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Flora and Fauna Assessment

Lot 1 // DP 1132852, 18-20 Sturdee Lane, Lovett Bay, NSW 2105

Proposed wastewater treatment system

Prepared for: James de Soyres & Associates Pty Ltd

5 June 2019

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Glossary and abbreviations

Acronym	Description
AWTS	Aerated Wastewater Treatment System
BC Act	NSW *Biodiversity Conservation Act 2016*
DotE	Commonwealth Department of the Environment (now DotEE)
DotEE	Commonwealth Department of the Environment and Energy
EEC	Endangered Ecological Community
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FFA	Flora and Fauna Assessment
ha	Hectares
HBT	Hollow Bearing Tree
LGA	Local Government Area
mm/cm/m/km	millimetres/centimetres/metres/kilometres
MNES	Matters of National Environmental Significance
PCT	Plant Community Type
PLEP	Pittwater Local Environmental Plan 2014
TEC	Threatened Ecological Community, listed as vulnerable, endangered or critically endangered under either the BC Act and/or EPBC Act
WoNS	Weeds of National Significance

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1. Introduction

1.1 Purpose of report and legislative context

This Flora and Fauna Assessment (FFA) has been undertaken for the proposed installation of an Aerated Wastewater Treatment System (AWTS) at Lot 1 // DP 1132852 (18-20 Sturdee Lane, Lovett Bay, NSW). The purpose of this report is to identify and assess the flora and fauna within the study area, the potential ecological values and constraints that may affect the proposed development and the likely impacts of the proposed development. This report addresses the legislative context provided in (**Table 1.1**) and the proposal is to be assessed under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Table 1.1: Legislative framework addressed in this report.

Instrument	Considerations	Context
Commonwealth		
Environment Protection and Biodiversity Conservation (EPBC) Act 1999	Matters of National Environmental Significance	An action will require approval from the Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance.
State (New South Wales)		
Biosecurity Act 2015	Priority weeds	Describes the state and regional priorities for weeds in New South Wales.
Environmental Planning and Assessment Act 1979 (EP&A Act)	Part 4	Includes the planning framework for this proposed development.
Biodiversity Conservation Act 2016 (BC Act)	Part 7.3	Assessment of the potential for an action or activity to have a significant effect on threatened species, populations or ecological communities, or their habitats.
Local		
Pittwater Local Environmental Plan (PLEP) 2014	Clause 7.6: Biodiversity	The objective of this clause is to protect, maintain and improve the diversity and condition of native vegetation and habitat.

1.2 Site description

1.2.1 Subject site and study area

Following the *Threatened Species Test of Significance Guidelines* (OEH 2018a) the ***subject site*** is defined as the area 'directly impacted upon by the proposal'. The ***study area*** is defined as the subject site and all areas that are indirectly impacted upon by the proposal. For the purposes of this report the study area consists of Lot 1 // DP 1132852 (18-20 Sturdee Lane, Lovett Bay, NSW) (**Figure 1.1**). The subject site is situated within the study area and includes all areas that will be impacted by the excavator track and effluent disposal areas.

The study area comprises 0.26 hectares (ha) of land, is situated in The Northern Beaches Local Government Area (LGA) and is currently zoned under the Pittwater Local Environmental Plan (PLEP) 2014 as E3 – Environmental Management. The study area comprises native vegetation in an intact condition class, existing infrastructure and planted vegetation surrounding the existing dwelling. The native vegetation in the study area contains established canopy trees, with a shrubby midstorey and groundlayer of native grasses and forbs. The northern portion of the study area mostly consists of planted vegetation and has been subject to vegetation clearing and other disturbances.

1.2.2 Locality

The locality is described as the area within 5 km of the study area (**Figure 1.2**). Land near the study area is zoned under the PLEP (2014) as RE-1 – Public Recreation, E2 – Environmental Conservation and E3 – Environmental Management. The study area is connected to Ku-ring-gai Chase National Park to the west. A large portion of the locality to the north, east and south consists of open water. Westhead Lookout is situated approximately 7 km to the north of the study area and Church Point is situated approximately 1 km to the south east.

1.3 Description of the proposed development

The proposed development is to demolish the existing sewerage collection tank adjacent to the cabin and replace it with an AWTS tank in the north of Lot 1 // DP 1132852 (**Figure 1.3** and **Figure 1.4**). The AWTS would be transported and fitted into its proposed location by a 2.5 tonne excavator, which would access the site via Sturdee Lane.

Two effluent disposal areas will be established in the study area, one in the northern portion of the site (Area 1) and the other in the southern portion of the site (Area 2). A 25 mm diameter HDPE effluent transfer pipe will run around the perimeter of the two effluent disposal areas. The effluent disposal area is to be constructed as a surface drip irrigation system, consisting of pressure compensating dripline (Netafim 13 mm or equivalent) laid on top of and connected to the ground and covered with leaf litter.

Figure 1.1: Study area and subject site.

Figure 1.2: Showing areas of native vegetation in the locality (OEH 2016).

Figure 1.3: Proposed effluent disposal area and excavator track.

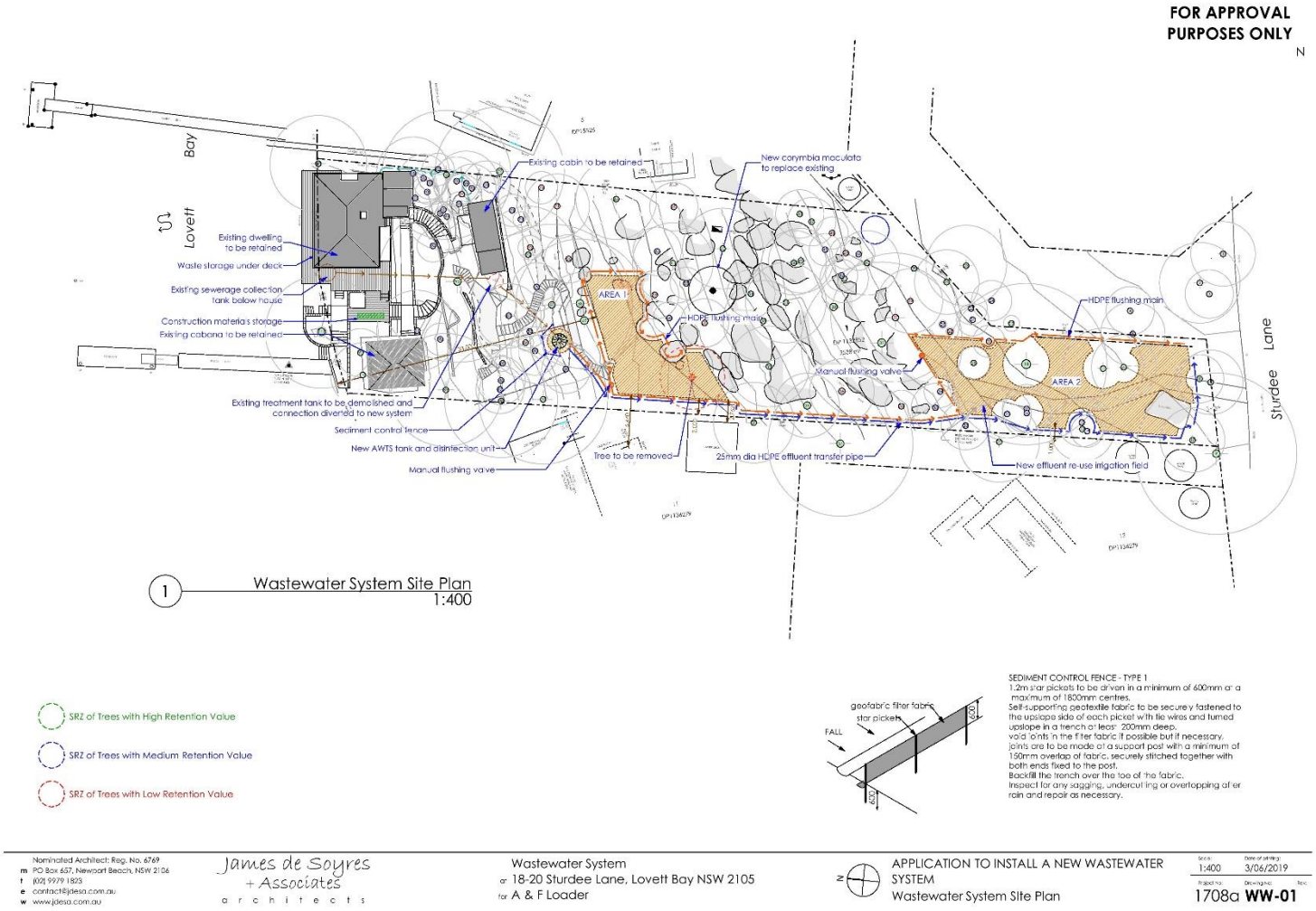

Figure 1.4: Wastewater System Site Plan.

2. Methods

2.1 Literature and database review

A site specific literature and database review was undertaken prior to undertaking field survey and the preparation of this report. This included desktop analysis of aerial photography and regional scale information from the following sources:

- NSW Planning Viewer (NSW Dept. of Planning and Environment 2019)
- BioNet Atlas of NSW Wildlife (NSW Office of Environment and Heritage 2019)
- Protected Matters Search Tool (Commonwealth Department of Environment and Energy 2019)
- SIX Maps (LPI 2019)
- The Native Vegetation of the Sydney Metropolitan Area (OEH 2016)

Policies and guidelines relating to the proposal:

- Threatened Species Test of Significance Guidelines (OEH 2018a)

Threatened species, populations and migratory species recorded within 5 km of the study area in a search of the Atlas of NSW Wildlife (OEH 2019) were consolidated and their likelihood of occurrence was assessed by:

- review of location and date of recent (<5 years) and historical (>5-20 years) records
- review of available habitat within the study area and surrounding areas
- review of the scientific literature pertaining to each species and population
- applying expert knowledge of each species

The potential for threatened species, populations and/or migratory species to occur was then considered and the necessity for targeted field surveys was determined. Following field survey and review of available habitat within the study area, the potential for species to utilise the site and to be affected directly or indirectly by the proposal were considered as either:

- “Recent record” = species has been recorded in the study area within the past 5 years
- “High” = species has previously been recorded in the study area (>5 years ago) or in proximity to (for mobile species), and/or habitat is present that is likely to be used by a local population
- “Moderate” = suitable habitat for a species is present onsite but no evidence of a species detected and relatively high number of recent records (5-20 years) in the locality or species is highly mobile
- “Low” = suitable habitat for a species is present onsite but limited or highly degraded, no evidence of a species detected and relatively low number of recent records in the locality
- “Not present” – suitable habitat for the species is not present onsite or adequate survey has determined species does not occur in the study area

2.2 Field survey

A field survey was undertaken on 11 April 2019 by Elizabeth Norris (Senior Botanist/Ecologist) and Thomas Hickman (Ecologist). The field survey included a general flora and fauna habitat and vegetation community assessment. Weather conditions on the day were cool and overcast with light showers in the morning (**Table 2.1**).

Table 2.1: Daily weather observation at Terrey Hills AWS (9 km south west of the study area).

Date	Temp (˚C)		Rainfall (mm)	Max wind	
	Min	Max		Direction	Speed (km/h)
11/04/19	10.9	19.3	0.8	SW	19

2.2.1 Vegetation communities and flora

Field survey involved traversing the study area, whilst recording all visible flora species and identifying potential habitat for threatened flora species. Areas of intact, resilient vegetation were surveyed more extensively than degraded areas of the site. Nomenclature follows the Flora of NSW (Harden 1990-2002) and updates provided in PlantNET (RBGDT 2019).

Field survey was undertaken to validate local vegetation mapping of OEH (2016) to prescribe a Plant Community Type (PCT). Vegetation communities were checked against described Threatened Ecological Communities (TEC) listed under either the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or the NSW *Biodiversity Conservation Act 2016* (BC Act).

2.2.2 Fauna and fauna habitat

Opportunistic fauna survey was undertaken for birds, amphibians, reptiles and mammals, which included opportunistic observations along with searches for signs of direct and indirect occupancy (i.e. scats, owl pellets, fur, bones, tracks, bark scratches, foliage chew marks and chewed cones of *Allocasuarina* spp. or *Pinus* spp. as well as some of the other cultivars known to be used by native fauna).

Fauna habitat searches were conducted for potential foraging, roosting, breeding or nesting habitat of nocturnal and diurnal species. This includes inspection for the presence of tree hollows, stags, bird nests, possum dreys, decorticating bark, rock shelters, rock outcrops/crevices, mature / old growth trees, food trees (*Banksia* spp., *Allocasuarina* spp., and winter-flowering eucalypts), culverts, dens, dams, riparian areas and refuge habitats of man-made structures.

Primary sources of literature accessed for species nomenclature were:

- Birds - Christidis and Boles (2008)
- Mammals - Van Dyck and Strahan (2008)
- Reptiles and amphibians - Cogger (2014)

2.2.3 Survey limitations

The flora survey aimed to record as many species as possible. However, a definitive list of the flora within the study area cannot be gathered without systematic traverses and survey

across a number of seasons. Additional species would be recorded during a longer survey over various seasons. However, the techniques used in this investigation are considered adequate to gather the data necessary to validate the vegetation communities and vegetation condition in the study area and assess the likelihood of occurrence of any threatened flora species.

A full fauna survey following *Threatened Species Survey and Assessment Guidelines* (OEH 2018b) was not undertaken as sufficient detail to determine the likelihood of occurrence of threatened and migratory species for the purpose of this report was achieved through a small amount of targeted survey and a habitat assessment during the field survey.

3. Results

3.1 Literature and database review

3.1.1 Topography, drainage, soils and biodiversity layer

There are no mapped watercourses in the study area. The study area is sloped to the north and becomes steeper in the central and northern portions of the site. The southern portion of the site is relatively flat, although remains slightly inclined to the north.

Regional scale soil landscape mapping (Chapman et al. 2009) maps the entirety of the study area within the Watagan (1930wn) soil landscape (**Figure 3.1**). Soils of the Watagan soil landscape are formed from the Narrabeen Group and are comprised of interbedded laminite and shale with quartz to lithic quartz sandstone. The Watagan soil landscape occurs north of Collaroy, on steep sideslopes of the Erina Hills. It is associated with coastal headlands and bluffs along the Hawkesbury River and its lower tributaries

The whole of Lot 1 // DP 1132852 is mapped as 'Biodiversity' on the Biodiversity Map under the PLEP (2014) (Error! Reference source not found.). As such, appropriate considerations have b een made to address Clause 7.6 (Biodiversity) of the PLEP (2014).

3.1.2 Threatened species, populations and migratory species

A search of relevant databases and literature identified a potential 59 threatened or migratory species with 5 km of the study area including twelve threatened flora species and 47 threatened or migratory fauna species (three frogs, 29 birds, seven microbats, one megabat, four arboreal/semi-arboreal mammals, two terrestrial mammals and one reptile) species with 5 km of the study area (**Figure 3.2**).

The likelihood of occurrence analysis undertaken prior to the field survey reduced the primary list to 25 threatened species that have a 'moderate' or 'high' likelihood to use the study area, and thus may be impacted by the proposed works. Field survey further reduced this list to 10 species (see **Appendix A**), including:

- Threatened birds
  - *Calyptorhynchus lathami* (Glossy Black-Cockatoo) (recent record)
  - *Glossopsitta pusilla* (Little Lorikeet) (moderate)
- Threatened microbats
  - *Miniopterus australis* (Little Bentwing-bat) (moderate)
  - *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat) (moderate)
  - *Mormopterus norfolkensis* (Eastern Freetail-bat) (moderate)
  - *Myotis macropus* (Southern Myotis) (moderate)
  - *Scoteanax rueppellii* (Greater Broad-nosed Bat) (moderate)
- Threatened megabats
  - *Pteropus poliocephalus* (Grey-headed Flying-fox) (high)
- Threatened mammals
  - *Isoodon obesulus obesulus* (Southern Brown Bandicoot -eastern) (moderate)
  - *Pseudomys novaehollandiae* (New Holland Mouse) (moderate)

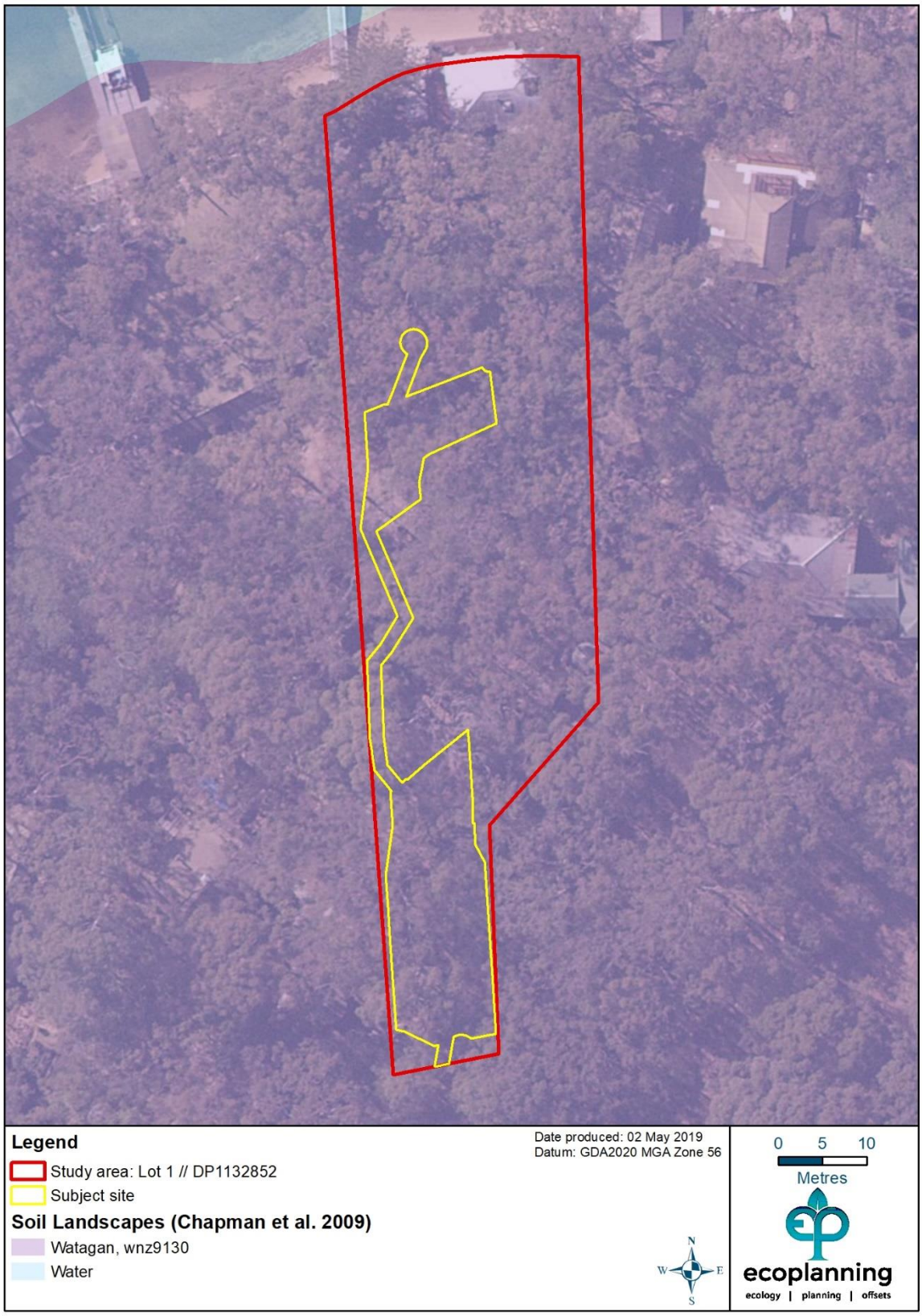

Figure 3.1: Soil landscapes in the study area (Chapman et al. 2009).

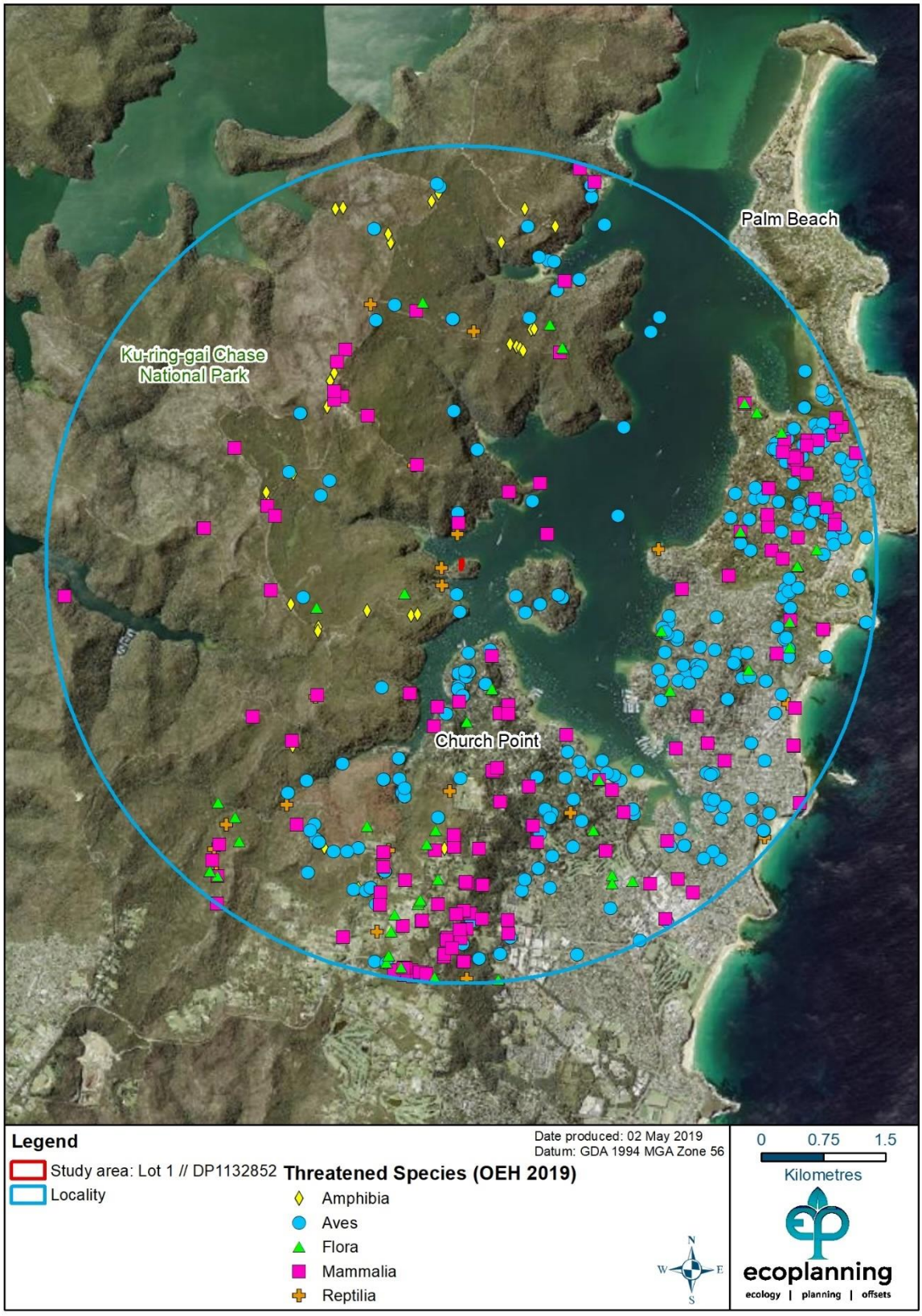

Figure 3.2: Threatened species records (OEH 2019).

3.1.3 State Environmental Planning Policy No.44 (SEPP 44) – Koala Habitat Protection

State Environmental Planning Policy (SEPP) applies to land that is listed in Schedule 1 of SEPP 44, and that has:

(i) Has an area of more than 1 ha, or
(ii) Has, together with any adjoining land in the same ownership, an area of more than 1 ha, whether or not the development application applies to the whole, or only part, of the land.

The study area is in the Northern Beaches LGA which was formed following the amalgamation of Manly, Warringah and Pittwater LGA. The study area was formerly in the Pittwater LGA, which is listed in Schedule 1 of SEPP 44 and is >1 ha, hence the SEPP 44 applies to the study area.

To determine if a development consent can be granted using SEPP 44, a two-step assessment is required:

- *Step 1: Is the land potential koala habitat (where potential koala habitat means areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component)?*

  The dominant canopy species in the study area was *Corymbia maculata* (Spotted Gum). *Corymbia gummifera* (Red Bloodwood), *Eucalyptus paniculata* (Grey Ironbark) and *Eucalyptus umbra* (Broad-leaved White Mahogany) also occurred sporadically within the vegetation community. None of these species are listed as feed trees under Schedule 2 of the SEPP 44, therefore, the study area does not constitute potential Koala habitat.

- *Step 2: Is the land core koala habitat (where core koala habitat means an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population)?*

  The study area does not constitute potential Koala habitat or support a known population of the Koala. Therefore, the site does not to constitute core Koala habitat.

3.1.4 Vegetation and threatened ecological communities

Desktop assessment identified one vegetation community in the study area, namely Pittwater Spotted Gum Forest (S_WSF11) (**Figure 3.3**). This community is equivalent to '*Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion*', an Endangered Ecological Community (EEC) listed under the BC Act. The community is not listed under the EPBC Act.

3.2 Field survey

3.2.1 Native vegetation communities

Field assessment determined the native vegetation in the study area was consistent with '*Spotted Gum - Grey Ironbark open forest in the Pittwater and Wagstaffe area, Sydney Basin Bioregion*' (PCT 1214) (**Figure 3.4**). This community occurred across the full extent of the study area as an open-forest dominated by *Corymbia maculata*. Additional canopy species, including *Corymbia gummifera*, *Eucalyptus umbra* and *Eucalyptus paniculata* also occurred sporadically

within the vegetation community. The PCT contained an understorey of dry sclerophyll shrubs and small trees, with occasional mesic shrub species, including *Allocasuarina torulosa*, *Elaeocarpus reticulatus*, *Melicytus dentatus* (Tree Violet), *Glochidion ferdinandi* (Cheese Tree), *Livistona australis* (Cabbage Fan Palm), *Pittosporum undulatum* (Native Daphne), *Pittosporum multiflorum* (Orange Thorn) and *Podolobium ilicifolium* (Prickly Shaggy Pea).

The groundlayer was dominated by native grasses, forbs and scramblers including *Cissus hypoglauca* (Water Vine), *Cymbopogon refractus* (Barbed Wire Grass), *Dianella caerulea* var. *producta*, *Dichondra repens* (Kidney Weed), *Entolasia stricta* (Wiry Panic), *Eustrephus latifolius* (Wombat Berry), *Geitonoplesium cymosum* (Scrambling Lily), *Hydrocotyle sibthorpioides*, *Imperata cylindrica* (Blady Grass), *Lomandra longifolia*, *Microlaena stipoides* (Weeping Grass), *Pomax umbellata*, *Pteridium esculentum* (Common Bracken), *Lobelia purpurascens* (Whiteroot), *Oplismenus aemulus* (Australian Basket Grass) and *Themeda triandra*. The groundlayer had a reasonably high cover of native species.

The study area contained two vegetation classes (condition classes) of Spotted Gum - Grey Ironbark open forest; 'intact' (**Figure 3.5**) and 'planted' (**Figure 3.6**). The northern boundary of the 'intact' vegetation has been subject to minor-moderate disturbance, hence had a reasonable cover of exotic grasses and herbaceous weeds, including *Asparagus aethiopicus** (Ground Asparagus), *Chlorophytum comosum** (Spider Plant), *Ehrharta erecta** (Panic Veldtgrass) and *Solanum nigrum** (Black-berry Nightshade). Evidence of past vegetation thinning along the western perimeter of the study area in the 'intact' vegetation was observed during the field assessment. However, this area was generally undisturbed and appeared to have good resilience.

Exotic species, such as *Asparagus aethiopicus**, *Lantana camara** (Lantana), *Ochna serrulata** (Mikey Mouse Plant) and *Senna pendula* var. *glabrata** were sporadically situated across the study area with low abundance and cover. The Spotted Gum - Grey Ironbark open forest in a 'planted' condition had been heavily modified and had an understorey and groundlayer dominated by planted and self-recruited 'exotic/non-indigenous' species. Occasional canopy and midstorey species were situated in the vegetation zone, including *Corymbia maculata* and *Pittosporum undulatum*.

3.2.2 Other vegetation

Cleared land/infrastructure

This consisted of cleared land and infrastructure associated with the existing residential dwelling (**Figure 3.7**).

Planted

Planted vegetation occurred in and around the existing residential dwelling in the north of the study area (**Figure 3.8**).

3.2.3 Flora species

A total of 69 flora species were identified in the study area during the field survey, of which 55 were native and 14 were exotic (**Appendix B**). Two weeds listed under the NSW *Biosecurity Act 2015* in accordance with priority weeds for the Greater Sydney Region were recorded in the study area, both of which are Weeds of National Significance (WoNS) (Error! Reference source n ot found.).

Table 3.1: Priority weeds and Weeds of National Significance.

Common name	Scientific name	WoNS	Duty
Ground Asparagus	*Asparagus aethiopicus*	Y	**Prohibition on dealings** *Must not be imported into the State or sold*
Lantana	*Lantana camara*	Y	

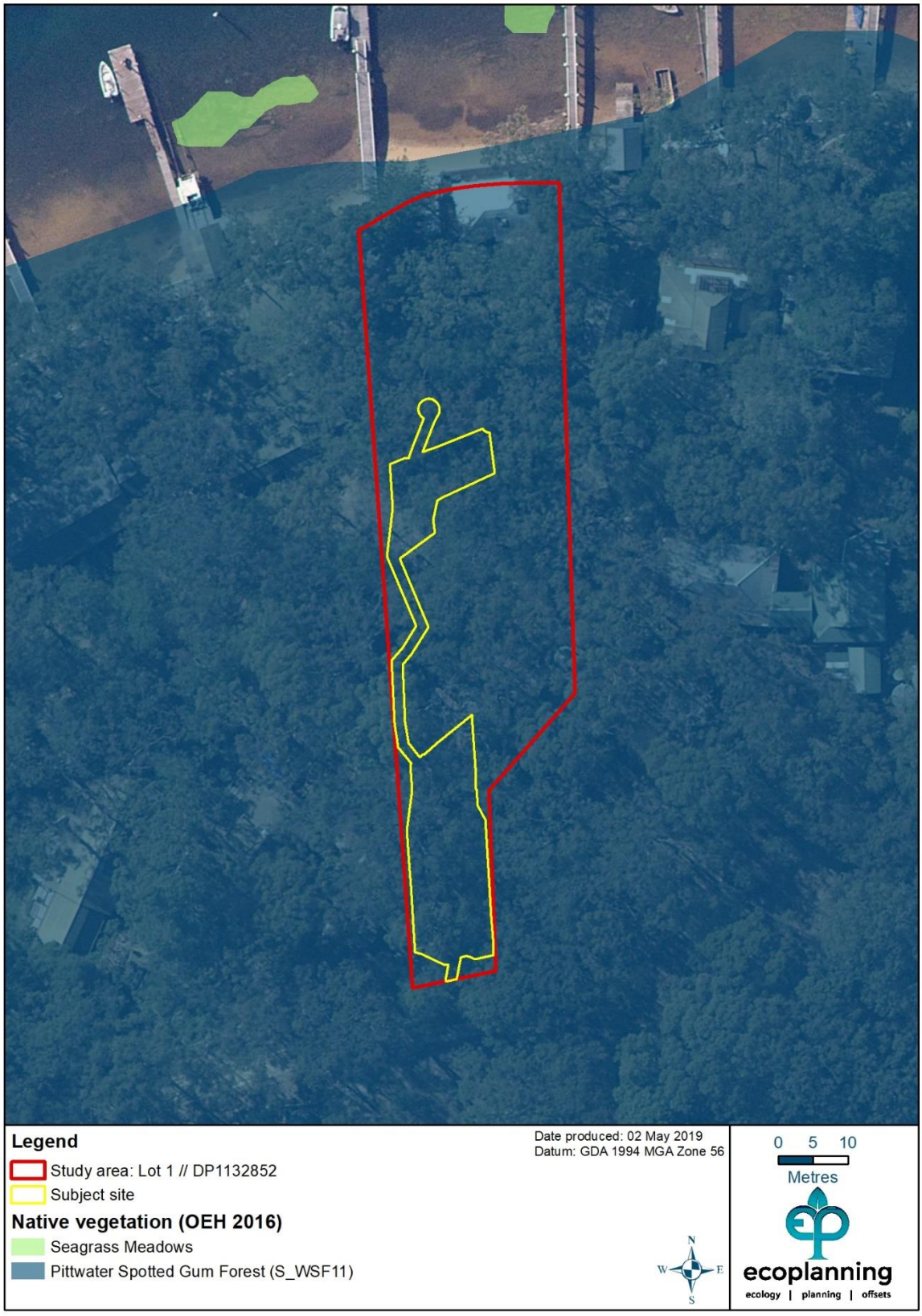

Figure 3.3: Regional vegetation mapping of the study area (OEH 2016).

Figure 3.4: Field validated vegetation in the study area and survey results (Ecoplanning 2019).

Figure 3.5: Spotted Gum - Grey Ironbark open forest 'intact'.

Figure 3.6: Spotted Gum - Grey Ironbark open forest 'planted'.

Figure 3.7: Cleared land/infrastructure.

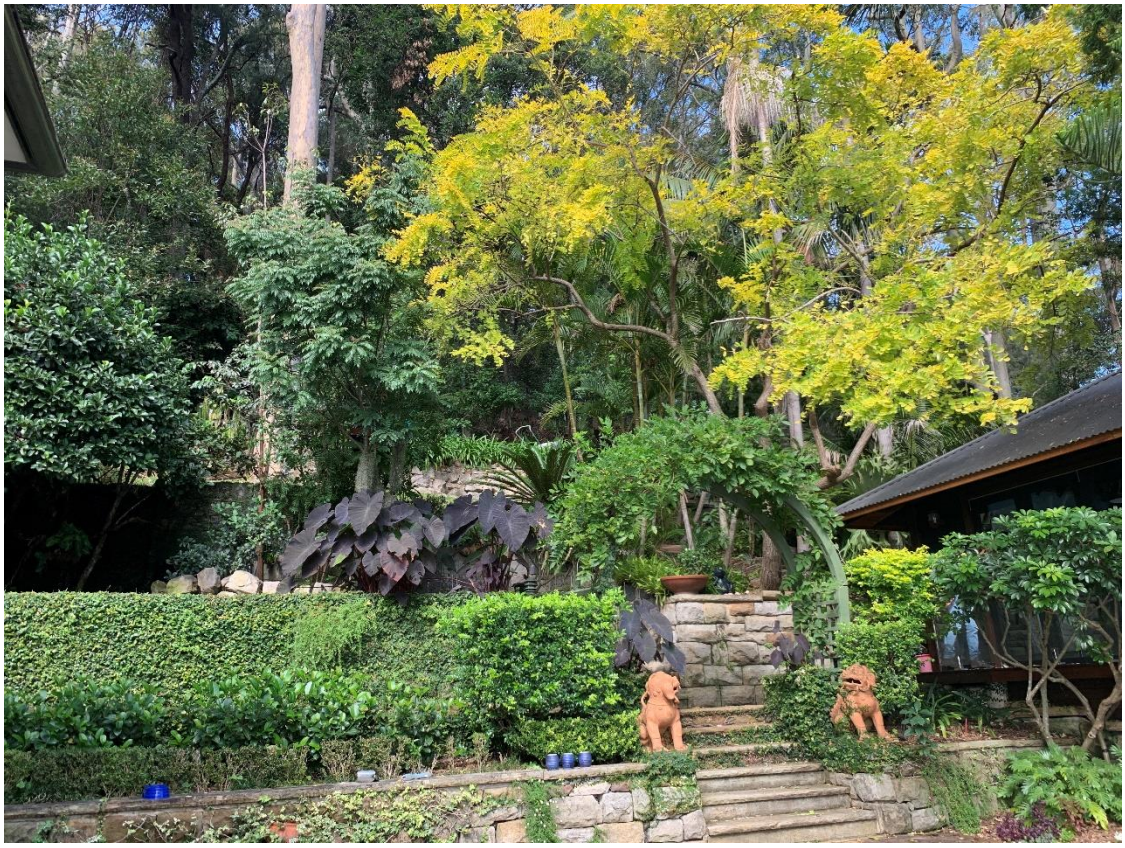

Figure 3.8: Planted vegetation in the north of the study area.

3.2.4 Fauna habitat

Habitat within the study area provided potential foraging, roosting, breeding and nesting resources for native fauna. Five hollow bearing trees (HBTs) were identified in the study area, most of which were located in large over-mature canopy trees. An additional four stag trees were identified in the study area, none of which were hollow bearing. The HBTs in the study area were unlikely to be large enough to be used by the Powerful Owl for nesting. Powerful Owl nest in old eucalypts with hollows >45 cm in diameter and >100 cm deep (DEC 2006a). There is also a low likelihood that other threatened owl species recorded within 5 km of the study area, such as the Barking Owl and the Masked Owl, nest in the study area.

The HBTs in the study area provided potential foraging, roosting and breeding habitat for threatened microbat species. The connectivity of the vegetation in the study area to Ku-ring-gai Chase National Park to the west of the study area also substantially increased the likelihood of threatened mammal species to frequent the study area. The native vegetation in the study area provided foraging habitat and refugia for non-threatened birds, reptiles and mammals and for species that rely on large areas for food resources, such as microbats and the Grey-headed Flying-fox. Habitat features relevant to each fauna group with potential to occur are identified in **Table 3.2**.

Table 3.2: Key fauna habitat features present across the study area.

Habitat features	Fauna species
Wet sclerophyll forest	Diurnal and nocturnal birds, arboreal mammals, microchiropteran bats, reptiles and frogs (**Figure 3.9**)
Hollow bearing trees	Arboreal mammals, birds, microchiropteran bats, reptiles and frogs
Stag trees	Arboreal mammals, birds, microchiropteran bats, reptiles and frogs (**Figure 3.10**)

3.2.5 Fauna species

The field survey undertaken for this report recorded a total of 11 fauna species, including nine birds, one mammal and one reptile species (**Appendix C**). One vulnerable species listed under the BC Act, the Glossy Black-Cockatoo was heard calling from vegetation adjoining the study area on 11 April 2019.

Figure 3.9: Wet sclerophyll forest providing foraging, perching and roosting habitat.

Figure 3.10: Hollow bearing tree in the study area.

4. Impact Assessment

This section outlines the anticipated direct and indirect impacts of the development on the ecological values of the study area.

4.1 Direct impacts

4.1.1 Vegetation clearing

A total of 0.05 ha of Spotted Gum – Grey Gum Ironbark open forest in an 'intact' condition would be impacted by the proposal (**Figure 4.1**). This includes an area of approximately 0.01 ha to facilitate a 1.5 m wide access track for the excavator to allow access for the installation of the AWTS. The remaining 0.04 ha of impacts to Spotted Gum – Grey Gum Ironbark open forests will occur within the proposed effluent disposal areas. The effluent disposal areas represent a partial impact and will not require the removal of any native vegetation. One canopy tree (Tree 53), *Corymbia maculata*, representative of Spotted Gum – Grey Ironbark open forest is required for removal (Bluegum Tree Care and Consulting 2019). The tree proposed for removal is largely situated within the effluent disposal impact footprint. The vegetation type and condition class requiring removal to facilitate the installation of the AWTS is displayed in **Table 4.1**.

Table 4.1: Direct impacts of the proposed effluent disposal areas and excavator track.

Plant Community Type	Vegetation zone (condition class)	BC Act	EPBC Act	Study Area (ha)	Development footprint (ha)*
Spotted Gum – Grey Ironbark open forests	Intact	Y	N	0.18	0.05
	Planted			0.06	0
			Total native vegetation	***0.24***	***0.05***
Other	Cleared land/infrastructure	-	-	0.01	0
	Plantings	-	-	0.01	0
			Total	***0.26***	***0***

Figure 4.1: Development footprint – proposed effluent disposal areas and excavator track over mapped vegetation.

4.1.2 Loss of fauna habitat

The proposal would require the removal of one canopy tree. All HBTs and stag trees in the study area will be retained. The 0.05 ha of impacts to Spotted Gum – Grey Gum Ironbark open forest does not constitute a loss of fauna habitat, as all vegetation will be retained within the effluent disposal areas and temporary access track for the excavator.

4.2 Indirect impacts

It is difficult to quantify indirect impacts of the proposed development, but these may include impacts such as erosion and water quality impacts that may be associated with the construction phase of the project. It is considered unlikely that the effluent disposal areas will have an indirect impact on the surrounding vegetation. However, there remains a possibility of increased availability will facilitate the growth of exotic species, which could subsequently spread into surrounding areas of intact vegetation. The management of exotic species onsite is discussed in the Ecological Sustainability Plan – Report (see **Appendix E**).

4.3 Avoidance and mitigation

4.3.1 Vegetation clearing

A total of 0.19 ha (i.e. 79.17%) of the 0.24 ha of Spotted Gum – Grey Gum Ironbark open forest in the study area has been avoided. Where impacts would occur, they are considered to be minimal and are limited to partial impacts, with the exception for the removal of one canopy tree (Tree 53). The effluent disposal areas and the location of the access track for the excavator have been positioned within a portion of the study area containing slightly more disturbed vegetation.

Impacts associated with the temporary access tracks for the excavator would be mitigated by traversing across the boulders and laying down planks on soft ground. This will reduce soil disturbances and limit the potential for the native groundlayer species to be squashed and uprooted. Where possible, the proposed excavator access track has been positioned in more disturbed areas of the site and has avoided areas of established midstorey vegetation.

4.4 Legislative context

4.4.1 Commonwealth listings

The significance of the impact that the proposal would have on Commonwealth listed threatened flora/fauna and migratory species assessed as having a ‘moderate’ or ‘high’ likelihood of occurring (**Appendix A**) was considered by applying the Significant Impact Criteria (**Appendix B**). The species assessed are:

- Threatened species
  - *Isoodon obesulus obesulus* (Southern Brown Bandicoot - eastern) - endangered
  - *Pseudomys novaehollandiae* (New Holland Mouse) – vulnerable
  - *Pteropus poliocephalus* (Grey-headed Flying-fox) – vulnerable

Assessment of the threatened species against the relevant components of the Significant Impact Guidelines Commonwealth Department of the Environment (DotE) (2013) concluded that a referral is not required.

4.4.2 State listings

BC Act

The significance of the impact of the proposal on state listed threatened species, populations and ecological communities was considered by applying the Test of Significance. The following threatened species and ecological communities listed under the BC Act may be impacted by the proposal:

- Ecological communities
  - Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion - endangered
- Threatened species
  - *Calyptorhynchus lathami* (Glossy Black-Cockatoo) – vulnerable
  - *Glossopsitta pusilla* (Little Lorikeet) – vulnerable
  - *Isoodon obesulus obesulus* (Southern Brown Bandicoot -eastern) - endangered
  - *Miniopterus australis* (Little Bentwing-bat) - vulnerable
  - *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat) - vulnerable
  - *Mormopterus norfolkensis* (Eastern Freetail-bat) - vulnerable
  - *Myotis macropus* (Southern Myotis) - vulnerable
  - *Pteropus poliocephalus* (Grey-headed Flying-fox) - vulnerable
  - *Scoteanax rueppellii* (Greater Broad-nosed Bat) - vulnerable

Impact assessment in accordance with Part 7.3 of the BC Act (i.e. the 'Test of Significance') and the associated guidelines (OEH 2017) have been undertaken. These assessments found that subject to the avoidance and mitigation measures outlined in **Section 4.3**, there is unlikely to be any significant impacts to the above-listed threatened species.

4.4.3 Pittwater LEP considerations

The study area is mapped as 'Biodiversity' on the Biodiversity Map under the PLEP (2014) and therefore, the consent authority must consider the following matters under Clause 7.6.

Clause 7.6

Before determining a development application for development on land to which this clause applies, the consent authority must consider:

(a) whether the development is likely to have:

- any adverse impact on the condition, ecological value and significance of the fauna and flora on the land, and

The proposal would result in the modification of 0.05 ha of Spotted Gum - Grey Ironbark open forest in an 'intact' condition to accommodate the temporary access track for the excavator (0.01 ha) and the installation of two effluent disposal areas (0.04 ha). All of the canopy trees in the study area will be retained, with exception for one individual (Tree 53). It is unlikely that the proposal would have an adverse impact on the condition, ecological value and significance of the fauna and flora in the study area, given the small amount of impact proposed, most of which

would have minimal impact on the vegetation in the study area (i.e. the effluent disposal areas), or would only be impacted by the initial disturbance along the proposed track for the excavator.

- any adverse impact on the importance of the vegetation on the land to the habitat and survival of native fauna, and

The proposal would result in the removal of one canopy tree, which is not a HBT. The 0.05 ha of vegetation proposed for modification would not result in the removal of vegetation, rather constitutes a minor impact associated with the effluent disposal area and the use of the temporary access track for the excavator. As such, the proposal is unlikely to have an adverse impact on the importance of the vegetation and its use as habitat by native fauna.

- any potential to fragment, disturb or diminish the biodiversity structure, function and composition of the land, and

The proposal would not result in the fragmentation of the land. Only one canopy tree is proposed for removal and the vegetation that would be modified by the temporary access track and effluent disposal area would not further fragment or isolate the habitat in the study area from adjoining areas of habitat. The proposal would result in the modification of 0.05 ha of Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal areas. The temporary access track would not result in the complete loss of vegetation and would be ameliorated following the installation of the AWTS. The effluent disposal areas is unlikely to diminish the biodiversity structure, function and composition of the land.

- any adverse impact on the habitat elements providing connectivity on the land, and

The proposal would only require the removal of one canopy tree within the study area. The remaining impacts would not result in the removal of vegetation, or have an adverse impact on the habitat elements providing connectivity within the 0.05 ha of land.

(b) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.

The proposal has largely avoided impacts to Spotted Gum - Grey Ironbark open forest in the study area. Where impacts are proposed they are limited to relatively minor impacts, which constitute either temporary impacts in the instance of the proposed excavator track, or would not require the removal of any vegetation, in the instance of the effluent disposal area. Impacts associated with the temporary access tracks for the excavator would be mitigated by traversing across the boulders and laying down planks on soft ground. This will reduce soil disturbances and limit the potential for the squashing and uprooting of native groundlayer species to occur. Only one canopy tree is proposed for removal and all HBTs have been retained within the study area. A total of 0.19 ha of the 0.24 ha of Spotted Gum – Grey Gum Ironbark open forest in the study area has been avoided, which constitutes approximately 79.17 % of the community in the study area.

5. Conclusion and recommendations

Two effluent disposal areas will be established in the study area, one in the northern portion of the site (Area 1) and the other in the southern portion of the site (Area 2). The AWTS would be transported and fitted into its proposed location by a 2.5 tonne excavator, which would access the site via Sturdee Lane. The proposal would require the modification of approximately 0.05 ha of Spotted Gum - Grey Ironbark open forest in an 'intact' condition to accommodate the temporary access track for the excavator (0.01 ha) and the installation of two effluent disposal areas (0.04 ha). The Spotted Gum - Grey Ironbark open forest constitutes the EEC Pittwater and Wagstaffe Spotted Gum Forest listed under the BC Act.

No threatened flora species listed under the EPBC Act or BC Act were identified in the study area during field assessment nor are considered likely to occur. One threatened fauna species listed under the BC Act, the Glossy Black-Cockatoo was recorded in the study area during field assessment on 11 April 2019. An additional nine threatened and migratory fauna species were assessed as having a 'high' or 'moderate' likelihood of occurring in the study area. Impacts to these threatened and migratory species will not be significant in accordance with Section 7.3 of the BC Act and the EPBC Act Significance Assessments (**Appendix B**). Five HBTs were identified in the study area, most of which were located in large over-mature canopy trees. An additional four stag trees were identified in the study area, none of which were hollow bearing.

A total of 0.19 ha (i.e. 79.17%) of the 0.24 ha of Spotted Gum – Grey Gum Ironbark open forest in the study area has been avoided. As such, the proposal has largely avoided impacts to Spotted Gum - Grey Ironbark open forest in the study area. Where impacts are proposed they are limited to relatively minor impacts, which constitute either temporary impacts in the instance of the proposed excavator track, or would not require the removal of any vegetation, in the instance of the effluent disposal area. Appropriate mitigation measures will be implemented (see **Section 4.3**) to further reduce the impacts of the temporary excavator track. No HBTs are proposed for removal and the habitat available to fauna will largely remain unchanged, with the exception for the removal of one canopy tree.

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Appendix A: Species likelihood of occurrence

The potential for each threatened species, population and/or migratory species to occur was then considered and the necessity for targeted field surveys was determined. Following field surveys and review of available habitat within the study area, the potential for species to utilise the site and be affected directly or indirectly by the proposal were considered as either:

- "Recent record" = species has been recorded in the study area within the past 5 years
- "High" = species has previously been recorded in the study area (>5 years ago) or in proximity (for mobile species), and/or habitat is present that is likely to utilised by a local population
- "Moderate" = suitable habitat for a species is present onsite but no evidence of a species detected and relatively high number of recent records (5-20 years) in the locality or species is highly mobile
- "Low" = suitable habitat for a species is present onsite but limited or highly degraded, no evidence of a species detected and relatively low number of recent records in the locality
- "Not present" – suitable habitat for the species is not present onsite or adequate survey has determined species does not occur in the study area

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
KINGDOM: Animalia; CLASS: Amphibia						
Heleioporus australiacus Giant Burrowing Frog	BC Act: V EPBC Act: V	17	1.85 km (9/02/2004)	2/11/2018 (4.49 km)	Low	Not present
Litoria aurea Green and Golden Bell Frog	BC Act: E1 EPBC Act: V	1	4.74 km (1/01/1997)	1/01/1997 (4.74 km)	Not present	Not present
Pseudophryne australis Red-crowned Toadlet	BC Act: V	28	0.75 km (19/07/2003)	2/11/2018 (4.50 km)	Moderate	Low
KINGDOM: Animalia; CLASS: Aves						
Anous stolidus Common Noddy	EBPC Act: C,J	1	4.52 km (16/03/2014)	16/03/2014 (4.52 km)	Low	Low
Anthochaera phrygia Regent Honeyeater	BC Act:E4A EPBC Act: CE	8	3.58 km (23/05/2014)	18/06/2014 (3.71 km)	Low	Low
Apus pacificus Fork-tailed Swift	EPBC Act: C,J,K	1	4.82 km (1/01/1995)	1/01/1995 (4.82 km)	Low	Low
Ardenna grisea Sooty Shearwater	EBPC Act: C,J	4	3.64 km (11/10/2012)	4/11/2016 (4.06 km)	Low	Low
Ardenna pacificus Wedge-tailed Shearwater	EBPC Act: J	1	3.21 km (2/05/2017)	2/05/2017 (3.21 km)	Low	Low

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Ardenna tenuirostris Short-tailed Shearwater	EBPC Act: J,K	20	3.59 km (1/01/2004)	8/01/2017 (4.92 km)	Low	Low
Artamus cyanopterus cyanopterus Dusky Woodswallow	BC Act: V	1	4.82 km (1/01/1995)	1/01/1995 (4.82 km)	Low	Low
Burhinus grallarius Bush Stone-curlew	BC Act: E1	35	2.96 km (30/11/2008)	16/03/2018 (4.76 km)	Moderate	Low
Callocephalon fimbriatum Gang-gang Cockatoo	BC Act: V	1	3.99 km (2/11/2004)	2/11/2004 (3.99 km)	Low	Low
Calyptorhynchus lathami Glossy Black-Cockatoo	BC Act: V	44	0.31 km (18/03/2003)	27/09/2018 (4.4 km)	High	Recent record
Egretta sacra Eastern Reef Egret	EPBC Act: C	1	4.88 km (19/04/2015)	19/04/2015 (4.88 km)	Low	Low
Glossopsitta pusilla Little Lorikeet	BC Act: V	5	3.68 km (23/04/2007)	18/06/2014 (3.71 km)	Moderate	Moderate
Haematopus fuliginosus Sooty Oystercatcher	BC Act: V	2	4.13 km (1/01/2006)	1/01/2006 (4.13 km)	Low	Low
Haliaeetus leucogaster White-bellied Sea-Eagle	BC Act: V	25	1.24 km (11/12/2007)	27/09/2018 (4.78 km)	Moderate	Low

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Hieraaetus morphnoides Little Eagle	BC Act: V	3	1.23 km (8/12/2016)	8/12/2016 (1.23 km)	Low	Low
Hirundapus caudacutus White-throated Needletail	EPBC Act: C,J,K	6	1.45 km (12/03/2004)	12/03/2004 (1.45 km)	Low	Low
Ixobrychus flavicollis Black Bittern	BC Act: V	1	4.33 km (31/07/2015)	31/07/2015 (4.33 km)	Not present	Not present
Lathamus discolor Swift Parrot	BC Act: E1 EPBC Act: CE	10	1.85 km (19/04/2009)	24/05/2015 (3.70 km)	Low	Low
Lophoictinia isura Square-tailed Kite	BC Act: V	2	2.46 km (28/09/2009)	3/05/2016 (3.34 km)	Low	Low
Melithreptus gularis gularis Black-chinned Honeyeater (eastern subspecies)	BC Act: V	1	3.67 km (1/08/2015)	1/08/2015 (3.67 km)	Low	Low
Ninox connivens Barking Owl	BC Act: V	16	1.03 km (13/06/2013)	15/10/2017 (1.68 km)	High	Low
Ninox strenua Powerful Owl	BC Act: V	191	0.51 km (7/01/2015)	15/10/2017 (1.68 km)	High	Low
Numenius madagascariensis Eastern Curlew	EPBC Act: CE,C,J,K	5	4.52 km (28/02/2012)	13/01/2013 (4.82 km)	Low	Low

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Numenius phaeopus Whimbrel	EPBC Act: C,J,K	2	4.52 km (7/08/2012)	7/08/2012 (4.52 km)	Low	Low
Pandion cristatus Eastern Osprey	BC Act: V	2	3.64 km (26/03/2015)	26/03/2015 (3.64 km)	Low	Low
Petroica boodang Scarlet Robin	BC Act: V	1	3.13 km (22/01/2017)	22/01/2017 (3.13 km)	Low	Low
Pluvialis squatarola Grey Plover	EPBC Act: C,J,K	2	3.64 km (3/10/2011)	17/07/2013 (4.44 km)	Low	Low
Thalassarche cauta Shy Albatross	BC Act: V EPBC Act: V	1	4.63 km (8/12/1997)	8/12/1997 (4.63 km)	Low	Low
Tyto novaehollandiae Masked Owl	BC Act: V	2	3.55 km (22/05/2015)	22/05/2015 (22/05/2015)	Moderate	Low
KINGDOM: Animalia; CLASS: Mammalia						
Cercartetus nanus Eastern Pygmy-possum	BC Act: V	58	1.00 km (1/10/2012)	20/01/2018 (4.89 km)	High	Low
Chalinolobus dwyeri Large-eared Pied Bat	BC Act: V EPBC Act: V	7	3.21 km (28/04/2016)	11/03/2018 (4.73 km)	Moderate	Low
Dasyurus maculatus Spotted-tailed Quoll	BC Act: V EPBC Act: E	2	4.35 km (26/07/1998)	26/07/1998 (4.35 km)	Low	Low

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Falsistrellus tasmaniensis Eastern False Pipistrelle	BC Act: V	1	4.74 km (1/01/1997)	1/01/1997 (4.74 km)	Moderate	Low
Isoodon obesulus obesulus Southern Brown Bandicoot (eastern)	BC Act: E1 EPBC Act: E	25	2.07 km (17/02/2006)	26/05/2017 (3.04 km)	Moderate	Moderate
Miniopterus australis Little Bentwing-bat	BC Act: V	15	0.45 km (18/10/2014)	11/03/2018 (4.72 km)	High	Moderate
Miniopterus schreibersii oceanensis Eastern Bentwing-bat	BC Act: V	19	1.73 km (6/09/2002)	20/09/2017 (3.35 km)	High	Moderate
Mormopterus norfolkensis Eastern Freetail-bat	BC Act: V	5	3.23 km (20/10/2004)	11/03/2018 (4.73 km)	Moderate	Moderate
Myotis macropus Southern Myotis	BC Act: V	9	1.60 km (19/10/2016)	15/11/2017 (3.42 km)	Moderate	Moderate
Petaurus norfolcensis Squirrel Glider	BC Act: V	4	1.80 km (31/12/2006)	31/12/2006 (1.80 km)	Moderate	Low
Petaurus norfolcensis Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill	BC Act: E2, V	1	4.18 km (2/12/2002)	2/12/2002 (4.18 km)	Not present	Not present
Phascolarctos cinereus Koala	BC Act: V EPBC Act: V	4	3.11 km (15/12/2010)	15/12/2010 (3.11 km)	Low	Low

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Phascolarctos cinereus Koala in the Pittwater Local Government Area	BC Act: E2, V EPBC Act: V	3	3.11 km (15/12/2010)	15/12/2010 (3.11 km)	Low	Low
Pseudomys novaehollandiae New Holland Mouse	EPBC Act: V	3	1.27 km (6/06/2015)	26/12/2016 (2.30 km)	Moderate	Moderate
Pteropus poliocephalus Grey-headed Flying-fox	BC Act: V EPBC Act: V	78	1.11 km (21/02/2000)	11/03/2018 (4.74 km)	High	High
Scoteanax rueppellii Greater Broad-nosed Bat	BC Act: V	6	1.60 km (19/10/2016)	15/10/2017 (1.68 km)	Moderate	Moderate
KINGDOM: Animalia; CLASS: Reptilia						
Varanus rosenbergi Rosenberg's Goanna	BC Act: V	17	1.28 km (21/10/2010)	9/12/2015 (3.50 km)	Moderate	Low
KINGDOM: Plantae						
Asterolasia elegans	BC Act: E1 EPBC Act: E	1	4.01 km (14/10/2014)	14/10/2014 (4.01 km)	Low	Not present
Callistemon linearifolius Netted Bottle Brush	BC Act: V	1	4.07 km (2/08/1995)	26/09/2014 (4.94 km)	Low	Not present
Eucalyptus camfieldii Camfield's Stringybark	BC Act: V EPBC Act: V	1	1.80 km (14/09/2005)	14/09/2005 (1.80 km)	Low	Not present

Scientific Name Common Name	Legal Status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Grevillea caleyi Caley's Grevillea	BC Act: E4A EPBC Act: CE	2	17/03/2000 (4.06 km)	4.06 km (17/03/2000)	Low	Not present
Kunzea rupestris	BC Act: V EPBC Act: V	1	7/05/2007 (4.74 km)	4.74 km (7/05/2007)	Low	Not present
Lasiopetalum joyceae	BC Act: V EPBC Act: V	1	5/07/2013 (4.86 km)	4.86 km (5/07/2013)	Low	Not present
Microtis angusii Angus's Onion Orchid	BC Act: E1 EPBC Act: E	1	25/09/2014 (4.84 km)	4.84 km (25/09/2014)	Low	Not present
Persoonia hirsuta Hairy Geebung	BC Act: E1 EPBC Act: E	5	2/12/2006 (3.14 km)	0.73 km (15/07/2003)	Moderate	Not present
Pimelea curviflora var. *curviflora*	BC Act: V EPBC Act: V	1	7/05/2007 (4.74 km)	4.74 km (7/05/2007)	Low	Not present
Rhodamnia rubescens Scrub Turpentine	BC Act: E4A	5	13/05/2010 (3.54 km)	0.73 km (15/07/2003)	High	Not present
Syzygium paniculatum Magenta Lilly Pilly	BC Act: E1 EPBC Act: V	15	4/12/2018 (4.30 km)	1.49 km (14/07/2004)	Moderate	Not present
Tetratheca glandulosa	BC Act: V	14	28/09/2007 (4.73 km)	3.16 km (11/07/1997)	Moderate	Not present

Unless other stated, text is taken from the OEH Threatened Species (http://www.environment.nsw.gov.au/threatenedspecies/); Legal Status codes from the Atlas of NSW Wildlife: V = Vulnerable, E1 = Endangered, E2 = Endangered Population, E4A = Critically Endangered, C = China and Australia Migratory Bird Agreement

(CAMBA), J = Japan and Australia Migratory Bird Agreement (JAMBA); BC Act = Biodiversity Conservation Act 2016, EPBC Act = Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

Appendix B: Assessments of Significance

Commonwealth listings under the EPBC Act

The EPBC Act Matters of National Environmental Significance (MNES) (EPBC Act Significant Impact Guidelines) (DotE 2013) provides 'Significant Impact Criteria' that are to be used to assist in determining whether a proposed action is likely to have a significant impact on a MNES and subsequently the need for referral. MNES identified within the study area have been addressed below.

Southern Brown Bandicoot (eastern) (*Isoodon obesulus obesulus*) – endangered species

The Southern Brown Bandicoot is a medium sized terrestrial marsupial approximately 400-1,600 g in weight and 300 mm in length. The species has a long tapering snout, with a bare nose, a compact body and a short-pointed tail, much like other members of the Bandicoot family. The Southern Brown Bandicoot is distributed patchily across its range, which in NSW is limited to the east of the Great Dividing Range and south from the Hawkesbury River. The Southern Brown Bandicoot is generally only found in heath or open forest with a heathy understorey on sandy or friable soils.

The species feeds on ground-dwelling invertebrates and underground fruiting fungi, in the process creating conical holes in the soil. The males have a home range of approximately 5-20 ha, whereas the females forage over a smaller range of approximately 2-3 ha. Nesting occurs during the day, with preferred nesting location including shallow depression covered by leaf litter, grass or other plant material, under *Xanthorrhoea* spp., or in rabbit burrows.

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

- lead to a long-term decrease in the size of a population

The proposal is unlikely to lead to a long-term decrease in the size of a population of Southern Brown Bandicoot. There are 25 records of this species within 5 km of the study area, with the most recent sighting made on 26 May 2017, approximately 3.04 km from the study area (OEH 2019). The closest record of the species was made approximately 2.07 km from the study area on 17 February 2006. No observations, such as conical shaped diggings were made during field assessment that would suggest that the species is foraging in the study area.

It is possible that the species could occasionally utilise the vegetation in the study area for foraging. However, the Southern Brown Bandicoot is generally confined to heathlands or woodlands and forests with heathy understorey, usually on friable sand soil (DEC 2006b). The vegetation in the study area lacks a heathy understorey and has a low cover and abundance of *Xanthorrhoea* spp. and *Banksia* spp, which are associated with the species habitat. As such, the study area represents marginally foraging habitat for the species, of which the proposal would only result in the modifications to 0.05 ha of Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal areas.

- reduce the area of occupancy of the species

The proposal would not reduce the area of occupancy of the species, as the species could continue to forage in the study area.

- fragment an existing population into two or more populations

This proposal will not lead to the fragmentation of an existing population of Southern Brown Bandicoot. Only one canopy tree is proposed for removal and the vegetation that would be modified by the temporary access track and effluent disposal area would not further fragment or isolate the habitat in the study area from adjoining areas of habitat.

- adversely affect habitat critical to the survival of a species

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

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

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

Critical habitat for the Southern Brown Bandicoot is not defined in the recovery plan for the species (b or the draft referral guidelines for the species (DSEWPaC 2011). The proposal would result in the modifications to 0.05 ha of Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal area. The proposal would not require the removal of groundlayer and midstorey vegetation and would only be altered by the initial disturbance of the excavator. The proposal is unlikely to have an adverse effect on habitat of the species, given the small amount of vegetation proposed for modification. Furthermore, no observations were made that suggests the species is foraging in the study area, such as conical shaped diggings, and the habitat in the study area is considered marginal foraging habitat for the species.

- disrupt the breeding cycle of a population

No observations that might suggest that the species is foraging in the study area were made during field assessment and the closest record of the species was made approximately 2.07 km from the study area on 17 February 2006 (OEH 2019). It is considered unlikely that a breeding population of the species occurs in the study area, further that the small amount of vegetation proposed for modification would constitute a 'disruption'.

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

The proposal would result in the modification of 0.05 ha of Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal area. The proposal would not require the removal of groundlayer and midstorey vegetation, which would only be altered by the initial disturbance of the excavator. One canopy

tree is proposed for removal. The proposal would not affect the habitat in the study area, such the that species is likely to decline.

- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The proposed works are unlikely to result in invasive species that are harmful.

- introduce disease that may cause the species to decline, or

The proposed works are unlikely to introduce disease that may cause the species to decline.

- interfere with the recovery of the species.

The proposal is unlikely to substantially interfere with the recovery of the species as the amount of potential habitat requiring modification is small and a substantial amount of more suitable habitat for the species is found within the adjoining Ku-ring-gai Chase National Park.

Conclusion of EPBC Act Significant Impact Guidelines (DotE 2013) for Southern Brown Bandicoot - eastern.

A referral is not recommended for the Southern Brown Bandicoot - eastern, as:

- a small amount of marginal habitat is proposed for modification
- the proposal would not require the removal of groundlayer and midstorey vegetation and would only be impacted by the initial disturbance of the excavator.
- the proposal is unlikely to lead to a long-term decrease in the size of a population
- the proposal would not remove habitat to the extent that the species would decline

New Holland Mouse (*Pseudomys novaehollandiae*) – vulnerable species

The New Holland Mouse is a small rodent with a body length of approximately 65-90 mm and a tail length of approximately 80-105 mm. The New Holland Mouse is grey-brown in colour and is similar in appearance to the introduced House Mouse* (*Mus musculus*), although can be distinguished by its slightly larger ears and eyes and a notch on the upper incisors.

In NSW, the New Holland Mouse is known from the Royal National Park, Kangaroo Valley, Ku-ring-gai Chase National Park and Port Stephens to Evans Head near the Queensland border. The species is known to inhabit open heathland, open woodland with a heathland understorey and vegetated sand dunes. The species is largely granivorous, therefore, sites where it is found are often high in floristic diversity, particularly leguminous perennials.

The New Holland Mouse is a social animal that lives in burrows in communal groups. The home range of the species ranges from 0.44 ha 1.4 ha. The New Holland Mouse breeds between late winter to early summer and sometimes extends into autumn. The timing of breeding is related to the abundance and quality of food, which is influenced by rainfall patterns and fire succession. The gestation period is approximately 32-39 days with young born diurnally in a nest burrow.

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

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

The proposal is unlikely to lead to a long-term decrease in the size of an important population of New Holland Mouse. There are three records of the species within 5 km of the study area, with

the most recent sighting made on 26 December 2016 approximately 2.30 km from the study area (OEH 2019). The closest record of the species was made approximately 1.11 km from the study area on 6 June 2015. The optimum habitat for the species consists of heath that is actively regenerating after fire (DoE 2019). The vegetation in the study area lacks a heathy understorey and is likely to be at best marginal foraging habitat for the species, of which the proposal would only result in the modifications to 0.05 ha of Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal areas.

- reduce the area of occupancy of an important population

The proposal would not reduce the area of occupancy of an important population, as the species could continue to forage in the study area.

- fragment an existing important population into two or more populations

This proposal will not lead to the fragmentation of an existing important population of New Holland Mouse. Only one canopy tree is proposed for removal and the vegetation that would be modified by the temporary access track and effluent disposal area would not further fragment or isolate the habitat in the study area from adjoining areas of habitat.

- adversely affect habitat critical to the survival of a species

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

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

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

There is currently no recovery plan for the New Holland Mouse and critical habitat for the species is not defined. The proposal would result in modifications to 0.05 ha of 0.05 ha Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal area. The proposal would not require the removal of groundlayer and midstorey vegetation and would only be altered by the initial disturbance of the excavator. The proposal is unlikely to have an adverse affect on habitat of the species, given the small amount of vegetation proposed for modification.

- disrupt the breeding cycle of an important population

The closest record of the species was made approximately 1.11 km from the study area on 6 June 2015. The habitat in the study represents marginal habitat for the species, which typically inhabit open heathland, open woodland with a heathland understorey and vegetated sand dunes with a high floristic diversity, particularly leguminous perennials. The study area does not contain heathy vegetation, or a high abundance of leguminous shrub species. It is considered unlikely

that a breeding population of an important population of the species occurs in the study area, further that the small amount of vegetation proposed for modification would constitute a 'disruption'.

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

The proposal would result in the modification of 0.05 ha of Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal area. The proposal would not require the removal of groundlayer and midstorey vegetation, which would only be impacted by the initial disturbance of the excavator. One canopy tree is proposed for removal. The proposal would not affect the habitat in the study area, such the that species is likely to decline.

- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The proposed works are unlikely to result in invasive species that are harmful.

- introduce disease that may cause the species to decline, or

The proposed works are unlikely to introduce disease that may cause the species to decline.

- interfere substantially with the recovery of the species.

The proposal is unlikely to substantially interfere with the recovery of the species as the amount of potential habitat requiring modification and removal is small and a substantial amount of more suitable habitat for the species is found within the adjoining Ku-ring-gai Chase National Park.

Conclusion of EPBC Act Significant Impact Guidelines (DotE 2013) for New Holland Mouse.

A referral is not recommended for the New Holland Mouse, as:

- a small amount of marginal habitat is proposed for modification
- the proposal would not require the removal of groundlayer and midstorey vegetation and would only be impacted by the initial disturbance of the excavator.
- the proposal is unlikely to lead to a long-term decrease in the size of a population
- the proposal would not remove habitat to the extent that the species would decline

Grey-headed Flying-fox (*Pteropus poliocephalus*) – vulnerable species

Grey-headed Flying-fox occurs within 200 km of the eastern coastline of Australia, from Rockhampton in Queensland to Adelaide in South Australia. They prefer subtropical and temperate rainforest, tall sclerophyll forests and woodlands, as well as heaths and swamps. Roosting areas are often selected upon their proximity to a regular food source (within 20 km), often in gullies, close to water, or in vegetation with a dense canopy. This species roosts communally in large, established camps which can support several thousand individuals. The Grey-headed Flying-fox can travel up to 50 km from camp to forage (typically <20 km), where they feed on nectar and pollen from *Eucalyptus, Banksia* and *Melaleuca* spp., as well as the fruits of native and exotic species.

Threats to this species include:

- Loss of roosting and foraging site
- Heat stress
- Electrocution on powerlines and entanglement in netting.

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

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

The proposal is unlikely to lead to a long-term decrease in the size of an important population of the Grey-headed Flying-fox, as the site does not contain a camp of Grey-headed Flying-fox. The most recent record of the species was made on 11 March 2018 approximately 4.74 km from the study area and a record of the species was made within 1.11 km of the study area 21 February 2000 (OEH 2019). It is likely that the Grey-headed Flying-fox may occasionally utilise the vegetation in the study area for foraging. However, the proposed development will not lead to a decrease in the population of the Grey-headed Flying-fox, as the species is not being directly impacted by the proposal. Large areas of vegetated land available for foraging are found within the locality, including Ku-ring-gai Chase National Park.

- reduce the area of occupancy of an important population

The proposal would not reduce the area of occupancy for the Grey-headed Flying-fox, as no resident population occurs within the study area or immediate surrounds. Furthermore, the species could continue to fly over the study area, or forage in the retained canopy trees.

- fragment an existing important population into two or more populations

The proposal would not lead to the fragmentation of a Grey-headed Flying-fox population, as the effects of fragmentation on Grey-headed Flying-fox is more important in areas directly surrounding roosting habitat. Furthermore, the ability for Grey-headed Flying-fox to travel large distances makes them less susceptible to the impacts of fragmentation. The study area is sufficiently far enough away from the closest Grey-headed Flying-fox population in Avalon (DotEE 2019) so as to not substantially impact on the species.

- adversely affect habitat critical to the survival of a species

According to the Draft National Recovery Plan for the Grey-headed Flying-fox, foraging habitat that meets at least one of the following criteria can be explicitly identified as habitat critical to survival, or essential habitat (DECCW 2009), including:

  - productive during winter and spring, when food bottlenecks have been identified
  - known to support populations of > 30 000 individuals within an area of 50 km radius (the maximum foraging distance of an adult)

The dominant canopy species in the study area is *Corymbia maculata*, which is a winter and spring flowering species and, therefore, could provide foraging habitat for the Grey-headed Flying-fox during this period. It is possible that the study area may be utilised during food availability bottlenecks. However, given that there is a large amount of foraging resources available in the locality (including Ku-ring-gai National Park), the importance of the habitat proposed for removal (one canopy tree) is substantially reduced. The closest known population to support >30,000 individuals is located approximately 30 km south of the study area at Centennial Park, with between 16,000-50,000 individuals of this species recorded from this camp in December 2018 (DotEE 2019b). The vegetation in the study area likely constitutes habitat critical to the survival of the species, although the removal of one canopy tree will not result in an adverse impact.

- disrupt the breeding cycle of an important population

The proposed development is unlikely to disrupt the breeding cycle of an important population given the abundance of potential foraging habitat adjoining the site.

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

The proposal would result in modifications to 0.05 ha of Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal areas. The species could continue to use the vegetation in the study area for foraging, as complete vegetation removal will not be required, and all canopy trees will be retained, except for one individual. Given that only one canopy tree will be removed, the proposal would not remove habitat to an extent that will cause a decline in the Grey-headed Flying-fox. Furthermore, the locality contains substantial foraging habitat for the species, including Ku-ring-gai National Park.

- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The proposed works are unlikely to result in invasive species that are harmful.

- introduce disease that may cause the species to decline, or

The proposed works are unlikely to introduce disease that may cause the species to decline.

- interfere substantially with the recovery of the species.

The proposal is unlikely to substantially interfere with the recovery of the species as the amount of potential habitat requiring removal is very small and a majority of the foraging habitat in the study area will be retained.

Conclusion of EPBC Act Significant Impact Guidelines (DotE 2013) for Grey-headed Flying-fox.

A referral is not recommended for the Grey-headed Flying-fox, as:

- no breeding or roosting habitat would be removed
- only one canopy tree is proposed for removal
- the proposal is unlikely to impact on the breeding cycle of nearby populations
- the proposal would not have an adverse affect on critical habitat

State listings under the BC Act

The following factors listed under Part 7.3 of the BC Act must be taken into account when deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats. The below assessments have been prepared in accordance with the appropriate guidelines (OEH 2018a).

Pittwater and Wagstaffe Spotted Gum Forest – EEC

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

Not applicable.

b. *in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
   (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
   (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

For the purposes of this report the local occurrence of Pittwater and Wagstaffe Spotted Gum Forest includes the vegetation in the study area and adjoining areas of the community to the east, west and south of the study area (**Appendix D**). The local occurrence of Pittwater and Wagstaffe Spotted Gum Forest covers an area of approximately 10.96 ha.

The proposal would result in 0.05 ha of direct impacts to Pittwater and Wagstaffe Spotted Gum Forest, which represents 0.46 % of the local occurrence. Where direct impacts occur the complete removal of vegetation would not be required, as impacts are limited to a temporary access track for the excavator and the minor impacts associated with the effluent disposal area. One canopy tree representative of Pittwater and Wagstaffe Spotted Gum Forest is proposed for removal. The proposal would not have an adverse effect on the extent of the community, given the relatively minor impacts that are proposed.

The proposal is unlikely to adversely and substantially modify the community in the study area, as all canopy will be retained (with exception for one tree) and the midstorey and groundlayer will remain largely intact. Those impacts that are proposed are considered minor and would not substantially and adversely modify the composition of the ecological community.

c. *in relation to the habitat of a threatened species, population or ecological community:*
   (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity,
   (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
   (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

The proposal would result in 0.05 ha of direct impacts to Pittwater and Wagstaffe Spotted Gum Forest in the study area to facilitate a temporary access track for the excavator and implement two effluent disposal areas. With exception for one canopy tree, all habitat onsite would be retained, and the proposed impacts would only result in minor disturbances to the vegetation in the study area. All HBTs and stag trees in the study area will be retained.

The proposal would only require the removal of one canopy tree in the study area. The removal of the one canopy tree would not fragment the habitat in the study area from adjoining areas of vegetation in the study area, or surrounding vegetation. Groundlayer and midstorey species initially impacted by the temporary access track for the excavator will be restored. All vegetation will be retained within the effluent disposal areas (with exception for Tree 53). As such, the proposal is unlikely to fragment or isolate and area of habitat form other areas of habitat.

The importance of the habitat to be removed and modified in the study area is low, given the small impact proposed. The impacts associated with the effluent disposal area and temporary access track for the excavator would result in minor modifications to the community. The temporary access track will be rehabilitated, and all vegetation will be retained within the effluent disposal areas, with exception for one canopy tree.

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

The proposed activity would not have any adverse effect (either directly or indirectly) on any declared area of outstanding biodiversity value.

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

There is one key threatening processes of relevance to this species:

- Clearing of native vegetation

The proposal would result in minor modifications to 0.05 ha of Pittwater and Wagstaffe Spotted Gum Forest to facilitate the temporary access track for the excavator and effluent disposal area. Only one canopy tree representative of the community is proposed for removal.

Conclusion of test of significance for Pittwater and Wagstaffe Spotted Gum Forest

The proposed development would not have a significant impact on Pittwater and Wagstaffe Spotted Gum Forest, as:

- the proposed impacts associated with the temporary access track and effluent disposal area are considered minor
- only one canopy trees is proposed for removal (Tree 53)
- the proposal would not have an adverse effect on the extent of the local occurrence, such that it is likely to be placed at risk of extinction
- the importance of the community to be modified and partially removed is low.

Glossy Black-Cockatoo (*Calyptorhynchus lathami*) – vulnerable species

The Glossy Black-Cockatoo lives in forests and woodlands occurring widely across NSW from coastal environments to the tablelands, with populations also on the western slopes and plains. The Glossy Black-Cockatoo occur primarily in eucalypt open forest and woodland with hollow bearing trees and a midstorey of sheoaks (NSW SC 2008). Glossy Black-Cockatoo nest in eucalypt hollows (about 26 cm wide and up to 1.4 m deep) that can be alive or dead, but commonly in the dead spout of a living tree. Glossy Black-Cockatoo feeds exclusively on the seeds of sheoak trees. Key food species in coastal habits include *Allocasuarina torulosa*, *Allocasuarina littoralis* with some *Allocasuarina distyla* (Scrub She-oak).

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

There are 44 records of the species within 5 km of the study area (OEH 2019), which was also heard calling nearby during the field assessment on 11 April 2019. The Glossy Black-Cockatoo is likely to feed on the *Allocasuarina torulosa* in the study area. It is also possible that the species may utilise the HBTs in the study areas for nesting. The proposal would not require the removal of any HBTs and vegetation removed would be limited to one canopy tree. The local population of Glossy Black-Cockatoo would rely on vast areas for foraging and infrequently utilise the foraging habitat in the study area, all of which will be retained. As such, the proposal is unlikely to have an adverse effect on the lifecycle of the Glossy Black-Cockatoo to an extent that may place the local population at risk of extinction.

b. *in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
   (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
   (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

c. *in relation to the habitat of a threatened species, population or ecological community:*
   (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity,
   (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
   (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

The proposal would result in modifications to 0.05 ha of Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal areas. One canopy tree is proposed for removal. No HBTs are proposed for removal and the *Allocasuarina torulosa* in the study area would be retained. As such, the proposal would not result in the removal or modification to habitat likely to be used by the species in the study area.

The proposed development would not result in the fragmentation or isolation of other areas of habitat for the species. Only one canopy tree is proposed for removal and the vegetation that would be modified by the temporary access track and effluent disposal area would not further fragment or isolate the habitat in the study area from other areas of habitat.

The importance of the habitat proposed for removal and modification in the study area for the importance of the long-term survival of the Glossy Black-Cockatoo in the locality is low. No impacts to HBTs or foraging habitat for the species would occur as a result of the proposal.

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

The proposed activity would not have any adverse effect (either directly or indirectly) on any declared area of outstanding biodiversity value.

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

There is one key threatening processes of relevance to this species:

- Clearing of native vegetation

The proposal would result in minor modifications to 0.05 ha of Pittwater and Wagstaffe Spotted Gum Forest to facilitate the temporary access track for the excavator and effluent disposal area. Only one canopy tree representative of the community is proposed for removal.

Conclusion of test of significance for Glossy Black Cockatoo

The proposed development would not have a significant impact on the Glossy Black Cockatoo, as:

- no nesting or foraging habitat is proposed for removal
- the proposal would not affect the life cycle of the species such that a viable population will be placed at risk of extinction
- the species could continue to utilise the retained HBTs in the study area for nesting and the *Allocasuarina torulosa* for foraging.

Little Lorikeet (*Glossopsitta pusilla*) – vulnerable species

Glossopsitta pusilla (Little Lorikeet) is a vulnerable species listed under the BC Act. It is a small parrot which is distributed widely across coastal areas of eastern Australia and the Great Divide from Cape York to South Australia. Within NSW the species occurs from coastal areas to as far west as Dubbo and Albury.

The species primarily forages in the canopy of open eucalypt forest and woodland though it also utilises other trees including *Angophora* spp., *Melaleuca* spp. and other tree species. Riparian habitats are commonly used, due to higher soil fertility and greater productivity. It forages mostly on nectar and pollen and only occasionally on native fruits such as mistletoes.

The species roosts in canopy vegetation, often at distances from feeding habitat. Nesting occurs in hollow bearing eucalypts in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Hollows are typically small and located high above the ground with riparian trees often chosen, including *Allocasuarina* spp.

The Little Lorikeet is threatened by a number of processes including the extensive clearing of woodlands for agriculture, particularly large old Eucalypt trees on fertile soils which produce more nectar. Additionally, the loss of old HBTs has reduced nest sites, and increased competition with other native and exotic species including the introduced Honeybee.

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

There are five records of this species with 5 km of the study area, with the most recent sighting made on 18 June 2014 approximately 3.71 km from the study area (OEH 2019). Little Lorikeets are generally nomadic and travel large distances in search of blossom, hence it is possible that the Little Lorikeet may utilise the canopy trees within the study area for foraging. It is also possible

that the species could utilise the HBTs in the study area for nesting. However, all HBTs will be retained, hence impacts to potential breeding habitat would not occur. Given the nomadic movements of the Little Lorikeet, the relative abundance of intact native vegetation in the locality, and the small amount of vegetation removal required (one canopy tree) the proposal would not place a viable local population of the species at risk of extinction.

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

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

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

Not applicable.

c. in relation to the habitat of a threatened species, population or ecological community:

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

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

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

The proposal would result in modifications to 0.05 ha of Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal areas. One canopy tree is proposed for removal. No HBTs are proposed for removal and only one canopy tree representing potential foraging habitat for the species is proposed for removal, which is considered a minor modification to the extent of habitat likely to be used by the species in the study area.

The proposed development would not result in the fragmentation or isolation of other areas of habitat for the species. Only one canopy tree is proposed for removal and the vegetation that would be modified by the temporary access track and effluent disposal area would not further fragment or isolate the habitat in the study area from adjoining areas of habitat.

The importance of the habitat proposed for removal in the study area for the long-term survival of the Little Lorikeet in the locality is low.

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

The proposed activity would not have any adverse effect (either directly or indirectly) on any declared area of outstanding biodiversity value.

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

There is one key threatening processes of relevance to this species:

- Clearing of native vegetation

The proposal would result in minor modifications to 0.05 ha of Pittwater and Wagstaffe Spotted Gum Forest to facilitate the temporary access track for the excavator and effluent disposal area. Only one canopy tree representative of the community is proposed for removal.

Conclusion of test of significance for Little Lorikeet

The proposed development would not have a significant impact on the Little Lorikeet, as:

- a small amount of potential foraging habitat is proposed for removal (one canopy tree)
- the vegetation proposed for removal is of low importance, given the large amount of native vegetation in the locality and the nomadic tendencies of the species
- no HBTs are proposed for removal
- the proposal would not affect the life cycle of the species such that a viable population will be placed at risk of extinction.

Southern Brown Bandicoot - eastern (*Isoodon obesulus obesulus*) – endangered species

A description of the Southern Brown Bandicoot is found in the Commonwealth listings above.

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

There are 25 records of the species with 5 km of the study area, with the most recent sighting made on 26 May 2017 approximately 3.04 km from the study area (OEH 2019). The closest record of the species was made approximately 2.07 km from the study area on 17 February 2006. No observations were made that might suggest that the species is foraging in the study area, such as conical shaped diggings. Records of the Southern Brown Bandicoot are generally confined to heathlands or woodlands and forests with heathy understorey, usually on friable sand soil (DEC 2006b). The vegetation in the study area lacks a heathy understorey and has a low cover and abundance of *Xanthorrhoea* spp. and *Banksia* spp. Nevertheless, it is possible that the species could occasionally forage in the study area, although the proposal is unlikely to have an adverse effect on the lifecycle of the species, such that a viable local population of the species is likely to be placed at risk of extinction.

b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:
(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

c. in relation to the habitat of a threatened species, population or ecological community:
(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity,
(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

The proposal would result in modifications to 0.05 ha of Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal areas. The proposal would not require the removal of groundlayer and midstorey vegetation and would only be altered by the initial disturbance of the excavator. One canopy tree is proposed for removal. No HBTs are proposed for removal and only one canopy tree is proposed for removal.

The proposed development would not result in the fragmentation or isolation of other areas of habitat for the species. Only one canopy tree is proposed for removal and the vegetation that would be modified by the temporary access track and effluent disposal area would not further fragment or isolate the habitat in the study area from adjoining areas of habitat.

The importance of the habitat proposed for removal and modification in the study area for the long-term survival of the Southern Brown Bandicoot in the locality is low.

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

The proposed activity would not have any adverse effect (either directly or indirectly) on any declared area of outstanding biodiversity value.

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

There is one key threatening processes of relevance to this species:

- Clearing of native vegetation

The proposal would result in minor modifications to 0.05 ha of Pittwater and Wagstaffe Spotted Gum Forest to facilitate the temporary access track for the excavator and effluent disposal area. Only one canopy tree representative of the community is proposed for removal.

Conclusion of test of significance for Southern Brown Bandicoot - eastern

The proposed development would not have a significant impact on the Southern Brown Bandicoot - eastern, as:

- a small amount of potential foraging habitat is proposed for modification (0.05 ha), which will largely remain in its existing condition
- the vegetation proposed for removal is of low importance, given the large amount of native vegetation in the locality
- the proposal would not affect the life cycle of the species such that a viable population will be placed at risk of extinction.

Microbats: Eastern Freetail-bat (*Mormopterus norfolkensis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*) and Southern Myotis (*Myotis macropus*) – vulnerable species

The Eastern Free-tail bat occurs along the coastal regions of eastern Australia. In NSW its range expands west out over the Great Diving Range. The habitat preference of the Eastern Freetail-bat is poorly known, however, it has been observed to occur in dry eucalypt forest, coastal woodland, riparian zones and wet sclerophyll forests. The Eastern Freetail-bat forages for moths

above forest canopy and along forest edges, and also consumes ground based invertebrates (e.g. ants and beetles). Hollow bearing trees are their preferred roosting sites.

The Greater Broad-nosed Bat occurs from north-eastern Victoria to the Atherton Tableland. In NSW, it occurs along the entire east coast but doesn't occur at altitudes above 500 m. It utilises a variety of habitat from woodlands through to moist and dry eucalypt forest and rainforest. It is most commonly found in tall wet forest. It usually roosts in tree hollows but has also been found in buildings.

The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. It generally roosts in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. It forages over streams and pools catching insects and small fish by raking their feet across the water surface.

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

It is possible that the vegetation in the study area provides potential foraging habitat for the three species of microbat. The proposal would require the modification of 0.05 ha Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal areas. The species could continue to use the vegetation in the study area for foraging, as complete vegetation removal will not be required, and all canopy trees will be retained, except for one individual. The local population of the species is likely to rely on large areas for foraging and would utilise the large intact areas of bushland in the locality (i.e. Ku-ring-gai Chase National Park). The proposal would not substantially reduce the foraging resources for a viable local population of the microbat species.

It is possible that the HBTs in the study area represent roosting and/or breeding habitat for the microbat species, all of which will be retained. As such, the proposal will not impact on breeding or roosting habitat. Based on the relatively small amount of native vegetation and lack of HBTs being removed, the proposal would not have an adverse effect on the lifecycle of the three species of microbat to an extent that may place the local population at risk of extinction.

b. *in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
    (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
    (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

c. *in relation to the habitat of a threatened species, population or ecological community:*
    (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity,
    (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
    (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

The proposal would result in modifications to 0.05 ha of Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal areas. The species could continue to use the vegetation in the study area for foraging, as complete vegetation removal would not be required, and all canopy trees will be retained, except for one individual. The species could continue to utilise the vegetation in the study area for foraging, roosting and possibly breeding, as all HBTs will be retained.

The proposed development would not result in the fragmentation or isolation of other areas of habitat for the species. Only one canopy tree is proposed for removal and the vegetation that would be modified by the temporary access track and effluent disposal areas would not further fragment or isolate the habitat in the study area from adjoining areas of habitat.

It is possible that the three species of microbat could utilise the study area as foraging, roosting, or possibly breeding habitat. However, the importance of the habitat to be modified for the long-term survival of the three species of microbat in the locality is low, given the availability of habitat in the locality, the small amount (0.05 ha) of vegetation proposed for modification and the retention of all HBTs and canopy trees, with the exception of one individual.

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

The proposed activity would not have any adverse effect (either directly or indirectly) on any declared area of outstanding biodiversity value.

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

There is one key threatening processes of relevance to this species:

- Clearing of native vegetation

The proposal would result in minor modifications to 0.05 ha of Pittwater and Wagstaffe Spotted Gum Forest to facilitate the temporary access track for the excavator and effluent disposal area. Only one canopy tree representative of the community is proposed for removal.

Conclusion of test of significance for Eastern Freetail-bat, Greater Broad-nosed Bat and Southern Myotis

The proposed development would not have a significant impact on the Eastern Freetail-bat, Greater Broad-nosed Bat and the Southern Myotis, as:

- a small amount of potential foraging habitat is proposed for removal (one canopy tree)
- the vegetation proposed for removal is of low importance, given the large amount of native vegetation in the locality
- the proposal would not affect the life cycle of the species such that a viable population will be placed at risk of extinction
- No HBTs are proposed for removal, which could represent roosting or breeding habitat for the species.

Microbats: Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) and Little Bentwing-bat (*Miniopterus australis*) – vulnerable species

Eastern Bent-wing Bat occupies a range of forested environments (including wet and dry sclerophyll forests), along the coastal portion of eastern Australia, and through the Northern Territory and Kimberley area (subject to subdivision of this species). This species forages from just above the tree canopy, to many times the canopy height in forested areas, and will utilise open areas where it is known to forage at lower levels. Moths appear to be the main dietary component. This highly mobile species is capable of large regional movements in relation to seasonal differences in reproductive behaviour and winter hibernation. Though, individuals often use numerous roosts (including, mines, culverts, stormwater channels, buildings, and occasionally tree-hollows), it congregates in large numbers at a small number of nursery caves to breed and hibernate.

The Little Bentwing-bat occurs along the east coast of Australia ranging from Cape York Qld south to Wollongong, NSW. They are generally found in well-timbered areas of moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. It can be distinguished from the Common Bentwing-bat by its smaller size. They roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts and bridges with foraging occurring at night for small insects beneath the canopy of densely vegetated habitats.

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

It is possible that the study area represents potential foraging habitat for the species. The proposal would require the modification of 0.05 ha Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal area. The species could continue to use the vegetation in the study area for foraging, as complete vegetation removal would not be required, and all canopy trees will be retained, except for one individual. The site does not constitute roosting or breeding habitat, as it does not contain caves or rock crevices in cliffs, which are required roosting habitat for the species. As such, the proposal is unlikely to have an adverse effect on the lifecycle of Eastern Bentwing-bat or Little Bentwing-bat, such that a viable local population is at risk of extinction.

b. *in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
   - *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
   - *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

c. *in relation to the habitat of a threatened species, population or ecological community:*
   - *(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity,*
   - *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*
   - *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.*

The proposal would result in modifications to 0.05 ha of Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal areas. The species could continue to use the vegetation in the study area for foraging, as complete vegetation removal would not be required, and all canopy trees will be retained, except for one individual. The species could continue to utilise the vegetation in the study area for foraging. However, the site does not constitute roosting or breeding habitat, as it does not contain caves or rock crevices in cliffs, which are required roosting habitat for the species.

The proposed development would not result in the fragmentation or isolation of other areas of habitat for the species. Only one canopy tree is proposed for removal and the vegetation that would be modified by the temporary access track and effluent disposal area would not further fragment or isolate the habitat in the study area from adjoining areas of habitat.

It is possible that the Eastern Bentwing-bat and Little Bentwing-bat could utilise the study area as foraging habitat. However, the importance of the habitat to be modified for the long-term survival of the two species is low, given the availability of habitat in the locality and that no potential roosting or breeding habitat would be impacted.

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

The proposed activity would not have any adverse effect (either directly or indirectly) on any declared area of outstanding biodiversity value.

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

There is one key threatening processes of relevance to this species:

- Clearing of native vegetation

The proposal would result in minor modifications to 0.0.5 ha of Pittwater and Wagstaffe Spotted Gum Forest to facilitate the temporary access track for the excavator and effluent disposal area. Only one canopy tree representative of the community is proposed for removal.

Conclusion of test of significance for Eastern Bentwing-bat and Little Bentwing-bat

The proposed development would not have a significant impact on the Eastern Bent-wing bat and Little Bentwing-bat, as:

- a small amount of potential foraging habitat is proposed for removal (one canopy tree)
- the vegetation proposed for removal is of low importance, given the large amount of native vegetation in the locality
- the proposal would not affect the life cycle of the species such that a viable population will be placed at risk of extinction
- no caves, cliffs or rock crevices or vegetation in close proximity of these features will be impacted by the proposal.

Grey-headed Flying-fox (*Pteropus poliocephalus*) – vulnerable species

A description of the Grey-headed Flying-fox is found in the Commonwealth listings above.

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

The study area and adjoining areas of bushland do not contain a roosting camp of Grey-headed Flying-fox. The most recent record of the species was made on 11 March 2018 approximately 4.74 km from the study area and a record of the species was made within 1.11 km of the study area on 21 February 2000 (OEH 2019). It is likely that the Grey-headed Flying-fox may occasionally utilise the study area for foraging.

The proposal would result in the modification of 0.05 ha Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal area. The species could continue to use the vegetation in the study area for foraging, as complete vegetation removal would not be required, and all canopy trees will be retained, except for one individual. Given these factors, it is most unlikely that the proposed development would have an impact on the lifecycle of the species, to an extent that may place the local population at risk of extinction.

b. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:
(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

c. in relation to the habitat of a threatened species, population or ecological community:
(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity,
(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

The proposal would result in the modification of 0.05 ha Spotted Gum - Grey Ironbark open forest to accommodate the temporary access track for the excavator and the installation of two effluent disposal areas. The species could continue to use the vegetation in the study area for foraging, as complete vegetation removal will not be required, and all canopy trees will be retained, except for one individual.

The proposed development would not result in the fragmentation or isolation of other areas of habitat for the species. Only one canopy tree is proposed for removal and the vegetation that would be modified by the temporary access track and effluent disposal area would not further fragment or isolate the habitat in the study area from adjoining areas of habitat.

It is possible that the Grey-headed Flying-fox could utilise the vegetation in the study area as foraging habitat. Nevertheless, the potential foraging habitat proposed for modification and removal in the study area is of low importance for the long-term survival of this species.

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

The proposed activity would not have any adverse effect (either directly or indirectly) on any declared area of outstanding biodiversity value.

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

There is one key threatening processes of relevance to this species:

- Clearing of native vegetation

The proposal would result in minor modifications to 0.05 ha of Pittwater and Wagstaffe Spotted Gum Forest to facilitate the temporary access track for the excavator and effluent disposal area. Only one canopy tree representative of the community is proposed for removal.

Conclusion of test of significance for Grey-headed Flying-fox

The proposed development would not have a significant impact on the Grey-headed Flying-fox, as:

- no roosts were identified in the study area or adjoining areas during field assessment
- a small amount of potential foraging habitat is proposed for removal (one canopy tree)
- the proposal would not affect the life cycle of the species such that a viable population will be placed at risk of extinction
- the vegetation proposed for removal is of low importance, given the large amount of native vegetation in the locality and the ability of the species to forage over large areas.

Appendix C: Flora and fauna species inventories

Flora

Family	Scientific Name	Common name	Native/ Exotic	Form
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash	Native	S/T
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower	Native	F
Alliaceae	*Agapanthus praecox*	African Lily	Exotic	F
Anthericaceae	*Chlorophytum comosum*	Spider Plant	Exotic	F
Araceae	*Gymnostachys anceps*	Settlers' Twine	Native	F
Araliaceae	*Hydrocotyle sibthorpioides*		Native	F
Arecaceae	*Livistona australis*	Cabbage Palm	Native	P
Asparagaceae	*Asparagus aethiopicus*	Ground Asparagus	Exotic	F
Asteraceae	*Bidens pilosa*	Cobblers Pegs	Exotic	F
Asteraceae	*Erigeron karvinskianus*	Bony-tip Fleabane	Exotic	F
Asteraceae	*Ozothamnus diosmifolius*	Rice Flower	Native	S
Bignoniaceae	*Pandorea pandorana*	Wong Wonga Vine	Native	L
Blechnaceae	*Blechnum cartilagineum*	Gristle Fern	Native	E
Campanulaceae	*Lobelia purpurascens*	Whiteroot	Native	F
Casuarinaceae	*Allocasuarina torulosa*	Forest Oak	Native	T
Commelinaceae	*Commelina cyanea*		Native	F
Convolvulaceae	*Dichondra repens*	Kidney Weed	Native	F
Cyperaceae	Gahnia aspera	Rough Saw-sedge	Native	V
Dennstaedtiaceae	*Pteridium esculentum*	Common Bracken	Native	E
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower	Native	L
Euphorbiaceae	*Euphorbia peplus*	Petty Spurge	Exotic	F
Fabaceae - Caesalpinioideae	*Senna pendula* var. *glabrata*		Exotic	S
Fabaceae - Faboideae	*Glycine tabacina*		Native	F
Fabaceae - Faboideae	*Kennedia rubicunda*	Dusky Coral Pea	Native	F
Fabaceae - Faboideae	*Podolobium ilicifolium*	Prickly Shaggy Pea	Native	S
Lamiaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum	Native	S
Lamiaceae	*Plectranthus parviflorus*	Cockspur Flower	Native	F
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	Native	R
Lomandraceae	*Lomandra* sp.		Native	R
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry	Native	L
Luzuriagaceae	*Geitonoplesium cymosum*		Native	L
Meliaceae	*Synoum glandulosum*	Scentless Rosewood	Native	S
Moraceae	*Ficus rubiginosa*	Port Jackson Fig	Native	T

Family	Scientific Name	Common name	Native/ Exotic	Form
Myrtaceae	*Corymbia gummifera*	Red Bloodwood	Native	T
Myrtaceae	*Corymbia maculata*	Spotted Gum	Native	T
Myrtaceae	*Eucalyptus paniculata*	Grey Ironbark	Native	T
Myrtaceae	*Eucalyptus umbra*	Broad-leaved White Mahogany	Native	T
Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant	Exotic	S
Oleaceae	*Ligustrum sinense*	Small-flowered Privet	Exotic	S
Oleaceae	*Notelaea longifolia*	Large Mock-olive	Native	S
Phormiaceae	*Dianella caerulea* var. *producta*		Native	F
Phyllanthaceae	*Glochidion ferdinandi*	Cheese Tree	Native	S/T
Phyllanthaceae	*Poranthera microphylla*		Native	F
Pittosporaceae	*Pittosporum multiflorum*	Orange Thorn	Native	S
Pittosporaceae	*Pittosporum undulatum*	Native Daphne	Native	S/T
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass	Native	G
Poaceae	*Digitaria parviflora*	Small-flowered Finger Grass	Native	G
Poaceae	*Digitaria sanguinalis*	Summer Grass	Exotic	G
Poaceae	*Echinopogon caespitosus*	Bushy Hedgehog-grass	Native	G
Poaceae	*Ehrharta erecta*	Panic Veldtgrass	Exotic	G
Poaceae	*Entolasia stricta*	Wiry Panic	Native	G
Poaceae	*Imperata cylindrica*	Blady Grass	Native	G
Poaceae	*Microlaena stipoides*	Weeping Grass	Native	G
Poaceae	*Oplismenus aemulus*	Australian Basket Grass	Native	G
Poaceae	*Panicum simile*	Two-colour Panic	Native	G
Poaceae	*Paspalidium* sp.		Native	G
Poaceae	*Stenotaphrum secundatum*	Buffalo Grass	Exotic	G
Poaceae	*Themeda triandra*	Kangaroo Grass	Native	G
Primulaceae	*Myrsine variabilis*		Native	S/T
Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung	Native	S
Rubiaceae	*Pomax umbellata*		Native	F
Rutaceae	*Correa lawrenceana* var. *cordifolia*	Mountain Correa	Native	S
Solanaceae	*Solanum aviculare*	Kangaroo Apple	Native	S
Solanaceae	*Solanum opacum*	Green Berry Nightshade	Native	F
Solanaceae	*Solanum prinophyllum*	Forest Knightshade	Native	F
Verbenaceae	*Lantana camara*	Lantana	Exotic	S
Violaceae	*Melicytus dentatus*	Tree Violet	Native	S
Violaceae	*Viola odorata*	Sweet Violet	Exotic	F
Vitaceae	*Cissus hypoglauca*	Water Vine	Native	L

Form: (E) Fern; (F) Forb; (G) Grass; (L) Vine/Climber/Scrambler; (P) Palm; (R) Rush; (S) Shrub; (T) Tree; (V) Sedge.

Fauna

Class	Family	Scientific name	Common name	Native/ Exotic	Observation Type
Aves	Artamidae	*Cracticus tibicen*	Australian Magpie	Native	W
Aves	Artamidae	*Cracticus torquatus*	Grey Butcherbird	Native	W
Aves	Artamidae	*Strepera graculina*	Pied Currawong	Native	W
Aves	Cacatuidae	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	Native	W
Aves	Corvidae	*Corvus coronoides*	Australian Raven	Native	W
Aves	Eupetidae	*Psophodes olivaceus*	Eastern Whipbird	Native	W
Aves	Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra	Native	O
Aves	Meliphagidae	*Manorina melanocephala*	Noisy Miner	Native	W
Aves	Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	Native	W
Mammalia	Macropodidae	*Wallabia biocolor*	Swamp Wallaby	Native	O
Reptilia	Scincidae	*Lampropholis delicata*	Dark-flecked Garden Skink	Native	O

O = observed; W = heard

Appendix D: Local occurrence of Pittwater Spotted Gum Forest

Appendix E: Ecological Sustainability Plan - Report

Requirements	Details
Site Preparation Description of: -Tree, vegetation and habitat protection -Sediment and erosion control for natural features -Weed control -Top soil/ litter layer treatment -Surface treatment and stabilisation (mulch etc) -Site drainage with respect to natural features	Avoidance and mitigation measures are detailed in **Section 4.3** of the FFA, which detail that all habitat will be protected, with exception for one canopy tree. Weed control will include the initial eradication of WoNS and priority weeds in the study area (see **Section 3.2.** and **Appendix C**). Environmental weeds will be kept at low abundance and cover (<1%) and treated prior to seeding, where possible. Sweeps will be conducted through the study area to prevent the further establishment existing exotic species onsite and to promptly eradicate any new infestations any weed species not previously identified in the study area. All other components relating to 'site preparation' are not considered necessary.
Weed Removal and Regeneration -List of priority and environmental weeds -Timeline for removing priority weeds and controlling/removing environmental weeds Timeline to include the area / number of weed species acceptable as a background level. Cross reference location with Map	A list of priority weeds for the Greater Sydney Region and WoNS are included in **Section 3.2.3** and a list of all weeds recorded in the study area, some of which are environmental weeds is included in **Appendix C**. The two priority weeds identified in the study are area also WoNS (*Lantana camara** and *Asparagus aethiopicus**). The two species are scattered across the study area homogenously, although occur in low abundance and cover (<1%). The abundance and cover of *Lantana camara** and *Asparagus aethiopicus** is considered an acceptable 'background level'. However, it is recommended that the two species are eradicated in the study area to prevent their further establishment. Environmental weeds are generally confined to the boundary of the 'intact' vegetation in the north of the study area and currently occur at an acceptable 'background level'. Environmental weeds should be kept at low levels (<1% cover of the study area) at all times, removed prior to seeding and disposed of in the properties green waste bin, or a licenced green waste facility.

Requirements	Details
Description of Planting -Planting aims, e.g. supplementary planting in a regeneration area, or a native vegetation area or planting in a landscape area -Species list recommended for planting–as appropriate (if the ESP is replacing a Landscaping Plan give details of species to be planted and size range / species). Local native species to be used (for at least 70% of plantings, 80% in Endangered Ecol. Comm.). Identify source of local native, plant stock -Description of areas for bush regeneration, trees to be retained, trees to be planted (and what size), etc. -A schedule of materials–including elements such as weed matting, mulch, edging, walling, paving and fencing -Description of works meeting minimum requirements of Landscaping Policy (i.e. 50% of development screened in 3 yrs)	Planting will not be necessary in the study area, as it consists of intact vegetation with a high resilience. Weed matting and mulching is not considered necessary for the study area, and is likely to be detrimental to the intact native vegetation in the study area.
Long-term Management -Management of habitat features, including protection during construction and for the life of development. Maintenance period for 12 to 24 months after Issue of Occupation Certificate. NB maintenance can be by land occupier -Indicate areas that are to be maintained as 'bushland' for the life of the development -Description of exclusion areas for domestic animals as relevant -Reference to other documents if relevant (e.g. frequency and type of fuel reduction, care for on-site water disposal system)	The proposal would require the removal of one canopy tree, which was not identified as a HBT. The area to be maintained as 'bushland' for the life of the development is mapped in the Ecological Sustainability Plan – Site Map and includes all vegetation mapped in an 'intact' condition in the south of the study area. A temporary fence and gate are installed along the lower edge of a set of stairs in the north of the study area. The location of the fence occurs approximately at the boundary of the 'intact' vegetation. It is recommended that a permanent fence is installed in its location to prevent domestic animals, particularly dogs, from accessing the southern portions of the study area.

Requirements	Details
Check-sheets listing activities to be completed on an on-going basis. -List of priority weeds to be managed/removed (at all times) -List of environmental weeds to be managed/removed (all times) -Area of native vegetation and trees to be maintained/retained -Area from which domestic animals are not permitted	A list of priority weeds for the Greater Sydney Region and WoNS are included in **Section 3.2.3**. A list of environmental weeds identified in the study area is included in **Appendix C**. The priority weeds and WoNS would be easily eradicated from the study area. Environmental weeds listed in **Appendix C** should be kept at low levels (<1% cover of the study area) at all times, removed prior to seeding and disposed of in the properties green waste bin, or a licenced green waste facility. The area of trees and native vegetation to be retained includes the southern portion of the study area, which contains vegetation in an 'intact' condition.