PRELIMINARY ECOLOGICAL ASSESSMENT

FOR A

PLANNING PROPOSAL

REGARDING

25 CASTAWAY CLOSE BOAT HARBOUR

Prepared by:

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Site Details:	25 Castaway Close, Boat Harbour (Lot 6 DP 1015409)
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Prepared for:	**Perception Planning Pty Ltd**
Reference No.	25 Castaway Close, Boat Harbour
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Abbreviations

Abbreviation	Meaning
BC Act	*Biodiversity Conservation Act 2016*
CKPoM	Comprehensive Koala Plan of Management
DCP	Development Control Plan
DEC	Department of Environment and Conservation
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
DoE	Department of Environment
EEC	Endangered Ecological Community
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
Ha	Hectare
KTP	Key Threatening Process
LEP	Local Environmental Plan
LGA	Local Government Area
LHRCP	Lower Hunter Regional Conservation Plan
LHRS	Lower Hunter Regional Strategy
MU	Map Unit
NPWS	NSW National Parks and Wildlife Service
OEH	Office of Environment and Heritage
PFC	Projected Foliage Cover
SEPP 44	*State Environmental Planning Policy No. 44 – 'Koala Habitat Protection'*
TSC Act	*Threatened Species Conservation Act 1995*

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1 INTRODUCTION

Firebird ecoSultants Pty Ltd has been engaged by Perception Planning Pty Ltd to provide a preliminary ecological assessment for 25 Castaway Close, Boat Harbour (Lot 6 DP 1015409) (hereafter referred to as 'the site'). It is proposed to investigate the rezoning of the site to pave way for future residential development. This preliminary assessment supports the preparation of a planning proposal to Port Stephens Council (PSC).

This report recognises the requirements of the relevant legislation (*Environmental Planning and Assessment Act 1979* (EP&A Act), *Biodiversity Conservation Act 2016* (BC Act), Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act)) and the relevant planning strategies (the *Lower Hunter Regional Strategy 2006-31*, the *Port Stephens Planning Strategy 2011-2036* and the *Port Stephens Comprehensive Koala Plan of Management* (CKPoM)). A literature review and desktop research was combined with flora and fauna surveys and a habitat assessment. Commonwealth, state and local government policies and guidelines formed the basis of project surveying and assessment methodology.

1.1 Site Particulars

Locality:	25 Castaway Close, Boat Harbour
LGA:	Port Stephens
Lot / DP:	Lot 6 DP 1015409
Zoning:	R5 Large Lot Residential (see Port Stephens Local Environment Plan (LEP) 2013 *Land Zoning Map Sheet LZN_005C)*
Land size:	5,993 m²
Current Land Use:	Large lot residential and remnant vegetation
Minimum Lot Size:	4,000 m² (see Port Stephens LEP 2013 *Lot Size Map - Sheet LSZ_005C*)
Bushfire Prone Land:	Vegetation Category 1
Acid Sulfate Soils:	Class 5 (see Port Stephens LEP 2013 *Acid Sulfate Soils Map – Sheet ASS_005C*)
Flood Planning Area:	Partially (northern portion of site) (see Port Stephens LEP 2013 *Flood Planning Map – Sheet FLD_005C*)

1.2 Site Description

The site contains an existing dwelling. It is largely cleared, although some scattered native trees occur to the north; the understorey in this area is cleared and managed. The northern portion of the site is also in a Flood Planning Area. The site is surrounded by a mix of residential development and remnant bushland, including parts of Tomaree National Park. The developed areas surrounding the site are part of an existing low density residential settlement with lot sizes ranging from 500m^2 to 600m^2, with the potential to down to 250m^2 under the density provisions in the Port Stephens LEP 2013.

Refer to Figure 1.1 for the site location.

1.3 Description and Background of the Proposal

The planning proposal aims to rezone the site from R5 Large Lot Residential to part E2 Environmental Conservation. This would pave the way for future residential development in the front (southern) section of the site, whilst protecting vegetation and habitat in the rear (northern) section of the site.

See Figure 1-2 for the rezoning proposal.

1.4 Purpose and Scope of Study

The scope of this ecological assessment report is to:

- Identify vascular flora species on the site;
- Identify and map existing vegetation communities;
- Identify existing habitat types on the site and assess the habitat potential for threatened species, populations, or ecological communities known from the proximate area;
- Conducted a targeted search and habitat assessment for *Phascolarctos cinereus* (Koala) on the site;
- Assess the status of identified or potentially occurring flora species, vegetation communities and fauna species under relevant legislation;
- Assess the potential impacts of the proposal on threatened species, populations or ecological communities, or their habitats;
- Identify the biodiversity values and constraints on the site; and
- Provide recommendations to ensure that the recorded biodiversity values on the site are adequately managed and/or protected.

Whilst survey work has been undertaken wholly within the bounds of the site, consideration has been afforded to areas off the site in order to appreciate the environmental context of the site.

The purpose of this report is to:

- Ensure planning, management and development decisions are based on sound scientific information and advice by documenting the presence of any biodiversity components or potential significant impacts that may exist on the site;
- Provide information to enable compliance with applicable assessment requirements contained within the EP&A Act, BC Act, EPBC Act and any other relevant state, regional and local environmental planning instruments;
- Enable the provision and analysis of ecological data that is comparable with data for other sites within the region to ensure continuity and consistency for survey and results; and
- To undertake a preliminary ecological assessment which is of sufficient detail to justify a decision being made at the “gateway”, regarding the proposal. Should the decision by the NSW Government be supportive, then further ecological studies may be required, to ensure compliance with assessment requirements under the BC Act and any other study requirements requested by PSC, Department of Planning & Environment and/or Office of Environment & Heritage (OEH), as part of the gateway determination / consultation process.

Note:
Boundaries are not survey accurate.
Although all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

FIGURE 1-1:SITE LOCALITY MAP

CLIENT	Client
SITE DETAILS	No.25 Castaway Close Boat Harbour
DATE	18 January 2018

Legend

Subject Site

NORTH

0 50 100 150

SCALE 2500 @ A3

Ref No 2254

Firebird ecoSultants Pty Ltd
ABN - 16 105 985 993
Level 1, 146 Hunter Street, Newcastle NSW 2300
P O Box 354 Newcastle NSW 2300

The Site

E2 - Environmental Conservation and W - 4,000sqm

Potential Building Envelope

R5 - Large Lot Residential and V - 2,000sqm

Recently House Constructed

Recently House Constructed

CASTAWAY CLOSE

1.5 Qualifications and Licensing

Qualifications

Fieldwork for this project was undertaken by Lizzie MacDonald. Report writing was undertaken by Lizzie MacDonald, with editing by Sarah Jones. Qualifications are provided in Appendix A.

Licensing

Research was conducted under the following licences:

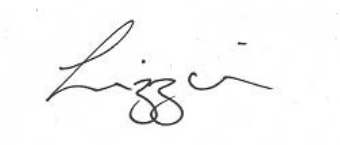
- NSW National Parks and Wildlife Service Scientific Investigation Licence SL100533;
- Animal Research Authority (Trim File No: TRIM 11/5655) issued by NSW Department of Primary Industries; and
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: TRIM 11/5655) issued by Department of Primary Industries.

Certification

As the principal author, I, Lizzie MacDonald make the following certification:

- The results presented in the report are, in the opinion of the principal author and certifier, a true and accurate account of the species recorded, or considered likely to occur within the site;
- Commonwealth, state and local government policies and guidelines formed the basis of project surveying methodology, or where the survey work has been undertaken with specified departures from industry standard guidelines, details of which are discussed and justified in Section 2;
- All research workers have complied with relevant laws and codes relating to the conduct of flora and fauna research, including the *Animal Research Act 1995, National Parks and Wildlife Act 1974* and the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes*.

Signature of Principal Author and Certifier:



Lizzie MacDonald
Ecologist
B.Sc., G.Cert.EnvMgt&Sus

2 METHODOLOGY

This assessment included a desktop based analysis of previous records of threatened species in the area, a review of any relevant literature and a field based survey of the site. Where possible, survey methods have been designed in accordance with the relevant survey and assessment guidelines.

The current study aims to provide a sufficient level of ecological information to support an initial gateway determination. Should a gateway determination be issued, a more comprehensive analysis of survey methods, results, and impact assessment can be provided in subsequent ecological assessment reports.

2.1 Desktop Research

2.1.1 Previous Vegetation Mapping

Vegetation mapping previously undertaken in the area was reviewed. This included a review of the Hunter and Central Coast Regional Environmental Management Strategy (HCCREMS) vegetation mapping.

2.1.2 Database Searches

The following database searches were undertaken, in order to compile a list of threatened flora and fauna species and Matters of National Environmental Significance (MNES), predicted to occur in the area:

- Review of threatened fauna and flora records within a 10 km radius of the site, contained in the OEH Atlas of NSW Wildlife (NSW BioNet).
- Review of the Matters of National Environmental Significance (MNES) records within a 10 km radius of the site, using the Commonwealth Department of Environment (DoE), EPBC Act Protected Matters Search Tool.

2.1.3 Literature Review

Information sources reviewed included, but were not limited to:

- Aerial Photograph Interpretation (API);
- Relevant guidelines, including (but not limited to):
    - HCCREMS *Flora and Fauna Survey Guidelines, Lower Hunter Central Coast Region 2002, Volume 1 & Volume 2* (Murray et al. 2002)*;*
    - OEH *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC 2004).
    - *EPBC Act Referral Guidelines for the Vulnerable Koala* (Commonwealth of Australia, 2014)
- Environmental / planning reports relevant to the site / area, including (but not limited to):

- *Lower Hunter Regional Strategy 2006-31* (Department of Planning 2006);
- *Anna Bay Strategy and Town Plan 2008*
- *Port Stephens Planning Strategy 2011* (PSC 2011);
- *Port Stephens Council Development Control Plan 2014;*
- *Port Stephens Local Environment Plan 2013;*
- *Port Stephens Comprehensive Koala Plan of Management* (CKPoM) (PSC, 2002); and

- OEH Threatened Species, Populations and Ecological Communities website <http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/>;
- DEE Species Profile and Threats Database website < http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>; and
- Any environmental / ecological reports relevant to the site or area including for instance, Lunney et al. (1998) and Conacher Travers (2001).

2.2 Flora Survey and Vegetation Mapping

A flora survey was conducted on 14 January 2017. The entire area was traversed in order to determine the boundaries of any vegetation communities and to determine the potential distribution of threatened flora species listed under the TSC Act and EPBC Act.

Vegetation communities on the site were mapped into definable map units, using a combination of API, confirmation of dominant structural / floristic attributes, a review of previous vegetation mapping in the area (see Section 2.1.1) and a review of Plant Community Types (PCTs) contained in the OEH BioNet Vegetation Classification database. This included an assessment of the potential for vegetation communities to constitute an EEC, listed under the TSC Act and EPBC Act.

2.3 Fauna and Habitat Assessment

2.3.1 Targeted Koala Survey and Habitat Assessment

A targeted survey for *P. cinereus* (Koala) was undertaken on 14 January 2017. The entire site was traversed, with searches being undertaken at the base of each tree, for indirect evidence (scats and scratch marks) and in the tree canopy, for direct sightings. Effort was made to search for any *P. cinereus* (Koala) feed trees. This included tree species defined as Preferred Koala Feed Trees by the Port Stephens CKPoM (i.e. *Eucalyptus tereticornis* (Forest Red Gum), *E. parramatensis* (Parramatta Red Gum) and *E. robusta* (Swamp Mahogany)), and additional tree species (i.e. *E. moluccana* (Grey Box) and *E. punctata* (Grey Gum)), which have recently been identified as preferred feed trees by a current PSC study (Michael Jacobson, PSC pers. comm. 21 July 2017).

A koala habitat assessment was undertaken in accordance with the *Guidelines for Koala Habitat Assessments*, in Appendix 6 of the CKPoM (PSC, 2002). This included the following:

- Previous mapping of the site by the *Koala Habitat Planning Map* (PSC, 2007) was examined.
- Effort was made to search for any *P. cinereus* (Koala) feed trees (as noted above). This data was combined with the flora survey data (see Section 2.2), to confirm the site's *P. cinereus* (Koala) habitat types (as defined by Lunney et al. (1998)).
- A map was produced, indicating the boundaries of the site's *P. cinereus* (Koala) habitat.

2.3.2 Habitat Survey

An assessment of the relative habitat values of the site was undertaken on 14 January 2017. The habitat assessment focused on the identification of habitat types and resources favoured by all major guilds of native flora and fauna, including threatened species known from the region. The assessment was based on specific habitat requirements in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements. Consideration was given to contributing factors including topography, soil, light and hydrology. Effort was made locate and GPS any hollow-bearing trees and *P. cinereus* (Koala) feed trees (as noted above).

2.4 Survey Limitations

The survey methods undertaken are unlikely to detect all of the species present within the site. In order to address this, the habitat assessment and the presence of local records for threatened species were used to assess whether threatened species were likely to be present. Where necessary the precautionary principle of 'assumed presence' was applied.

3 RESULTS

3.1 Desktop Research

3.1.1 HCCREMS Vegetation Mapping

The site has been mapped as Map Unit (MU) 33 Coastal Sand Apple-Blackbutt Forest (LHCCREMS, 2003).

3.1.2 Database Searches

A number of threatened species, EECs and MNES have been recorded on the Atlas of NSW Wildlife database and EPBC Act Protected Matters Search Tool, within a 10 km radius of the site. These are listed in Table 3-1. Note that marine species, not relevant to the site, have been excluded.

Table 3-1: Threatened Species, EEC and MNES Identified Within a 10km Radius of the Site by a Search of the NSW Atlas of Wildlife and the EPBC Act Protected Matters Search Tool

Scientific Name	Common Name	TSC Act	EPBC Act
Threatened Flora			
Prostanthera densa	Villous Mintbush	V	V
Callistemon linearifolius	Netted Bottle Brush	V	-
Melaleuca groveana	Grove's Paperbark	V	-
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V
Diuris praecox	Newcastle Doubletail	V	V
Phaius australis	Lessor Swamp Orchid	E	E
Eucalyptus parramattensis subsp. decadens	Earp's Gum	V	V
Melaleuca biconvexa	Biconvex Paperbark	V	V
Syzygium paniculatum	Magenta Lily Pilly	E	V
Tetratheca juncea	Black-eyed Susan	V	V
Diuris arenaria	Sand Doubletail	E	-
Diuris praecox	Rough Doubletail	V	V
Threatened Fauna			
Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area		EP	-

Scientific Name	Common Name	TSC Act	EPBC Act
Ephippiorhynchus asiaticus	Black-necked Stork	E	-
Haliaeetus leucogaster	White-bellied Sea-eagle	V	-
Erythrotriorchis radiatus	Red Goshawk		V
Botaurus poiciloptilus	Australasian Bittern	E	E
Dasyornis brachypterus	Eastern Bristlebird	E	E
Ninox strenua	Powerful Owl	V	-
Ninox connivens	Barking Owl	V	-
Tyto longimembris	Eastern Grass Owl	V	-
Tyto novaehollandiae	Masked Owl	V	-
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-
Glossopsitta pusilla	Little Lorikeet	V	-
Lathamus discolor	Swift Parrot	E	E
Anthochaera phrygia	Regent Honeyeater	CE	E
Grantiella picta	Painted Honeyeater	V	V
Daphoenositta chrysoptera	Varied Sittella	V	-
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-
Dasyurus maculatus subsp. *maculatus*	Spotted-tailed Quoll	V	E
Petaurus norfolcensis	Squirrel Glider	V	-
Petauroides volans	Greater Glider	-	V
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE Mainland)	V	V
Phascogale tapoatafa	Brush-tailed Phascogale	V	-
Phascolarctos cinereus	Koala	V	V
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Chalinolobus dwyeri	Large-eared Pied Bat	V	V
Mormopterus norfolkensis	Eastern Free-tail Bat	V	-
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-
Miniopterus australis	Little Bentwing-bat	V	-
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-

Scientific Name	Common Name	TSC Act	EPBC Act
Myotis Macropus	Southern Myotis	V	-
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-
Pseudomys novaehollandiae	New Holland Mouse	-	V
Crinia tinnula	Wallum Froglet	V	-
Mixophyes balbus	Stuttering Frog	E	V
Litoria aurea	Green and Golden Bell Frog	E	V
Petalura gigantea	Giant Dragonfly	E	-
Ecological Communities			
Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions (E, CE*)		E	CE
Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions (E, CE*)		E	CE
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E, V*)		E	V
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E)		E	-
Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions (E)		E	-
Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions (E)		E	-
Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion (V, CE*)		V	CE
Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions (E)		E	-
Hunter Valley Weeping Myall Woodland in the Sydney Basin Bioregion (E, CE*)		E	CE
Kurri Sand Swamp Woodland in the Sydney Basin Bioregion (E)		E	-
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E, CE*)		E	CE
Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion (E)		E	-
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions (E, CE*)		E	CE
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E)		E	-

Scientific Name	Common Name	TSC Act	EPBC Act
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E)		E	-
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (E)		E	-
Sydney Freshwater Wetlands in the Sydney Basin Bioregion (E)		E	-
Warkworth Sands Woodland in the Sydney Basin Bioregion (E)		E	-
White Box Yellow Box Blakely's Red Gum Woodland (E, CE*)		E	CE

Status: V: Vulnerable**,** E: Endangered**,** CE: Critically Endangered

3.2 Flora Survey and Vegetation Mapping

The site is largely cleared; although some scattered remnant native trees occur in the northern half. The understorey is cleared and managed. Two native vegetation communities were identified on site, including Coastal Sand Apple Blackbutt Forest and Coastal Sand Swamp Forest; although these are highly modified from their natural condition.

Figure 3-1 indicates the distribution of the vegetation community on the site. See Appendix B for a full recorded species list. The dominant floral characteristics of each vegetation community are described below:

Coastal Sand-Apple Blackbutt Forest (MU33 in HCCREMS)

Upper Stratum – 20 to 25 m high, with a Projected Foliage Cover (PFC) of <5% to 10%. This stratum is dominated almost entirely by *Eucalyptus pilularis* (Blackbutt), with some very occasional *Angophora costata* (Smooth-barked Apple).

Mid Stratum – up to 2 m high with a PFC of <5%. This stratum is almost entirely absent. Only very occasional *Styphelia laeta* (Five Corners) were recorded.

Lower Stratum – <1 m high with a PFC of 90%. This stratum is almost entirely dominated by the exotic lawn species, *Stenotaphrum secundatum* (Buffalo Grass), with some occasional *Cynodon dactylon* (Common Couch), *Dichondra repens* (Kidney Weed) and *Hypochaeris radicata* (Catsear).

Coastal Sand Swamp Forest (MU37e in HCCREMS)

Upper Stratum – 15 m to 20 m high, with a PFC of <5% to 20%. This stratum is dominated entirely by *Melaleuca quinquenervia* (Broad-leaved Paperbark).

Mid Stratum – up to 5 m high with a PFC of <5%. This stratum is almost entirely absent. Only very occasional small trees and shrubs were recorded along the northern boundary of the site. These included *Glochidion ferdinandi* (Cheese Tree), *Myrsine howittiana* (Brush Muttonwood), *Acacia longifolia* (Sydney Golden Wattle), *Gahnia clarkei* (Tall Saw-sedge) and the exotic species, *Senna pendula* (Easter Cassia).

Lower Stratum – <1 m high with a PFC of 80%. This stratum is dominated by *Viola hederacea* (Ivy-leaved Violet), *Hydrocotyle bonariensis* (Large-leaf Pennywort) and the exotic species *Axonopus fissifolius* (Narrow-leaved Carpet Grass). There are occasional clumps of the ferns, *Blechnum indicum* (Swamp Water Fern), *Pteridium esculentium* (Common Bracken Fern) and *Cyclosorus interruptus*.

3.2.1 Endangered Ecological Communities

The site's MU 37e Coastal Sand Swamp Forest is a subunit of MU 37 Swamp Mahogany-Paperbark Forest. This community is commensurate with the BC Act listed EEC, Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions. See Figure 3-1 for the distribution of this EEC on the site.

3.2.2 Threatened Flora Species / Populations

No threatened flora species or populations were recorded on the site.

3.3 Fauna and Habitat Assessment

3.3.1 General Habitat Description

The following provides a summary of the site's habitat values:

- The site some scattered hollow-bearing trees. There are confined to the areas of the site mapped as Coastal Sand-Apple Blackbutt Forest (see Figure 3-1). Hollows recorded ranged from small to medium size and would be suitable for microbats, small to medium mammals and small to medium birds.
- The trees on the site may provide foraging, nesting, resting and roosting opportunities for a range of birds and mammals; however the shrub layer is almost entirely absent and the groundlayer is managed (mowed). This limits habitat availability significantly, for wide range of birds (particularly small woodland birds), mammals, lizards, frogs and invertebrates.
- The site is managed in a 'tidy' condition and contains minimal fallen timber. This also limits habitat resources significantly, for birds, reptiles, frogs and invertebrates that rely on ground timber for foraging, nesting, resting, perching or basking.
- The site lacks rocky surfaces, outcrops, caves or ledges.
- The sparsely vegetated parts of the site may be utilised as foraging areas for microchiropteran bat species that prefer structurally open habitats and associated edge habitat for foraging.

3.3.2 Koala Survey and Habitat Assessment

The targeted survey found no direct or indirect (e.g. scats and scratch marks on trees) evidence of *P. cinereus* (Koala) on the site. A search of the Atlas of NSW Wildlife database indicated that *P. cinereus* (Koala) has not been recorded in the site; however, there are a very high number of records in the boat harbour area.

The *Koala Habitat Planning Map* (PSC, 2007) identifies the site as a mix of 'Supplementary' habitat and 'Mainly Cleared' habitat. Areas mapped as 'Preferred' habitat occur approximately 150 m to the east and approximately 200 m north.

No *P. cinereus* (Koala) feed tree species were recorded on or immediately adjacent to the site. This assessment concludes that the site would indeed contain a mix of 'Supplementary' habitat and 'Mainly Cleared' habitat; however, the distribution of these habitat types would differ slightly from that mapped in the *Koala Habitat Planning Map* (PSC, 2007). Figure 3-2 provides a *P. cinereus* (Koala) habitat map, based on the findings of this assessment.

3.3.3 Corridors and Connectivity

The site is connected to relatively large areas of bushland (including parts of Tomaree National Park) in the Anna Bay area (to the west) and the Boat Harbour area (to the east). Residential development between these areas of bushland has caused some local fragmentation. It is considered that the vegetation at the rear (northern portion) of the site would provide some of the last remaining habitat connectivity between these areas, and would thus be very important for local connectivity.

The site is located outside of the Watalgan to Stockton Green Corridor, which is identified in the *Lower Hunter Regional Strategy 2006-31* (Department of Planning, 2006). A review of OEH key habitats and corridors mapping (Scotts, 2003) shows that the site is not part of any state or regional wildlife corridor.

Photo 1: Coastal Sand Apple-Blackbutt Forest (foreground) and Coastal Sand Swamp Forest (background). Cleared and managed understorey.

Photo 2: Coastal Sand Swamp Forest (foreground) and Coastal Sand-Apple Blackbutt Forest (background). Cleared and managed understorey.

Photo 3: Hollow-bearing tree.

Photo 4: Hollow-bearing tree.

Note:
Boundaries are not survey accurate.
Although all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

FIGURE 3-1: VEGETATION MAP

CLIENT	Client
SITE DETAILS	No.25 Castaway Close Boat Harbour
DATE	18 January 2018

Legend

- Subject Site
- 100m Buffer
- Hollow-bearing Tree
- Coastal Sand Swamp Forest
- Coastal Sand-Apple Blackbutt Forest

NORTH

0 25 50 75

SCALE 1500 @ A3

PIXELDRAFTING

Ref No 2254

Firebird ecoSultants Pty Ltd
ABN - 16 105 985 993
Level 1, 146 Hunter Street, Newcastle NSW 2300
P O Box 354 Newcastle NSW 2300

firebird

Note:
Boundaries are not survey accurate.
Although all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

FIGURE 3-2: KOALA HABITAT MAP

CLIENT	Client
SITE DETAILS	No.25 Castaway Close Boat Harbour
DATE	18 January 2018

Legend

- Subject Site
- 100m Buffer
- Supplementary Koala Habitat
- Mainly Cleared Land

NORTH

0 25 50 75

SCALE 1500 @ A3

PIXELDRAFTING

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Ref No 2254

4 THREATENED SPECIES / COMMUNITY / MNES LIKELIHOOD OF OCCURRENCE

Several threatened species / populations were identified in Section 3 of this report, as potentially occurring in the area. An assessment of the likelihood of occurrence for each of these threatened species / populations was conducted; see Table 4-1. This assessment deals with the following heads of consideration in tabulated form:

'**Species / Population'**– Lists each threatened species / populations known from the vicinity. The status' of each, under the TSC Act and EPBC Act, are also provided.

'Habitat Description and Known Populations' – Provides a brief account of the preferred habitat attributes required for the existence / survival of each species / population and information on known populations in the area.

'Likelihood of Occurrence' – Assesses the likelihood of each species / population to occur in or within the immediate vicinity of the study area in terms of the aforementioned habitat description and taking into account local habitat preferences, results of current field investigations, data gained from various sources (such as OEH Atlas of NSW Wildlife, herbariums, etc.) and previously gained knowledge via fieldwork undertaken within other ecological assessments in the locality.

'Potential for Impact'– Assesses the likely level / significance of impacts to each species / population that would result from the proposed development, taking into account direct and indirect short and long-term impacts.

Table 4-1: Chance of Occurrence & Potential for Impact

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence
Threatened Flora		
Prostanthera densa Villous Mintbush (V, V*)	Generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea. Has been recorded from the Currarong area in Jervis Bay, Royal National Park, Cronulla, Garie Beach and Port Stephens (Gan Gan Hill, Nelson Bay). The Sydney and Royal National Park populations were thought possibly extinct, but the species is now known to occur at Bass and Flinders Point in Cronulla (OEH, 2017a).	**Low** Was not recorded on the site. The site's understorey is almost entirely cleared and managed. This species is unlikely to have been overlooked during the flora survey.
Callistemon linearifolius Netted Bottlebrush (V)	Grows in dry sclerophyll forest on the coast and adjacent ranges. Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Currently only 5-6 populations remaining from the 22 populations historically recorded in the Sydney area. Three of the remaining populations are reserved in Ku-ring-gai Chase National Park, Lion Island Nature Reserve and Spectacle Island Nature Reserve. Has also been recorded from Yengo National Park (OEH, 2017a)	**Low** Was not recorded on the site. The site's understorey is almost entirely cleared and managed. This species is unlikely to have been overlooked during the flora survey.
Melaleuca groveana Grove's Paperbark (V)	Widespread, scattered populations in coastal districts north of Yengo National Park to southeast Queensland. Also found as a disjunct population near Torrington on the northern tablelands. Grows in heath and shrubland, often in exposed sites, in low coastal hills, escarpment ranges and tablelands on outcropping granite, rhyolite and sandstone on rocky outcrops and cliffs (OEH, 2017a).	**Low** Was not recorded on the site. The site's understorey is almost entirely cleared and managed. This species is unlikely to have been overlooked during the flora survey.
Cryptostylis hunteriana Leafless Tongue-orchid (V, V*)	Has been recorded in a wide variety of habitats including heathlands, heathy woodlands, sedgelands, *Xanthorrheoa* spp. plains, dry sclerophyll forests (shrub/grass sub-formation and shrubby sub-formation), forested wetlands, freshwater wetlands, grasslands, grassy woodlands, rainforests and wet sclerophyll forests (grassy sub-formation). Soils are generally considered to be moist and sandy, however, this is also known to grow in dry or peaty soils (OEH, 2-17a; DEE, 2017).	**Low** Was not recorded. The site's understorey / groundlayer is almost entirely cleared and managed (mowed). This species would be unlikely to persist on the site.
Phaius australis Lessor Swamp Orchid (E, E*)	Associated with coastal wet heath/sedgeland wetlands, swampy grassland or swampy forest and often in association with Broad-leaved Paperbark or Swamp Mahogany. Occurs in Queensland and north-east NSW as far south as Coffs Harbour. Historically, it extended farther south, to Port Macquarie (OEH, 2017a; DEE, 2017).	**Low** Was not recorded. The site's understorey / groundlayer is almost entirely cleared and managed (mowed). This species would be unlikely to persist on the site.
Diuris praecox Rough Doubletail (V, V*)	Grows on hills and slopes of near-coastal districts in open forests which have a grassy to dense understorey. Known from between Bateau Bay and Smiths Lake (OEH, 217a; DEE, 2017).	**Low** Was not recorded. The site's understorey / groundlayer is almost entirely cleared and managed (mowed). This species would be unlikely to persist on the site.
Eucalyptus parramattensis subsp. decadens Earp's Gum (V, V*)	Occurs in low-lying, often swampy areas and in woodlands with associates such as *Eucalyptus racemosa, E. globoidea* and *Angophora bakeri*. Occurs in two vegetation communities: Tamago Sand Swamp and the Kurri Sands Swamp communities, both of which occur on poor sandy soils from either Pleistocene sands or Permian sediments (OEH, 2017a; DEE, 2017).	**Low** Was not recorded on the site. This is a relatively conspicuous species; it is unlikely to have been overlooked in the flora survey.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence
Melaleuca biconvexa Biconvex paperbark (V, V*)	Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. 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 (OEH, 2-17a; DEE, 2017).	**Low** This species was not recorded on the site. This is a relatively conspicuous species; it is unlikely to have been overlooked in the flora survey.
Syzygium paniculatum Magenta Lily Pilly (E, V*)	A small to medium sized rainforest tree that grows to 8 m tall. Bark is flaky and the leaves are shiny, dark-green above and paler underneath. Leaves can be up to 10 cm long. Plants produce white flower-clusters at the end of each branch, between November and February. This species is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest (OEH, 2017a; DEE, 2017).	**Low** The site lacks suitable rainforest habitat.
Tetratheca juncea Black-eyed Susan (V, V*)	Found in sandy, occasionally moist heath and in dry sclerophyll vegetation communities endemic to coastal NSW. Also prefers ridges in areas from 0–200 m in altitude with an annual rainfall of 1000–1200 mm and restricted to open forest of *Angophora costata, Eucalyptus haemastoma, E. globoidea, Corymbia gummifera*, and *E. capitellata*. The preferred substrates are: sandy skeletal soil on sandstone, sandy-loam soils, low nutrients; and clayey soil from conglomerates, pH neutral. Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock (OEH, 2017a; DEE, 2017).	**Low** Was not recorded. The site's understorey / groundlayer is almost entirely cleared and managed (mowed). This species would be unlikely to persist on the site.
Diuris arenaria Sand Doubletail (E)	Occurs in coastal heath and dry grassy eucalypt forest on sandy flats. Also grows in gently undulating country in eucalypt forest with a grassy understorey on clay soil. Known from the Tomaree Peninsula near Newcastle OEH, 2017a).	**Low** Was not recorded. The site's understorey / groundlayer is almost entirely cleared and managed (mowed). This species would be unlikely to persist on the site.
Threatened Fauna		
Dromaius novaehollandiae Emu Population in the NSW North Coast Bioregion and Port Stephens local government area (EP)	Occurs in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities. It is not known whether a natural population continues to persist in the Port Stephens area.; although there have been recent sightings in the Williamtown area (OEH, 2017a; OEH, 2017b).	**Low** There has been no recent sightings in the Boat Harbour area. This is a conspicuous species and the lack of recent sightings would indicate that this population is unlikely occur in the Boat Harbour area.
Ephippiorhynchus asiaticus Black-necked Stork (E)	Requires relatively large, open wetlands. Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries. Builds large nests high in tall trees close to water. Widespread in coastal and subcoastal northern and eastern Australia, as far south as central NSW (although vagrants may occur further south or inland, well away from breeding areas) (OEH, 2017a).	**Low** The site lacks suitable wetland habitat.
Haliaeetus leucogaster White-bellied Sea-eagle (V)	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways (OEH, 2017a).	**Moderate** Although the site lacks wetland habitat, this species may at least occasional pass through the site.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence
Botaurus poiciloptilus Australasian Bittern (E, E*)	Requires large, relatively undisturbed freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.). Widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west (OEH, 2017a; DEE, 2017).	**Low** The site lacks suitable wetland habitat
Dasyornis brachypterus Eastern Bristlebird (E, E*)	Requires dense understory vegetation in a broad range of habitat types including sedgeland, heathland, swampland, shrubland, sclerophyll forest and woodland, and rainforest. Occurs near the coast, on tablelands and in ranges (OEH, 2017a; DEE, 2017).	**Low** The site lacks dense understorey vegetation.
Erythrotriorchis radiatus Red Goshawk (CE, V*)	Inhabits 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. Distributed sparsely through northern and eastern Australia, from the western Kimberley Division of northern Western Australia to north-eastern Queensland and south to far north-eastern NSW, and with scattered records in central Australia. 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 (OEH, 2017a; DEE, 2017).	**Low to Moderate** Not typically reported in the Port Stephens area; however the site does contain potential marginal habitat.
Ninox strenua Powerful Owl (V)	Occurs in coastal and adjacent ranges of eastern Australia in sclerophyll forests and woodlands where suitable prey species occur (being predominantly arboreal mammals such gliders and flying foxes, but also birds). Requires large and specific tree hollow characteristics for nesting. Occupies exclusive territories in the order of 1000 ha in size (OEH, 2017a).	**Moderate to High** Has been recorded 300 m northwest of the site (BioNet). No suitable hollow-bearing trees were recorded; however the site contains potential foraging habitat.
Ninox connivens Barking Owl (V)	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile soils. Found throughout continental Australia except for the central arid regions. Although common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests (OEH, 2017a).	**Moderate** No suitable hollow-bearing trees for this species were recorded; however the site contains potential foraging habitat.
Tyto longimembris Eastern Grass Owl (V)	Found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. Have been recorded occasionally in all mainland states of Australia but are most common in northern and north-eastern Australia. In NSW they are more likely to be resident in the north-east (OEH, 2017a).	**Low** The site lacks suitable grassy / heathy habitat.
Tyto novaehollandiae Masked Owl (V)	Found in a range of habitats; locally it occurs within sclerophyll forests and woodlands where preferred prey species occur (being predominantly terrestrial mammals). Requires large tree hollows for nesting and prefers to roost in these hollows as well. Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner (OEH, 2017a).	**Moderate** No suitable hollow-bearing trees for this species were recorded; however the site contains potential foraging habitat.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence
Calyptorhynchus lathami Glossy Black Cockatoo (V)	Highly dependent on the distribution of *Allocasuarina* species and is found in woodland dominated by *Allocasuarina* and in open forests where it forms a substantial middle layer. Often confined to remnant *Allocasuarina* patches surrounded by cleared farmlands. Uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia (OEH, 2017a).	**Low to Moderate** The site lacks *Allocasuarina* trees and hollow-bearing trees of suitable size; although this species may occasionally pass through the site.
Glossopsitta pusilla Little Lorikeet (V)	Found in dry, open *Eucalyptus* forests and woodlands. Feeds on abundant flowering *Eucalyptus* sp., but will also take nectar from *Melaleuca* sp and fruit from *Mistletoe* sp. On the eastern slopes and coastal areas favoured food sources are *Corymbia maculata* (Spotted Gum), *E. fibrosa* (Broad-leaved Ironbark), *E. robusta* (Swamp Mahogany) and *E. pilularis* (Blackbutt). Requires hollow-bearing trees for nesting (OEH, 2017a).	**Moderate** The site contains potential breeding habitat (hollow-bearing trees) and potential foraging habitat (including a favoured feed tree species, *E. pilularis* (Blackbutt)).
Lathamus discolor Swift Parrot (E, E*)	Occurs where eucalypts are flowering profusely or where there are abundant lerp (from sap sucking bugs) infestations. Favoured feed trees include winter flowering species such as *E. robusta* (Swamp Mahogany), *C. maculata* (Spotted Gum), *E. gummifera* (Red Bloodwood), *E. sideroxylon* (Mugga Ironbark) and *E. albens* (White Box). Commonly used lerp infested trees include Grey Box *E. macrocarpa* (Grey Box), *E. moluccana* (Grey Box) and *E. pilularis* (Blackbutt). Breeds in Tasmania during spring and summer and migrates to south-eastern Australia during autumn and winter. In NSW, it mostly occurs on the coast and south west slopes (OEH, 2017a; DEE, 2017).	**Moderate** The site contains potential foraging habitat (including a winter feed trees species, *E. pilularis* (Blackbutt)).
Anthochaera Phrygia Regent Honeyeater (CE, CE*)	Inhabits dry open forest and woodlands that support a high abundance and species richness of birds; these areas have large numbers of mature trees, high canopy cover and abundance of mistletoes. A shrubby understorey is an important source of insects and nesting material. Distributed in NSW is very patchy but mainly confined to breeding areas in the Capertee Valley and the Bundarra-Barraba regions (OEH, 2017a; DEE, 2017).	**Low** The site lacks mistletoe species, which are a vital habitat requirement.
Grantiella picta Painted Honeyeater (V, V*)	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Nomadic; the greatest concentrations of birds 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 (OEH, 2017a; DEE, 2017).	**Low** The site lacks mistletoe species, which are a vital habitat requirement.
Daphoenositta chrysoptera Varied Sittella (V)	Distribution in NSW is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy (OEH, 2017a).	**Low to Moderate** The site contains potential foraging habitat, although this would be limited due to the site's cleared / managed understorey and limited biodiversity.
Artamus cyanopterus cyanopterus Dusky Woodswallow (V)	Primarily inhabits dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland. Widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range (OEH, 2017a).	**Low to Moderate** The site contains potential foraging habitat, although this would be limited due to the site's cleared / managed understorey and limited biodiversity.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence
Dasyurus maculatus subsp. *maculatus* Spotted-tailed Quoll (V, E*)	Found in a variety of forested habitats from sclerophyll forests, rainforests and coastal woodlands. Creates a den in fallen hollow logs or among rocky outcrops and is an opportunistic hunter of a variety of prey. Generally does not occur in otherwise suitable habitats that are in close proximity to urban development. Hunter Region records are largely confined to the surrounding ranges and larger vegetation remnants (OEH, 2017a; DEE, 2017).	**Low** This species is generally not tolerant of human disturbance and is known to favour extensive tracts of undisturbed habitat. Local records date back to the 1980s.
Petaurus norfolkensis Squirrel Glider (V)	Occurs in eucalypt forests and woodlands where it feeds on sap exudates and blossoms. Tree hollows are required for nesting. Also requires winter foraging resources when the availability of normal food resources may be limited, such as winter-flowering shrubs and small tree species. Sparsely distributed in eastern Australia, from northern Queensland to western Victoria (OEH, 2017a).	**Moderate** Was recently recorded 700 east of the site, in 2017 (OEH, 2-17a). The site contains potential breeding habitat (hollow-bearing trees) and potential margina foraging habitat.
Petauroides volans Greater Glider (V*)	Largely restricted to eucalypt forests and woodlands. Particularly sensitive to forest clearance. Have relatively low persistence in small forest fragments. Modelling suggests that they require native forest patches of at least 160 km2 to maintain viable. Restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest), with an elevational range from sea level to 1200 m above sea level (DEE, 2017).	**Low** This species is generally not tolerant of human disturbance and is known to favour extensive tracts of undisturbed habitat. There are no local records (OEH, 2017b).
Potorous tridactylus tridactylus Long-nosed Potoroo (SE Mainland) (V, V*)	In NSW it is sparsely distributed along the coast and Great Dividing Range. Found in wet eucalypt forests to coastal heaths and scrubs. Requires access to dense vegetation for shelter and the presence of an abundant supply of fungi for food (OEH, 2017a).	**Low** The site lacks suitable dense understory vegetation.
Phascogale tapoatafa Brush-tailed Phascogale (V)	Inhabits dry open forest and woodlands, often in areas with sparse groundcover. Hunts mainly invertebrates, although some vertebrate prey is taken on occasion. Utilises small tree hollows for nesting and refuge sites (OEH, 2017a).	**Moderate** The site contains potential breeding habitat (hollow-bearing trees) and potential marginal foraging habitat.
Phascolarctos cinereus Koala (V, V*)	Occurs in forests and woodlands where it requires suitable feed trees (particularly *Eucalyptus* spp.) and habitat linkages. Will occasionally cross open areas, although it becomes more vulnerable to predator attack and road mortality during these excursions. Within the Greater Hunter Region it is largely confined to the Port Stephens area, the Lake Macquarie hinterland and the Watagan Mountains. Several records in the area.	**Moderate to High** There are a high number of records in the area (OEH, 2017b). No evidence of *P. cinereus* was recorded on the site and the site lacks feed trees. It is likely however that this species may at least occasionally pass through the site.
Pteropus poliocephalus Grey-headed Flying-Fox (V, V*)	Occurs along the east coast from Bundaberg, Queensland to Melbourne, Victoria. Utilises a range of habitats including rainforests, sclerophyll forests and woodlands, heaths, swamps and mangroves. Considered an important pollinator and seed disperser of native trees. Colonies usually formed in gullies with a dense vegetation canopy and a water source nearby (OEH, 2017a).	**Moderate to High** The site provides potential foraging habitat. There are several local records in the area (OEH, 2017b).

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence
Pseudomys novaehollandiae New Holland Mouse (V*)	Inhabits open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. Habitats with soft sandy substrates are an important habitat requirement. Fragmented distribution across Tasmania, Victoria, New South Wales and Queensland (OEH, 2017a).	**Low** The site's understorey / groundcover is cleared and managed (mowed). This species is unlikely to occur.
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat (V)	Wide-ranging species found across northern and eastern Australia. Roosts singly or in groups of up to six, in tree hollows and buildings. Forages in most habitats across its very wide range, with and without trees. Forages for insects, high over the forest canopy, but lower in more open country (OEH, 2017a).	**Moderate** The site contains hollow-bearing trees and potential foraging habitat.
Mormopterus norfolkensis Eastern Freetail-bat (V)	Distributed south of Sydney extending north into south-eastern Queensland. No records west of the Great Dividing Range. Most records have been reported from dry eucalypt forest and woodland. It is expected that open forested areas and the cleared land adjacent to bushland, constitutes important habitat. Predominantly a tree-dwelling species, roosting in hollows or behind loose bark in mature *Eucalypts* (OEH, 2017a).	**Moderate** The site contains hollow-bearing trees and potential foraging habitat.
Falsistrellus tasmaniensis Eastern False Pipistrelle (V)	Found in a variety of forest types such as open forests, woodlands and wetter sclerophyll forests (usually with trees >20 m). Roosts in tree hollows. Appears to locally favour upland habitats. A limited number of records occur on the central coast and the Hunter Region (OEH, 2017a).	**Moderate** The site contains hollow-bearing trees and potential foraging habitat.
Miniopterus australis Little Bentwing-bat (V)	Prefers moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Roosts in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings. Forages for small insects beneath the canopy of densely vegetated habitats (OEH, 2017a).	**Moderate** The site contains hollow-bearing trees and potential foraging habitat.
Miniopterus schreibersii subsp. *oceanensis* Eastern Bentwing-Bat (V)	Utilises a range of habitats for foraging, including rainforest, wet and dry sclerophyll forests, woodlands and open grasslands. Requires caves or similar structures for roosting habitat (OEH, 2017a).	**Moderate** The site lacks roosting habitat, but contains potential foraging habitat.
Myotis Macropus Southern Myotis (V)	Found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. Rarely found more than 100 km inland, except along major rivers. Roosts in groups of 10-15, close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings and under bridges. Forages over streams and pools catching insects and small fish by raking their feet across the water surface (OEH, 2017a).	**Moderate** The site contains hollow-bearing trees but lacks aquatic foraging habitat.
Scoteanax rueppellii Greater Broad-nosed Bat (V)	Forages in moister gullies and wet sclerophyll forests as well as in lightly wooded areas and open spaces / ecotones. Roosts in tree hollows and is relatively widespread within the Lower Hunter Region (OEH, 2017a).	**Moderate** The site contains hollow-bearing trees and potential foraging habitat.
Chalinolobus dwyeri Large-eared Pied Bat (V, V*)	Roosts in caves, crevices in cliffs, old mine workings. Frequents low to mid-elevation dry open forest and woodland close to these features. Requires a canopied habitat (OEH, 2017a).	**Moderate** The site lacks roosting habitat, but contains potential foraging habitat.
Crinia tinnula Wallum Froglet (V)	Confined to nutrient poor, acidic (pH < 6.0) coastal swamps and/or lakes. Found along the coastal margin from Litabella National Park in south-east Queensland to Kurnell in Sydney (OEH, 2017a).	**Low** Unlikely to occur due to the cleared and managed (mowed) understorey / ground cover in the site.

Species / Population	Habitat Description & Known Populations	Likelihood of Occurrence
Mixophyes balbus Stuttering Frog (E, V*)	Found in association with permanent streams through temperate and sub-tropical rainforest and wet sclerophyll forest. Shows a preference for the interiors of large forest tracts in areas with relatively cool mean annual temperatures. These sites are typically free from any disturbance with a thick canopy and relatively simple understorey. Occurs along first order streams and occasionally associated with springs. Not associated with ponds or ephemeral pools (OEH, 2017a).	**Low** The site lacks a permanent stream.
Litoria aurea Green and Golden Bell Frog (E, V*)	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. Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range, however they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands (OEH, 2017a).	**Low** The site lacks suitable aquatic habitat.
Petalura gigantean Giant Dragonfly (E)	Live in permanent swamps and bogs with some free water and open vegetation. Found along the east coast of NSW from the Victorian border to northern NSW. It is not found west of the Great Dividing Range. There are known occurrences in the Blue Mountains and Southern Highlands, in the Clarence River catchment, and on a few coastal swamps from north of Coffs Harbour to Nadgee in the south (OEH, 2017a).	**Low** The site lacks suitable swamp / bog habitat.

Notes: V = Vulnerable (TSC Act), **V* =** Vulnerable (EPBC Act), **E** = Endangered (TSC Act), **E*** = Endangered (EPBC Act), **CE** = Critically Endangered (TSC Act), **CE*** = Critically

5 BIODIVERSITY CONSTRAINTS AND OPPORTUNITIES

This assessment has identified some biodiversity values on the site; however, the proposed rezoning would conserve these values by protecting the rear (north portion) of the site with E2 Environmental Conservation zoning. The entire EEC recorded on the site would be protected within this E2 zone. At present the vegetation to the rear of the site is vulnerable to impacts from activities that would be permitted under its current R5 Large Lot Residential zoning. The rezoning would thus have a beneficial biodiversity outcome by ensuring that this habitat connectivity is maintained.

Further development controls and/or design features to minimise impacts on threatened species habitats could be established through subsequent development assessment processes, post gateway determination. For instance, future developments in the R5 Large Lot Residential area may be designed to avoid or minimise removal of hollow-bearing trees.

The site's biodiversity constraints and opportunities are detailed below.

5.1 Biodiversity Conservation Act 2016

5.1.1 Threatened Species and Endangered Ecological Communities

One EEC, listed under the BC act, was recorded in the site (being Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions); however this would be conserved entirely within the proposed E2 zone. No threatened species, listed under the BC Act, were recorded on the site. Notably the site is underscrubbed, mowed and maintained in a 'tidy condition', which limits habitat features for several threatened species; however as demonstrated in Section 4, the site could potentially provide habitat for the following threatened fauna species:

- *Haliaeetus leucogaster* (White-bellied Sea-eagle)
- *Erythrotriorchis radiates* (Red Goshawk)
- *Ninox strenua* (Powerful Owl)
- Ninox connivens (Barking Owl)
- *Tyto novaehollandiae* (Masked Owl)
- *Calyptorhynchus lathami* (Glossy Black Cockatoo)
- *Glossopsitta pusilla* (Little Lorikeet)
- *Lathamus discolour* (Swift Parrot)
- *Daphoenositta chrysoptera* (Varied Sittella)
- *Artamus cyanopterus cyanopterus* (Dusky Woodswallow)

- *Petaurus norfolkensis* (Squirrel Glider)
- *Phascogale tapoatafa* (Brush-tailed Phascogale)
- *Phascolarctos cinereus* (Koala)
- *Pteropus poliocephalus* (Grey-headed Flying-Fox)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat)
- *Mormopterus norfolkensis* (Eastern Freetail-bat)
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Miniopterus australis* (Little Bentwing-bat)
- *Miniopterus schreibersii* subsp. *Oceanensis* (Eastern Bentwing-Bat)
- *Myotis Macropus* (Southern Myotis)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)

5.1.2 Biodiversity Offset Scheme

The BC Act sets out the Biodiversity Offsets Scheme (BOS) framework, which aims to avoid, minimise and offset impacts on biodiversity from development and clearing, and to ensure land that is used to offset impacts is secured in-perpetuity. The types of developments that the BOS applies to, include local development (under Part 4 of the EP&A Act) that is likely to significant affect threatened species / EECs, as determined by:

- BOS development threshold; or
- Assessment of Significance; or
- Development on Areas of Outstanding Biodiversity Value (AOBV) (note, at this stage AOBVs include areas of declared critical habitat under the *Threatened Species Conservation Act 1995.* This site does not contain any such areas).

The BOS development threshold has two elements:

- Area Criteria – whether the amount of native vegetation being cleared exceeds a threshold area set out below; and
- Biodiversity Values Map (BVM) – whether the impacts occur on an area mapped on the BVM.

Consideration of the site, under the BOS development threshold is discussed below.

Area Criteria

Under the Area Criteria, the clearing threshold for land containing a minimum lot size of <1 ha is 0.25 ha. The entire area of vegetation occurring within the R5 Large Lot Residential area totals 900 m², or 0.09 ha. Thus, any future development proposals in this area would not meet the area criteria.

Biodiversity Values Map

The BVM identifies the site as having high biodiversity values. This is presumably due to the site containing 'Supplementary' *P. cinereus* (Koala) habitat, as the distribution of this area in the BVM is identical with the area mapped as 'Supplementary' in the *Koala Habitat Planning Map* (PSC, 2007). As discussed in previous Section 3.3.2, the site does indeed contain Supplementary *P. cinereus* (Koala) habitat; however, the distribution of this habitat type, identified in this assessment, differs slightly from that in the *Koala Habitat Planning Map* (PSC, 2007). Previous Figure 3-2 provides a *P. cinereus* (Koala) habitat map, based on the findings of this assessment. It is considered that the areas mapped as Supplementary habitat in Figure 3-2 would provide a more accurate (ground-truthed) indication of the distribution of land with high biodiversity values, on the site.

A small portion of land containing high biodiversity values (i.e. Supplementary *P. cinereus* (Koala) habitat) occurs within the proposed R2 zone. Any future proposal to clear this vegetation would meet this criterion.

5.1.2.1 BC Act Conclusion

Should a decision be made at the "gateway" to proceed with the preparation of a planning proposal, further ecological surveys should be undertaken in accordance with Port Stephens Council's flora and fauna survey guidelines to determine the likely presence of the aforementioned threatened species and to provide a more detailed assessment of potential development scenarios, in accordance with the BC Act for future development of the site.

Any future developments within the vegetated R5 zoned areas of the site are likely to require an assessment in accordance with the Biodiversity Assessment Method (BAM), as they are likely to exceed the BOS development threshold.

5.2 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth EPBC Act requires approval for actions that are likely to have a significant impact on MNES. There are seven MNES that are triggers for Commonwealth assessment and approval; these include the following:

- World Heritage Properties;
- National Heritage Places;
- Wetlands of International Importance (declared Ramsar wetlands);
- Listed threatened species and ecological communities;
- Listed migratory species;
- Commonwealth marine area;
- Commonwealth land; and
- The Great Barrier Reef Marine Park.

The MNES and study area-specific responses are as follows.

5.2.1 World Heritage Areas

The site is not a World Heritage area, and is not in close proximity to any such area.

5.2.2 National Heritage Places

The site is not part of a National Heritage Place, and is not in close proximity to any such area.

5.2.3 Wetlands of International Importance (declared Ramsar wetlands)

The site is within 10 km of the Myall Lakes RAMSAR site. The proposal is unlikely to Impact on this wetland.

5.2.4 Listed Threatened Species and Ecological Communities

No EECs listed under the EPBC Act occur in the site. No threatened species were recorded on the site; however, as detailed in Section 5.1, a number of threatened species have the potential to occur in the site. Of these, the following are listed under the EPBC Act:

- *Erythrotriorchis radiates* (Red Goshawk)
- *Lathamus discolour* (Swift Parrot)
- *Phascolarctos cinereus* (Koala)
- *Pteropus poliocephalus* (Grey-headed Flying-Fox)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)

Due to the presence of Supplementary Koala Habitat on the site (as defined by the CKPoM (PSC, 2014)) (see Section 3.3.2) and the high number of records in the area (OEH, 2017b), an assessment under the *EPBC Act Referral Guidelines for the Vulnerable Koala* (Commonwealth of Australia, 2014) has been undertaken. These guidelines encourage the assessment of significant impacts on the *P. cinereus* (Koala), through the assessment of habitat critical to the survival of *P. cinereus* (Koala) and actions that interfere substantially with the recovery of *P. cinereus* (Koala). The Koala Habitat Assessment Tool (Table 4 of Commonwealth of Australia, (2014)) was utilised and it was determined that the site's habitat would constitute 'critical koala habitat', as defined under the EPBC act (see Appendix C for the full habitat assessment); however, as indicated in Table 5-1, the proposal is unlikely to lead to any development applications that would require referral under the EPBC act.

Table 5-1: EPBC Act Referral Guidelines for *P. cinereus* (Koala)

Does your impact area contain habitat critical to the survival of the koala (habitat score ≥ 5)?	YES See Appendix C
Do the area(s) proposed to be cleared contain known koala food trees?	NO
REFERRAL NOT RECOMMENDED Low risk of resulting in significant impact	

5.2.5 Listed Migratory Species

Several listed Migratory species may occur in the area (see Appendix D for a full list of these species); however, the proposal is unlikely to impact on these species, particularly as the majority of habitat on the site would be protected under E2 Environmental Conservation zoning.

5.2.6 Commonwealth Marine Area

The 'EEZ and Territorial Sea' occurs near the site; however this Commonwealth marine area would not be impacted by the proposal.

5.2.7 Commonwealth Land

Commonwealth lands occurring in the area including the Australian Telecommunications Commission, Defence Housing Authority and Telstra Corporation Limited occur in the area. The proposal will not impact on these lands.

5.2.8 The Great Barrier Reef Marine Park

Not applicable.

5.2.9 EPBC Act Assessment Conclusion

The MNES potentially applicable to the site include five threatened fauna species. Should a decision be made at the "gateway" to proceed with the preparation of a planning proposal, further ecological studies should be undertaken to determine the likely presence of the aforementioned species and to provide a more detailed impact assessment of potential development scenarios. As indicated by previous Table 5.1, the proposal is unlikely to lead to any development applications that would require referral under the EPBC act for *P. cinereus* (Koala).

5.3 Strategic planning guidelines

The land is currently zoned R5 Large Lot Residential under the Port Stephens LEP 2013. There are three primary planning guidelines applicable to the site, being the *Port*

Stephens Planning Strategy 2011-2036, the *Anna Bay Strategy and Town Plan* 2008 and the Port Stephens CKPoM (PSC, 2002).

5.3.1 Hunter Regional Plan 2036

The site is located outside of the Watalgan to Stockton Green Corridor, identified in the *Hunter Regional Plan* (HRP) *Map* (Department of Planning & Environment, 2016). The HRP Map identifies that the site occurs in an area mapped as 'Existing Residential and Employment Land', which is defined as "*land that provides valuable economic environmental and social benefits to the region*". The site does not occur within an 'Proposed Urban Area'; however, the LHRS makes provision for consideration of the release of land for urban development, not currently identified in the LHRS, if the proposal satisfies certain specified Sustainability Criteria (in Appendix 1 of the LHRS). Assessment of the proposal against the specific Sustainability Criteria that are relevant to this ecological assessment is provided in Table 5-2.

5.3.2 Port Stephens Planning Strategy 2011-2036

The site is location in the Tomaree Tourism and Lifestyle Growth Area in the *Port Stephens Planning Strategy* (PSPS) *Map*; it is projected that an additional 1,200 dwellings will be required in this area. Population projections for the Anna Bay - Boat Harbour - Fishermans Bay - One Mile - Bobs Farm area indicate population will increase from 5,503 people in 2009 to 6,600 people in 2031, an increase of 1,097 people. It is considered that the proposal would support this anticipated population growth and respond to housing demand, whilst ensuring future protection of the high ecological values identified at the rear of the lot.

5.3.3 Port Stephens Comprehensive Koala Plan of Management

PSC (2002) has prepared the Port Stephens CKPoM in accordance with SEPP 44. Rather than assessing the presence of 'potential' or 'core' Koala habitat, as defined under SEPP 44, the Performance Criteria for Re-zoning Requests / Development Applications, in the Port Stephens CKPoM (PSC, 2002) must be addressed.

Assessment of the proposal against the Performance Criteria for Re-zonings, is provided in Table 5-3.

Table 5-2: Assessment of the Proposal against the Port Stephens CKPoM Performance Criteria for Re-zoning Requests

Performance Criteria **Council should be satisfied that the rezoning would:**	**Response**
a) Not result in development within areas of Preferred Koala Habitat or defined Habitat Buffers;	The site does not contain any Preferred Koala Habitat or defined Habitat Buffers. As detailed in Section 3.3.2, this assessment has concluded that the site would be defined as a Supplementary Koala Habitat and Mainly Cleared land.

b) Allow for only low impact development within areas of Supplementary Koala Habitat and Habitat Linking Areas;	The proposed rezoning would result in a minor increase in residential dwellings in the area and would conserve habitat in the rear (north portion) of the site with E2 zoning. It therefore is considered that that proposal would result in low impact development.
c) Minimise the removal of any individuals of preferred koala food trees, where ever they occur on the site; and	As discussed in Section 3.3.3, there are no preferred koala feed trees on the site.
d) Not result in development which would sever koala movement across the site. This should include consideration of the need for maximising tree retention on the site generally and for minimising the likelihood of impediments to safe/unrestricted koala movement.	The vegetation at the rear of the site is relatively important for local habitat connectivity (see previous Section 3.3.3). The proposed E2 zoning at the rear of the site would maintain and increase protection of this connectivity.
Conclusion: the proposal would meet the Port Stephens CKPoM Performance Criteria for Rezoning Requests.	

6 CONCLUSION

This assessment has identified some biodiversity values on the site; however, the proposed rezoning would conserve these values by protecting the rear of the site with E2 Environmental Conservation zoning. At present the vegetation to the rear of the site is vulnerable to impacts from activities that would be permitted under its current R5 Large Lot Residential zoning. The rezoning to E2 Environmental Conservation would thus have a beneficial biodiversity outcome by ensuring that this habitat connectivity is maintained.

Further development controls and/or design features to minimise impacts on threatened species habitats could be established through subsequent development assessment processes, post gateway determination. For instance, future developments in the R5 Large Lot Residential area may be designed to avoid or minimise removal of hollow-bearing trees.

The planning proposal to rezone the site from R5 Large Lot Residential to part E2 Environmental Conservation is therefore considered to have minimal ecological impacts. It is also concluded that compliance with the relevant planning strategies (the *Hunter Regional Plan 2036*, the *Port Stephens Planning Strategy 2011-2036* and the Port Stephens CKPoM) can be achieved on site.

The baseline ecological investigations outlined therein are considered to provide a sufficient level of detail to justify a decision being made at the “gateway” regarding the proposal.

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APPENDIX A QUALIFICATIONS

APPENDIX B RECORDED SPECIES LIST

Survey Date: 14/1/18

FLORA

CLASS PTERIDOPSIDA (Ferns)	
BLECHNACEAE	
Blechnum indicum	Swamp Water Fern
DENNSTAEDTIACEAE	
Pteridium esculentum	Bracken Fern
THELYPTERIDACEAE	
Cyclosorus interruptus	
CLASS MAGNOLIOPSIDA (Flowering Plants)	
ARALIACEAE	
Hydrocotyle bonariensis	Large-leaf Pennywort
ASTERACEAE	
*Bidens pilosa**	Cobblers Pegs
Chrysanthemoides monilifera subsp. *rotundata**	Bitou Bush
*Hypochaeris radicata**	Castear
*Senecio madagascariensis**	Fireweed
CONVULVILACEAE	
Dichondra repens	Kidney Weed
CYPERACEAE	
Gahnia clarkei	Tall Saw-sedge
ERICACEAE (EPACRIDOIDEAE)	
Styphelia laeta subsp. *laeta*	Five Corners
FABACEAE (FABOIDEAE)	
Hardenbergia violacea	Purple Coral Pea
*Senna pendula**	Easter Cassia
*Trifolium repens**	White Clover
FABACEAE (MIMOSOIDEAE)	
Acacia longifolia	Sydney Golden Wattle
LOMANDRACEAE	
Lomandra longifolia	Spiny-headed Mat-rush
LUZURIAGACEAE	
Geitonoplesium cymosum	Scrambling Lily
MALVACEAE	
*Sida rhombifolia**	Paddy's Lucerne
MYRTACEAE	
Angophora costata	Smooth-barked Apple
Eucalyptus pilularis	Blackbutt

Melaleuca quinquenervia	Broad-leaved Paperbark
OXALIDACEAE	
Oxalis perennans	Wood Sorrel
PHYLLANTHACEAE	
Glochidion ferdinandi	Cheese Tree
PITTOSPORACEAE	
Pittosporum undulatum	Sweet Pittosporum
PLANTAGINACEAE	
*Plantago lanceolata**	Lamb's Tongue
POACEAE	
*Axonopus fissifolius**	Narrow-leaved Carpet Grass
Cynodon dactylon	Common Couch
Entolasia stricta	Wiry Panic
Imperata cylindrica	Blady Grass
Microlaena stipoides	Weeping Grass
*Pennisetum clandestinum**	Kikuyu
*Stenotaphrum secundatum**	Buffalo Grass
PRIMULACEAE	
Myrsine howittiana	Brush Muttonwood
VERBENACEAE	
*Lantana camara**	Lantana
*Verbena bonariensis**	Purpletop
VIOLACEAE	
Viola hederacea	Ivy-leaved Violet

** Denotes non-endemic / introduced species*

APPENDIX C EPBC ACT KOALA HABITAT ASSESSMENT TOOL

Assessment of the site's *P. cinereus* (Koala) habitat, using the Koala Habitat Assessment Tool in *EPBC Act Referral Guidelines for the Vulnerable Koala* (Commonwealth of Australia, 2014).

Attribute	Score	Habitat Appraisal	
Koala Occurrence	+1 Evidence of one or more koalas within 2 km of the edge of the impact area within the last 5 years.	Desktop	The targeted survey found no direct or indirect (e.g. scats and scratch marks on trees) evidence of koalas on the site.
		On Ground	A search of the Atlas of NSW Wildlife database indicated that there are several recent records of *P. cinereus* in the area.
Vegetation Composition	0 No known koala food tree species	Desktop	The *Koala Habitat Planning Map* (PSC, 2007) identifies the site as a mix of 'Supplementary' habitat and 'Mainly Cleared' habitat.
		On Ground	No *P. cinereus* (Koala) feed trees (as defined by the Port Stephens CKPoM and Michael Jacobson, PSC pers. comm. 21 July 2017) (i.e. *E. tereticornis* (Forest Red Gum), *E. parramatensis* (Parramatta Red Gum), *E. robusta* (Swamp Mahogany), *E. moluccana* (Grey Box) and *E. punctata* (Grey Gum)) were recorded on or near the site.
Habitat Connectivity	+2 The area is part of a contiguous landscape ≥ 500 ha.	The site is connected to large areas of bushland.	
Key Existing Threats	+1 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,	The site is surrounded by residential development. There is some existing threat of vehicle strike and dog attack in the area.	
Recovery Value	+2 Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	The site forms part of a large contiguous range system and is important for local connectivity.	
Total	**6**	**Habitat critical to the survival of the koala**	

APPENDIX D EPBC PROTECTED MATTERS SEARCH REPORT