications are used:

Presence of habitat:

Present: Potential or known habitat is present within the study area.

Marginal: Habitat present that could be used by the species on occasion but not preferred.

Absent: No potential or known habitat is present within the study area.

Likelihood of occurrence

Recorded: The species was observed in the study area during the current survey

High: It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (ie. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.

Moderate: Potential habitat is present in the study area. Species Low to maintain sedentary populations, however, may seasonally use resources within the study area opportunistically or during migration. The species is Low to be dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.

Low: It is Low that the species inhabits the study area and has not been recorded recently in the locality (10km). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.

[1] This online tool is designed for the public to search for matters protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is managed by the Commonwealth Department of the Environment and Energy.

Potential to be impacted

Low: The proposal would not impact this species or its habitats. No Assessment of Significance (AoS) is necessary for this species.

Moderate: The proposal could impact this species or its habitats however the impacts are considered manageable such that no direct or indirect impacts are likely. No Assessment of Significance (AoS) is necessary for this species.

High: The proposal is likely to impact this species or its habitats. An Assessment of Significance (AoS) has been applied to these entities.

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Flora				
Acronychia littoralis Scented Acronychia	Scented Acronychia is found between Fraser Island in Queensland and Port Macquarie on the north coast of NSW. Occurs in transition zones between littoral rainforest and swamp sclerophyll forest; between littoral and coastal cypress pine communities; and margins of littoral forest mainly within 2km of the coast.	Marginal	Low	Low
Allocasuarina defungens Dwarf Heath Casuarina	Dwarf Heath Casuarina is found only in NSW from the Nabiac area, north-west of Forster, to Byron Bay on the NSW north coast.	Absent	Low	Low
Allocasuarina thalassoscopica	In graminoid low heath, on coastal flats or on rhyolite or granite outcrops close to the coast. Widespread along the North Coast as far south as Diamond Head, extending north to the Noosa Heads area of SE Queensland.	Absent	Low	Low
Arthraxon hispidus Hairy Jointgrass	Occurs over a wide area in south-east Queensland, and on the northern tablelands and north coast of NSW. Moisture and shade-loving grass, found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps.	Marginal	Low	Low
Asperula asthenes Trailing Woodruff	This small herb occurs only in NSW and occurs in damp sites, often along river banks. It is found in scattered locations from Bulahdelah north to near Kempsey, with several records from the Port Stephens/Wallis Lakes area.	Marginal	Low	Low

[1] Information sourced from species profiles on NSW OEH's threatened species database or the Australian Government's Species Profiles and Threats database (SPRAT) unless otherwise stated.

BCD threatened species database: http://www.threatenedspecies.environment.nsw.gov.au/index.aspx
SPRAT: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Cryptostylis hunteriana Leafless Tongue Orchid	The species occurs mostly in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. It prefers open areas in the understorey of forested communities. The soils include moist sands, moist to dry clay loam and occasionally in accumulated eucalypt leaves. The larger populations typically occur in woodland dominated by Scribbly Gum (Eucalyptus sclerophylla), Silvertop Ash (E. sieberi), Red Bloodwood (Corymbia gummifera) and Black Sheoak (Allocasuarina littoralis); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (C. subulata) and the Tartan Tongue Orchid (C. erecta).	Absent	Low	Low
Cynanchum elegans White-flowered Wax Plant	. The White-flowered Wax Plant usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree Leptospermum laevigatum – Coastal Banksia Banksia integrifolia subsp. integrifolia coastal scrub; Forest Red Gum Eucalyptus tereticornis aligned open forest and woodland; Spotted Gum Corymbia maculata aligned open forest and woodland; and Bracelet Honeymyrtle Melaleuca armillaris scrub to open scrub. Restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region.	Absent	Low	Low
Euphrasia arguta	Plants from the Nundle area have been reported from eucalypt forest with a mixed grass and shrub understorey; here, plants were most dense in an open disturbed area and along the roadside, indicating the species had regenerated following disturbance.	Absent	Low	Low
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smoothshelled Macadamia, Bush Nut, Nut Oak	The Macadamia Nut is found in remnant rainforest in northern NSW and south-east Queensland	Absent	Low	Low
Melaleuca biconvexa Biconvex Paperbark	Biconvex Paperbark is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	Marginal, known to inhabit swamp forests and forested wetlands around Port Macquarie.	Low, not recorded, a conspicuous species that would be readily identified.	Low

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Parsonsia dorrigoensis Milky Silkpod	Found in subtropical and warm-temperature rainforest, on rainforest margins, and in moist eucalypt forest up to 800 m, on brown clay soils. Milky Silkpod is found only within NSW, with scattered populations in the north coast region between Kendall and Woolgoolga.	Absent	Low	Low
Phaius australis Southern Swamp Orchid	Occurs in Queensland and north-east NSW as far south as Coffs Harbour. Historically, it extended farther south, to Port Macquarie. Swampy grassland or swampy forest including rainforest, eucalypt, or paperbark forest, mostly in coastal areas.	Marginal	Low, given historical disturbance and weed invasion.	Low
Syzygium paniculatum Magenta Lilly Pilly	Found in rainforest on sandy soils or stabilised Quaternary sand dunes at low altitudes in coastal areas. Rainforests are often remnant stands of littoral or gallery rainforest. Associated species include Alphitonia excelsa, Acmena smithii, Cryptocarya glaucescens, Toona ciliata Eucalyptus saligna, Ficus fraseri, Syzygium oleosum, Acmena smithii, Cassine sp., F. blique, Glochidion ferdinandi, Endiandra sieberi, Synoum glandulosum, Podocarpus elatus, Notelaea longifolia, Guioa semiglauca and Pittosporum undulatum. Is thought to tolerate wet and dry conditions on sands. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	Absent	Low	Low
Thesium australe Austral Toadflax	Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (Themeda australis).	Absent	Low	Low
Ecological Communities				
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	This community is found on the coastal floodplains of NSW. It has a dense to sparse tree layer in which Casuarina glauca (Swamp Oak) is the dominant species northwards from Bermagui. Other trees including Acmena smithii (Lilly Pilly), Glochidion spp. (Cheese Trees) and Melaleuca spp. (Paperbarks) may be present as subordinate species and are found most frequently in stands of the community northwards from Gosford. Tree diversity decreases with latitude, and Melaleuca ericifolia is the only abundant tree in this community south of	Marginal, can occur in areas with the characteristics of Zone 2.	Low, key characteristics not met. i.e. dominance of Swamp Oak.	Low, community may occur to the south of the development

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
	Bermagui. Associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Generally, occurs below 20 m (rarely above 10 m) elevation. The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. Often fringes treeless floodplain lagoons or wetlands with semi-permanent standing water.			site but indirect impacts will be mitigated.
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Littoral Rainforest occurs only on the coast and is found at locations in the NSW North Coast Bioregion, Sydney Basin Bioregion and South East Corner Bioregion. Littoral Rainforest is very rare and occurs in many small stands. In total, it comprises less than one percent of the total area of rainforest in NSW. The largest known stand occurs in Iluka Nature Reserve, which is about 136 hectares in size. Occurs on sand dunes and on soil derived from underlying rocks. Stands on headlands exposed to strong wind-action may take the form of dense, wind-pruned thickets. Stands are generally taller in sheltered sites such as hind dunes, although wind-pruning may still occur on their windward sides. Most stands occur within two kilometres of the sea, though are occasionally found further inland within reach of the maritime influence.	Absent	Low	Low
Lowland Rainforest of Subtropical Australia	An ecological community of subtropical rainforest and some related, structurally complex forms of dry rainforest. Lowland Rainforest, in a relatively undisturbed state, has a closed canopy, characterised by a high diversity of trees whose leaves may be mesophyllous and encompass a wide variety of shapes and sizes. A range of plant growth forms are present in Lowland Rainforest, including palms, vines, and vascular epiphytes. In disturbed stands of this community the canopy cover may be broken, or the canopy may be smothered by exotic vines. The Hawkesbury River notionally marks the southern limit of Lowland Rainforest in the NSW North Coast and Sydney Basin bioregions. South of the Sydney metropolitan area, Lowland Rainforest is replaced by Illawarra Subtropical Rainforest of the Sydney Basin Bioregion, which is listed as an endangered ecological community. Milton Ulladulla Subtropical Rainforest is also a related rainforest endangered ecological community that occurs still further south in the South East Corner Bioregion. Typically occurs on relatively nutrient-rich, such as basic volcanic or fine-grained sedimentary substrates, but may also occur on substrates of intermediate fertility, including acid volcanics.	Absent	Low	Low
Subtropical and Temperate Coastal Saltmarsh	The Subtropical and Temperate Coastal Saltmarsh ecological community occurs within a relatively narrow margin of the Australian coastline, within the subtropical and temperate climatic zones. The physical environment for the ecological community is coastal areas under	Absent	Low	Low

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
	regular or intermittent tidal influence. In southern latitudes saltmarsh is often the main vegetation-type in the intertidal zone and commonly occurs in association with estuaries. It is typically restricted to the upper intertidal environment, occurring in areas within the astronomical tidal limit, often between the elevation of the mean high tide and the mean spring tide. The Coastal Saltmarsh ecological community consists mainly of salt-tolerant vegetation (halophytes) including grasses, herbs, sedges, rushes, and shrubs. Succulent herbs, shrubs and grasses generally dominate and vegetation is generally of less than 0.5 m height (with the exception of some reeds and sedges). Many species of non-vascular plants are also found in saltmarsh, including epiphytic algae, diatoms, and cyanobacterial mats.			
Birds				
Anthochaera phrygia Regent Honeyeater	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. In NSW, the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. The Regent Honeyeater is a generalist forager, although it feeds mainly on the nectar from a relatively small number of eucalypts that produce high volumes of nectar. Key eucalypt species include Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany. Other tree species may be regionally important. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks.			
Botaurus poiciloptilus Australasian Bittern	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleocharis spp.)	Absent	Low	Low
Calidris canutus Red Knot	The Red Knot is a non-breeding migratory visitor from Arctic regions of Siberia. It is capable of flying non-stop between north-eastern China and northern Australia. Birds arrive between September and October and leave between March and April, with a small number of individuals overwintering. In NSW it is recorded in small numbers along some of the major river estuaries and sheltered embayments of the coastline, in particular the Hunter River estuary. Mainly occurs in small numbers on intertidal mudflats, estuaries, bays, inlets, lagoons, harbours and sandflats and sandy beaches of sheltered coasts.	Absent	Low	Low

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Calidris ferruginea Curlew Sandpiper	The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes, and lagoons on the coast and sometimes inland.	Absent	Low	Low
Charadrius mongolus Lesser Sand Plover	Found along the east coast of Queensland and northern NSW. Individuals are rarely recorded south of the Shoalhaven estuary, and there are few inland records. Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs, and rock platforms.	Absent	Low	Low
Dasyornis brachypterus Eastern Bristlebird	There are three main populations: Northern - southern Queensland/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW, the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.	Absent	Low	Low
Diomedea antipodensis Antipodean Albatross	A large Albatross species, with breeding confined to New Zealand.	Absent	Low	Low
Diomedea gibsoni Gibson's Albatross	A large Albatross species, with breeding confined to New Zealand. The species is regularly encountered on trans-Tasman shipping routes and at seas off Sydney, and regularly occurs off the NSW coast usually between Green Cape and Newcastle.	Absent	Low	Low
Diomedea epomophora Southern Royal Albatross	The range of Diomedea epomophora extends throughout the oceans of the Southern Hemisphere. Two subspecies of D. epomophora are recognized today. Southern royal albatrosses (D.e. epomophora) nest almost exclusively on the Chatham Islands, located hundreds of miles east of New Zealand. After breeding, the species may circumnavigate the Southern Ocean, though it is most commonly sighted in New Zealand and South American waters. It has never been recorded north of the Equator.	Absent	Low	Low

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Diomedea exulans Wandering Albatross	The Wandering Albatross visits Australian waters extending from Fremantle, Western Australia, across the southern water to the Whitsunday Islands in Queensland between June and Spetember. It has been recorded along the length of the NSW coast. At other times birds roam the southern oceans and commonly follow fishing vessels for several days.	Absent	Low	Low
Diomedea sanfordi Northern Royal Albatross	The Northern Royal Albatross ranges widely over the Southern Ocean, with individuals seen in Australian waters off south-eastern Australia (Environment Australia 2001f). The Northern Royal Albatross feeds regularly in Tasmanian and South Australian waters, and less frequently in NSW waters	Absent	Low	Low
Erythrotriorchis radiatus Red Goshawk	The species is very rare in NSW, extending south to about 30°S, with most records north of this, in the Clarence River Catchment, and a few around the lower Richmond and Tweed Rivers. Formerly, it was at least occasionally reported as far south as Port Stephens. Red Goshawks inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers. Breeding is likely to be in spring and summer in southern Queensland and NSW.	Absent	Low	Low
Fregetta grallaria White-bellied Storm-Petrel	A wide oceanic distribution in the south Pacific and Atlantic Oceans, ranging into tropical waters from various breeding grounds. Known to breed at various island groups including Lord Howe Island.	Absent	Low	Low
Grantiella picta Painted Honeyeater	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria, and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree/ Weeping Myall (Acacia pendula), Brigalow (A. harpophylla) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark, or mistletoe branches.	Absent	Low	Low
Lathamus discolor Swift Parrot	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Migrates to the	Absent	Low	Low

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
	Australian south-east mainland between March and October. No breeding in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*.			
Limosa lapponica baueri Bar-tailed Godwit	It is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, and bays. Less frequently it occurs in salt lakes and brackish wetlands, sandy ocean beaches and rock platforms.	Absent	Low	Low
Limosa lapponica menzbieri Northern Siberian Godwit	Found in coastal areas of NSW.	Absent	Low	Low
Macronectes giganteus Southern Giant Petrel	The Southern Giant Petrel has a circumpolar pelagic range from Antarctica to approximately 20° S and is a common visitor off the coast of NSW.	Absent	Low	Low
Macronectes halli Northern Giant-Petrel	The Northern Giant-Petrel has a circumpolar pelagic distribution, usually between 40-64ºS in open oceans. Their range extends into subtropical waters (to 28ºS) in winter and early spring, and they are a common visitor in NSW waters, predominantly along the south-east coast during winter and autumn.	Absent	Low	Low
Numenius madagascariensis Eastern Curlew	In NSW, the species occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast. It generally occupies coastal lakes, inlets, bays, and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets.	Absent	Low	Low
Pachyptila turtur subantarctica Fairy Prion (Southern)	The fairy prion (southern) breeds on Macquarie Island and a number of other subantarctic islands outside of Australia. There are 80 to 250 breeding pairs in Australia and a global population of 80 000. In Australia, breeding is recorded on two rock stacks off Macquarie Island and on the nearby Bishop and Clerk Island. Some individuals may migrate towards New Zealand and southern Australia in winter	Absent	Low	Low
Phoebetria fusca Sooty Albatross	The Sooty Albatross occurs in the South Atlantic and southern Indian Oceans and has not been recorded in the Pacific Ocean between Australia and South America. In Australian	Absent	Low	Low

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
	waters, this species is generally recorded in winter off the south coast from Tasmania to Western Australia, while there are occasional sightings off the NSW coast, north of Grafton.			
Pterodroma leucoptera leucoptera Gould's Petrel	Breeds on both Cabbage Tree Island, 1.4 km offshore from Port Stephens and on nearby Boondelbah island. The range and feeding areas of non-breeding petrels are unknown.	Absent	Low	Low
Pterodroma neglecta neglecta Kermadec Petrel	A medium-sized petrel. Several colour phases from dark brown over the whole body, with a few flecks of grey on the face to a lighter form which is sooty brown above with pale grey head and white underparts. The darker form is characteristic at Lord Howe Island. Tail short and square cut. White markings on upper wings. Bill short and black and legs and feet flesh-coloured. Eyes dark brown.	Absent	Low	Low
Rostratula australis Australian Painted Snipe	The Australian Painted Snipe is restricted to Australia. Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. In NSW, many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Prefers fringes of swamps, dams, and nearby marshy areas where there is a cover of grasses, lignum, low scrub, or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks, or reeds.	Absent	Low	Low
Thalassarche bulleri Buller's Albatross	This albatross only nests on islands off New Zealand. The northern subspecies (*platei*) nests on islands off Chatham Island with an estimated population of around 18,200 breeding pairs. The southern subspecies (*bulleri*) breeds on the Snares and Solander islands with a total population of around 13,600 breeding pairs. After breeding both subspecies migrate to the seas off Peru and Chile. In NSW waters it is a relatively common visitor between March and October, with few sightings outside this period.	Absent	Low	Low
Thalassarche bulleri platei Northern Buller's Albatross	The Pacific Albatross is a non-breeding visitor to Australian waters. Foraging birds are mostly limited to the Pacific Ocean and the Tasman Sea, although birds do reach the east coast of the Australian mainland. Occurrence within the Australian Fishing Zone is likely, however, the threat from longline injury is considered low.	Absent	Low	Low

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Thalassarche cauta Shy Albatross	This species is circumpolar in distribution, occurring widely in the southern oceans. Islands off Australia and New Zealand provide breeding habitat. In Australian waters, the Shy Albatross occurs along the east coast from Stradbroke Island in Queensland along the entire south coast of the continent to Carnarvon in Western Australia. Although uncommon north of Sydney, the species is commonly recorded off southeast NSW, particularly between July and November, and has been recorded in Ben Boyd National Park.	Absent	Low	Low
Thalassarche cauta steadi White-capped Albatross	This species breeds on a number of islands in New Zealand waters. Virtually the entire population nests in the Auckland Islands, comprising between 75,000 and 117,000 breeding pairs. A small number of pairs nest on Bollons Island in the Antipodes Islands and occasionally on The Forty-Fours in the Chatham Islands. After breeding most birds remain in Australasian waters with some adults migrating across the Indian Ocean to seas off South Africa and Namibia. In NSW waters it is probably frequently overlooked due to the difficulties of separating it from the Shy Albatross. However, it appears to be a regular visitor principally occurring between March and December.	Absent	Low	Low
Thalassarche eremita Chatham Albatross	Breeding for the Chatham Albatross is restricted to Pyramid Rock, Chatham Islands, off the coast of New Zealand. The principal foraging range for this species is in coastal waters off eastern and southern New Zealand, and Tasmania	Absent	Low	Low
Thalassarche impavida Campbell Albatross	This species nests only at Campbell Island and the adjacent Isle de Jeanette Marie south of New Zealand, with a total population estimated at 24,600 pairs. It ranges widely in Australasian seas. In NSW waters it is probably frequently overlooked due to the difficulties of separating it from the Black-browed Albatross. However, it appears to be a regular visitor occurring in most months of the year with peaks in winter during the non-breeding season.	Absent	Low	Low
Thalassarche melanophris Black-browed Albatross	The Black-browed Albatross has a circumpolar range over the southern oceans and are seen off the southern Australian coast mainly during winter. This species migrates to waters off the continental shelf from approximately May to November and is regularly recorded off the NSW coast during this period. The species has also been recorded in Botany Bay National Park.	Absent	Low	Low
Thalassarche salvini Salvin's Albatross	It ranges widely through the South Pacific Ocean, particularly in the Humboldt Current off western South America. In NSW waters it is an uncommon visitor principally occurring between June and October, with the majority of sightings from waters south of Sydney.	Absent	Low	Low

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Frogs				
Litoria aurea Green and Golden Bell Frog	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.), Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (Gambusia holbrooki), have a grassy area nearby and diurnal sheltering sites available.	Absent	Low	Low
Mixophyes iteratus Giant Barred Frog	The Giant Barred Frog is distributed along the coast and ranges from Eumundi in south-east Queensland to Warrimoo in the Blue Mountains. Northern NSW, particularly the Coffs Harbour-Dorrigo area, is a stronghold. Moist riparian habitats such as rainforest or wet sclerophyll forest are favoured for the deep leaf litter that they provide for shelter and foraging, as well as open perching sites on the forest floor. However, Giant Barred Frogs will also sometimes occur in other riparian habitats, such as those in drier forest or degraded riparian remnants, and even occasionally around dams.	Absent	Low	Low
Mammals				
Chalinolobus dwyeri Large-eared Pied Bat	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (Petrochelidon ariel), frequenting low to mid-elevation dry open forest and woodland close to these features. Found in well-timbered areas containing gullies.	Absent	Low	Low
Dasyurus maculatus maculatus Spot-tailed Quoll	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath, and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks.	Absent	Low	Low
Petauroides volans Greater Glider	Arboreal nocturnal marsupial largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. Favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.	Absent	Low	Low

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Petrogale penicillata Brush-tailed Rock-wallaby	In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupy rocky escarpments, outcrops, and cliffs with a preference for complex structures with fissures, caves and ledges facing north.	Absent	Low	Low
Phascolarctos cinereus Koala	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Generally solitary but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery.	Present, foraging species such as Narrow-leaved Stringybark present.	Recorded, scats observed on northern side of Hastings River Drive	High, species present and habitat would be removed. AoS completed.
Potorous tridactylus tridactylus Long-nosed Potoroo	In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm. Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns, or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.	Absent	Low	Low
Pseudomys novaehollandiae New Holland Mouse	Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. It is a social animal, living predominantly in burrows shared with other individuals. Distribution is patchy in time and space, with peaks in abundance during early to mid-stages of vegetation succession typically induced by fire.	Absent	Low	Low
Pteropus poliocephalus Grey-headed Flying-fox	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths, and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Marginal, foraging only.	Low	Low
Migratory Wetland Species				
Actitis hypoleucos Common Sandpiper	Found along all coastlines of Australia and in many areas inland. The population that migrates to Australia breeds in the Russian far east. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species utilises a wide range of	Absent	Low	Low

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
	coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.			
Arenaria interpres Ruddy Turnstone	The Ruddy Turnstone is widespread within Australia during its non-breeding period of the year, including from Tasmania in the south to Darwin in the north and many coastal areas in between. It is found in most coastal regions, with occasional records of inland populations. It strongly prefers rocky shores or beaches where there are large deposits of rotting seaweed.	Absent	Low	Low
Calidris acuminata Sharp-tailed Sandpiper	The Sharp-tailed Sandpiper spends the non-breeding season in Australia Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats.	Absent	Low	Low
Calidris canutus Red Knot	The Red Knot is a rare visitor to wetlands away from the coast with a few records (mostly during southward migration) as far west as Lake Menindee and the Riverina. Mainly occurs in small numbers on intertidal mudflats, estuaries, bays, inlets, lagoons, harbours and sandflats and sandy beaches of sheltered coasts. It is occasionally found on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms and is a rare visitor to terrestrial saline wetlands and freshwater swamps. Birds roost on sandy beaches, spits, islets, and mudflats close to feeding grounds, usually in open areas. Rarely found on inland lakes or swamps.	Absent	Low	Low
Calidris ferruginea Curlew Sandpiper	The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes, and lagoons on the coast and sometimes inland.	Absent	Low	Low
Calidris melanotos Pectoral Sandpiper	In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains, and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers	Absent	Low	Low

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
	wetlands that have open fringing mudflats and low, emergent, or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum.			
Calidris ruficollis Red-necked Stint	It is distributed along most of the Australian coastline with large densities on the Victorian and Tasmanian coasts. The Red-necked Stint has been recorded in all coastal regions and found inland in all states when conditions are suitable.	Absent	Low	Low
Charadrius bicinctus Double-banded Plover	The Double-banded Plover can be found in both coastal and inland areas. During the non-breeding season, it is common in eastern and southern Australia, mainly between the Tropic of Capricorn and western Eyre Peninsula, with occasional records in northern Queensland and Western Australia. The greatest numbers are found in Tasmania and Victoria, but numbers diminish to the north and west of these regions.	Absent	Low	Low
Charadrius mongolus Lesser Sand Plover, Mongolian Plover	Found along the east coast of Queensland and northern NSW. Individuals are rarely recorded south of the Shoalhaven estuary, and there are few inland records. Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs, and rock platforms.	Absent	Low	Low
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Latham's Snipe is a non-breeding visitor to south-eastern Australia and is a passage migrant through northern Australia. occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands, or heathlands, around bogs and other water bodies). known to occur in the upland wetlands of the New England Tablelands and Monaro Plateau.	Absent	Low	Low
Gallinago megala Swinhoe's Snipe	Few definite records exist for Swinhoe's Snipe in Australia. The species has been recorded in the north between the Kimberley Divide and Cape York Peninsula. In Western Australia the species has been recorded in Pilbara, the Kimberley region, Mount Goldsworthy, Mount Blaize and in the north-west regions around the Mitchell Plateau. In the Northern Territory the species is believed to be common and widespread in the Top End. Definite records exist from Darwin, Melville Island, Cannon Hill, Red Lily Lagoon and Mount Brockman. In Queensland specimens have been taken at Normanton. The species has also been sighted at Mount Isa.	Absent	Low	Low

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Gallinago stenura Pin-tailed Snipe	The species distribution within Australia is not well understood. There are confirmed records from NSW, south-west Western Australia, Pilbara and the Top End. In NSW a single banded bird was reported near West Wyalong. In Western Australia the species was reported at Pilbara, Port Headland, Myaree Pool, Maitland River and near Karratha. In Pilbarra the distribution is believed to be bound by Pardoo (Banningarra Spring) and the lower Maitland River and Shay Gap. The Pin-tailed Snipe has also been reported on the Cocos-Keeling Islands as well as Christmas Island.	Absent	Low	Low
Limosa lapponica Bar-tailed Godwit	Bar-tailed Godwits arrive in Australia each year in August from breeding grounds in the northern hemisphere. Birds are more numerous in northern Australia. Bar-tailed Godwits inhabit estuarine mudflats, beaches, and mangroves. They are common in coastal areas around Australia.	Absent	Low	Low
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew	In NSW, the species occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast. It generally occupies coastal lakes, inlets, bays, and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets.	Absent	Low	Low
Numenius minutus Little Curlew, Little Whimbrel	Little Curlews generally spend the non-breeding season in northern Australia from Port Hedland in Western Australia to the Queensland coast. There are records of the species from inland Australia, and widespread but scattered records on the east coast.	Absent	Low	Low
Numenius phaeopus Whimbrel	The Whimbrel is a regular migrant to Australia and New Zealand, with a primarily coastal distribution. There are also scattered inland records of Whimbrels in all regions. It is found in all states but is more common in the north.	Absent	Low	Low
Pandion haliaetus Osprey	The osprey tolerates a wide variety of habitats, nesting in any location near a body of water providing an adequate food supply. It is found on all continents except Antarctica, although in South America it occurs only as a non-breeding migrant. In Australia it is mainly sedentary and found patchily around the coastline, though it is a non-breeding visitor to eastern Victoria and Tasmania.	Absent	Low	Low

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Pluvialis fulva Pacific Golden Plover	Within Australia, the Pacific Golden Plover is widespread in coastal regions, though there are also a number of inland records (in all states), sometimes far inland and usually along major river systems, especially the Murray and Darling Rivers and their tributaries. Most Pacific Golden Plovers occur along the east coast and are especially widespread along the Queensland and NSW coastlines. Elsewhere, they are recorded at scattered sites in the south-east, with most records in Victoria along the coast between Jack Smith Lake (south of Sale) and the Bellarine Peninsula, including Western Port and Port Phillip Bay.	Absent	Low	Low
Pluvialis squatarola Grey Plover	face is whitish with fine grey-brown streaks. The In Australia, the Grey Plover has been recorded in all states, where it is found along the coasts, and it especially abundant on the western and southern coastlines, mainly between The Coorong and western beaches of the Eyre Peninsula in South Australia, and the coast of Western Australia between Albany and the northern Kimberley coast.	Absent	Low	Low
Tringa brevipes Grey-tailed Tattler	Grey-tailed Tattlers are usually seen in small flocks on sheltered coasts with reefs and rock platforms or with intertidal mudflats. They are also found in intertidal rocky, coral, or stony reefs, platforms and islets that are exposed at high tide, also shores of rock, shingle, gravel and shells and on intertidal mudflats in embayments, estuaries and coastal lagoons, especially those fringed with mangroves.	Absent	Low	Low
Tringa nebularia Common Greenshank, Greenshank	The Common Greenshank does not breed in Australia; however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia. In NSW, the species has been recorded in most coastal regions. It is widespread west of the Great Dividing Range, especially between the Lachlan and Murray Rivers and the Darling River drainage basin, including the Macquarie Marshes, and north-west regions.	Absent	Low	Low
Xenus cinereus Terek Sandpiper	In Australia, has been recorded on coastal mudflats, lagoons, creeks, and estuaries. Favours mudbanks and sandbanks located near mangroves but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools. Generally, roosts communally amongst mangroves or dead trees, often with related wader species. Breaks up into smaller flocks or even solitary birds when feeding in open intertidal mudflats.	Absent	Low	Low

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Migratory Terrestrial Species				
Cuculus optatus Oriental Cuckoo, Horsefield's Cuckoo	Found in woodlands, forest, and riparian area. Nests in cup shaped nests of other species such as honeyeaters, flycatchers.	Absent	Low	Low
Hirundapus caudacutus White-throated Needletail	White-throated Needletails arrive in Australia from their breeding grounds in the northern hemisphere in about October each year and leave somewhere between May and August. White-throated Needletails are non-breeding migrants in Australia. Breeding takes place in northern Asia.	Absent	Low	Low
Monarcha melanopsis Black-faced Monarch	The Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub, and damp gullies. It may be found in more open woodland when migrating. The Black-faced Monarch builds a deep cup nest of casuarina needles, bark, roots, moss, and spider web in the form of a tree, about 3 m to 6 m above the ground.	Absent	Low	Low
Monarcha trivirgatus Spectacled Monarch	The Spectacled Monarch is found in coastal north-eastern and eastern Australia, including coastal islands, from Cape York, Queensland to Port Stephens, New South Wales. It is much less common in the south. The Spectacled Monarch prefers thick understorey in rainforests, wet gullies, and waterside vegetation, as well as mangroves.	Absent	Low	Low
Myiagra cyanoleuca Satin Flycatcher	The Satin Flycatcher is found along the east coast of Australia in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	Absent	Low	Low
Rhipidura rufifrons Rufous Fantail	The Rufous Fantail is found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. During migration, it may be found in more open habitats or urban areas	Marginal	Low	Low

E EPBC = listed as Endangered under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*
V EPBC = listed as Vulnerable under the Commonwealth Environment Protection & Biodiversity Conservation Act 1999.
M EPBC = listed as Migratory under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

CE EPBC = listed as Critically Endangered under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*
CAMBA = Chinese-Australia Migratory Bird Agreement
JAMBA = Japan-Australia Migratory Bird Agreement
ROKAMBA = Republic of Korea–Australia Migratory Bird Agreement

Appendix E EPBC ACT ASSESSMNET OF SIGNIFICANT IMPACT

The *Environment Protection and Biodiversity Conservation Act* 1999 specifies factors to be taken into account in deciding whether a development is likely to significantly affect EECs, threatened species and migratory species, listed at the Commonwealth level. The following assessment assesses the significance of the likely impacts associated with the proposed works on:

Koala *Phascolarctos cinereus*– Vulnerable

Lead to a long-term decrease in the size of an important population of a species?
An important population is defined as one that is necessary for a species' long-term survival and recovery, and includes: • A key source population either for breeding or dispersal; • A population that is necessary for maintaining genetic diversity, and/or • A population that is near the limit of the species' distribution range. Given the evidence of Koala is observed within the development site and high number of BioNet records (over 8500) within the locality, it is clear that the proposal would impact upon a population of Koala to a small degree. However, there is insufficient evidence to suggest that this population would qualify as an important population as it would not be a key population either for breeding or dispersal, a population necessary for maintaining genetic diversity, or a population near the limits of the Koala's range.
Reduce the area of occupancy of an important population
Any population of the species occurring within the proposal site is not considered to constitute an important population, therefore the proposal is not considered likely to reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations;
Any population of the species occurring within the proposal site is not considered to constitute an important population, therefore the proposal is not considered likely to fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species
The proposal will remove approximately 0.36 ha of habitat for Koala which through the use of the habitat assessment tool may represent habitat critical to the survival of Koala. Consideration has been given the

impacts of the 2019/2020 bushfire season, whereby 25% of suitable Koala habitat in eastern NSW may have been impacted (DPIE 2020b) exacerbating the loss of any Koala habitat. However, as the area of impact is dramatically below 2 ha, referral for this scale of impact is not recommended (DoE 2014).
Disrupt the breeding cycle of an important population
Any population of the species occurring within the proposal site is not considered to constitute an important population, therefore the proposal is not considered likely to disrupt the breeding cycle of an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The extent of habitat modification and removal is not considered likely to occur to the extent that the species is likely to decline as the impact area is small (0.36 ha). The habitat to be removed comprises five known feed trees within a highly urbanised landscape. This would decrease the availability of habitat slightly in the locality, but this would not isolate or decrease the quality of remaining areas of habitat, particularly to the south. Therefore, the species is no considered likely to decline as a result of the proposal.
Result in invasive species that are harmful to an vulnerable species becoming established in the vulnerable species' habitat
The proposal is not considered likely to generate an increase in invasive species harmful to the species than already occur. The proposal is not considered likely to exacerbate this impact to the point that it would constitute a substantial reduction in the quality or integrity of the species habitat within the proposal site.
Introduce disease that may cause the species to decline;
The proposal is considered unlikely to introduce disease that may cause the species to decline.
Interfere substantially with the recovery of the species;
The proposal is not considered likely to interfere with the recovery of the species, as the members of a population that may frequent the development site is unlikely to be part of an important population. Koala, in small numbers, are likely to only be occasional transients to the development site. The removal of a small number of potential feed trees in a locality containing similar vegetation is a minimal impact to such individuals and unlikely to interfere substantially with the recovery of the species.

The proposal is not considered likely to significantly impact the species, as Koala that may frequent the development suite are not considered part of an important population. Habitat within the development site was tentatively scored as critical habitat, primarily on the basis of occurrence (scats observed) and presence of five

feed trees. However, as the scale of habitat removal is below 2 ha, despite the impacts on Koala habitat of the 2019/2020 bushfire season in the region, referral is not recommended (DoE 2014). The removal of a small number of feed trees is considered unlikely to substantially interfere with the recovery of the species or cause the local population of Koala to decline.

Given the above, referral of the proposal to the DAWE is not recommended.

Appendix F

BAM CALCULATOR CREDIT REPORT

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00015483/BAAS17093/19/00015484	Hastings River Drive Upgrade	10/06/2021
Assessor Name	Report Created	BAM Data version *
Mitchell Palmer	29/09/2021	45
Assessor Number	BAM Case Status	Date Finalised
BAAS17051	Finalised	29/09/2021
Assessment Revision	Assessment Type	BOS entry trigger
5	Part 4 Developments (General)	BOS Threshold: Biodiversity Values Map

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

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion											
1	1064_Maintained	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	47.6	47.6	0.24	Endangered Ecological Community		High Sensitivity to Potential Gain	2.00		6
2	1064_Drainage	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	40.1	40.1	0.04	Endangered Ecological Community		High Sensitivity to Potential Gain	2.00		1
										Subtotal	**7**
										Total	**7**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits
Crinia tinnula / Wallum Froglet (Fauna)								
1064_Drainage	40.1	40.1	0.04	Vulnerable	Not Listed	1.5	False	1
							Subtotal	**1**

Myotis macropus / Southern Myotis (Fauna)								
1064_Maintained	47.6	47.6	0.24	Vulnerable	Not Listed	2	False	6
1064_Drainage	40.1	40.1	0.04	Vulnerable	Not Listed	2	False	1
							Subtotal	**7**
Phascolarctos cinereus / Koala (Fauna)								
1064_Maintained	47.6	47.6	0.24	Vulnerable	Vulnerable	2	False	6
1064_Drainage	40.1	40.1	0.04	Vulnerable	Vulnerable	2	False	1
							Subtotal	**7**