Flora & Fauna Assessment and Concept Landscape Plan

49 Binburra Avenue Avalon Beach 2107

By Ecological Consultants Australia Pty Ltd TA

Kingfisher Urban Ecology and Wetlands

KINGFISHER
URBAN ECOLOGY | WETLANDS

About this document

Copyright Statement©

Statement of Authorship

This study and report was undertaken by Ecological Consultants Australia at Studio 1/33 Avalon Parade, Avalon. The author of the report is Geraldene Dalby-Ball with qualifications BSc. majoring in Ecology and Botany with over 20 years' experience in this field, and Jack Hastings with qualifications B EnvSc.

Limitations Statement

Information presented in this report is based on an objective study undertaken in response to the brief provided by the client. Any opinions expressed in this report are the professional, objective opinions of the authors and are not intended to advocate any particular proposal or pre-determined position.

Document Control Sheet	
Title:	Flora and Fauna Assessment 49 Binburra Avenue Avalon Beach
Version:	Final
Author:	Jack Hastings, Myrna Calumpong and Geraldene Dalby-Ball
Date:	March 2021
File location:	ECA 4 Projects\2 Projects\2019-2020\Flora Fauna\ 49 Binburra Avenue Avalon
Distribution:	Will Kiloh c/o THW Architects Tim West - BArch, BSci(Arch) Director THW Architects NSW Arch Reg 7417 0419 210 480 tim@thw.net.au

Signed: Geraldene Dalby-Ball – Director of Ecological Consultants Australia 

Executive Summary

Introduction

- This Flora and Fauna was prepared for Will Kiloh c/o THW Architects for the proposed alterations and additions at 49 Binburra Avenue, Avalon Beach NSW 2107.
- The proposed actions involve the modification of the existing dwelling.
- Recommendations have been provided to enhance areas for locally native Flora and Fauna.

Methods

- On-ground survey took place on the 17th March 2021 by Senior Ecologist Geraldene Dalby-Ball.
- Flora and fauna observations were recorded on-site using binoculars and physical examination. Notes, photos and samples of flora species were taken to assess ecological health and value of the site.
- Bionet searches were performed for flora, fauna and endangered populations to identify if there were previous records of threatened species occurring within the local area using a 10km radius around the site.
- Requirements for Landscaping was reviewed – screening in particular.

Results

- The proposal does not trigger the Biodiversity Offset Scheme (BOS).
- Weeds of National Significance (WoNS) are present onsite. Weeds to remove as a priority are: Asparagus fern (*Asparagus aethiopicus*) and Bitou bush (*Chrysanthemoides monilifera*). Other weeds have been listed for removal as these are invasive in bushland.
- No threatened flora or fauna species or EECs were on-site during on site searches.
- The site has no native vegetation but is opposite private 'bushland' and land that is adjoining Bangalley reserve and asset protection zones apply to the site.

Conclusions and Recommendations

- The concept landscape plan provides recommended species and areas to cover. A detailed plan could be provided at construction certificate stage noting the area is already landscaped and is existing 'garden'.
- Weed removal and native landscaping will enhance the habitat on the site.
- Companion animals are to be kept from wandering unaccompanied. Cats in particular must be retained in the property boundaries. Bangalley Head land is a Wildlife Protection Areas and Cats are prohibited.

Mitigation Measures

Before and During works:

- Removal of weed species to prevent spread of seed.
- Effective site management to ensure sediment doesn't leave the site.
- Bush hygiene protocols should be followed to prevent the spread of pathogens including *Phytophthora*.

After completion of works and on-going

- Landscaping will be completed and include native species and will stay consistent with bush fire requirements.
- Companion animals are to be kept from wandering unaccompanied. Cats in particular must be retained in the property boundaries. Bangalley Head land is a Wildlife Protection Areas and Cats are prohibited.

Legislation: Various pieces of legislation apply to this location and the proposed works are in keeping with the objective of the Acts. Key acts are listed below.

- *Cwlth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).*
- *Environmental Planning and Assessment Act 1979 (EP&A Act).*
- *Biodiversity Conservation Act 2016 (BC Act).*
- *National Parks & Wildlife Act 1974 (NP&W Act).*
- *Biosecurity Act (superseding the Noxious Weed Act 1993) (NW Act).*

Table of Contents

1 Introduction

Kingfisher Urban Ecology & Wetlands (Kingfisher) has been contracted by Will Kiloh c/o THW Architects to provide a "Flora and Fauna Assessment" to assess potential direct and indirect impacts on any threatened species, populations and communities as per section 5A of the Environmental Planning & Assessment Act 1979. The 'test of significance' has been undertaken in accordance with the NSW Department of Planning, Industry and Environment (DPIE) 'threatened species test of significance'. The test of significance is set out in s. 7.3 of the Biodiversity Conservation Act 2016 (BC Act).

1.1 Site Location

The Subject Site (the "Site") is known as 67 Marine Parade, Avalon Beach NSW 2107, Australia (Lot 53/-/DP22275) (see Figure 1). The site is the area of direct and likely indirect impacts and is defined as the whole of the property.

Category	Details
Title Reference (Lot/DP)	Lot 53/-/DP22275
Area (Ha)	598m^2
Street Address	49 Binburra Avenue Avalon Beach 2107
LGA	Northern Beaches Council
Land Zoning	E4: Environmental Living

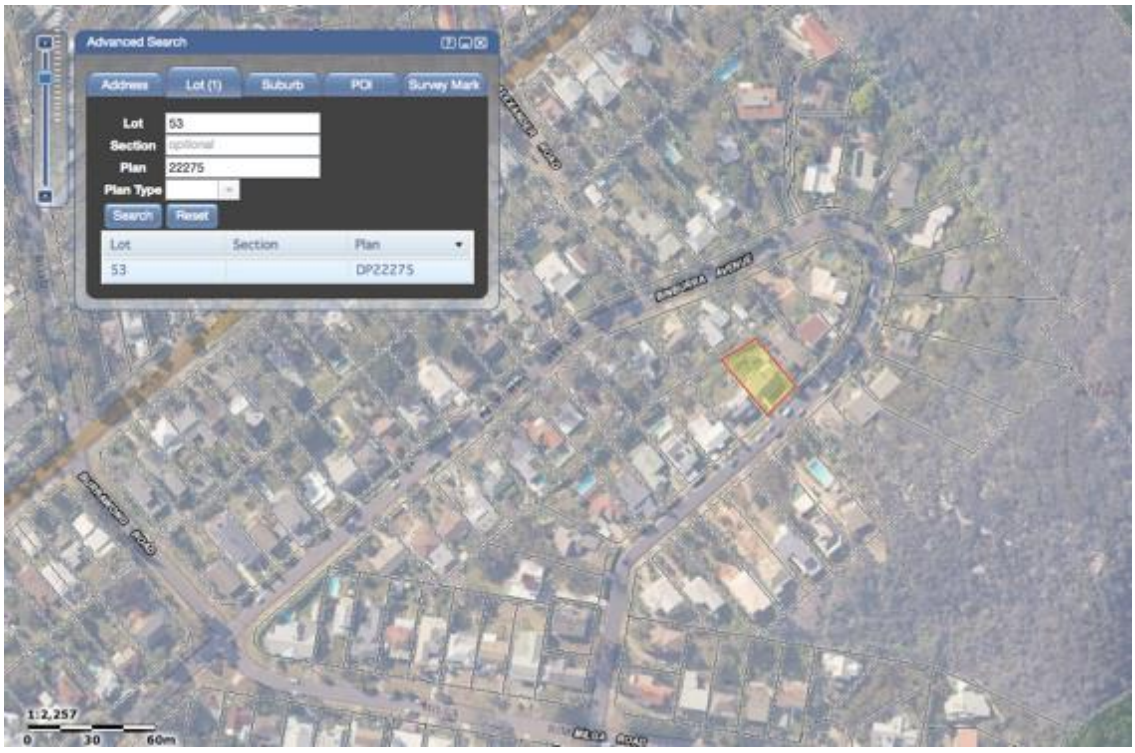


Figure 1. Location of the site. Source: Six Maps, 2021.

1.2 Site description

An existing building currently occupies the site to the south-east. The remaining north-western portion – approximately 30% of the site, is vegetated with landscaped gardens. Gardens contain a mix of exotic species (planted and self-sown weeds).

1.3 Catchment Context

There are no creeks or waterways on site. The site falls within the Careel Creek catchment. Careel Creek flows north from Avalon into Pittwater (figure 1.1).

Figure 1.1. The site within the Careel Creek catchment. Careel Creek flows north from Avalon into Pittwater. (Source: Six Maps 2021).

1.4 Geology and Soil Landscapes

NSW soil mapping service (eSPADE) has identified the soil landscape at the site as Hawkesbury. The Hawkesbury soil landscape consists of medium to coarse-grained quartz sandstone with minor shale and laminite lenses. Sandstones are either massive or cross-bedded sheet facies with vertical or subvertical joint sets (eSPADE V2.1).

Sandstone on site is landscaped blocks, no obvious sandstone floaters were visible. The bed-rock here is expected to be a mix of sandstone and shales.

1.5 Vegetation

The site does not host a native vegetation community, all vegetation on is planted. The nearest identified vegetation community, approximately 50m south-east of the site, is PCT 1776 (*Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast*). The proposal will not directly affect this community. The site contains a mixture of exotic and native species throughout the gardens –see photos for details. The site also hosts several weed species two of which are Weeds of National Significance (WoNS) (section 4.2.3).

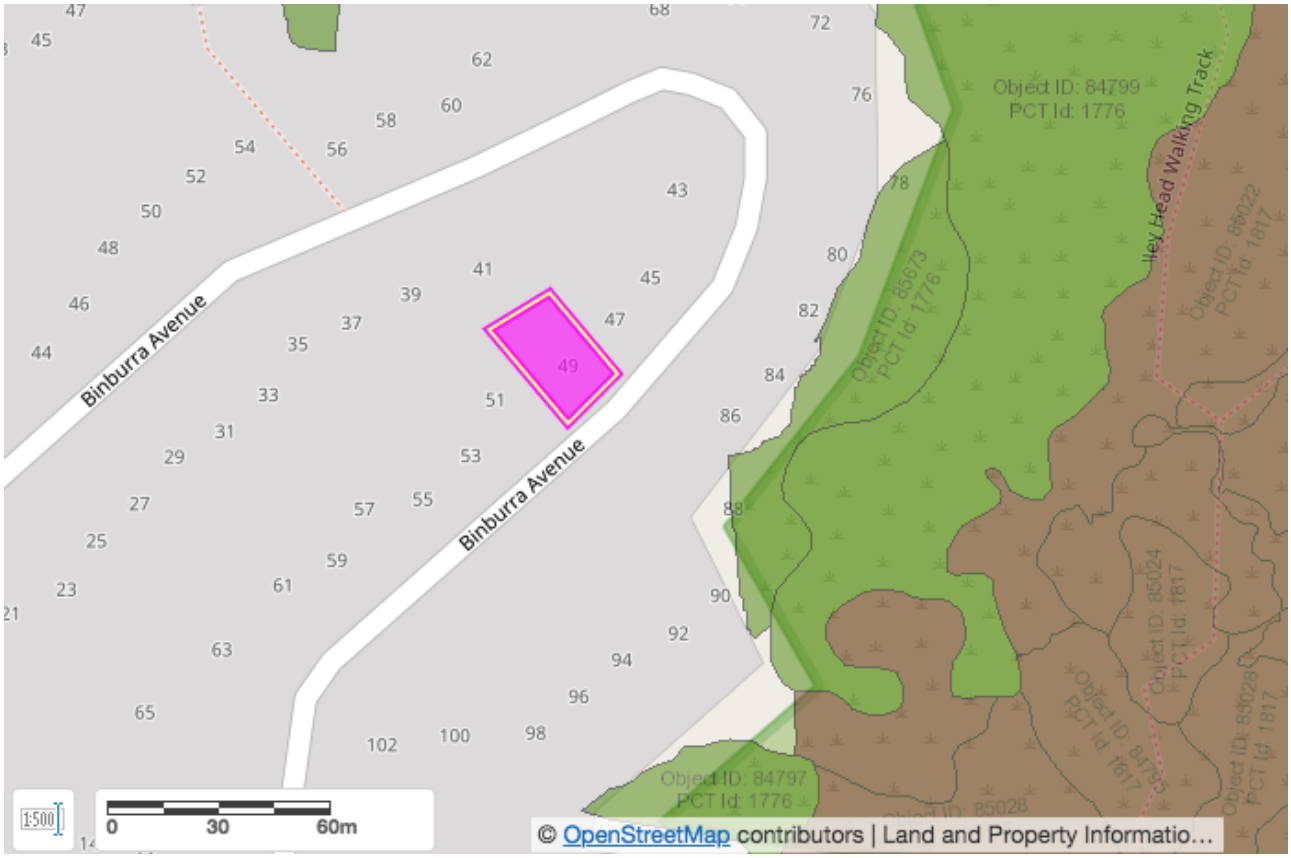


Figure 1.2. The site no long has a native vegetation community, all vegetation is planted or self-sown exotic. Map Source: SEED 2021

2 Proposed Actions

The proposed actions involve the modification of the existing dwelling.

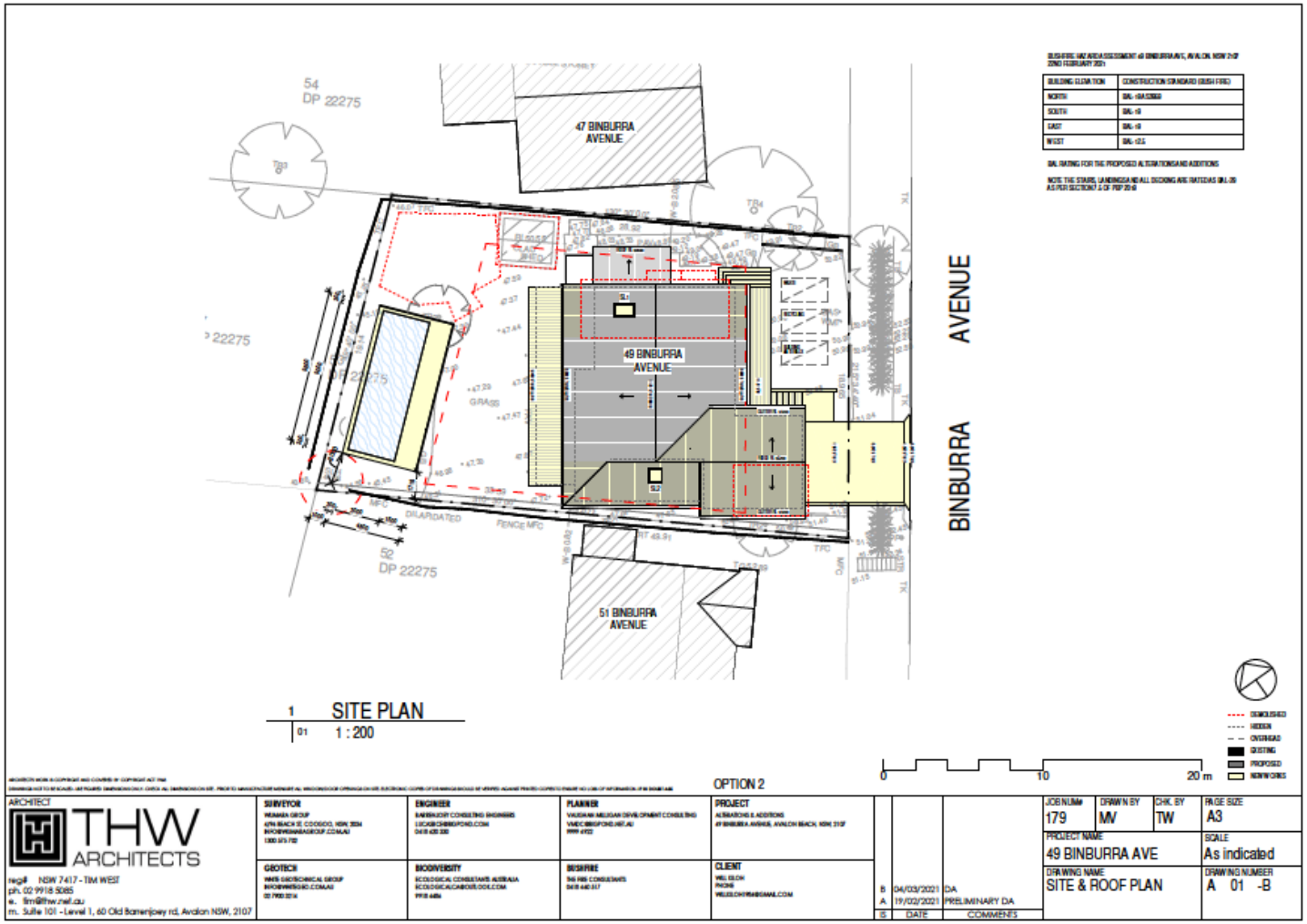


Figure 1.2. The proposed development. Source – THW Architects. Rev. B 04/03/2021.

2.1 Photos from the site

The following are photos gathered from the recent site visit. The first three photos are from the block of land on the other side of the road this is the block that is continuous with the bushland. There is no other continuous bushland on the site, no native canopy trees and is dominated by dogs. No areas of vegetation on the site that require retention for native flora or fauna purposes were found.

Plate 1. Property across the road with intact vegetation.

Includes exotics that are recommended for removal

Plate 2. West-side of th house – turf dominates

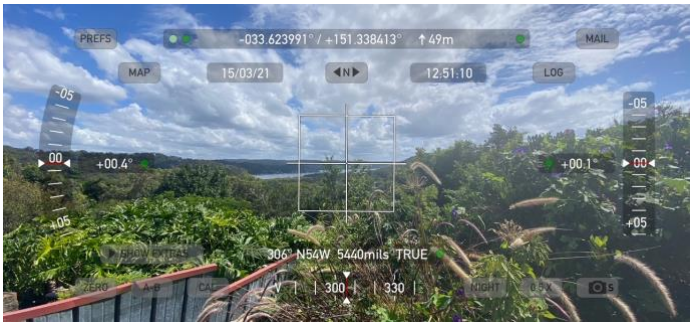


Plate 3. From west side garden looking west - exotics

Plate 4. Vegetation is all exotic and will be replaced with native species.

Plate 5. Morning glory, castor oil, fountain grass, exotic Senna - all to be removed and replaced with natives.

Plate 6. Bamboo to be removed.

Plate 7. Western garden turf and gardens- exotic plants being replaced with native species.

Plate 8. Exotic plants being replaced with native species.

2.2 Legislation and policy

The implications for the proposal were assessed in relation to key biodiversity legislation and policy including:

- *Cwlth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).*

  The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is applicable if it was considered that an impact on a 'matter of National Environmental Significance (NES)' were likely, thus providing a trigger for referral of the proposal to the Department of Environment and Heritage.

  Matters of national environmental significance identified in the Act are:

  - world heritage properties;
  - national heritage places;
  - Ramsar wetlands;
  - nationally threatened species and communities;
  - migratory species protected under international agreements;
  - the Commonwealth marine environment; and
  - nuclear actions.

  The Commonwealth Government has published Significant Impact Guidelines (DE 2013) to assist in the determination of whether an action is likely to have a significant impact on a matter of NES. The proposal does not impact on a 'matter of National Environmental Significance' and therefore is compliant with the EPBC Act.

- *Environmental Planning and Assessment Act 1979 (EP&A Act).*

  The EPA Act requires that the assessing body, in this case local government, consider the impact of the development on the surroundings – with respect to this ecology report the impacts on the environment are assessed. The proposal indicates no significant impact on threatened species, populations or communities.

- *Biodiversity Conservation Act 2016 (BC Act).*

  Recently replacing the Threatened Species Conservation Act this includes the test of significance for impacts on threated species, communities. The test of significance have been conducted and the proposal was found to not have a significant impact on the current ecology of the site. The proposed development is complaint with the BC Act.

- *National Parks & Wildlife Act 1974 (NP&W Act).*

  The proposed development is complaint with the NP&W Act.

- *Biosecurity Act (superseding the Noxious Weed Act 1993) (NW Act).*

  The Biosecurity Act replaced the Noxious Weeds Act and the objectives of this Act are to manage, and eradicate and Weeds that cause a high level of environmental, economic or social harm. With the removal of and management of weeds the sites work with be complaint with the objectives of this Act.

2.1.1 Biodiversity Offsets Scheme Threshold

The Biodiversity Offsets Scheme (BOS) is a test used to determine when it is necessary to engage an accredited assessor to apply the Biodiversity Assessment Method (the BAM) and thus evaluate the impacts of a proposal.

It has been concluded that the development does not trigger the BOS area clearing threshold nor is the site located on the BV map. The area clearing threshold trigger is based on the minimum lot size associated with the property (<1Ha) and the thresholds for clearing which triggers BOS (0.25Ha or more). The building footprint will not remove more than 0.25Ha of native vegetation therefore the development does not trigger the BOS.

Area clearing threshold

Minimum lot size associated with the property	Threshold for clearing, above which the BAM and offsets scheme apply
Less than 1 ha	0.25 ha or more
1 ha to less than 40 ha	0.5 ha or more
40 ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

Minimum lot size associated with site is <1Ha and the development will not clear >0.25Ha of vegetation.

Thus, the BOS area clearing threshold does not apply.

Figure 2.0. Building impact area of approximately ~100m^2 – No vegetation community or remnant vegetation affected.

Biodiversity Values Map threshold

The Biodiversity Values (BV) Map identifies land of high biodiversity value, as defined by clause 7.3(3) of the Biodiversity Conservation Regulation 2017. The Biodiversity Offsets Scheme applies to clearing of native vegetation and other biodiversity impacts prescribed by clause 6.1 of the Biodiversity Regulation 2017 on land identified on the map.

The site (red marker) is not located on high biodiversity value land as identified on the Biodiversity Values Map.

Therefore, the development does not trigger the BOS as per the Biodiversity Values Map threshold.

Figure 2.2. The site (red marker) located on the BV map

2.3 Scope of Flora and Fauna

To provide a flora and fauna assessment for assessing the potential direct and indirect impacts of any threatened species, populations and communities on the site. This includes applying the threatened species test of significance' which is set out in s. 7.3 of the Biodiversity Conservation Act 2016 (BC Act). The assessment will also include other ecological impacts and providing recommendations for mitigating these.

The objectives of this Flora and Fauna Impact Assessment are to:

- Identify any native vegetation communities, significant species or significant habitat features present within the study area.
- Identify any known or potential habitat for threatened species.
- Review the implications of relevant biodiversity legislation and policy.
- Identify potential impacts on significant ecological communities, species or habitats from the proposed development and provide recommendations to assist with the mitigation of those potential impacts during the construction and operation stages.
- Targeted searches for significant species are based on the authors' knowledge of the site.

Works included a site survey/assessment, review of project design and any additional reports and review of available literature to produce site specific ecological and environmental effects report.

2.4 Limitations of the Study

Limitations of the study may arise where certain cryptic species of plants may occur as soil-stored seed or as subterranean vegetative structures. Some species are identifiable above-ground only after particular environmental circumstances related to factors such as periodic fire frequency, intensity or seasonality, soil moisture regime, biological life-cycle patterns as in the case of small plants such as species of orchids etc. No specific invertebrate surveys were conducted.

Surveys at one time of the year cannot be expected to detect the presence of all species occurring, or likely to occur, in the study area. This is because some species may (a) occur seasonally, (b) utilise different areas periodically (as a component of a more extensive home range), or (c) become dormant during specific periods of the year. Rather, the survey provides the opportunity to sample the area, search specifically for species likely to be encountered within the available time frame and assess the suitability of habitat for particular species.

Considering the site and habitat availability Kingfisher are confident that this survey is representative of the likely species and vegetation community and that future studies at other times would not change the conclusions in this report.

3 Methods

3.1 Site Inspections

Senior Ecologist Geraldene Dalby-Ball assessed the site on the 17th March 2021. Weather was fine and sunny during time of visit. During site visits, notes and photos were taken of the important vegetation types, flora and fauna present. Due to the small area of proposed impacts, detailed or systematic surveys were not performed. Surveys were general and opportunistic in nature and were performed by traversing the site. Surveys included one diurnal bird and fauna survey, a single vegetation survey and a general habitat survey in which fauna habitat resources were identified.

3.2 Previous studies

Bionet, previous studies and the author's knowledge of the local area, were used to determine the possible occurrence of endangered ecological communities and threatened plant species on-site. The Bionet records accessed cover a 10km^2 area extending from the site and include recordings from 1993 to the present day.

Records from the following databases were collated and reviewed:

- Atlas of NSW Wildlife (Bionet). New South Wales, Department of Planning, Industry and Environment (DPIE).
- NSW Threatened Species Information (DPIE).
- The Native Vegetation of the Sydney Metropolitan Area - Version 3.1 (OEH, 2016) VIS_ID 4489.
- PlantNET (The Royal Botanic Gardens and Domain Trust 2014).

- Protected Matters Search Tool of the Australian Government Department of the Environment (DoE) for matters protected by the Cwlth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

4 Flora

The purpose of the flora work was an investigation to determine the flora composition of the site, particularly vulnerable and endangered species. It also included an assessment of the flora as habitat. Furthermore, an assessment of potential impact of the development with a determination of native ground and shrub was conducted.

4.1 Threatened flora

BioNet records within 10km of the study site had 9 species currently listed as vulnerable or endangered under state and/or commonwealth legislation. The vulnerable and endangered species to focus on-site searches for can be seen in **Table 2** below. This is based on likelihood of occurrence.

Table 2. Threatened flora recorded within a 10km radius since 1993. Source: NSW OEH Bionet 2019.

Family	Scientific Name	Common Name	NSW status	Comm. status	Records
Rutaceae	*Asterolasia elegans*		E1	E	1
Rutaceae	*Boronia umbellata*	Orara Boronia	V,P	V	1
Myrtaceae	*Callistemon linearifolius*	Netted Bottle Brush	V,3		2
Euphorbiaceae	*Chamaesyce psammogeton*	Sand Spurge	E1		7
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	V	V	3
Orchidaceae	*Genoplesium baueri*	Bauer's Midge Orchid	E1,P,2	E	1
Proteaceae	*Persoonia hirsuta*	Hairy Geebung	E1,P,3	E	3
Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine	E4A		4
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	E1	V	14

Note: E = Endangered, V = Vulnerable, P = Protected.

4.2 Flora Findings from Site Investigations

4.2.1 Threatened plant species findings

No threatened plant species were found during site assessments.

4.2.2 Observed Flora

During the site visit a variety of native flora was observed. No native species were recorded onsite.

4.2.3 Notable weeds

Several weed species were recorded onsite, some of which are Weeds of National Significance (WoNS) as listed by the Department of the Environment and Energy. Weeds listed here are invasive in bushland and can spread from the site hence have been listed for removal

Table 3 Weeds within the subject site.

Scientific Name	Common Name	WoNs
Lonicera japonica	Honeysuckle	No
Pennisetum sp.	Fountain Grass	No
Bambusoideae	Bamboo	No
Asparagus aethiopicus	**Asparagus Fern**	**Yes**
Chrysanthemoides monilifera	**Bitou Bush**	**Yes**
Conyza bonariensis	Conyza	No
Ehrharta erecta	Panic Veldt Grass	No
Ipomoea indica	Morning Glory	No
Ricinus communis	Castor Oil	No
Acetosa sagittata	Turkey Rhubarb	No
Protoasparagus aethiopicus	Asparagus Fern	No
Senna pendula	Cassia	No

4.2.6 Tree Removal

No native trees are proposed for removal.

5 Fauna

5.1 Threatened fauna

BioNet records within 10km of the study site had 50 fauna species currently listed as vulnerable or endangered under state and/or commonwealth legislation. The vulnerable and endangered species to focus on-site searches for can be seen in **Table 4** below. This is based on likelihood of occurrence.

Table 4. Threatened fauna observed in previous ecological surveys within a 10km radius since 1993. Source: NSW OEH Bionet 2019.

Class	Scientific Name	Common Name	NSW Status	Comth. Status	No. of records
Amphibia	*Pseudophryne australis*	Red-crowned Toadlet	V,P		6
Aves	*Anthochaera phrygia*	Regent Honeyeater	E4A,P	CE	1
Aves	*Ardenna carneipes*	Flesh-footed Shearwater	V,P	J,K	1
Aves	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V,P		1
Aves	*Burhinus grallarius*	Bush Stone-curlew	E1,P		48
Aves	*Callocephalon fimbriatum*	Gang-gang Cockatoo	V,P,3		1
Aves	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	V,P,2		14
Aves	*Dasyornis brachypterus*	Eastern Bristlebird	E1,P,2	E	1
Aves	*Diomedea exulans*	Wandering Albatross	E1,P	E	3
Aves	*Diomedea gibsoni*	Gibson's Albatross	V,P	V	1
Aves	*Esacus magnirostris*	Beach Stone-curlew	E4A,P		1
Aves	*Glossopsitta pusilla*	Little Lorikeet	V,P		3
Aves	*Haematopus fuliginosus*	Sooty Oystercatcher	V,P		4
Aves	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V,P		34
Aves	*Hieraaetus morphnoides*	Little Eagle	V,P		1
Aves	*Hirundapus caudacutus*	White-throated Needletail	P	V,C,J,K	3
Aves	*Ixobrychus flavicollis*	Black Bittern	V,P		1
Aves	*Lathamus discolor*	Swift Parrot	E1,P,3	CE	2
Aves	*Lophoictinia isura*	Square-tailed Kite	V,P,3		2
Aves	*Macronectes giganteus*	Southern Giant Petrel	E1,P	E	1
Aves	*Neophema pulchella*	Turquoise Parrot	V,P,3		1
Aves	*Ninox connivens*	Barking Owl	V,P,3		11

Class	Scientific Name	Common Name	NSW Status	Comth. Status	No. of records
Aves	*Ninox strenua*	Powerful Owl	V,P,3		233
Aves	*Numenius madagascariensis*	Eastern Curlew	P	CE,C,J,K	8
Aves	*Onychoprion fuscata*	Sooty Tern	V,P		1
Aves	*Pandion cristatus*	Eastern Osprey	V,P,3		3
Aves	*Petroica boodang*	Scarlet Robin	V,P		1
Aves	*Ptilinopus regina*	Rose-crowned Fruit-Dove	V,P		3
Aves	*Ptilinopus superbus*	Superb Fruit-Dove	V,P		2
Aves	*Thalassarche cauta*	Shy Albatross	V,P	V	3
Aves	*Thalassarche melanophris*	Black-browed Albatross	V,P	V	1
Aves	*Tyto novaehollandiae*	Masked Owl	V,P,3		2
Mammalia	*Cercartetus nanus*	Eastern Pygmy-possum	V,P		6
Mammalia	*Chalinolobus dwyeri*	Large-eared Pied Bat	V,P	V	6
Mammalia	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P	E	2
Mammalia	*Isoodon obesulus obesulus*	Southern Brown Bandicoot (eastern)	E1,P	E	2
Mammalia	*Micronomus norfolkensis*	Eastern Coastal Free-tailed Bat	V,P		4
Mammalia	*Miniopterus australis*	Little Bent-winged Bat	V,P		23
Mammalia	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	V,P		32
Mammalia	*Myotis macropus*	Southern Myotis	V,P		7
Mammalia	*Petauroides volans*	Greater Glider	P	V	1
Mammalia	*Petaurus norfolcensis*	Squirrel Glider	V,P		1
Mammalia	*Phascolarctos cinereus*	Koala	V,P	V	71
Mammalia	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	91
Mammalia	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V,P		2
Mammalia	*Vespadelus troughtoni*	Eastern Cave Bat	V,P		1
Reptilia	*Caretta caretta*	Loggerhead Turtle	E1,P	E	4
Reptilia	*Chelonia mydas*	Green Turtle	V,P	V	6
Reptilia	*Eretmochelys imbricata*	Hawksbill Turtle	P	V	4
Reptilia	*Varanus rosenbergi*	Rosenberg's Goanna	V,P		2

Note: E = Endangered, V = Vulnerable, P = Protected. Species in bold have been identified as having appropriate habitat present on-site.

Likelihood of occurrence

The habitat suitability is a broad categorisation used by Kingfisher to indicate the potential for a species to occur within the study area. It is based on expert opinion and implies the relative value of a study area for a particular species. See Appendix I for rational lists of what threatened fauna species may occur on site due to habitat preferences and whether the site offers these habitat features.

During the survey, none of the above threatened species were observed on-site. However, marginal foraging habitat for the Microbats may be present as they have all been recorded within 2km of the site. Spotted Tail Quolls have not been sighted for over 30 years and the habitat is not suitable for Bush-stone Curlews

5.1 Endangered populations

Two endangered populations have been recorded to occur within 10km of the site. Table 5 outlines these populations. It is unlikely that either of these populations would occur at the site due to habitat requirements and site accessibility. See Appendix I for rationale.

Table 5. Endangered Populations in the LGA. Source NSW OEH Bionet 2019.

Endangered Population	Scientific Name	NSW Status	Comth. Status	No. of records
Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill	*Petaurus norfolcensis*	E2,V,P		1
Koala in the Pittwater Local Government Area	*Phascolarctos cinereus*	E2,V,P	V	71

5.2 Fauna findings from site assessment

Table 6 provides a list of vertebrate fauna recorded during the site visit.

Table 6. Fauna recorded within the site.

Class	Scientific Name	Common Name	NSW Status	Comth. Status
Reptilia	*Lampropholis* sp.	unidentified grass skink	P	
Aves	*Lopholaimus antarcticus*	Topknot Pigeon	P	
Aves	*Manorina melanocephala*	Noisy Miner	P	

Note - None of these species are listed as threatened under wither State or Federal legislation.

5.2.1 Fauna habitat

Weeds on the western boundary are potential habitat for invertebrates. It is unlikely that ring-tails would use the vegetation here for drey building and none were seen.

6 Bushfire

The bushfire hazard was identified as being located within neighbouring private allotments to the east (over the road) of the proposed works. The proposed alterations and additions have been designed in reference to Planning for Bushfire Protection. The locating of the building is not going to change / increase the requirement to manage fuels in surrounding properties. All grounds within the subject property not built upon will be maintained as an Asset Protection Zone (Inner Protection Area). as detailed in the NSW Rural Fire Service's document 'Standards for Asset Protection Zones' and Appendix 2 of Planning for Bush Fire Protection 2006. The landscaping proposed with this plan is concurrent with this.

7 Impacts

7.1 Direct Impacts

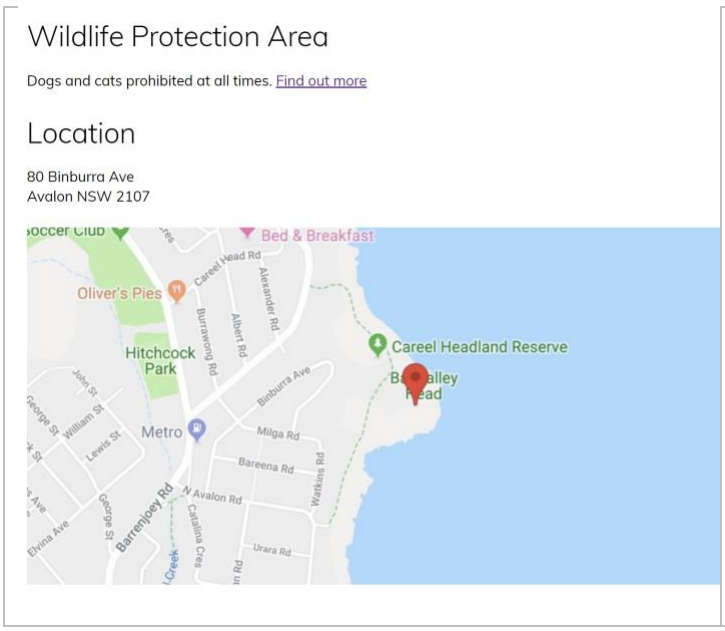
7.1.1 Vegetation disturbance

No native vegetation will be removed. Planting will increase native species diversity, weeds will be removed.

7.2 Indirect Impacts

The proposed actions have a low level of indirect impacts, there is already a home on the site and the changes are insignificant from a vegetation perspective. Storm-water management is standard and will stop materials leaving the site. When the ground is cleared for construction there is to be sediment management such that no silty water leaves the site.

Companion animals are to be kept from wandering unaccompanied. Cats in particular must be retained in the property boundaries. Bangalley Headland is a Wildlife Protection Areas and Cats are prohibited.



https://www.northernbeaches.nsw.gov.au/things-to-do/recreation-area/bangalley-headland-bushland-reserve

8 Landscaping

Concept Landscape Plan

This concept plan includes the areas to plant, recommended species and areas for screening. The detailed Landscape Plan, if needed, will be submitted at CC.

Recommended Species

Recommended Species are listed in Appendix VII for this location to provide screening from the road and neighbours as well as increasing habitat. Plants from the species list above can be used to substitute for any here providing the landscape dynamics of screening is fulfilled. Minimum requirements are 15 species with no more than 20% from any one species. Planting of 2 x tube-stocks trees with the aim that at least 1 will grow to maturity. Planted area to be at least 60% of the open area with turf areas 40% or less.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Coastal Tea Tree	*Leptospermum laevigatum*		Small Tree	NF Planting within the East Area as entry plant set back from the road and path so it can grow without needing pruning. Suitable for cluster planting in the open grass area near car parks.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Coastal Banksia	*Banksia integrifolia*		Small Tree	NF Planting within the East Area as entry plant set back from the road and path so it can grow without needing pruning. Suitable for cluster planting in the open grass area near car parks.
Myoporum insulare	*Common Boobialla*		Shrub	NF, BF Planting within the East Area as entry plant set back from the road and path so it can grow without needing pruning. Planting along the boat hire boundary recommended. Inter-planting with Coastal Wattle.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Coastal Wattle	*Acacia longifolia subsp. sophorae*		Shrub	NF, BF Planting along the boat hire boundary recommended. Inter-planting with Boobialla. Suitable for cluster planting in the open grass area near car parks.
Knobby Club-Rush	*Ficinia nodosa*		Tussock	NF Edge Plant with in East Area as entry plant and along path ways. Inter-planting with Pigface and Sea Rush. Plant around tree plantings in open space grass areas to protect tree roots from excess compaction. Rhizomatous root structure.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Pig Face	*Carpobrotus glaucescens*		Ground Cover	NF, BF Entry plant and along path ways. Will grow on edges under pines. Inter-planting with Nobby Club Rush. Plant around tree plantings in open space grass areas to protect tree roots from excess compaction. Sprawling root mass.
Purple Fanfare	*Scaevola aemula*		Ground Cover	NF Entry plant and along path ways. Will grow on edges under pines. Inter-planting with Nobby Club Rush and Sea Rush on the foreshore. Plant around tree plantings in open space grass areas to protect tree roots from excess compaction. Sprawling root mass.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Native Violet	*Viola hederacea*		Ground Cover	NF Along path ways directly on edge to create open edge on path. Possible to plant under raised walkways as well. Will grow on edges under pines. Sprawling root mass.
Warrigal Greens	*Tetragonia tetragoinoides*		Ground Cover	Will grow on edges in shaded areas. Main reason for planting is the high bush-tucker value. Grows in shade. Sprawling plant and root mass.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Trailing Guinea Flower	*Hibbertia scandens*		Vine NF	All vines species can be inter-planted. Trailing Guinea Flower and Purple Coral Pea are the most appropriate as Dusky Coral Pea can be very vigorous in growth. Trailing Guinea Flower and Dusky Coral Pea are recommended in the open space to provide colour, habitat and "rooms" (delineated areas). Both are recommended for over copper-log posts and along rails used to delineate access ways on the estuary foreshore.
Dusky Coral Pea	*Kennedia rubicunda*		Vine NF	Dusky Coral Pea is recommended in the open space foreshore zone to provide colour, habitat and "rooms" (delineated areas) for sitting on the foreshore also for over copper-log posts and along rails used to delineate access ways on the estuary foreshore. Too vigorous for within east area.

Common Name	Scientific Name	Photo	Growth Habit	Notes (NF) habitat for native fauna, (BF) Bush Food.
Purple Coral Pea	*Hardenbergia violacea*		Vine NF	Purple Coral Pea is one of the most appropriate species to plant within the open space area near dining and in pots in and around the Built areas.
Native Sarsaparilla	*Smilax glyciphylla*		Vine NF, BF	The least aesthetic of the recommended vines Native Sarsaparilla has been chosen due to it plant food and tea attributes. Leaves are sweet and make local tea.

Note - Habitat for Native Fauna (NF), Bush Food (BF)

9 Recommendations

9.1 Mitigation Measures

9.1.1 Delineation of work areas

During construction, impacts on the site and adjacent vegetation should be minimized by the delineation of works zones. Access to the site would be best restricted to small passageways avoiding native vegetation to prevent soil disturbance in general and damage to native vegetation. Access will be restricted to disturbed open areas.

9.1.2 Landscaping Weed management, and planting natives

Weed management to remove invasive exotics. Planting locally native species to increase the habitat value of the site while retaining a low fuel condition.

9.1.3 Erosion and runoff

Where required, sediment controls will be put in place. These will include, but not be limited to sediment fences, jute matting and crushed sandstone. Sediment controls will be reviewed during site inspections and/or after significant rainfall (more than 10mm in 24hrs resulting in site runoff).

9.1.4 Weed Removal Techniques

Weed removal proposed for the site will consist of hand removal techniques, manual/mechanical removal using bush regenerator tools. This approach will reduce the amount of herbicide used and reduce the amount of off-target damage through spot on application.

Woody perennial weeds less than 2 metres in height will require cut and paint or scrape and paint bush regenerator techniques based on the germinating/epicormic behaviour of the plant (especially plants that tend to coppice or sucker).

It is recommended that seed heads are removed prior to commencement of primary works. This would be best performed carefully by hand with secateurs with the aim of avoiding the spread flowers or seeds into planting zones. See Appendix II for further details.

9.1.5 Pathogen prevention

To prevent the introduction of pathogens, Bushland Hygiene Protocols outlined in Appendix V should be followed. The site is considered to be an area which may promote the spread of Phytophthora (a group of fungus-like diseases affecting plants) due to its moist soil and proximity to water. It is recommended that Bushland Hygiene Protocols be followed closely.

Phytophthora infected vegetation. (Image by Rasbak, licensed under the Creative Commons Attribution-Share Alike 3.0 Unported, 2.5 Generic, 2.0 Generic and 1.0 Generic license.)

Myrtle Rust generally infects new leaf growth. (Image by John Tann, licensed under the Creative Commons Attribution 2.0 Generic license.)

10 Appendices

10.1 Appendix I – Threatened Species Habitat Preferences

Rationale for Likelihood of Occurrence

Flora - following are considerations of species likelihood of being on-site or impacted by proposed activities.

Family	Scientific Name	Common Name	Habitat Requirements	Site Suitability
Rutaceae	*Asterolasia elegans*		Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Found in sheltered forests on mid-to lower slope sand valleys, e.g. in or adjacent to gullies which support sheltered forest.	None
Rutaceae	*Boronia umbellata*	Orara Boronia	This Boronia grows as an understorey shrub in and around gullies in wet open forest. It appears to regenerate well after disturbance, but it is not known whether prolonged or repeated disturbance affects long-term persistence.	None
Myrtaceae	*Callistemon linearifolius*	Netted Bottle Brush	For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. The species was more widespread in the past, and there are 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. The species has also been recorded from Yengo National Park. Grows in dry sclerophyll forest on the coast and adjacent ranges. Flowers in spring to summer.	None

Family	Scientific Name	Common Name	Habitat Requirements	Site Suitability
Euphorbiaceae	*Chamaesyce psammogeton*	Sand Spurge	Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (*Spinifex sericeus*) and Prickly Couch (*Zoysia macrantha*). Flowering recorded in spring and summer. Sand Spurge seeds float, so some dispersal between beaches may occur. Longevity of the species is approximately 5–30 years with a primary juvenile period of less than 1 year. Plant growth occurs in spring and summer.	None
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	It occurs in grassy or sclerophyll woodland in association with many other eucalypts that grow in the area, including *E. andrewsii* and many of the stringybarks, such as *E. caliginosa*. Grows on shallow relatively infertile soils on shales and slates; Niangala to Glen Innes. The distribution of this species overlaps with the following EPBC Act-listed threatened ecological communities: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, and Upland Wetlands of the New England Tablelands and the Monaro Plateau.	None
Orchidaceae	*Genoplesium baueri*	Bauer's Midge Orchid	Grows in dry sclerophyll forest and moss gardens over sandstone.	None
Proteaceae	*Persoonia hirsuta*	Hairy Geebung	Usually found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Usually present as isolated individuals or very small populations. Habitat Preferences: It also favours disturbed heath, shrubby thickets and sandstone scrubs	None

Family	Scientific Name	Common Name	Habitat Requirements	Site Suitability
Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	None
Myrtaceae	*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. Is thought to tolerate wet and dry conditions on sands.	None on site. There is an original *Syzygium paniculatum* in Bangalley Headland ~ 700m from the site.

Endangered Population

Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
Mammalia	*Petaurus norfolcensis* – *endangered population*	Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill	NSW: Occurs on the coast in a range of habitats including low scrubby eucalypt woodlands and banksia thickets to tall, wet eucalypt forests bordering on rainforest . The availability of a year-round supply of carbohydrates (nectar, sap, gum, and honeydew) appears to be an important habitat feature. In NSW, this corresponds to a high diversity of tree and shrub species, including a high nectar producing species and one or more winter flowering species. In Pittwater, important food sources are likely to be the winter flowering Coast Banksia *(Banksia integrifolia*) and Spotted Gum (*Corymbia maculata*) and the summer	None

Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
			flowering Old Man Banksia (B. *serrata*) and Grey Ironbark (*Eucalyptus paniculata*). Other likely food sources include *Angophora costata, Banksia spinulosa, Corymbia gummifera, Eucalyptus botryoides, E. punctata, E. robusta, Melaleuca quinquernervia*, mistletoes and *Xanthorrhoea* species. This animal will gouge and lick incisions on the trunks and main branches of *Eucalyptus*, *Corymbia* and *Angophora* trees to feed on sap and on Acacia trees and shrubs to feed on gum, especially when nectar is in short supply. Tree hollows are an important habitat feature providing den sites for raising young. Hollows can be found in trees of the following genera *Eucalyptus, Corymbia and Angophora*. Other species such as *Melaleuca quinquenervia* can also provide suitable hollows.	
Mammalia	*Phascolarctos cinereus* – *endangered population*	Koala in the Pittwater Local Government Area	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	None

Fauna

Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
Amphibia	*Pseudophryne australis*	Red-crowned Toadlet	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Eggs are laid in moist leaf litter, from where they are washed by heavy rain; a large proportion of the development of the tadpoles takes place in the egg. Disperses outside the breeding period, when they are found under rocks and logs on sandstone ridges and forage amongst leaf-litter.	None
Aves	*Anthochaera phrygia*	Regent Honeyeater	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. This species has been seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests.	None
Aves	*Ardenna carneipes*	Flesh-footed Shearwater	Nest on Lord Howe Island in forests on sandy soils from Ned's Beach to Clear Place, with smaller colonies below	None

Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
			Transit Hill and at Old Settlement Beach. Eggs are laid at the end of a burrow 1 - 2 metres in length.	
Aves	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	Woodlands and dry open forests with preference for those dominated by eucalypts with mallee associations. May also be found in shrublands, heaths and occasionally in modified habitats and wet forests.	No specific habitat
Aves	*Burhinus grallarius*	Bush Stone-curlew	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch. Two eggs are laid in spring and early summer.	None
Aves	*Callocephalon fimbriatum*	Gang-gang Cockatoo	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. Favours old growth forest and woodland attributes for nesting and roosting. Nests are	None

Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
			located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts.	
Aves	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	Lives in coastal woodlands and drier forest areas, open inland woodlands or timbered watercourses where casuarinas (or sheoaks), its main food trees, are common. Glossy black-cockatoos occasionally eat seeds from eucalypts, angophoras, acacias and hakeas, as well as eating insect larvae. Prefers to nest in the hollows of large, old eucalypt trees, alive or dead. The typical nest site will be around 3 to 30 metres above the ground.	None
Aves	*Dasyornis brachypterus*	Eastern Bristlebird	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.	None
Aves	*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. Wandering albatross spend the majority of their time in flight, soaring over the southern oceans. They breed on a number of islands just north of the Antarctic Circle: South	None

Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
Aves	*Diomedea gibsoni*	Gibson's Albatross	Essentially endemic to the Auckland Islands of New Zealand. The non-breeding range is poorly known however the species probably disperses across the southern Pacific. The species is regularly encountered on trans-Tasman shippping routes and at seas off Sydney, and regularly occurs off the NSW coast usually between Green Cape and Newcastle.	None
Aves	*Esacus magnirostris*	Beach Stone-curlew	The species has largely disappeared from the south-east of its former range and is now rarely recorded on ocean beaches in NSW. Occurs on open, undisturbed beaches, islands, reefs, and estuarine intertidal sandflats and mudflats; beaches with estuaries or mangroves nearby are preferred; may also frequent river mouths, offshore sandbars and rock platforms. Individuals forage with slow deliberate heron-like actions. The diet consists of crabs and other marine invertebrates. Less strictly nocturnal than the Bush Stone-curlew.	None
Aves	*Glossopsitta pusilla*	Little Lorikeet	Prefers open Eucalypt forest and woodlands. Primarily feeds within the canopy of Eucalyptus, Angophora and Melaleuca trees. Prefers riparian areas but may visit isolated trees in open or cleared land.	None
Aves	*Haematopus fuliginosus*	Sooty Oystercatcher	Inhabits rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels. Breeds in spring and summer, almost	None

Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
			exclusively on offshore islands, and occasionally on isolated promontories.	
Aves	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	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). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'.	None – is in the area but confined the cliff top zone
Aves	*Hieraaetus morphnoides*	Little Eagle	Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.	None
Aves	*Hirundapus caudacutus*	White-throated Needletail	White-throated Needletails often occur in large numbers over eastern and northern Australia. They arrive in Australia	None

Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
			from their breeding grounds in the northern hemisphere in about October each year and leave somewhere between May and August.	
Aves	*Ixobrychus flavicollis*	Black Bittern	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. Feeds on frogs, reptiles, fish and invertebrates, including snails, dragonflies, shrimps and crayfish, with most feeding done at dusk and at night. During the day, roosts in trees or on the ground amongst dense reeds.	None
Aves	*Lathamus discolor*	Swift Parrot	On the mainland they occur in areas 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 Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Grey Box *E. microcarpa,* Grey Box *E. moluccana* and Blackbutt *E. pilularis*. Return to home foraging sites on a cyclic basis depending on food availability.	None
Aves	*Lophoictinia isura*	Square-tailed Kite	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of	None

Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
			chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage.	
Aves	*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. Over summer, the species nests in small colonies amongst open vegetation on Antarctic and subantarctic islands, including Macquarie and Heard Islands and in Australian Antarctic territory.	None
Aves	*Neophema pulchella*	Turquoise Parrot	Occurs on edges of eucalypt woodlands, ridges through forests and creeks. Prefers shading for ground foraging.	None
Aves	*Ninox connivens*	Barking Owl	Inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. Denser vegetation is used occasionally for roosting. During the day they roost along creek lines, usually in tall understorey trees with dense foliage such as Acacia and Casuarina species, or the dense clumps of canopy leaves in large Eucalypts. Feeds on a variety of prey, with invertebrates predominant for most of the year, and birds and mammals such as smaller gliders, possums, rodents and rabbits becoming important during breeding.	None

Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
Aves	*Ninox strenua*	Powerful Owl	The species requires large tracts of forest or woodland, however fragmented landscapes can contribute to their range. Breeds in forests and woodlands but may forage in open areas. Mainly preys upon medium sized arboreal mammals. Requires tree hollows for breeding.	In the area but no particular habitat on site
Aves	*Numenius madagascariensis*	Eastern Curlew	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. The Eastern Curlew mainly forages on soft sheltered intertidal sandflats or mudflats, open and without vegetation or covered with seagrass, often near mangroves, on saltflats and in saltmarsh, rockpools and among rubble on coral reefs, and on ocean beaches near the tideline. The Eastern Curlew roosts on sandy spits and islets, especially on dry beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. It occasionally roosts on reef-flats, in the shallow water of lagoons and other near-coastal wetlands.	Breeding pair at Careel bay – but this site is not habitat and works here will not impact the Curlew habitats. Providing Cats are not permitted to roam.
Aves	*Onychoprion fuscata*	Sooty Tern	The Sooty Tern is found over tropical and sub-tropical seas and on associated islands and cays around Northern Australia.	None
Aves	*Pandion cristatus*	Eastern Osprey	Inhabits coastal areas, especially the mouths of large rivers, lagoons and lakes. Feeds on fish over clear, open water. Breed from July to September in NSW.	None – closest at Mona Vale and Narrabeen Lagoon

Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
Aves	*Petroica boodang*	Scarlet Robin	Ideal habitat includes eucalypt forests and woodlands with an open and grassy understorey with few shrubs. Can occur in mature or regrowth vegetation. Sometimes seen in mallee, wet forests, wetlands and tea-tree swamps. Habitat generally contains many logs and fallen timber.	None
Aves	*Ptilinopus regina*	Rose-crowned Fruit-Dove	Coast and ranges of eastern NSW and Queensland, from Newcastle to Cape York. Vagrants are occasionally found further south to Victoria. Rose-crowned Fruit-doves occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful. They are shy pigeons, not easy to see amongst the foliage, and are more often heard than seen. They feed entirely on fruit from vines, shrubs, large trees and palms, and are thought to be locally nomadic as they follow the ripening of fruits.	None – but occasionally on figs in Bangalley reserve.
Aves	*Ptilinopus superbus*	Superb Fruit-Dove	The species is found in rainforests, rainforest margins, mangroves, wooded stream-margins, and even isolated figs, lilly pilies and pittosporums. The Superb Fruit-Dove may migrate to New Guinea in winter, but little is known of its movements, or the reasons for its sometimes southerly flights as far as Tasmania. Feeds almost exclusively on fruit, mainly in large trees.	None – but occasionally on figs in Bangalley reserve.
Aves	*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	None

Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
			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. This pelagic or ocean-going species inhabits subantarctic and subtropical marine waters, spending the majority of its time at sea. While at sea, it soars on strong winds and when calm, individuals may rest on the ocean, in groups during the breeding season or as individuals at other times. Occasionally the species occurs in continental shelf waters, in bays and harbours.	
Aves	*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. Inhabits antarctic, subantarctic, subtropical marine and coastal waters over upwellings and boundaries of currents.	None
Aves	*Tyto novaehollandiae*	Masked Owl	The species prefers dry eucalypt forests and woodlands and hunts along the edges and forests and roadsides. Mainly	None

Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
			preys upon arboreal and ground mammals, primarily rats. Requires tree hollows in moist gullies for breeding.	
Mammalia	*Cercartetus nanus*	Eastern Pygmy-possum	Found in rainforests communities to sclerophyll (including Box-Ironbark) forests, woodland and heath. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes, soft fruits are eaten when flowers are unavailable and insects.	None – though they are expected to be in Bangaley Reserve.
Mammalia	*Chalinolobus dwyeri*	Large-eared Pied Bat	Large-eared Pied Bat 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.	Possible in the area but low quality foraging habitat on-site and no roosting / breeding habitat.
Mammalia	*Dasyurus maculatus*	Spotted-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. Mostly nocturnal animal feeding on medium-sized (500g-5kg) mammals.	None
Mammalia	*Isoodon obesulus obesulus*	Southern Brown Bandicoot (eastern)	Species found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogenous (underground-fruiting) fungi.	None

Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
Mammalia	*Micronomus norfolkensis*	Eastern Coastal Free-tailed Bat	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roosts mainly in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous.	Possible in the area but low quality foraging habitat on-site and no roosting / breeding habitat.
Mammalia	*Miniopterus australis*	Little Bent-winged Bat	Moist eucalypt forest, rainforest or dense coastal banksia scrub. Little Bentwing-bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters.	Possible in the area but low quality foraging habitat on-site and no roosting / breeding habitat.
Mammalia	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	Primarily roosts in caves but will utilise mine shafts, storm-water tunnels, buildings and other man-made structures. Forms colonies within a maternity cave and disperse within a 300km range. Forage in forested areas in the tree canopy.	Possible in the area but low quality foraging habitat on-site and no roosting / breeding habitat.
Mammalia	*Myotis macropus*	Southern Myotis	Roosts in groups of 10-15 in areas close to water. Will utilise caves, mine shafts, tree hollows, storm water drains, buildings, bridges and dense foliage. Forages over water bodies catching insects and small fish.	Possible in the area but low quality foraging habitat on-site and no roosting / breeding habitat.
Mammalia	*Petauroides volans*	Greater Glider	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse	None

Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
			species. Inactive for most of the day, feeding and moving mostly at night.	
Mammalia	*Petaurus norfolcensis*	Squirrel Glider	Inhabits mature or old growth Blackbutt-Bloodwood forests with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia mid-storey. Requires abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.	In area but foraging habitat or connecting habitat on-site and no roosting / breeding habitat.
Mammalia	*Phascolarctos cinereus*	Koala	Inhabit eucalypt woodlands and forests. Feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	No foraging habitat or connecting habtiat on-site and no roosting / breeding habitat.
Mammalia	*Pteropus poliocephalus*	Grey-headed Flying-fox	Occurs within tall sclerophyll forests and woodlands, heath, swamp subtropical and temperate rainforests, and urban areas. Occurs within 20km of a significant food source. May be found close to gullies and water within vegetation with a dense canopy.	In area however no foraging habitat or connecting habitat on-site.
Mammalia	*Scoteanax rueppellii*	Greater Broad-nosed Bat	Roosts in tree hollows but may be found in buildings. Primarily found in gullies and river systems that drain the Great Dividing Range. Occurs in a range of habitats including woodlands to moist or dry eucalypt forest, rainforest with greatest preference for tall wet forests. Forages along creeks and river corridors.	In area but foraging habitat or connecting habitat on-site and no roosting / breeding habitat.

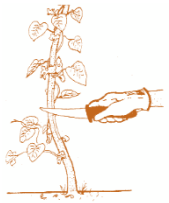
Class	Scientific Name	Common Name	Habitat Requirements	Site Suitability
Mammalia	*Vespadelus troughtoni*	Eastern Cave Bat	Roosts in caves, mine shafts. Generally found in dry open forest and woodlands. Prefers areas near cliffs and rocky overhangs.	In area but foraging habitat or connecting habitat on-site and no roosting / breeding habitat. Caves are in the sea-side of cliffs at Bangalley
Reptilia	*Caretta caretta* *Eretmochelys imbricata* *Chelonia mydas*	Loggerhead Turtle Hawksbill Turtle Green Turtle	Turtles = ocean-dwellers, foraging in deeper water for fish, jellyfish and bottom-dwelling animals. The female comes ashore to lay her eggs in a hole dug on the beach in tropical regions during the warmer months. May be coastal to follow food or shelter form storms.	None
Reptilia	*Varanus rosenbergi*	Rosenberg's Goanna	Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Individuals require large areas of habitat. Feeds on carrion, birds, eggs, reptiles and small mammals. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens.	None

Note: Species in **bold** have been assumed as having appropriate habitat present on-site.

10.2 Appendix II– Key Weed Removal Methods

Physical removal

Technique	Method	Equipment
Hand Removal 	Seedlings and smaller weed species where appropriate will be pulled out by hand, without risk of injury to workers. The size that this can occur varies throughout the treatment area. Generally, it ranges from post seed to approximately 300mm in height. Rolling and raking is suitable for larger infestations of Wandering Jew. The weed can be raked and stems and plants parts rolled. The clump of weed material can then be bagged and removed from site.	Tools: Gloves, Rakes, Knife and Weed Bags
Crowning 	Plants that possess rhizomes or bulbs might not respond to various removal techniques and may need to be treated with crowning. A knife, mattock or trowel is to be driven into the soil surrounding the bulb or rhizome at an angle of approximately 45 degrees with surrounding soil, so as to cut any roots that may be running off. This is to occur in 360 degrees around the bulb/rhizome. The rhizome or bulb is to be bagged and removed from the site and disposed of at an appropriate waste recycling facility Soil disturbance is to be kept to a minimum when using this technique.	Tools: Knife, mattock, trowel, impervious gloves, and all other required P.P.E.
Cut and Paint Stems 	Weed species deemed unsuitable for hand removal shall be cut. Those that have persistent of vigorous growth will be cut and painted with Roundup® Biactive Herbicide or equivalent. Juvenile and smaller weed species will be cut with secateurs at base of plant, and herbicide applied via applicator bottle. Stem to be cut horizontally as close to the ground as possible, using secateurs, loppers or a pruning saw. Horizontal cuts to be made on top of stem to prevent the herbicide running off the stump. Apply herbicide to the cut stem immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. Herbicide is not to reach sediment or surrounding non-targeting plants.	Tools: loppers, secateurs, pruning saw, herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide and all other required P.P.E.

Technique	Method	Equipment
Scrape and Painting 	More resilient weed species, where other techniques are less reliable are to be scraped with a knife or chisel and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current herbicide license. Weed species will be scraped with a knife or chisel up the length of the trunk, and herbicide applied via applicator bottle. Scrape the trunk from as close to the ground as possible to approximately ¾ of the plants height. Where trunk diameters exceed approximately 5 cm a second scrape shall be made on the other side of the trunk. Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. All care must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targeting plants. Follow up treatment may be required. If plants resprout, scrape and paint the shoots using the same method after sufficient regrowth has occurred.	Tools: knife, chisel, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E.
Cut with a Chainsaw and Paint 	Larger size weed species, too large for cutting with hand tools, shall be cut with a chainsaw and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current chainsaw and herbicide license. Larger weed species will be cut with a chainsaw at base of plant, and herbicide applied via applicator bottle. Cut the stem horizontally as close to the ground as possible, using the chainsaw. Remove upper branches to reduce bulk of plant. If cutting at the base is impractical, cut higher to get rid of the bulk of the weed, then cut again at the base and apply herbicide. Make cuts horizontal to prevent the herbicide running off the stump. Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. Ensure there is no runoff of poison. All care must be taken by the contractor not to spill herbicide into water, onto sediment, or surrounding non-targeting plants. Follow up treatment will be required. If plants resprout, cut and paint the shoots using the same method.	Tools: chainsaw, ear muffs, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E.

Technique	Method	Equipment
Spot Spraying	Spot spraying involves spraying non-seeding annuals and grasses, and for regrowth of weeds once an area has been cleared or brushcut. Works to be carried out by a contractor with a current herbicide license. Herbicide will be mixed up according to the manufacturer's directions for the particular weed species being targeted. Mixed herbicide shall be applied to the targeted weed species with a backpack sprayer. All care must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targeting plants.	Tools: protective clothing, safety glasses, herbicide sprayer, impervious gloves, Herbicide, and all other required P.P.E.

Flame Weeding

Thermal (flame) weeding is a method where high temperatures are applied to weeds, causing the plant to die. Thermal weeding is particularly useful in situations where conservation or health considerations are high and weed density is low such as waterways where herbicide use is not permitted.
While flame weeding is not suited to most streetscapes due to the fire hazard nor can it be used on materials such as soft fall and similar playground equipment it is noted that 'flame' weeding in waterways allows weed management in areas where herbicides are not permitted.
Also for native vegetation areas thermal weeding, with a flame weeder, has been shown to stimulate germination of native plants while killing the seeds of annual weeds such as Devils Pitchfork, *Bidens pilosa*. Flame weeding is also effective in killing persistent weeds like
Mother of Millions.
Best results are obtained when follow up weed control is undertaken 4-6 weeks after treatment. In addition, weed control should be conducted periodically after that for example to control weeds over a period of a year it is likely that between 3-5 applications will be necessary, depending on rainfall and the extent of the weed seed bank. This method is most effective on young annual weeds and least effective on older perennial weeds. In some cases, control of perennial weeds will be ineffective however this depends on the species present and its age.

Images provided by Dragonfly Environmental

Flame weeding should be undertaken outside of the fire seasons. Flame weeding allows for the mimicking of a burn in areas where a control burn could not be undertaken. See native plants regenerating after flame weeding.

10.3 Appendix III– Bushland Hygiene Protocols for Phytophthora (Hornsby Council Recommendations)

- Always assume that the area you are about to work in is free of the disease and therefore needs to be protected against infection.
- And, always assume that the activity you are about to undertake has the potential to introduce the disease.
- Arrive at site with clean shoes, i.e.: no dirt encrusted on them.
- If you arrive with shoes that are encrusted with dirt, they will have to be completely soaked in metho or disinfectant and allow a few minutes to completely soak in. NEVER scrape untreated dirt off your shoes onto the ground.
- Before you move onto the site spray the bottom of your shoes with 70 % metho. Bleach solution (1% strength) or household/commercial disinfectant (as per label) are also suitable.
- Check all tools and equipment that comes in contact with soil are clean before entering the area (they should have been cleaned on site at the end of the previous work session). If there is any dirt on them, spray them with 70% metho.
- Clean all tools at the end of each work session while still on site ensuring this is done away from drainage lines and adjacent work areas. Knock or brush off encrusted dirt and completely spray with 70 % metho. Replace in storage/transport containers.
- Preferably compost all weed material on site.
- Never drag vegetation with exposed roots and soil through bushland.
- When removing weeds from site, remove as much soil as possible from them in the immediate work area and carefully place vegetative material into plastic bags.
- Try not to get the bag itself dirty; don't put it on/in a muddy area.
- Always work from the lower part of a slope to the upper part.
- Always work in areas known to be free of the pathogen before working in infected areas.
- Minimise activities wherever possible when the soil is very wet.
- Vehicles should not be driven off track or into reserves (unless vehicle decontamination is carried out before and after entering a single work site)
- Only accredited supplies of plants/mulch to be used.

Kit should contain: 1 bucket, 1 scrubbing brush, 1 spray bottle (metho 70% solution), 1 bottle tap water, 1 bottle methylated spirits.

Facts about Phytophthora

Phytophthora cinnamomi (Phytophthora) is a microscopic, soil borne, water-mould that has been implicated in the death of remnant trees and other plants in Australian bushland. Phytophthora is not native to Australia. It is believed to have been introduced sometime after European settlement. Phytophthora is a national problem and is listed as a key threatening process under the Commonwealth's Environmental Protection and Biodiversity Conservation Act 1999.

Symptoms including Dieback

"Dieback" simply means dying or dead plants. There are many causes of dieback; Phytophthora is just one of them. Often dieback is the result of a combination of factors such as; changed drainage patterns and nutrient loads (e.g.: increased stormwater run-off) or changed soil conditions (e.g.: dumped fill or excavation of/near root zone). Plants that are stressed are more vulnerable to Phytophthora.

Initial symptoms of Phytophthora include; wilting, yellowing and retention of dried foliage, loss of canopy and dieback. Infected roots blacken and rot and are therefore unable to take-up water and nutrients. Severely infected plants will eventually die. Symptoms can be more obvious in summer when plants may be stressed by drought. If you suspect that Phytophthora is on your site, please contact the Bushcare team to collect a soil sample to be lab tested. This is usually done in the warmer months where conditions are optimum for the disease.

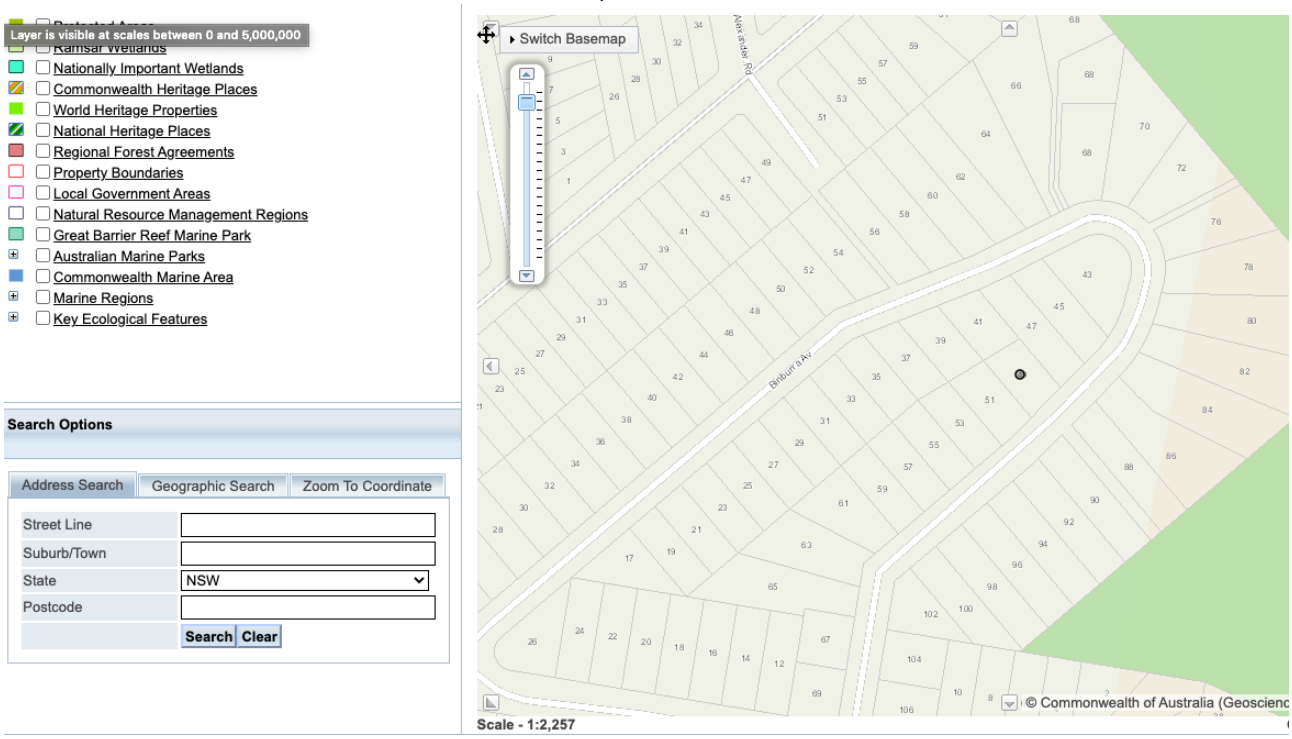
Infection

There is no way of visually telling if Phytophthora is present in the soil as its structures and spores are microscopic (invisible to the naked eye). Phytophthora requires moist soil conditions and warm temperatures for infection, growth and reproduction. Spores travel through moist soil and attach to plant roots. Once Phytophthora has infected a host plant it can grow inside plant root tissue independent of external soil moisture conditions. After infection, Phytophthora grows through the root destroying the tissue which is then unable to absorb water and nutrients.

10.4 Appendix IV– MNES Search

A Protected Matters Search was conducted.

Report Generation ID: 51XS3X Coordinates: -33.62403,151.33585



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:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	6
Listed Threatened Species:	91
Listed Migratory Species:	63

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
Coastal Upland Swamps in the Sydney Basin Bioregion	Endangered	Community likely to occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion	Endangered	Community likely to occur within area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area

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

Name	Status	Type of Presence
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known 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
Isoodon obesulus obesulus Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Acacia bynoeana Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area
Asterolasia elegans [56780]	Endangered	Species or species habitat known to occur

Name	Status	Type of Presence within area
Astrotricha crassifolia Thick-leaf Star-hair [10352]	Vulnerable	Species or species habitat known to occur within area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Darwinia biflora [14619]	Vulnerable	Species or species habitat may occur within area
Eucalyptus camfieldii Camfield's Stringybark [15460]	Vulnerable	Species or species habitat known to occur within area
Genoplesium baueri Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528]	Endangered	Species or species habitat likely to occur within area
Grevillea caleyi Caley's Grevillea [9683]	Critically Endangered	Species or species habitat likely to occur within area
Grevillea shiressii [19186]	Vulnerable	Species or species habitat known to occur within area
Haloragodendron lucasii Hal [6480]	Endangered	Species or species habitat may occur within area
Kunzea rupestris [8798]	Vulnerable	Species or species habitat likely to occur within area
Lasiopetalum joyceae [20311]	Vulnerable	Species or species habitat known to occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat likely to occur within area
Melaleuca deanei Deane's Melaleuca [5818]	Vulnerable	Species or species habitat likely to occur within area
Microtis angusii Angus's Onion Orchid [64530]	Endangered	Species or species habitat may occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area
Persoonia hirsuta Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat known to occur within area
Pimelea curviflora var. curviflora [4182]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Prostanthera askania Tranquillity Mintbush, Tranquility Mintbush [64958]	Endangered	Species or species habitat likely to occur within area
Prostanthera junonis Somersby Mintbush [64960]	Endangered	Species or species habitat may occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat likely to occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat 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
Hoplocephalus bungaroides Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

10.1 Appendix V – Test of Significance

None required

10.2 Appendix VI Landscape Species List

Ground Plants	**Small Shrubs (many with flowers)**
Pseuderanthemum variabile	*Actinotus helianthi*
Centella asiatica	*Poliscias sambucifolia*
Hydrocotyle acutiloba	*Cassinia longifolia*
Platysace linearifolia	*Hibbertia obtusifolia*
Craspedia glauca	*Hibbertia pedunculata*
Gahnia sieberana	*Hibbertia dentata*
Isolepis nodosus	*Brachyloma daphnoides*
Lepidosperma laterale	*Epacris pulchella*
Scaevola ramosissima	*Leucopogon parviflorus*
Dianella caerulea	*Platylobium formosum*
Viola hederacea	*Pultenea daphnoides*
Lomandra obliqua	*Pultenea elliptica*
	Geranium homeanun
Vines	*Goodenia bellidifolia*
Pandorea pandorana	*Goodenia ovata*
Kennedia rubicunda	*Patersonia sericea*
Hardenbergia violacea	*Plectranthus parviflorus*
Billardiera scandens	*Breynia oblongifloia*
Smilax glyciphylla	*Zieria laevigata*
Cissus antarctica	*Dodonea triquetra*
	Mirbelia rubifolia
Ferns	*Westringia fruticosa*
Blechnum cartilagineum	
Doodia aspera	**Large Shrubs**
Adiantum aethiopicum	*Banksia ericifolia*
	Banksia integrifolia
	Banksia oblongifolia
Trees	*Banksia serrata*
Allocasuarina distyla	*Banksia spinulosa*
Allocasuarina littoralis	*Grevillea sericea*
Angophora florabunda	*Hakea dackyloides*
Rapanea variabillis	*Hakea gibbosa*
Acmena smithii (large shrub to tree)	*Hakea sericea*
Corrymbia gummifera	*Hakea teretifolia*
Eucalyptus piperita	*Isopogon anemonifolius*
Eucalyptus umbra	*Persoonia linearis* or *levis*
	Eupomatia laurina
Grasses	*Jacksonia scoparia*
Imperata cylindrica	*Acacia brownei*
Themeda australia	*Acacia myrtifolia*
	Acacia suaveolens
Cycad and Grass trees	*Baeckea imbricata*
Macrozamia communis	*Callistemon rigidus*
Xanthorrhoea media	*Leptospermum attenuatum*
	Leptospermum laevigatum
	Melaleuca hypericifolia
	Melaleuca thymifolia
	Tristanioptus laurina
	Exocarpos cupressiformus

11 Expertise of authors

Geraldene Dalby-Ball

DIRECTOR With over 25 years wetland and urban ecology experience, a great passion for what she does, and extensive technical and on-ground knowledge make Geraldene a valuable contribution to any project.

Geraldene has over 8 years local government experience as manager of environment and education for Pittwater Council. Geraldene presented papers on the topic at the NSW Coastal Conference, Sydney CMA and Hawkesbury Nepean forums. Geraldene is a Technical Advisor Sydney Olympic Park Wetland Education and Training (WET) panel.

Geraldene has up to date knowledge of environmental policies and frequently provides input to such works. Geraldene was a key contributor to the recent set of Guidelines commissioned by South East Queensland Healthy Waterways Water Sensitive Urban Design Guidelines. Geraldene's role included significant contributions and review of the Guideline for Maintaining WSUD Assets and the Guideline for Rectifying WSUD Assets.

Geraldene is a frequent contributor to many community and professional workshops on ecological matters particularly relating to environmental management. She is an excellent Project Manager.

Geraldene is a joint author on the popular book Burnum Burnum's Wildthings published by Sainty and Associates. Author of the Saltmarsh Restoration Chapter Estuary Plants of East Coast Australia published by Sainty and Associates (2013). Geraldene's early work included 5 years with Wetland Expert

SPECIALISATIONS

- Urban Ecology – and habitat rehabilitation and re-creation.
- Urban waterway management – assessing, designing and supervising rehabilitation works
- Saltmarsh and Wetland re-creation and restoration – assessment, design and monitoring
- Engaging others in the area of environmental care and connection
- Technical Advisor – environmental design, guidelines and policies
- Sound knowledge and practical application of experimental design and statistics
- Project management and supervision
- Grant writing and grant assessment
- Budget estimates and tender selection
- Expert witness in the Land and Environment Court

CAREER SUMMARY

- **Director and Ecologist**, Ecological Consultants Australia. 2014-*present*
- **Director and Ecologist**, Dragonfly Environmental. 1998-*present*
- **Manager** Natural Resources and Education, Pittwater Council 2002-2010
- **Wetland Ecologist** Sainty and Associates 1995-2002

QUALIFICATIONS AND MEMBERSHIPS

- **Bachelor of Science with 1st Class Honors**, Sydney University
- WorkCover WHS General Induction of Construction Industry NSW White Card.
- Senior First Aid Certificate.
- **Practicing member and vice president** Ecological Consultants Association of NSW
- **Accredited Biobank Assessor**

Jack Hastings

ECOLOGIST

Jack is a passionate ecologist who has demonstrated technical knowledge and the ability to provide specialist ecological advice across a variety of projects, in both the private and public sector. He is responsible for providing practical ecological interpretation, research and advice to a diverse range of clients. These attributes would make Jack a valued partner to any project.

Growing up in Northern NSW, Jack developed a keen interest in the natural environment. This passion lead Jack to graduate with a Bachelor of Environmental Science (SCU) in 2018.

As an undergraduate student, he published a study that examined the cost of revegetation across the Richmond River Catchment in NSW. This study provided Jack with a deep understanding of urban and landscape ecology and the environmental factors associated with habitat restoration.

Diverse industry experience has enabled Jack to deliver a range of ecological reports and management plans. He also has considerable knowledge in applying the Biodiversity Assessment Method (BAM). He has completed a range of significant projects, working as the project ecologist on local developments through to state significant infrastructure.

As a result, Jack has valuable on-ground experience to complement his wide-ranging knowledge regarding state and federal legislation.

Jack would be a valuable addition to any project as he is committed to achieving the best possible outcome for both the client and the environment.

SPECIALISATIONS

- Reporting –
- Biodiversity Assessment Reports (BDAR), Ecological Assessments, REFs, CEMP, PoM, VMP, Flora & Fauna, Certification Certificates.
- Providing specialist ecological advice across a variety of projects, private and public sector, to identify environmental constraints and opportunities.
- Demonstrated project management skills in relation to leading small teams to achieve milestones within project budget and time frames.
- Demonstrated capacity to coordinate and undertake field work – including: vegetation surveys, species monitoring, fauna survey.
- Mapping and geographic information system (GIS) skills using QGIS Mapping Software.
- High level communication and interpersonal skills to engage effectively with organisations in the public or private sector.
- Botanical skills including the identification of native and introduced flora and vegetation structural class and community types.
- Educating and engaging with the public about ecology, environmental issues and conservation biology.

CAREER SUMMARY

- **Ecologist**, Ecological Consultants Australia, *2019-present.*
- **Environmental Consultant**, BBN Consulting. *2018-2019.*

QUALIFICATIONS AND MEMBERSHIPS

- Bachelor of Environmental Science, Southern Cross University (2018).
- Practicing member - Ecological Consultants Association of NSW.
- Certificate II Agriculture.
- WHS General Induction of Construction Industry NSW White Card