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Altitude Aspire, Terranora

Ecological Assessment

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Executive Summary

Burchills was engaged by Newland Developers Pty Ltd to prepare an Ecological Assessment for a Development Application over Lot 1 DP175234, 93 Parkes Lane, Terranora (subject site).

This ecological assessment was prepared to comply with the provisions of the NSW Biodiversity Conservation Act 2016 and the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Tweed Local Environment Plan zones the majority of the subject site as General Residential with the balance zoned Deferred Matter.

Results of desktop surveys indicate seven (7) matters of local environmental significance are mapped as occurring on the site:

- SEPP Coastal Management 2018 coastal wetlands, coastal environment and coastal use;
- Bioregional Fauna Corridor;
- Tree Preservation;
- Areas of very high ecological status;
- Areas of high ecological sensitivity;
- Drainage channels of 2nd order or above; and
- Priority areas for bushland and non-bushland habitat rehabilitation.

Flora and fauna surveys were undertaken across the site during April and May 2017. A total of 163 species of flora were identified within the site, comprising 108 native species and 55 non-native species.

One (1) threatened flora species was recorded during the surveys – Rough-shelled bushnut (*Macadamia tetraphylla*). A single juvenile specimen (1.2m high) was recorded in Vegetation Association A, on the site's eastern boundary in close vicinity to the existing dwelling. A subsequent site investigation (JWA, 2019) found four (4) additional specimens in close proximity to this individual. This species is listed as Vulnerable under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). All specimens of *Macadamia tetraphylla* will be translocated prior to earthworks commencing in accordance with the Translocation Plan (JWA, 2018b).

The flora survey recorded a total of 37 weed species (23% of the site's total flora species) within the site including seven (7) identified as a biosecurity matter under the NSW *Biosecurity Act 2015*. Camphor laurel was the most widely recorded weed, detected in all mapped vegetation associations.

Vegetation communities were verified through ground truthing and classified as follows:

Type A. Tall Closed Forest (*Cinnamomum camphora*);
Type B. Tall Open/Closed Swamp Sclerophyll Forest (*Archontophoenix cunninghamiana*,-*Melaleuca quinquenervia*);
Type C. Tall Open/Closed Moist Sclerophyll Forest with Rainforest Understorey;
Type D. Mid-high Wet Grassland / Sedgeland

Type E. Maintained Anthropogenic Grassland.

Vegetation Association B represents an alliance of the TSC Act Endangered Ecological Community (EEC) Swamp Sclerophyll Forest on Coastal Floodplains. This EEC falls within a protected area under the plan of development and will not be impacted by the proposed development.

Fauna surveys detected three (3) threatened species on the subject site including:

- *Nyctimene robinsoni* (Eastern tube-nosed bat);
- *Ptilinopus regina* (Rose-crowned fruit-dove); and
- *Daphoenositta chrysoptera* (Varied sittella).

Though these species were detected within the development footprint, their primary habitat (Vegetation Association B) falls within a protected area under the plan of development and will not be impacted by the proposed development.

The site falls within a koala management area under the *Tweed Coast Comprehensive Koala Plan of Management 2014* so this species was targeted during surveys. No koalas or evidence of recent activity by this species was detected.

An assessment of significance pursuant to Part 7 (7.3) of the *Biodiversity Conservation Act 2016* was performed for all threatened flora, fauna and ecological communities likely to occur within the subject site. Criteria used to select the threatened species for assessment included:

- Distribution of the species;
- Database records within 10 km of the site; and
- Availability of the species' habitat on the site.

Based on the results of the assessments of significance, it was concluded that the proposed development would not contribute to a reduction in local populations of affected species nor remove any critical foraging or breeding habitat.

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1. Introduction

Burchills Engineering Solutions Pty Ltd (Burchills) was engaged by Newland Developers Pty Ltd to prepare a Detailed Ecological Assessment over Lot 1 DP175234, located at 93 Parkes Lane, Terranora within the Tweed Shire local government area (the subject site).

The intent of this assessment is to detail the ecological features and functions within the subject site and identify any potential impacts to these values as a result of development. The report includes desktop assessments and field investigations. Development approval has been granted and a Planning Agreement between the proponent and Tweed Shire Council established for the initial stages of the Altitude Aspire neighbourhood, located to the immediate east of the subject site.

1.1 Objectives

The objectives of this Ecological Assessment are to:

- Map site features such as Vegetation Associations, topographical features, and existing infrastructure;
- Assess ecological features including:
    - Location of expected and known significant flora, fauna and habitat;
    - Location of poorly conserved ecosystems;
    - Significant weed infestations;
    - All waterbodies and drainage lines;
    - Location and tenure of conservation reserves; and
    - Location of areas subject to *Voluntary Conservation Agreements*;
- Perform Assessments of Significance for threatened species confirmed or potentially occurring on the subject site (including 7 Part Tests of Significance);
- Assess the proposed development against the Tweed Coast Comprehensive Koala Plan of Management;
- Assess ecological functions, including core habitat areas and ecological corridors;
- Assess the potential impacts of the development on matters of environmental significance;
- Provide recommendations to mitigate the impacts of development on matters of environmental significance; and
- Propose any additional management plans required to conserve matters of environmental significance identified in the study area.

1.2 Site Description and Surrounding Land Use

The subject site is located at 93 Parkes Lane, Terranora, within the Tweed Shire Council local government area. The site has a total area of approximately 31 ha. The site is currently undeveloped and is used for cattle grazing at present. Historically, the site has been used for agriculture and cattle grazing. There are several sheds on the site and a disused dwelling.

The surrounding land use pattern is characterised by rural living and low-scale residential to the south east. The site's northern boundary adjoins Trutes Bay, part of the Terranora Broadwater (Terranora Creek).

Site access is via Parkes Lane in the south-eastern corner (Figure 1.1). The site was cleared historically for agricultural use with parts of the site vegetated with regrowth and Camphor laurel.

Under the *Tweed Local Environmental Plan 2014* (Tweed LEP), the majority of the site is zoned as R1 – General Residential. The northern third of the site is mapped as Deferred Matter. Under the superseded LEP 2000, this area was mapped as Environmental Protection (Wetland and Littoral Rainforest) zoning is present along the northern site boundary (7a in Figure 1.2) and the western boundary is zoned Environmental Protection (Scenic / Escarpment) (7d in Figure 1.2). The majority of the site falls within the Urban Release area under the Tweed LEP.

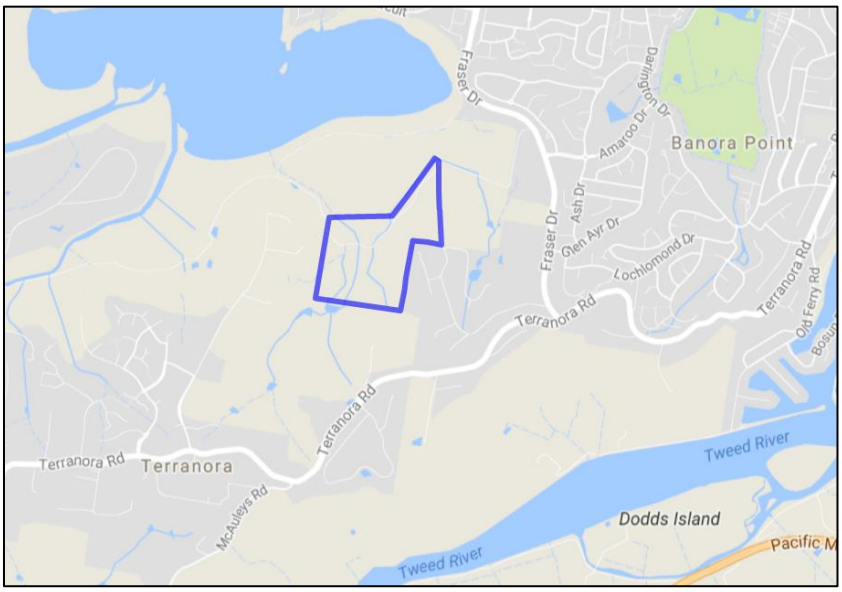

Figure 1.1 Site Location Map (Source: Nearmaps 2017)

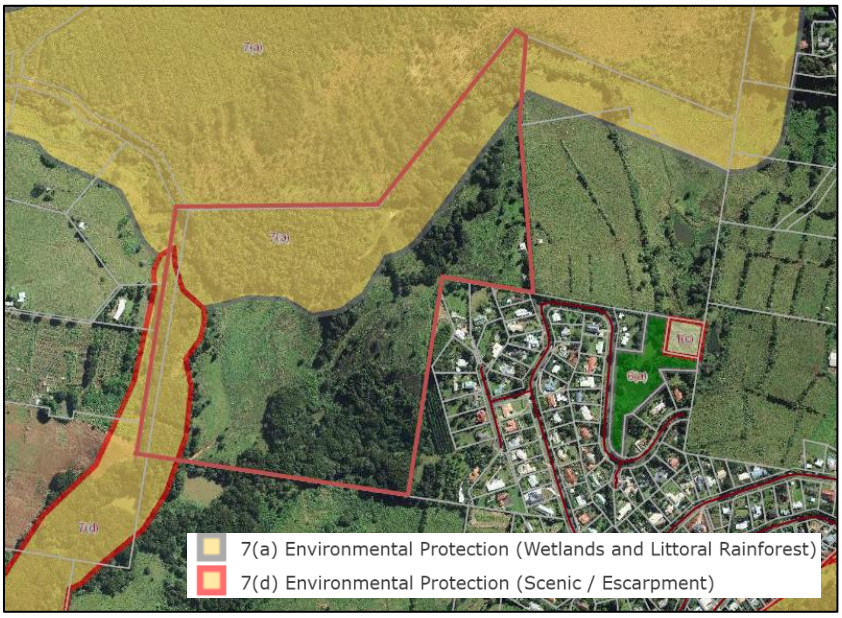

Figure 1.2 Tweed LEP 2014 Zoning

2. Description of Proposed Development

The proposed development comprises 131 residential lots, four (4) unit sites, two (2) shop precincts, public reserves and drainage reserves. The development will be staged commencing on the eastern boundary to connect with the existing Altitude Aspire development. Figure 2.1 shows the proposed layout over recent satellite imagery.

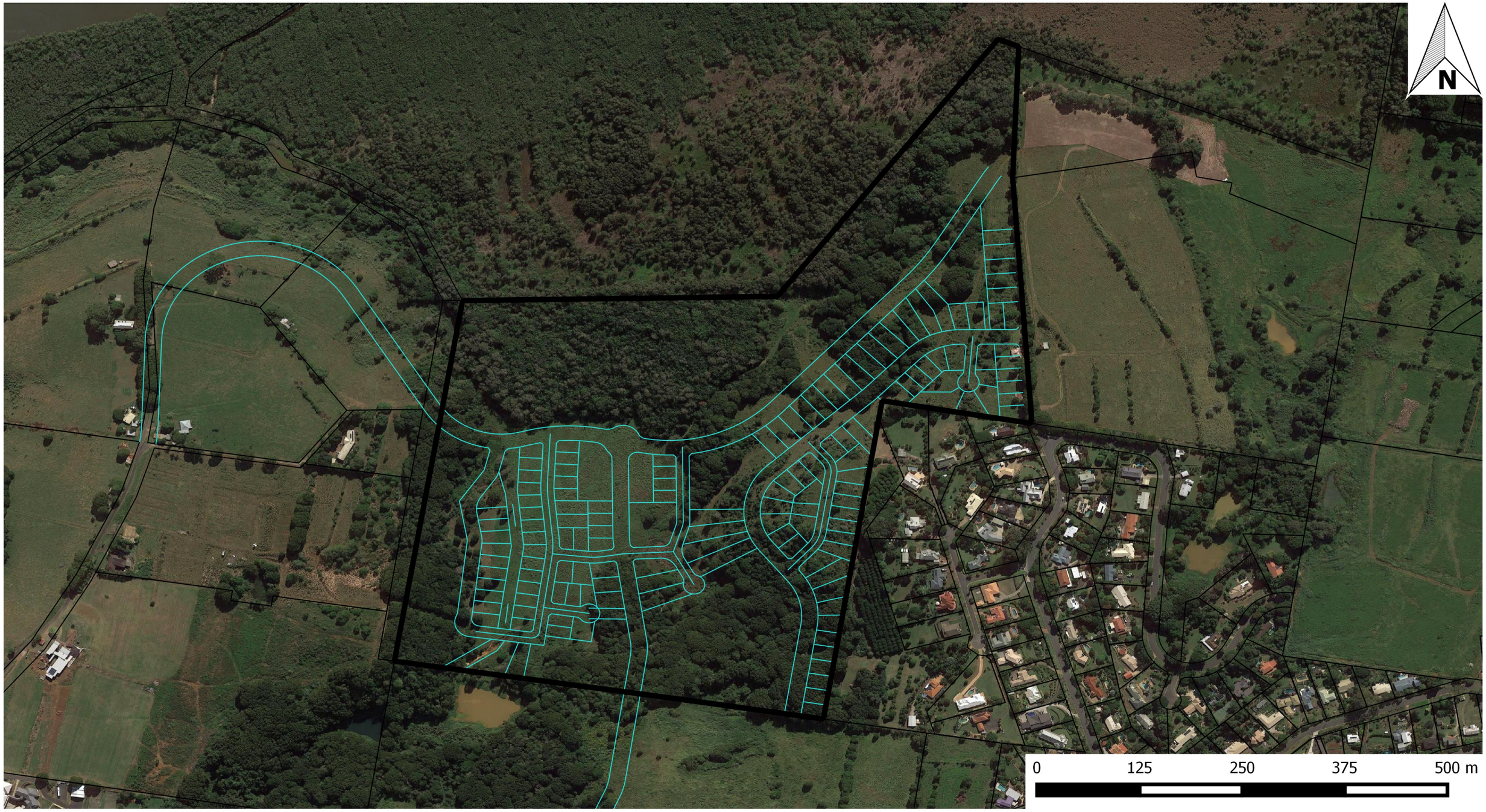

FIGURE 2.1 Aerial Imagery
LOT 1 ON DP175234
NEWLAND DEVELOPERS PTY LTD

PROJECTION: GDA94/MGA ZONE 56
PROJECT: BE170043
DATE: JULY 2017

LEGEND

- Site_Location
- Proposed Layout BPS 170308

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3. Abiotic Environment

To provide a background and context for the investigation of ecological features and functions for the site, a desktop review of abiotic parameters associated with the site has been undertaken. The following sections present the findings of these assessments.

3.1 Topography and Drainage

The site generally slopes north-westerly from a ridgeline at approximately 55-60m AHD in the south east to an alluvial flat in the north-west of the site at approximately 2-5AHD (Figure 3.1).

Stormwater flows northerly through the site mostly by sheet flow but also via a number of small drainage lines to the wetland area north of the site. This wetland flows into the Terranora Broadwater (part of Terranora Ck).

3.2 Soils and Geology

The geology of the local area including the subject site comprises aeolian and marine quartz sand sheets overlying peat and alluvium in the lower areas, with deep soils (>200 cm) and basalt derived Ferrosols on the slopes and higher ground (Morand 1996).

The Soil Landscapes of the Murwillumbah-Tweed Heads 1:100,000 mapping (OEH, 1996) indicates the site soils are classified as “Estuarine Cobaki” and “Erosional Billinudgel” (Figure 3.1). A small area of the site on the higher ridgeline at the south-eastern corner is classified as “Carool Variant a”.

The Billinudgel Soil Landscape is described as: *Palaeozoic Neranleigh-Fernvale Group - Thinly bedded fissile shales, siltstones and sandstones with occasional more massive greywackes, volcanic tuffs, agglomerates, sandstones and massive cobble conglomerates* (Morand 1996).

The Cobaki Landscape is described as: *Pleistocene sand sheets overlying peat and alluvium. Soils are commonly (up to 100 cm) brownish black peaty loam (field pH 5.5), overlying >200 cm of dark buttery silty marine clay (field pH 5.5 – 7.0 when wet but which may drop to 2.0 – 3.0 when exposed)* (Morand 1996).

The Carool Soil Landscape is described as: *Lamington Volcanics – Tertiary basalt with members of rhyolite, trachyte, tuff, agglomerate, conglomerate* (Morand 1996).

3.3 Acid Sulfate Soils

The *Tweed Local Environmental Plan 2014* (LEP) - Acid Sulfate Soils Planning Map classifies the site as Class 2 (works below the ground surface) and Class 5 (works within 500m of adjacent class 1, 2, 3 or 4 land which are likely to lower the watertable below 1m AHD in class 1, 2, 3, or 4 land) within the development footprint (Figure 3.2). In accordance with Part 7, Section 7.1, Clause 3 of the LEP, no works may be carried out on the allotted land parcel unless an Acid Sulfate Soils Management Plan has been prepared and has been provided to the consent authority (Tweed Shire Council).

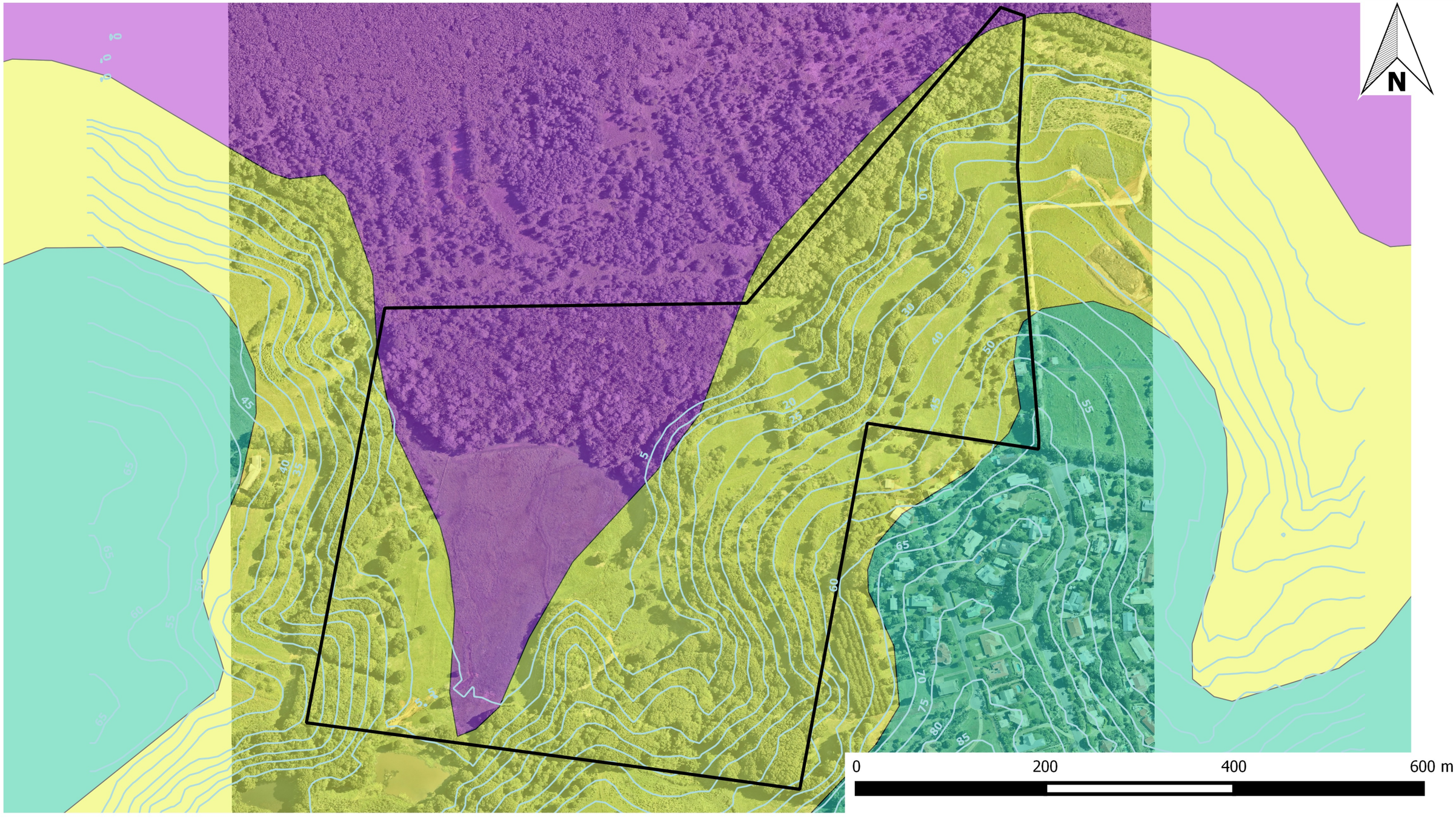

FIGURE 3.1 Soil Landscapes and 5m Contours
LOT 1 ON DP175234
NEWLAND DEVERLOPERS PTY LTD

PROJECTION: GDA94/MGA ZONE 56
PROJECT: BE170043
DATE: APRIL 2017

LEGEND

Soils Landscapes OEH 1996

- BILLINUDGEL
- CAROOL variant a
- COBAKI

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3.4 Flooding Hazard

Tweed Shire Council Planning Maps indicates an area in the north of the site is subject to flooding. The design flood level is at 2.6M AHD (Figure 3.2). Design flood levels are based on the 100-year average recurrence interval (ARI) year flood, or a flood that has a 1% chance of occurring in a given year.

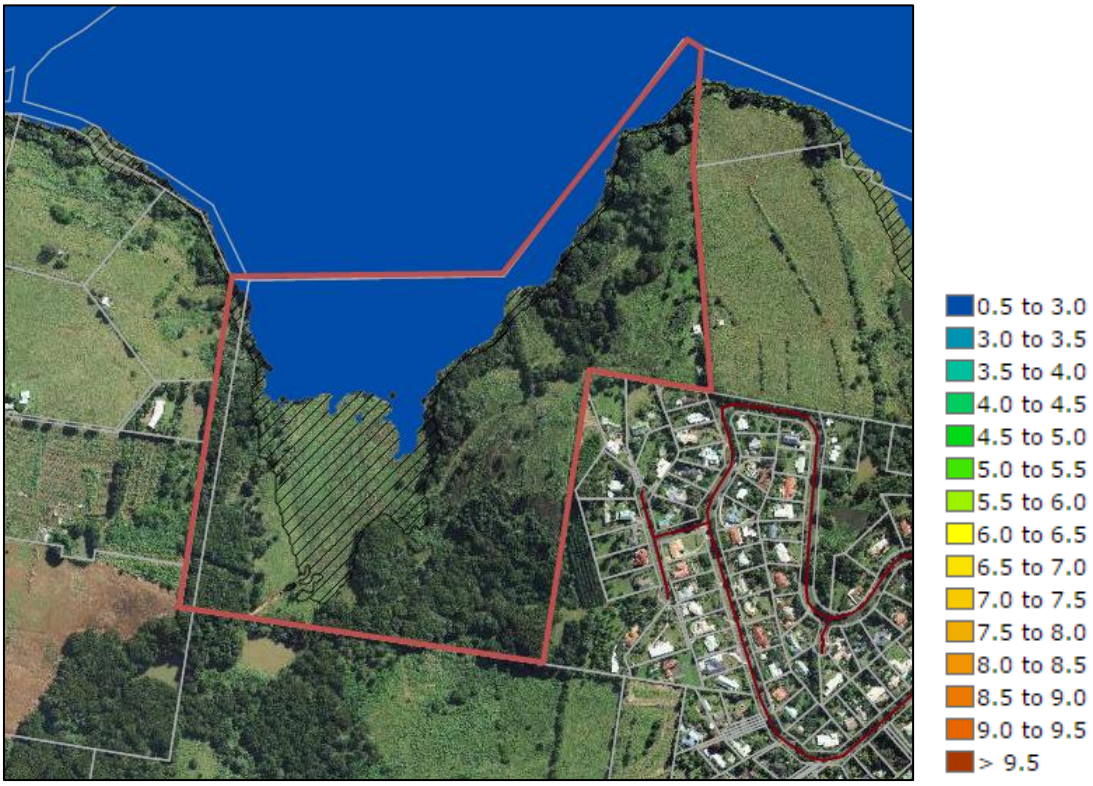

Figure 3.2 Tweed Shire Council Design Flood Levels (Source: Tweed Local Environment Plan 2014)

3.5 Bush Fire Prone Land

The NSW Rural Fire Service's *Guide for Bush Fire Prone Land Mapping* document identifies two (2) categories of vegetation with relation to bush fire prone land:

- Vegetation Category 1:
  - Areas of forest, woodlands, heaths (tall and short), forested wetlands and timber plantations.
  - Remnant and Short Fire Run vegetation within 30 metres of each other where the combined area is greater than 2.5 hectares.
- Vegetation Category 2:
  - Grasslands, freshwater wetlands, semi-arid woodlands, arid shrublands and rainforests.
  - Remnant vegetation and short fire runs greater than 100 metres lateral separation from Category 1 vegetation and 30 metres from other Category 2 vegetation.

The LEP – Bushfire Prone Land Map (2012) shows large areas of Vegetation Category 1 and 2 over the site. Buffers surround these areas (Figure 3.3).

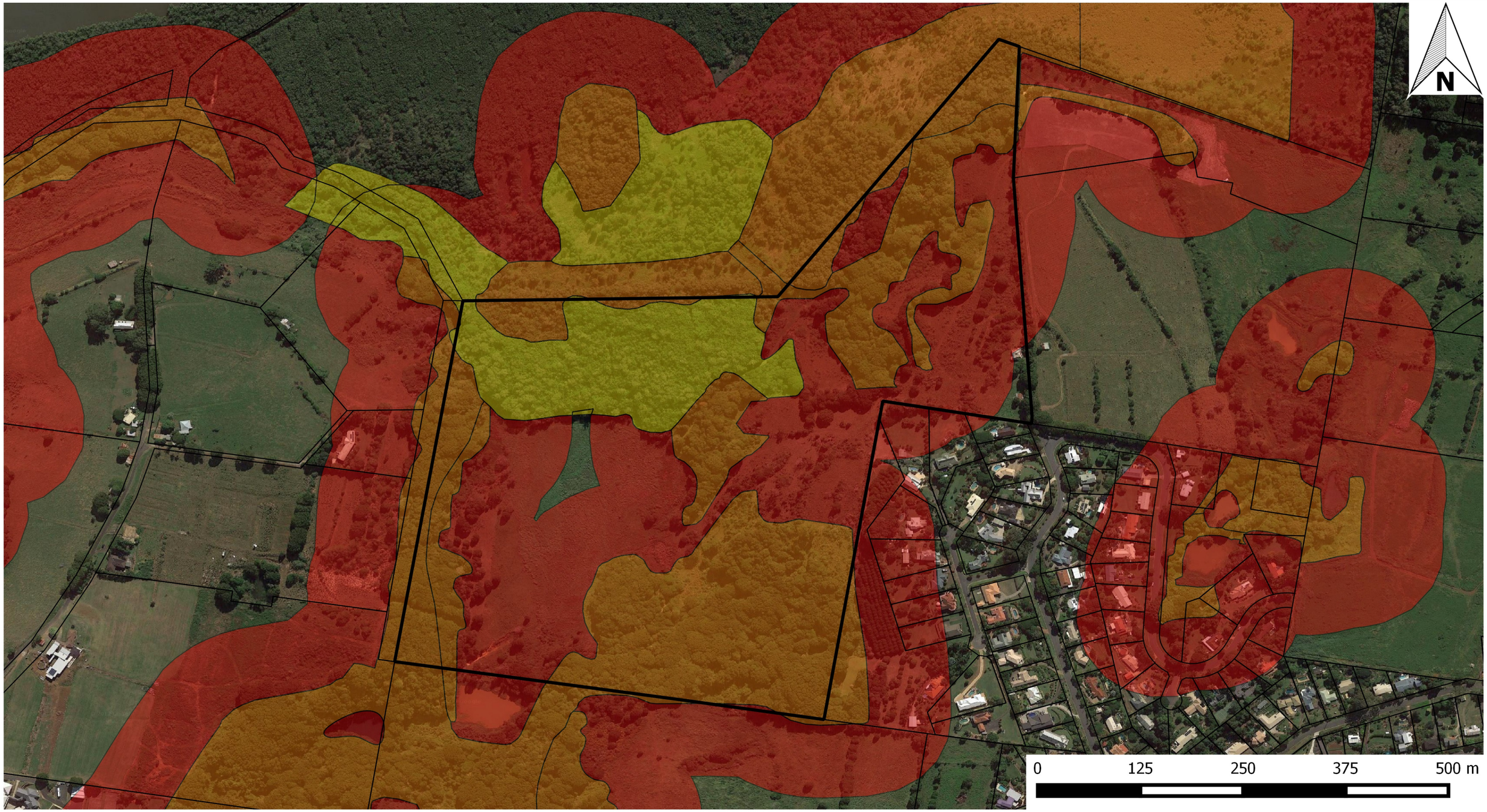

FIGURE 3.3 Potential Bushfire Areas
LOT 1 ON DP175234
NEWLAND DEVELOPERS PTY LTD

PROJECTION: GDA94/MGA ZONE 56
PROJECT: BE170043
DATE: JULY 2017

LEGEND

Bushfire Hazard Category

- Vegetation Buffer
- Vegetation Category 1
- Vegetation Category 2

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4. Matters of Environmental Significance

A desktop assessment was conducted to evaluate the national, state and local matters of environmental significance within and proximate to the subject site. The outcomes of these investigations are presented in the following sections.

4.1 Desktop Survey Overview

To provide a background and context for the investigation of ecological features and functions for the site, and to devise the methodology and survey effort for field investigations relating to vegetation communities and their associated fauna, a desktop analysis was undertaken. The likely quality of potential fauna habitat and any potentially significant species that may be using the site or local area was also investigated using these methods. The following sections present the findings of these assessments.

The following desktop search tools and databases were analysed to obtain information relating to the site:

- Previous site investigations;
- Tweed Shire Council *Local Environmental Plan 2014* mapping;
- Tweed Shire Council *Vegetation Management Strategy 2004* mapping;
- BioNet Atlas of NSW Wildlife Records; and
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool.

A brief discussion in relation to the results, search parameters and rationale for search parameters for the desktop survey are presented in the following sections.

4.2 Matters of National Environmental Significance

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is Federal legislation that provides a framework for the protection and management of nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the Act as *Matters of National Environmental Significance*.

A significant impact is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. All of these factors should be considered when determining whether an action is likely to have a significant impact on the environment. If a proposed action is likely to have a significant impact on a Matter of National Environmental Significance, it must be referred to the Australian Government Minister for Sustainability, Environment, Water, Population and Communities for assessment against the EPBC Act.

The Protected Matters Search Tool was used to determine if matters of National significance were present on the subject site. No confirmed matters protected under the EPBC Act were present on the site.

Based on an assessment of the environmental features, functions and values of the site, and the geographical location, scale and potential impacts associated with the proposal, there are no impacts

that could be considered as important, notable or significant at a national level, or other factors associated with the subject site or development that trigger the provisions of EPBC Act. Therefore, it has been concluded that the proposal does not require referral to the Australian Government Minister for the Environment, Heritage and the Arts.

4.3 Matters of State Environmental Significance

Planning in NSW is largely governed by two pieces of legislation; the *Environmental Planning and Assessment Act 1979* and the *Environmental Planning and Assessment Regulation 2000*. Whilst both legislative instruments provide the overarching structure for planning in NSW, there are several other statutory documents that support this structure including; State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs) (NSW Planning and Environment, 2015).

State Environmental Planning Policies (SEPPs) deal with matters of State or regional environmental planning significance.

There are three (3) SEPPs that are applicable to the site or in immediately adjacent areas. These SEPPs include:

- State Environmental Planning Policy (Coastal Management) 2018;
- State Environmental Planning Policy No. 44 - Koala Habitat Protection; and
- State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017.

4.3.1 State Environmental Planning Policy (Coastal Management) 2018

The aim of Coastal Management State Environmental Planning Policy 2018 is to protect and manage the natural, cultural, recreational and economic attributes of the NSW coast. It defines the four coastal management areas in the *Coastal Management Act 2016* through detailed mapping and specifies assessment criteria that are tailored for each coastal management area.

The Coastal Management Act defines the four (4) coastal management areas in the coastal zone as:

- Coastal wetlands and littoral rainforests area;
- coastal vulnerability area;
- coastal environment area; and
- coastal use area.

Development consent is required where land falls within one of the four management areas. Figures 4.1 - 4.3 indicate the site falls within a coastal wetland area, coastal environment and coastal use area. No maps are currently available for coastal vulnerability areas. Therefore, development consent is required.

This policy requires certain development applications where there is deemed to be a cumulative impact of the development on the environment to be referred to the Director-General for comment.

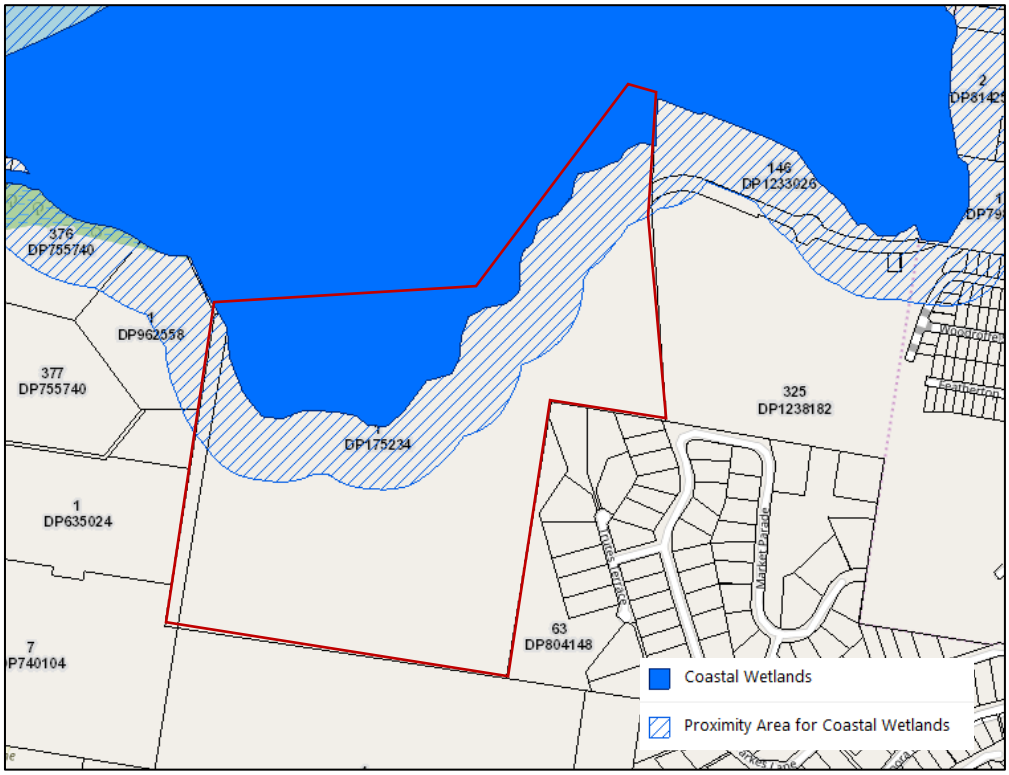

Figure 4.1 Coastal Wetlands and Proximity Areas Mapping

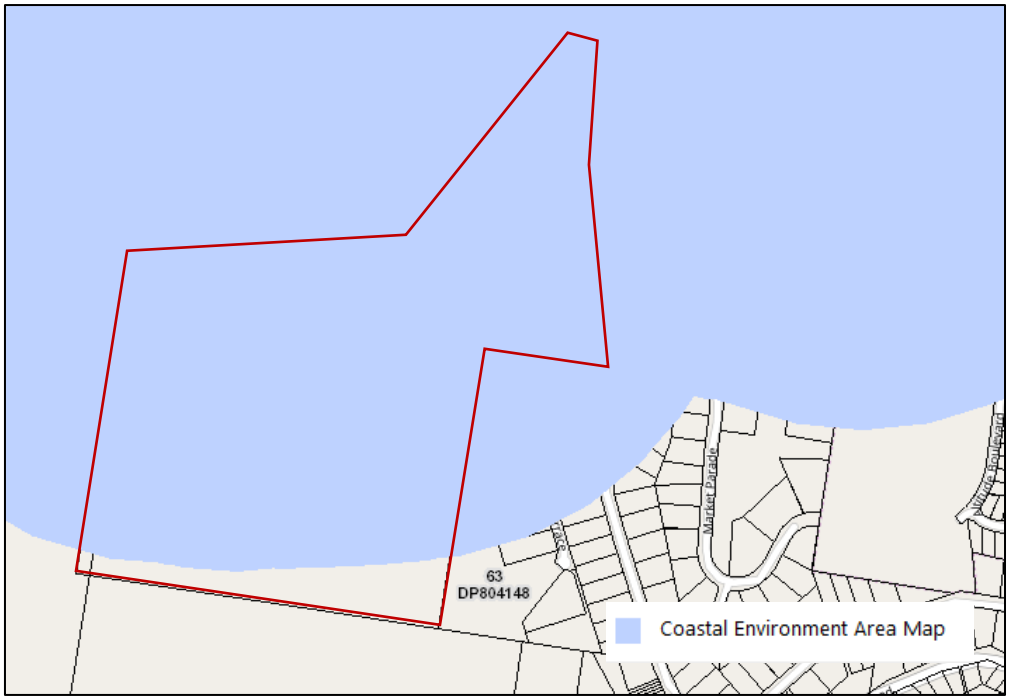

Figure 4.2 Coastal Environment Area Mapping

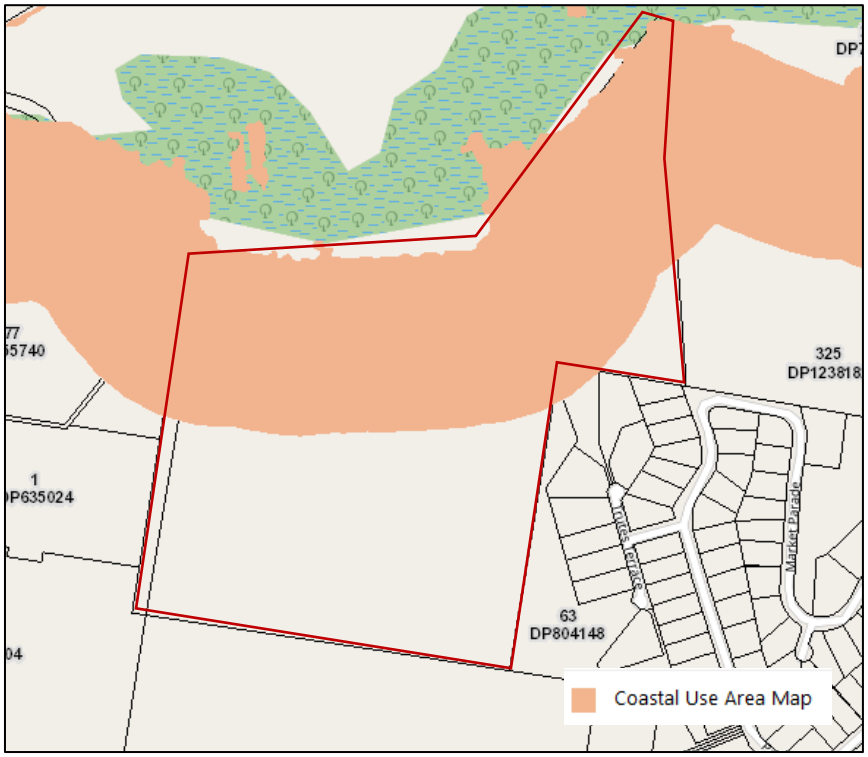

Figure 4.3 Coastal Use Area Map

Tweed Area E Local Environment Study identifies the wetland to the immediately north of the subject site as "significant ecological areas not suitable for development" (Parsons Brinckerhoff, 2004, p47). Parsons Brinckerhoff (2004) also indicates that a 50m buffer is required to this area.

4.3.2 State Environmental Planning Policy No. 44 – Koala Habitat Protection

The *State Environmental Planning Policy No. 44 – Koala Habitat Protection* encourages the conservation and management of natural vegetation areas that provide habitat for koalas to ensure permanent free-living populations will be maintained over their present range. The policy applies to 107 local government areas, including the Tweed. Local councils cannot approve development in an area affected by the policy without an investigation of core koala habitat. The policy provides the state-wide approach needed to enable appropriate development to continue, while ensuring there is ongoing protection of koalas and their habitat.

Before a council may grant consent for a development, it must satisfy itself whether or not the land is a potential koala habitat. If the land is considered potential koala habitat, it needs to be determined if the land is core koala habitat. The definition of core and potential koala habitat is as follows:

- **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.
- **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.

Where it is determined that the land is core koala habitat, a plan of management is required.

Tweed Shire mapping indicates areas to the north of the site and along the northern boundary contain areas of preferred koala habitat (green shaded areas on Figure 4.5).

Figure 4.4 Koala Habitat Mapping

4.3.3 State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017

The State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 (Vegetation SEPP) works together with the *Biodiversity Conservation Act 2016* and *the Local Land Services Amendment Act 2016* to create a framework for the regulation of clearing of native vegetation in NSW.

The Vegetation SEPP will regulate clearing of native vegetation on urban land and land zoned for environmental conservation/management that does not require development consent.

The Vegetation SEPP applies to clearing of:

1. Native vegetation above the Biodiversity Offset Scheme (BOS) threshold where a proponent will require an approval from the Native Vegetation Panel established under the *Local Land Services Amendment Act 2016*; and

2. Vegetation below the BOS threshold where a proponent will require a permit from Council if that vegetation is identified in the council's development control plan (DCP).

4.3.4 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BCA) establishes an integrated legislative framework for land management and biodiversity conservation. Biodiversity components include provisions for offsetting and private land conservation, as well as setting out the direction for threatened species conservation and the management of human-wildlife interactions.

Biodiversity values are defined under the act as:

- Vegetation integrity—being the degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state;
- Habitat suitability—being the degree to which the habitat needs of threatened species are present at a particular site; and
- Biodiversity values, or biodiversity-related values, prescribed by the regulations.

Under the BCA, proponents must apply the test of significance (under Section 7.3) to determine whether the proposed activity is likely to significantly affect threatened species or ecological communities, or their habitats.

If the activity is likely to have a significant impact, or will be carried out in a declared area of outstanding biodiversity value, the proponent must either apply the Biodiversity Offsets Scheme or prepare a species impact statement.

4.3.4.1 Biodiversity Offsets Scheme

The Biodiversity Offsets Scheme (BOS) helps to compensate for potential impact on biodiversity from development. Under the BOS, applications for development or clearing approvals must set out how impacts on biodiversity will be avoided and minimised.

BOS applies to local development (assessed under Part 4 of the *Environmental Planning and Assessment Act 1979*) that triggers the Biodiversity Offsets Scheme threshold or is likely to significantly affect threatened species based on the test of significance in section 7.3 of the *Biodiversity Conservation Act 2016*.

The *Biodiversity Conservation Regulation 2017* sets out threshold levels for when the BOS will be triggered. The threshold has two elements:

1. Whether the amount of native vegetation being cleared exceeds a threshold area; or
2. Whether the impacts occur on an area mapped on the Biodiversity Values Map.

The area threshold varies depending on the minimum lot size and are presented in Table 4.1.

Table 4.1 Area Threshold for Biodiversity Offsets

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

The Biodiversity Values Map identifies land with high biodiversity value, as defined by clause 7.3(3) of the *Biodiversity Conservation Regulation 2017.* Figure 4.5 shows that a very small area along the northern boundary is within a high biodiversity area. This area is excluded from the development footprint. The balance of the site does not fall within a high biodiversity area.

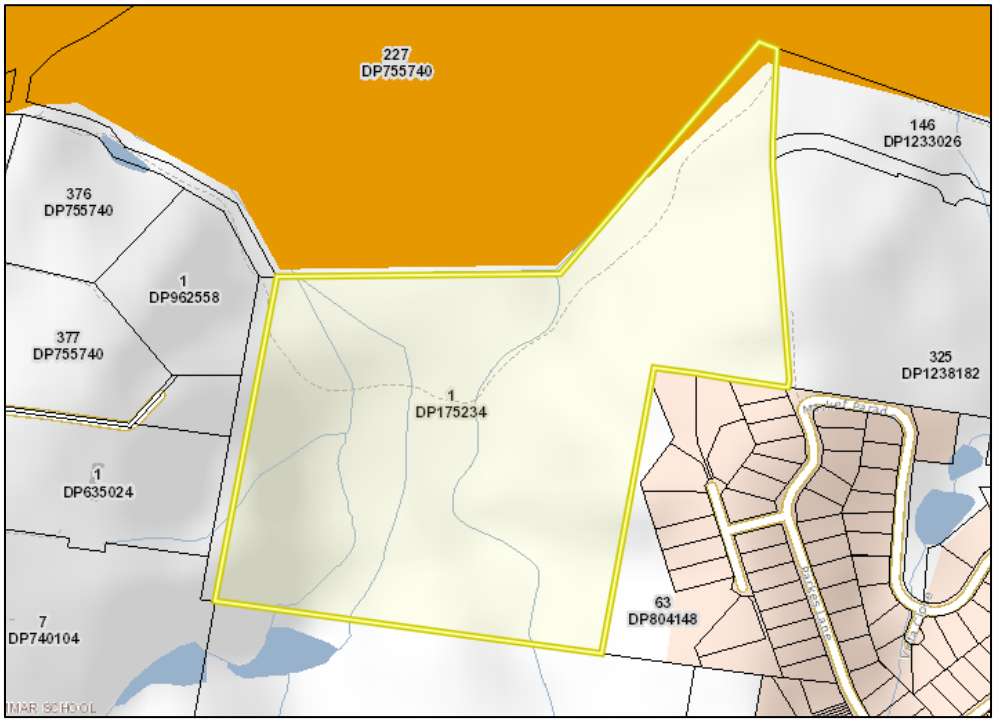

Figure 4.5 Biodiversity Values Map

The BOS applies to all clearing of native vegetation and other biodiversity impacts prescribed by clause 6.1 of the *Biodiversity Regulation 2017* on land identified on the map.

When either of these threshold levels apply, the Biodiversity Assessment Method (BAM) must be used to determine the level of impacts.

The BAM assesses the biodiversity value of land and calculates likely losses in biodiversity values resulting from clearing of native vegetation and habitat destruction. The *Biodiversity Conservation Regulation 2017* includes principles for determining which impacts are 'serious and irreversible impacts on biodiversity values'.

The proposed developed does not trigger either of the thresholds for BOS, therefore, no offsets are applicable.

For developments not triggered by the threshold, the 'test of significance' in Part 7 (7.3) of the *Biodiversity Conservation Act 2016* must be used to determine whether a development is likely to significantly affect threatened species. Where a significant affect is likely, the proponent must carry out a detailed evaluation and produce a Biodiversity Development Assessment Report (BDAR) prior to the development application being lodged for assessment.

Tests of significance have been conducted to determine the impacts to threatened species identified on the site during field and desktop assessments.

4.4 BioNet Atlas of NSW Wildlife Records

For the purposes of ensuring that all management strategies are based on current and integrated data sets, the Atlas of NSW Wildlife Records database was queried. The search area included a 10km radius of the site, the minimum search distance allowable. The co-ordinates for this search area are provided in Table 4.2.

Table 4.2 BioNet Database Query Search Parameters

Parameter	Value
North	-28.17
West	153.46
East	153.56
South	-28.27

While the result from the database query will provide the most comprehensive potential species list, it should be noted that this search parameter considers a variety of vegetation community types and environmental features (e.g. alluvial flats, marine environments) that are not present within the site. Therefore, it could be reasonably expected that the search might return a result that over-represents the potential number and type of flora species that could be expected to utilise the site.

4.4.1 Flora

The BioNet database search reported that 36 flora species that are threatened in New South Wales or Nationally, have previously been recorded within 10 km of the site (Table 4.3). Threatened species are those that have a conservation status of vulnerable, endangered or critically endangered.

Table 4.3 Threatened Flora (BioNet Records)

Scientific Name	Common Name	TSCA Status#	EPBC Act Status*
Ochrosia moorei	Southern Ochrosia	E1,P	E
Diospyros mabacea	Red-fruited Ebony	E1,P	E
Diospyros yandina	Shiny-leaved Ebony	E1,P	
Acalypha eremorum	Acalypha	E1,P	
Cassia marksiana		E1,P	
Acacia bakeri	Marblewood	V,P	
Archidendron hendersonii	White Lace Flower	V,P	
Xylosma terrae-reginae	Queensland Xylosma	E1,P	
Grammitis stenophylla	Narrow-leaf Finger Fern	E1,P,3	
Cryptocarya foetida	Stinking Cryptocarya	V,P	V
Endiandra hayesii	Rusty Rose Walnut	V,P	V
Endiandra muelleri subsp. bracteata	Green-leaved Rose Walnut	E1,P	
Lindsaea brachypoda	Short-footed Screw Fern	E1,P,3	
Lindsaea fraseri	Fraser's Screw Fern	E1,P,3	
Gossia fragrantissima	Sweet Myrtle	E1,P	E
Syzygium hodgkinsoniae	Red Lilly Pilly	V,P	V
Syzygium moorei	Durobby	V,P	V
Geodorum densiflorum	Pink Nodding Orchid	E1,P,2	
Oberonia titania	Red-flowered King of the Fairies	V,P,2	

Scientific Name	Common Name	TSCA Status[#]	EPBC Act Status*
Peristeranthus hillii	Brown Fairy-chain Orchid	V,P,2	
Phaius australis	Southern Swamp Orchid	E1,P,2	E
Floydia praealta	Ball Nut	V,P	V
Grevillea hilliana	White Yiel Yiel	E1,P	
Hicksbeachia pinnatifolia	Red Boppel Nut	V,P	V
Macadamia tetraphylla	Rough-shelled Bush Nut	V,P	V
Randia moorei	Spiny Gardenia	E1,P	E
Acronychia littoralis	Scented Acronychia	E1,P	E
Bosistoa transversa	Yellow Satinheart	V,P	V
Coatesia paniculata	Axe-Breaker	E1,P	
Cupaniopsis serrata	Smooth Tuckeroo	E1,P	
Diploglottis campbellii	Small-leaved Tamarind	E1,P,2	E
Lepiderema pulchella	Fine-leaved Tuckeroo	V,P	
Niemeyera whitei	Rusty Plum, Plum Boxwood	V,P	
Symplocos baeuerlenii	Small-leaved Hazelwood	V,P	V
Centranthera cochinchinensis	Swamp Foxglove	E1,P	
Corokia whiteana	Corokia	V,P	V

*****Status under the Commonwealth EPBC Act: V = Vulnerable, E = Endangered

[#]Status under the *Threatened Species Conservation Act 1995* unless otherwise noted.

E1 Endangered **E2** Endangered Population **E3** Endangered Ecological Community **E4** Presumed Extinct **E4A** Critically Endangered **E4B** Critically Endangered Ecological Community **P** Protected (*National Parks & Wildlife Act 1974*) **V** Vulnerable **V2** Vulnerable Ecological Community

4.4.2 Ecological Communities

The BioNet database was also interrogated for the presence of endangered ecological communities. Nine (9) endangered ecological communities have been recorded within this search area (Table 4.4). Discussion on the likelihood of these ecological communities occurring on the subject site is provided in Section 6.6.

Table 4.4 Endangered Ecological Communities (BioNet Records)

Endangered Community Name	TSCA Status	EPBC Act Status*
Coastal Cypress Pine Forest in the New South Wales North Coast Bioregion	EEC	
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC	V
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC	
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC	CE
Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	EEC	CE
Lowland Rainforest on Floodplain in the New South Wales North Coast Bioregion	EEC	CE

Endangered Community Name	TSCA Status	EPBC Act Status*
Subtropical Coastal Floodplain Forest of the New South Wales North Coast Bioregion	EEC	
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC	
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	EEC	

***** Status under the Commonwealth EPBC Act: V = Vulnerable, E = Endangered, CE = Critically endangered

4.4.3 Fauna

The database search reported that 54 threatened fauna species have previously been recorded within 10 km of the site (Table 4.5). Threatened species are those that have a conservation status of vulnerable, endangered or critically endangered.

Table 4.5 Threatened Fauna (BioNet Records)

Scientific Name	Common Name	TSCA Status	EPBC Act Status
Amphibians			
Litoria olongburensis	Olongburra frog	V,P	
Crinia tinnula	Wallum froglet	V,P	V
Birds			
Anseranas semipalmata	Magpie Goose	V,P	
Ptilinopus magnificus	Wompoo Fruit-Dove	V,P	
Ptilinopus regina	Rose-crowned Fruit-Dove	V,P	
Ardenna carneipes	Flesh-footed Shearwater	V,P	J,K
Ephippiorhynchus asiaticus	Black-necked Stork	E1,P	
Ixobrychus flavicollis	Black Bittern	V,P	
Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P	C
Hieraaetus morphnoides	Little Eagle	V,P	
Pandion cristatus	Eastern Osprey	V,P,3	
Amaurornis moluccana	Pale-vented Bush-hen	V,P	
Burhinus grallarius	Bush Stone-curlew	E1,P	
Esacus magnirostris	Beach Stone-curlew	E4A,P	
Haematopus fuliginosus	Sooty Oystercatcher	V,P	
Haematopus longirostris	Pied Oystercatcher	E1,P	
Charadrius leschenaultii	Greater Sand-plover	V,P	V,C,J,K
Charadrius mongolus	Lesser Sand-plover	V,P	E,C,J,K
Irediparra gallinacea	Comb-crested Jacana	V,P	
Calidris canutus	Red Knot	P	E,C,J,K
Calidris ferruginea	Curlew Sandpiper	E1,P	CE,C,J,K
Calidris tenuirostris	Great Knot	V,P	CE,C,J,K
Limosa limosa	Black-tailed Godwit	V,P	C,J,K
Numenius madagascariensis	Eastern Curlew	P	CE,C,J,K

Scientific Name	Common Name	TSCA Status	EPBC Act Status
Xenus cinereus	Terek Sandpiper	V,P	C,J,K
Sternula albifrons	Little Tern	E1,P	C,J,K
Calyptorhynchus lathami	Glossy Black-Cockatoo	V,P,2	
Glossopsitta pusilla	Little Lorikeet	V,P	
Ninox connivens	Barking Owl	V,P,3	
Tyto longimembris	Eastern Grass Owl	V,P,3	
Todiramphus chloris	Collared Kingfisher	V,P	
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V,P	
Gavicalis fasciogularis	Mangrove Honeyeater	V,P	
Daphoenositta chrysoptera	Varied Sittella	V,P	
Coracina lineata	Barred Cuckoo-shrike	V,P	
Carterornis leucotis	White-eared Monarch	V,P	
Mammals			
Dasyurus maculatus	Spotted-tailed Quoll	V,P	E
Planigale maculata	Common Planigale	V,P	
Phascolarctos cinereus	Koala	V,P	V
Phascolarctos cinereus	Koala Phascolarctos cinereus (Goldfuss, 1817) between the Tweed and Brunswick Rivers east of the Pacific Highway	E2,V,P	V
Nyctimene robinsoni	Eastern Tube-nosed Bat	V,P	
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V,P	
Mormopterus lumsdenae	Northern Free-tailed Bat	V	
Mormopterus norfolkensis	Eastern Freetail-bat	V,P	
Chalinolobus nigrogriseus	Hoary Wattled Bat	V,P	
Miniopterus australis	Little Bentwing-bat	V,P	
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V,P	
Myotis macropus	Southern Myotis	V,P	
Nyctophilus bifax	Eastern Long-eared Bat	V,P	
Reptiles			
Caretta caretta	Loggerhead turtle	E1,P	E
Chelonia mydas	Green turtle	V,P	V
Eretmochelys imbricata	Hawksbill Turtle	P	V
Invertebrates			
Thersites mitchellae	Mitchell's Rainforest Snail	E1	CE

*****Status under the Commonwealth EPBC Act: V = Vulnerable, E = Endangered, C = Listed under the CAMBA, J = Listed under JAMBA, K = Listed under RoKAMBA.

[#]Status under the *Threatened Species Conservation Act 1995* unless otherwise noted.

E1 Endangered **E2** Endangered Population **E3** Endangered Ecological Community **E4** Presumed Extinct **E4A** Critically Endangered **E4B** Critically Endangered Ecological Community **P** Protected (*National Parks & Wildlife Act 1974*) **V** Vulnerable **V2** Vulnerable Ecological Community **1** Sensitivity Class 1 (Sensitive Species Data Policy) **2** Sensitivity Class 2 (Sensitive Species Data Policy) **3** Sensitivity Class 3 (Sensitive Species Data Policy).

An assessment of the likelihood of occurrence of these threatened species on the site and the impacts of the proposed development is provided in Section 5 of this report.

4.5 Matters of Local Environmental Significance

In NSW, each local government area has a Local Environmental Plan (LEP) to guide development and protect natural resources such as waterways and heritage within local government areas. LEPs are prepared by local Councils.

Although the rules and guidelines for land use within local Council areas are dictated to some degree by State Environmental Planning Policies, local Councils can administer more specific rules about land use through their Local Environmental Plans, and can provide additional guidance in their development control plans (DCPs).

Matters of local environmental significance for the subject site were determined using the Tweed Council's planning and land use mapping, results of which are presented in the following sections.

4.5.1 Tweed Shire Council *Local Environmental Plan 2014* Mapping

The Planning Services of the Tweed Shire Council have an online, web based mapping tool. The *Tweed Vegetation Mapping 2009*, indicates that much of the site is highly modified and disturbed (Figure 4.6). A narrow band of *Miscellaneous Map Units* exist along the western boundary. The northern boundary is predominantly mapped as *Rainforest and Riparian Communities* with smaller areas of *Melaleuca and Swamp She-oak Forests.* The entire site falls within a regional fauna corridor (red hatching Figure 4.6).

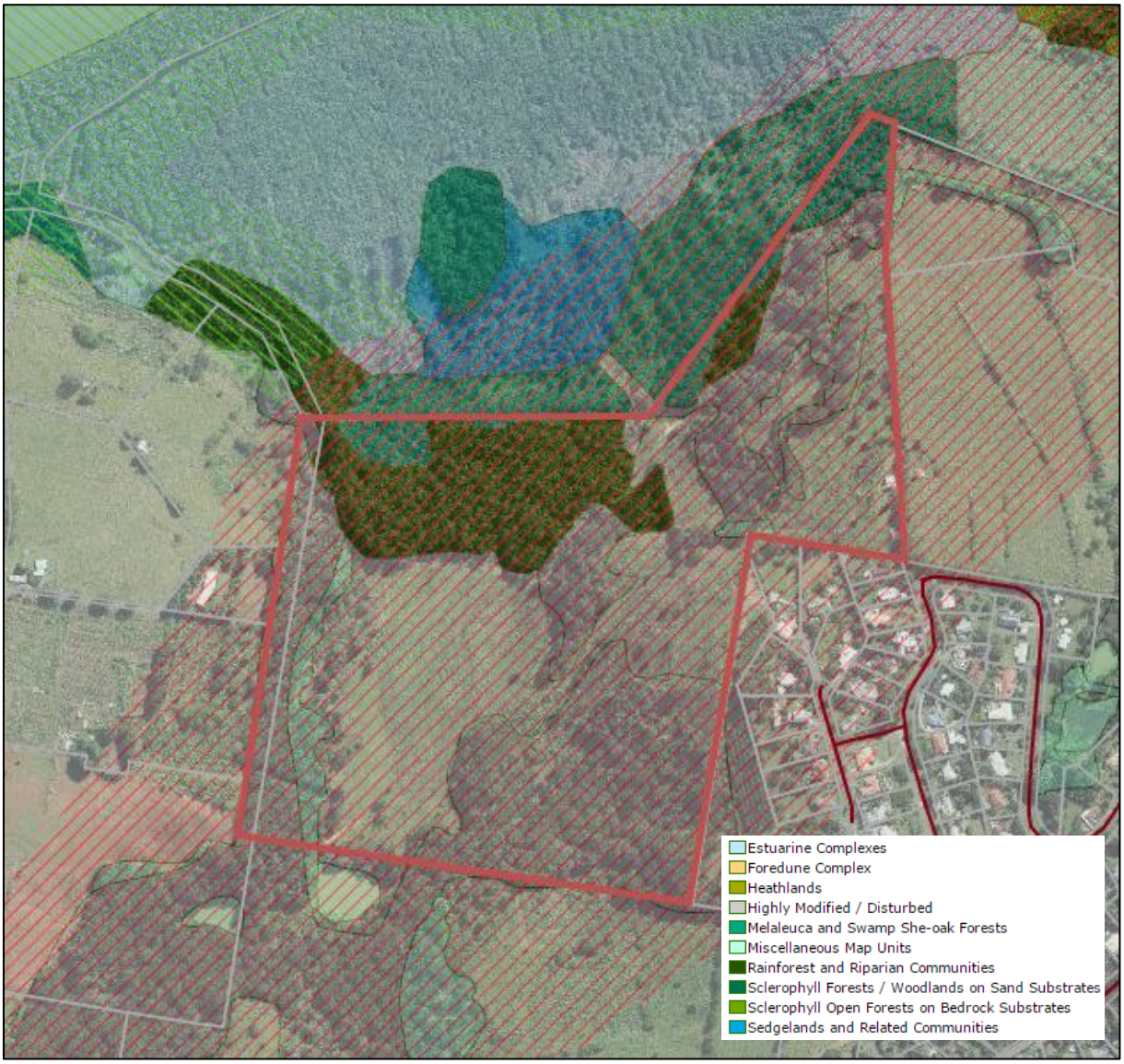

Figure 4.6 Tweed Shire Council Vegetation Mapping 2009 (Source: Local Environmental Plan 2014)

4.5.2 DCP A16 - Tree Preservation

Tweed Shire Council has tree management planning controls for prescribed vegetation through the Tweed Development Control Plan Section A16 - Preservation of Trees or Vegetation (DCP A16).

Prescribed vegetation is classified as any one of the following:

- Local native trees equal to or greater than 5 m in height and/or;
- Local native vegetation (of any height) that occurs as part of a bushland community and/or;
- Very large trees (trunk diameter = 0.8 m, measured at 1.4 m above natural ground level) and/or;
- Primary Koala feed trees - *Eucalyptus robusta* (swamp mahogany), *E. Tereticornis* (forest red gum), *E. Microcorys* (tallowwood) and *E. Propinqua* (small-fruited grey gum) greater than 5 m in height and/or;
- Threatened plant species, population or community listed under the *Biodiversity Conservation Act 2016* (BCA) or EPBC Act and/or;

- Listed significant vegetation e.g. heritage listed tree under Schedule 2 of DCP A16.

Prescribed vegetation cannot be removed from applicable zones under DCP A16 without an application unless:

- An exemption applies under Schedule 1 of DCP A16;
- Works are in accordance with an approved Property Vegetation Plan; or
- Works are part of an approved Development Application.

DCP A16 applies if a property is zoned under the TLEP 2014 as:

- Residential Zones (R1, R2, R3);
- Village (RU5); and
- All Environmental Protection Zones.

As the site is falls mostly within the R1 zone, under the TLEP 2014, an application will need to be made to remove any prescribed vegetation.

4.5.3 Tweed Shire Council *Vegetation Management Strategy 2004* (TVMS)

The *Tweed Vegetation Management Strategy 2004* (TVMS) provides information regarding the status of Tweed's natural and environmentally sensitive areas, outlining co-ordinated planning framework in accordance with the *Native Vegetation Act 2003* and the *Environmental Planning and Protection Act 1979* to protect and enhance local and regional native biodiversity. A review of TVMS Maps 1-7 was undertaken to help inform the planning and design for the proposed development.

4.5.3.1 Vegetation Associations

The TVMS (2004) mapped broad vegetation communities and dominant Vegetation Associations. The vegetated areas on the subject site are broadly classified as rainforest and riparian communities, Melaleuca and Swamp Oak forests and highly modified areas (Figure 4.8). The highly disturbed areas are further classified as camphor laurel dominated forest. The rainforest and riparian community is mapped as lowland rainforest on floodplain. The Melaleuca and swamp oak forest is mapped as broad-leaved paperbark closed forest to woodland (Figure 4.9).

Map 3 of the TVMS indicates areas where camphor laurel is present within the shire. As shown in Figures 4.9 and 4.10, the site has large areas of camphor laurel, especially in the southern portion.

Figure 4.7 Tree Preservation Order Mapping (Source: Local Environmental Plan 2014)

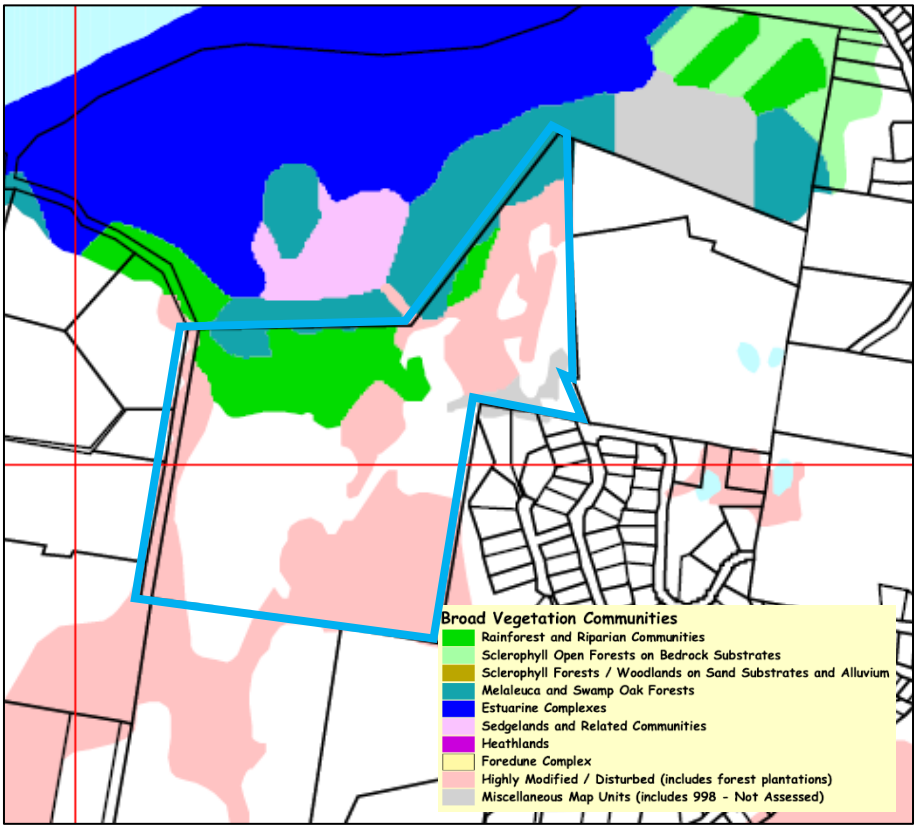

Figure 4.8 Broad Vegetation Associations (Source: TVMS 2004)

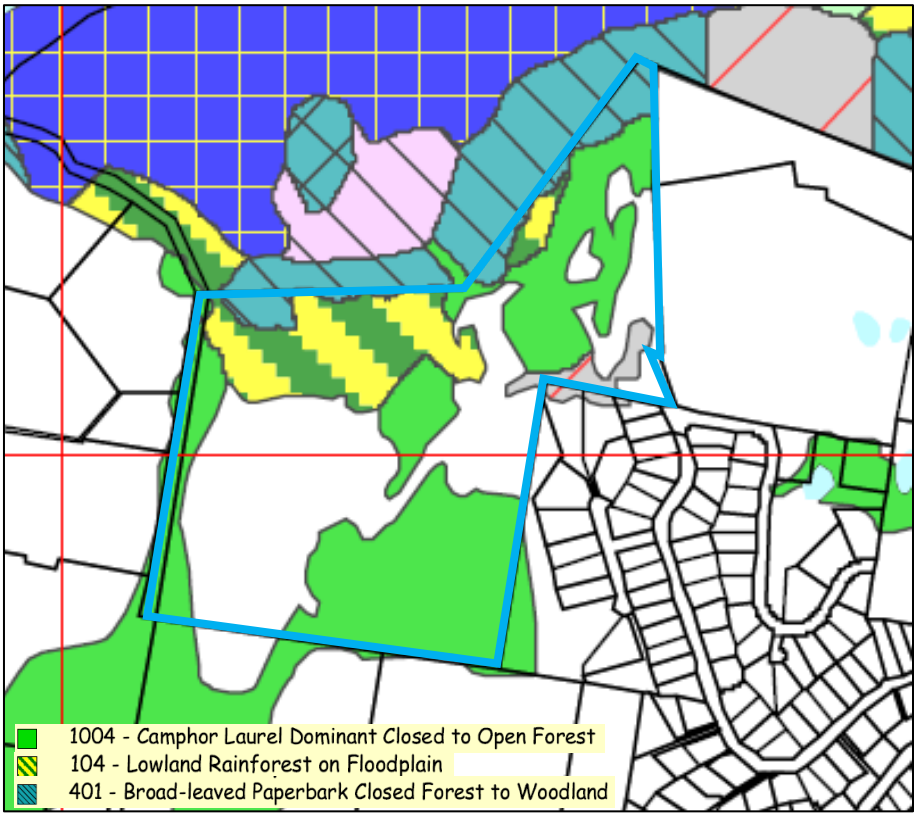

Figure 4.9 Vegetation Associations (Source: TVMS, 2004)

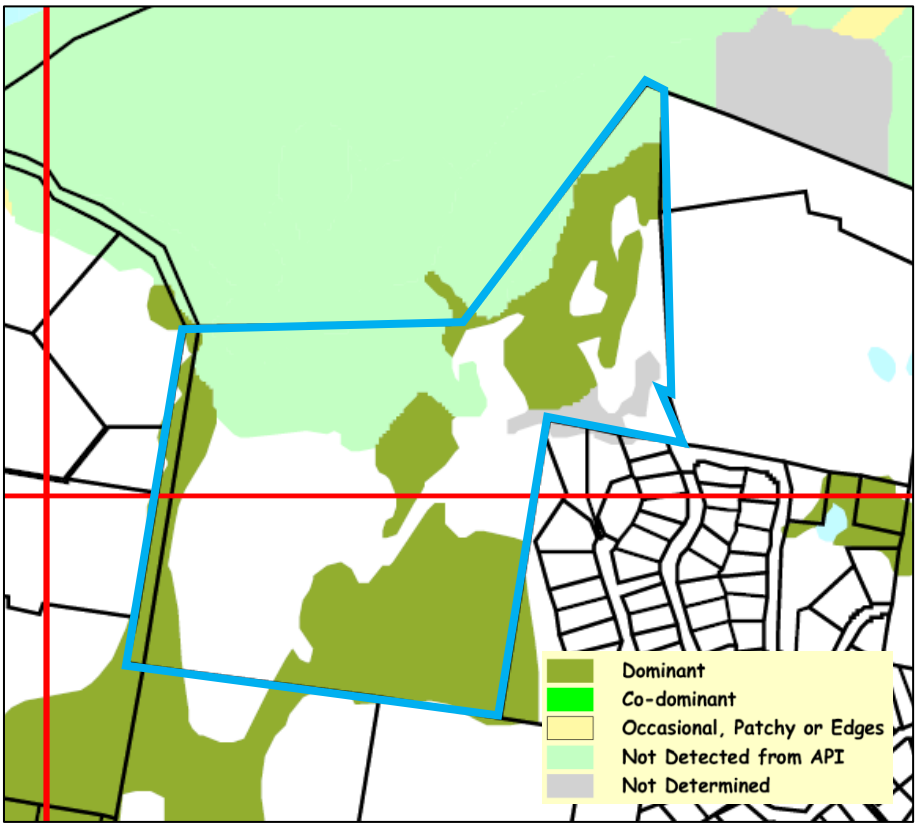

Figure 4.10 Camphor laurel abundance (Source: TVMS, 2004)

Ecological Values

The TVMS (2004) mapped areas based on their ecological status and then assigned an ecological sensitivity criterion. Ecological sensitivity criteria were determined by an area's sensitivity to degradation. The site is mapped as containing areas of high sensitivity and very high ecological status (Figure 4.11).

Areas mapped as having very high ecological status generally identifies areas with special ecological values. This includes areas which are either very poorly conserved or highly depleted as well as old growth forest, or significant ecosystems such as riparian areas and wetlands above certain area thresholds.

Ecological sensitivity measures those components of the ecological system that are sensitive to degradation. Degradation may take many forms, but inevitably results in a decline in the quality of an area of vegetation. Sensitivity can be considered a broad measure of the extent of degradation likely without deliberate human disturbance. On the highest end of the spectrum are areas where degradation is likely under prevailing environmental conditions – i.e. without active human disturbance. Within the fragmented landscape, forest edges are often susceptible to weed invasion and other biological changes without any active intervention.

At the lower end of the sensitivity spectrum are areas that are more resilient to all forms of disturbance and would require considerable human input to cause degradation. For example, wetlands are susceptible to changes in the water table caused by drainage works. Drainage works require a level of intervention above prevailing environmental conditions. Clearing is a further example of high level intervention. Under TVMS mapping, three (3) broad categories of sensitivity are defined: High, Moderate, and Low. Areas classified as the most sensitive (High) are subject to degradation without human disturbance (TVMS, 2004).

The subject site contains areas of very high ecological status and high ecological sensitivity along the northern boundary.

Soil Landscapes, Steep Land and Drainage

The TVMS maps on a broad scale the soil landscape of the Shire, areas of steep land and drainage lines. Characteristics of both soils and landforms contribute to land degradation hazards. Mapping indicates that drainage lines of 2nd order or above are present on the subject site (Figure 4.12). The protection of lands within, or within 20m of a prescribed stream is mandated under the *Native Vegetation Act 2003*. In these areas, consent must be sought to clear native vegetation and exotic trees.

The soil landscape on the site consists Cobaki (cb). Suggestions for sustainable land use as provided in TVMS (2004) are as follows:

Cobaki. *Maintain undisturbed areas. Within residential areas appropriate effluent disposal systems (avoid septic systems) should be established. Minimal tillage and incorporation of organic matter is recommended to reduce soil structure decline. Appropriate guidelines should be followed to manage actual and potential acid sulphate soils*

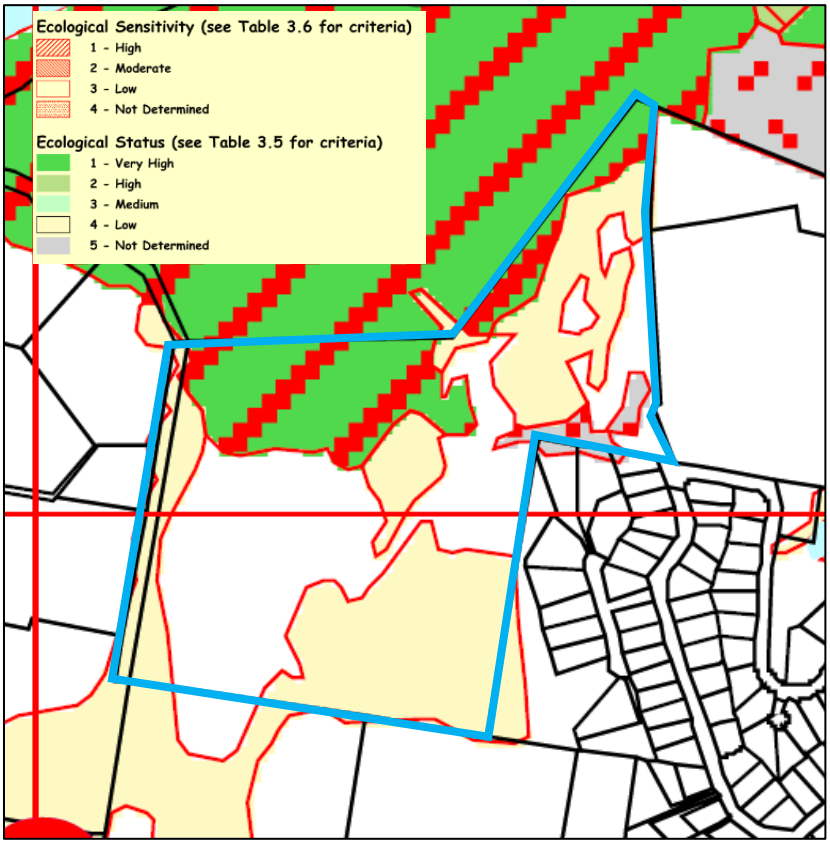

Figure 4.11 Tweed Shire Council Vegetation Association Map 4 – Ecological Values (Source: TVMS, 2004)

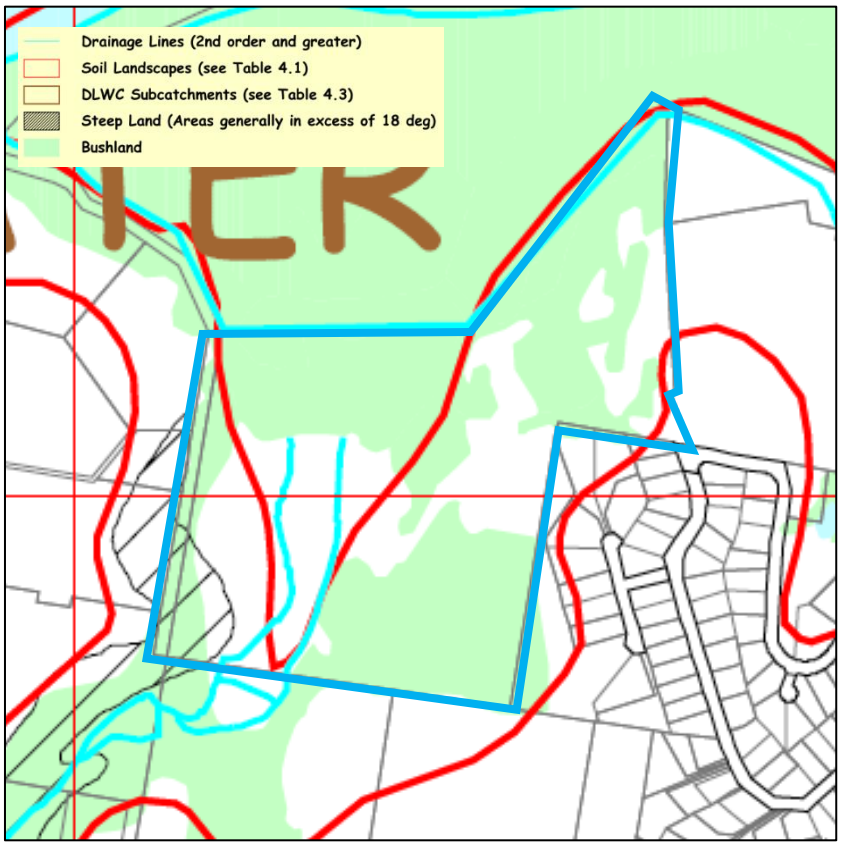

Figure 4.12 Soil Landscape, steep land and drainage (Source: TVMS, 2004).

Rehabilitation Priorities

Under the TVMS, the Shire was mapped with consideration to the rehabilitation priorities for existing bushland and potential non-bushland habitat areas. The site has been mapped as being part of the NPWS Regional Corridor and having riparian linkages (Figure 4.13). These are considered priority non-bushland habitat areas. HCV Bushland is also mapped as occurring on the site. These are priority bushland areas for rehabilitation.

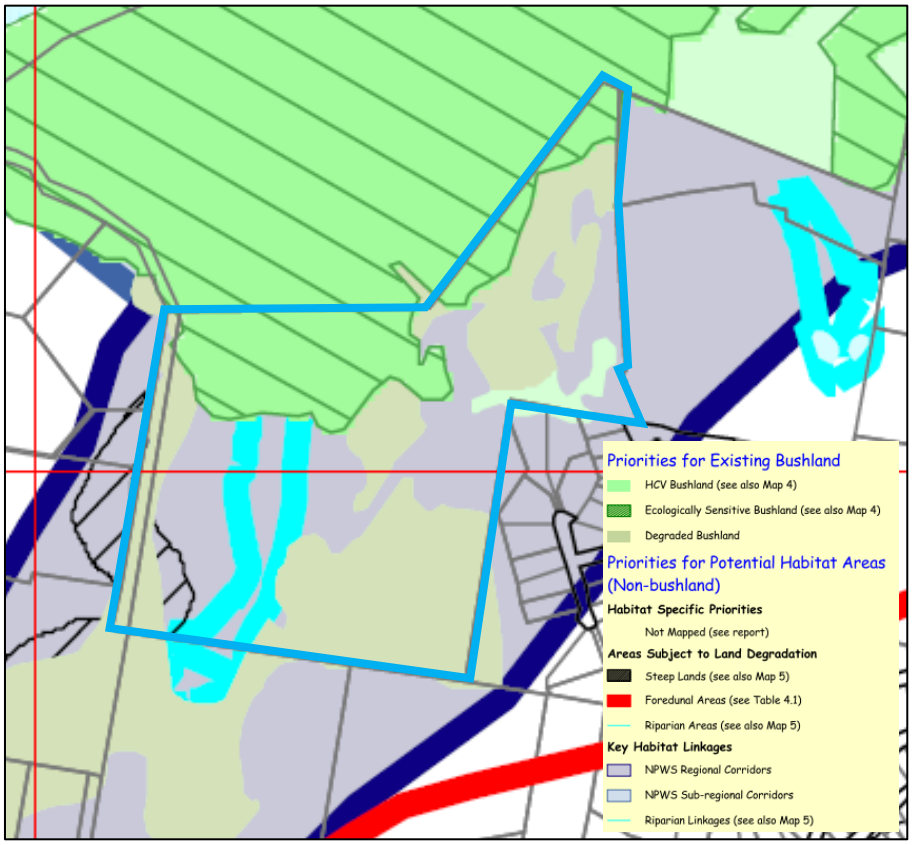

Figure 4.13 Rehabilitation Priorities (Source: TVMS, 2004)

4.6 Previous Site Investigations

The subject site was subject to an ecological assessment in 2008 (JWA, 2009). Results of these surveys determined that there were six (6) vegetation communities on the subject site (Figure 4.14). One (1) threatened bird species - Rose-crowned fruit-dove (*Ptilinopus regina*) and two (2) threatened mammalian species - Grey-headed flying-fox (*Pteropus poliocephelus*), and Eastern long-eared bat (*Nyctophilus bifax*) were recorded during these surveys.

The adjacent Altitude Aspire development to the east, was subject to ecological assessments in 2010 and 2011 (JWA, 2012; 2013). This site was found to contain two (2) degraded endangered ecological communities; lowland rainforest and freshwater wetlands. One (1) threatened flora species, Rough-shelled bush nut (*Macadamia tetraphylla*) was recorded. No threatened fauna species were recorded during these survey events. However, eight (8) threatened fauna species were considered a possible occurrence based on the availability of suitable habitat:

- Pale-vented bush-hen (*Amaurornis moluccana*)
- Collared kingfisher (*Todiramphus chloris*)

- Eastern bent-wing bat (*Mormopterus schreibersii oceanensis*)
- Eastern long-eared bat (*Nyctophilus bifax*)
- Grey-headed flying fox (*Pteropus poliocephalus*)
- Little bent-wing bat (*Miniopterus australis*)
- Rose-crowned fruit dove (*Ptilinopus regina*)
- Yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*)

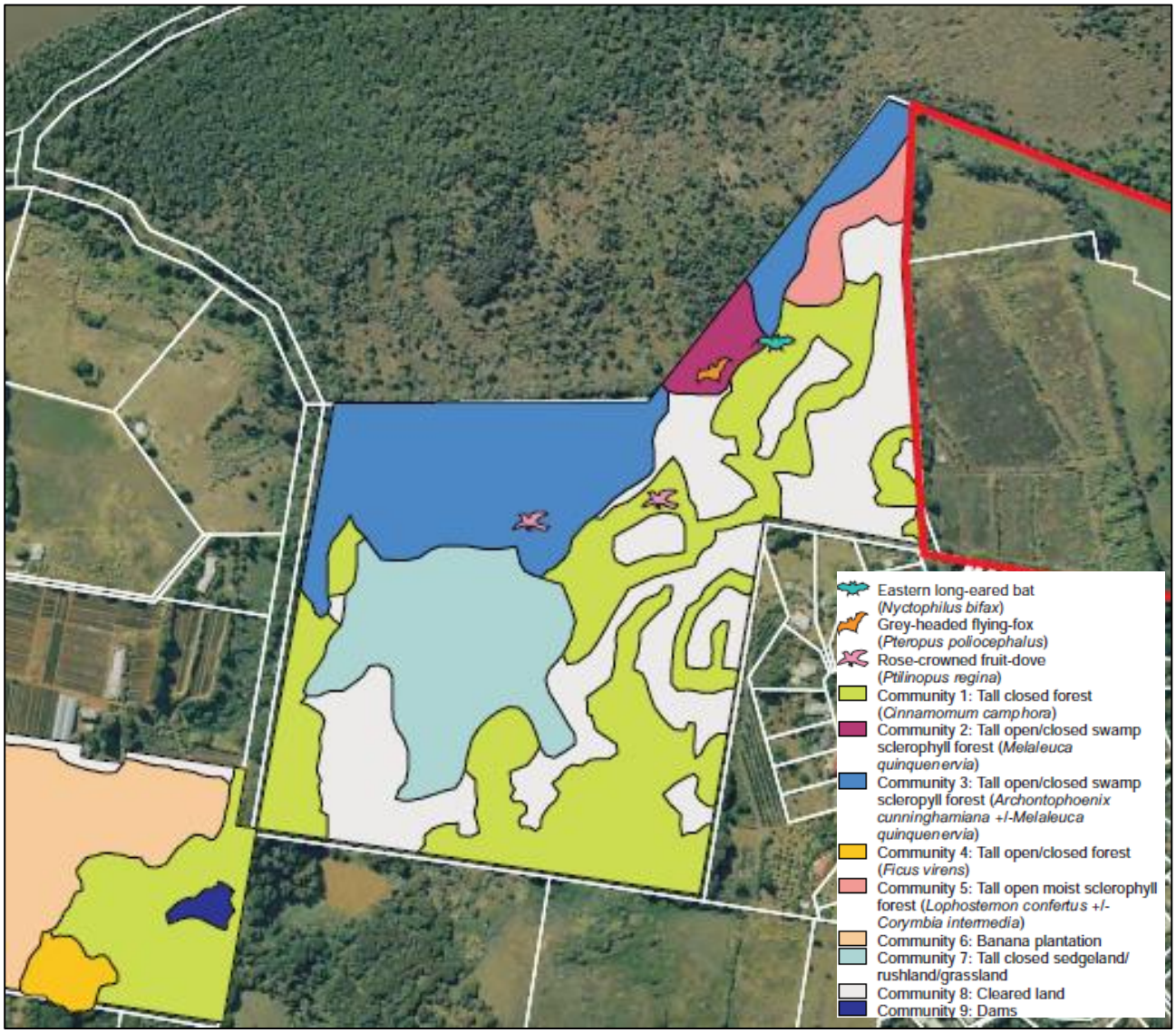

Figure 4.14 Vegetation Communities (Source: JWA, 2013)

4.7 Desktop Assessment Summary

The subject site contains seven (7) matters of local environmental significance:

- Mapped vegetation communities;
- Fauna corridor;
- Tree Preservation Order;
- Areas of very high ecological significance;
- Areas of high ecological sensitivity;
- Drainage channels of 2nd order or above; and
- Priority areas for bushland and non-bushland habitat rehabilitation.

The results of the desktop survey indicate that the site and surrounding area (i.e. within a 10km radius of the site) may provide potential habitat for 90 species of flora and fauna listed as threatened under State or Commonwealth legislation. Nine (9) threatened ecological communities are also known to occur within 10km of the site. Assessment of the likelihood of the threatened species occurring on the subject site is discussed in Section 6 of this report.

Three (3) State Environmental Planning Policies are applicable to the site (SEPP 44 – Koala Habitat Protection, SEPP Coastal Management 2018 and SEPP Vegetation in Non-Rural Areas 2017).

5. Site Survey

This section outlines the methods and results of the flora and fauna surveys.

5.1 Methods – Flora Survey

To ground-truth the information obtained through the desktop assessment, field surveys were undertaken within the subject site over three days in late April to early May 2017. Where relevant, observations regarding floristic values on adjacent sites were also recorded.

Vegetation structure and floristics have been described in accordance with Hnatiuk *et al.* (2009). This classification is equivalent to the *Level IV: Broad floristic subformation* description under the National Vegetation Information System (NVIS) established by the Executive Steering Committee for Australian Vegetation Information (ESCAVI). This level of reporting incorporated data collection for structural formations (i.e. growth form, stratum intervals, crown cover and height) and floristic associations (i.e. species diversity).

Survey methodology comprised an initial visual audit, followed by quantitative assessment of vegetation associations and communities. The initial visual audits consisted of a random meander over the site to ground-truth desktop investigations and satellite imagery. Site locations for quantitative assessments were subsequently determined based on information obtained from the initial visual audit.

Vegetation mapping was undertaken by interpolating site survey data and recent Nearmaps satellite imagery (2017). The results of previous vegetation mapping over the site by other consultants and Council was also considered in the mapping process.

Quantitative data collected at each site includes structural formation (i.e. growth form, stratum intervals, crown cover and height) and floristics as well as level and type of disturbance.

Unless otherwise noted, all quantitative observations were recorded as follows:

- Individual site survey data entered into excel proforma on tablet in situ;
- Single point locations where required (e.g. site survey locations, significant species / habitat trees) was recorded by GPS in easting and northing Universal Transverse Mercator (UTM) projected co-ordinates;
- Growth form – determined in accordance with pp 88-93 of Hnatiuk *et al.* (2009);
- Stratum intervals – determined by recording the median height of the top of each stratum. Strata were defined in accordance with Table 5.1 which is summarised from Hnatiuk *et al.* (2009);
- Crown cover – determined using a field estimation of the crown separation ratio in accordance with Table 5.2, which is reproduced from Hnatiuk *et al.* (2009).

Table 5.1 Criteria for Defining Vegetation Strata

Stratum	Description
Emergent	Tallest plants in vegetation associations/communities that are so sparsely distributed that they do not form the dominant or most significant layer (e.g. large trees that rise above a distinct canopy layer).
Dominant or Upper Stratum	In most cases the tallest stratum will be the dominant stratum (i.e. except when emergents are present).
Mid-stratum	If present, this stratum is between the dominant (upper) stratum and the ground stratum. There are no pre-conceived height limits for this stratum. Where multiple strata are present between the dominant (upper) stratum and the ground stratum, the mid-stratum can be subdivided in order of decreasing height (i.e. the highest mid-stratum is termed Mid-stratum 1, the next highest mid-stratum is termed Mid-stratum 2 etc).
Ground stratum	Typically consists of herbaceous ferns, forbs and graminoids; although can also include juvenile species from other strata. The ground stratum can also be the dominant stratum (e.g. where grass cover is closed and trees are very sparse). There are no pre-conceived height limits for this stratum; however, it is usually less than 2.0 m tall.

Table summarised from Hnatiuk *et al.* (2009).

Table 5.2 Crown Cover Classes

Criteria Assessed in Field	Description	Crown Separation Ratio	Crown Cover (%)	Foliage Cover (%)
Crowns touching to overlapping	Closed or Dense	<0*	>80	>70
Crowns touching or slightly separated	Mid Dense	0-0.25	50-80	30-70
Crowns clearly separated	Sparse or Open	0.25-1	20-50	10-30
Crowns well separated	Very Sparse	1-20	0.25-20	0.2-10
Isolated plants (trees approximately 100 m apart; shrubs approximately 20 m apart)	Isolated Plants	>20	<0.25	<0.20
Isolated clumps of 2 to many plants approximately 200 m apart	Isolated Clumps	>20	<0.25	<0.20
Emergent	Emergents	>3	<5 % total crown cover	<3% of total foliage cover

Where crown overlap occurs, the crown ratio has a negative value: the larger the negative value, the greater the overlap.
Table reproduced from Table 17 in Hnatiuk *et al.* (2009).

Subsequent to collection of quantitative data at each site, additional qualitative data was gathered by undertaking a random meander through the balance of the vegetation community/association. Specifically, assessment of disturbance and any additional plant species occurring in each stratum were recorded.

When compiling strata-specific species lists, epiphytes, vines and mistletoes were assigned to the strata in which they occurred.

Binomial nomenclature follows the Census of Australian Plant Species Taxa list of the NSW National Herbarium.

5.2 Results – Flora Survey

A total of 166 species of flora were identified within the site, comprising 110 native species and 56 non-native species (Appendix B).

The vegetation communities of the site are described as follows:

Type A. Tall Closed Forest (*Cinnamomum camphora*);
Type B. Tall Open/Closed Swamp Sclerophyll Forest (*Archontophoenix cunninghamiana-Melaleuca quinquenervia*);
Type C. Tall Open/Closed Moist Sclerophyll Forest with Rainforest Understorey;
Type D. Closed Sedgeland/Rushland/Grassland; and
Type E. Maintained Anthropogenic Grassland.

The locations and mapped extent of the described vegetation associations are presented in Figure 5.1.

The results of the flora survey are described in the following sections.

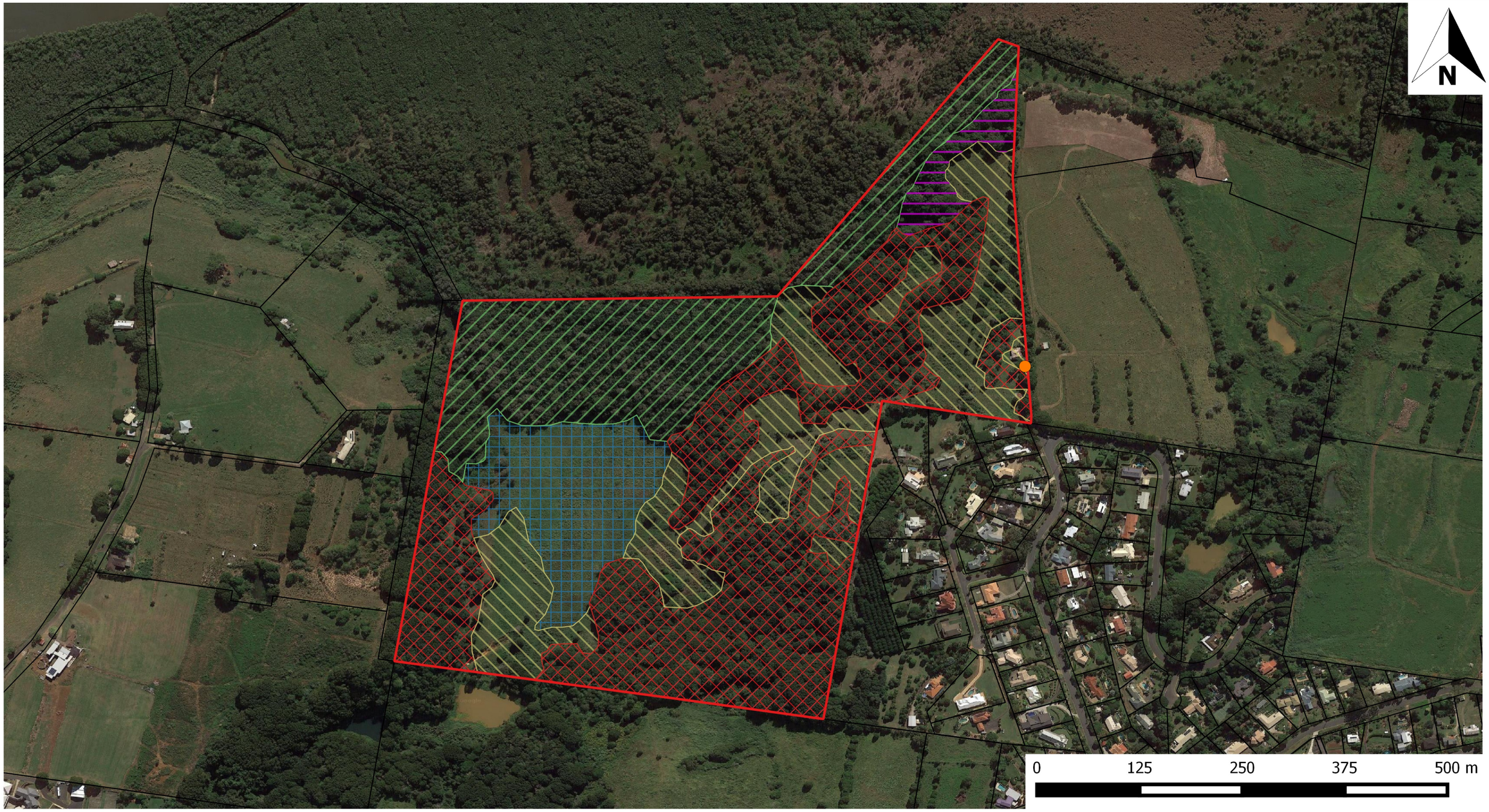

Figure 5.1 Vegetation Associations
LOT 1 ON DP175234
NEWLAND DEVELOPERS PTY LTD

PROJECTION: GDA94/MGA ZONE 56
PROJECT: BE170043
DATE: May 2018

LEGEND

- Site Boundary
- Type A: Tall Closed Forest *(Cinnamomum camphora)*
- Type B: Tall Open/Closed Swamp Sclerophyll Forest *(Archontophoenix cunninghamiana +/- Melaleuca quinquenervia)* **- EEC**
- Type C: Tall Open Moist Sclerophyll Forest *(Lophostemon confertus +/- Corymbia intermedia)*
- Type D: Tall Closed Sedgeland/Rushland/Grassland
- Type E: Maintained Anthropogenic Grassland
- Rough Shelled Bush Nut *(Macadamia tetraphylla)* **- Vulnerable under the TSC Act**
- Aerial Imagery - Google December 2016

BURCHILLS ENGINEERING SOLUTIONS

5.2.1 Vegetation Association A - Tall Closed Forest (*Cinnamomum camphora*)

Vegetation Association A is dominated by Camphor laurel (*Cinnamomum camphora*) as a canopy layer dominant with the mid storey containing a mix of rainforest regrowth and exotic weeds.

The results of the quantitative assessments and floristic formations are listed in Table 5.3 and Table 5.4 respectively. The species encountered within each stratum in this vegetation unit are provided in Appendix B.

Table 5.3 Vegetation Association A Quantitative Assessments

Stratum†	Growth Form	Crown Separation Ratio	Stratum Height (m)
Upper	tree	<0	12-18
Mid	small tree / shrub	0-0.25	5-12
Mid 2	Shrub	0-0.25	1.5-3
Ground	sedge / fern	0.25-1	0.5-1

†Strata that were not present have been omitted.

Table 5.4 Vegetation Association A Floristic Formation

Stratum†	Species
Upper	Camphor laurel (*Cinnamomum camphora*), Bennett's ash (*Flindersia bennettii*), Tuckeroo (*Cupaniopsis anacardioides*), Foambark (*Jagera pseudorhus*)
Mid	Maiden's wattle (*Acacia maidenii*), Tuckeroo (*Cupaniopsis anacardioides*), Guioa (*Guioa semiglauca*), Brown kurrajong (*Commersonia bartramia*), Foambark (*Jagera pseudorhus*), Macaranga (*Macaranga tanarius*), Umbrella tree (*Schefflera actinophylla**), Sweet pittosporum (*Pittosporum undulatum*), Umbrella cheese tree (*Glochidion sumatranum*), Red kamala (*Mallotus philippensis*), Bennett's ash (*Flindersia bennettii*), Rough leaved elm (*Aphananthe philippinensis*), Red bean (*Dysoxylum mollissimum* subsp. *Molle),* Cudgerie (*Flindersia schottiana*), Scrub turpentine (*Rhodamnia rubescens*), Birds nest fern (*Asplenium australasicum*), Cocos palm (*Syagrus romanzoffiana*)*
Mid 2	Camphor laurel (*Cinnamomum camphora*)*, Lantana (*Lantana camara*)*, Mickey mouse plant (*Ochna serrulata*)*, Winter senna (*Senna pendula var. glabrata*)*, Cockspur (*Maclura cochinchinensis*), Common silkpod (*Parsonsia straminea*), Large-leaved privet (*Ligustrum lucidum*)*, Passionfruit (*Passiflora edulis*)*, Guava (*Psidium guajava*)*, Burney vine (*Trophis scandens subsp. scandens*), Cat's claw creeper (*Dolichandra unguis-cati*)*, Corky prickle vine (*Caesalpinia subtropica*), Smooth Clerodendrum (*Clerodendrum floribundum*)
Ground	Climbing Asparagus fern (*Asparagus plumosus**), Asparagus fern (*Asparagus africanus*)*, Gristle fern (*Blechnum cartilagineum*), Scrambling lily (*Geitonoplesium cymosum*), Prickly smilax (*Smilax australis*), Rough maidenhair fern (*Adiantum hispidulum*), Blue flax lily (*Dianella caerulea*), Mat rushes (*Lomandra hystrix, L. longifolia*)

†Species are listed in order of dominance.

Based on the data obtained from the quantitative assessment, the broad floristic subformation (Hnatiuk *et al*., 2009) of Vegetation Association A is: Tall closed forest over dense mid strata over open fern and sedge ground stratum.

Variation

The majority of this vegetation unit is dominated by Camphor laurel with some floristic variation attributed to weed incursion and rainforest regrowth.

Disturbance

This Association is dominated by Camphor laurel in the upper stratum while the mid-layer is dominated by wattles, lantana, rainforest regrowth and weedy vines. This association is considered to be highly disturbed and modified as the dominant stratum (canopy) is dominated by the invasive tree-weed, Camphor laurel. This weed is currently suppressing the natural succession of this community which is unlikely to recover naturally without intervention by weed control.

Significance

The floristic composition of this association does not represent a significant ecological community (as listed under the TSC Act). Camphor laurel dominates ecologically dominant layer – the Upper Canopy; and the Mid2 stratum. Though rainforest species are present in the Upper and Mid strata, the predominance of Camphor laurel in these strata precludes it from meeting the criteria of an ecological community listed under the schedules of the TSC Act.

One (1) threatened flora species was recorded during the surveys – Rough-shelled bushnut (*Macadamia tetraphylla*). A single juvenile specimen (1.2m high) was recorded in Vegetation Association A, on the site's eastern boundary in close vicinity to the existing dwelling. A subsequent site investigation (JWA, 2019) found four (4) specimens in this location. All specimens of *Macadamia tetraphylla* will be translocated prior to earthworks commencing in accordance with the Translocation Plan (JWA, 2019).

Figure 5.2 Vegetation Association A

5.2.2 Vegetation Association B – Tall Closed Swamp Sclerophyll Forest (*Archontophoenix cunninghamiana / Melaleuca quinquenervia*)

This association occupies the northern parts of the site generally below 2.6AHD, outside of the development footprint. The results of the quantitative assessments and floristic formations are listed in Table 5.5 and Table 5.6 respectively. The species encountered within each stratum in this vegetation unit are provided in Appendix B.

Table 5.5 Vegetation Association B Quantitative Assessments

Stratum†	Growth Form	Crown Separation Ratio	Stratum Height (m)
Upper	tree	<0	15-22
Mid	Tree/shrub/fern	0.25-1	3-5
Ground	Sedge/fern	0.25-1	0.5-1.5

†Strata that were not present have been omitted.

Table 5.6 Vegetation Association B Floristic Formation

Stratum†	Species
Upper	Bangalow palm (*Archontophoenix cunninghamiana*), Paperbark (*Melaleuca quinquenervia*), Strangler fig (*Ficus watkinsiana*)
Mid	Prickly tree fern (*Cyathea leichhardtiana*), Cockspur (*Maclura cochinchinensis*), Creek sandpaper fig (Ficus coronata), Common silkpod (*Parsonsia straminea*), Lantana (*Lantana camara*)*, Winter senna (*Senna pendula var. glabrata*)*, Mickey mouse plant (*Ochna serrulata*)*, Small-leaved privet (*Ligustrum sinense*)*, Broad-leaved palm lily (*Cordyline petiolaris*), Red-fruited palm lily (*Cordyline rubra*), Red ash (Alphitonia excelsa), Whip vine (*Flagellaria indica*), White supplejack (*Ripogonum album*), Blue lilly pilly (*Syzygium oleosum*), Lilly pilly (*Acmena smithii*), Blueberry ash (*Elaeocarpus reticulatus*), Cheese tree (*Glochidion ferdinandi*), Camphor laurel (*Cinnamomum camphora*)*
Ground	Smartweed (*Persicaria strigosa),* Mistflower (*Ageratina riparia*),* Swamp water fern (*Blechnum indicum),* Prickly smilax (*Smilax australis),* Corky passionfruit (*Passiflora suberosa var. suberosa*),* White passionflower (*Passiflora subpeltata*),* Coral berry (*Rivina humilis*),* Jointed twig-rush (*Baumea articulata),* Bare twig-rush (*Baumea juncea),* Soft twig-rush (*Baumea rubiginosa),* Zig-zag bog rush (*Schoenus brevifolius),* Native yam (*Dioscorea transversa),* Water vine (*Cissus antarctica),* Five-leaf water vine (*Cissus hypoglauca),* Mangrove Fern (*Acrostichum speciosum*), Common Reed (*Phragmites australis*), Cunjevoi (*Alocasia brisbanensis*), Crinum lily (*Crinum pedunculatum*)

†Species are listed in order of dominance.

Based on the data obtained from the quantitative assessment, the broad floristic subformation (Hnatiuk *et al*., 2009) of Vegetation Association A is: Tall dense to closed forest over open understorey over open fern and sedge groundcover.

The floristic composition represents Tweed VMS 2004 Vegetation Type 401 - Broad-leaved paperbark closed forest to woodland.

Variation

Canopy dominants alternate between Bangalow palm and Broad-leaved paperbark. The majority of the map unit is dominated by Bangalow palm however small sections in the eastern and far western ends of the map unit are dominated by Broad-leaved paperbark.

Disturbance

Vegetation Association B represents remnant vegetation and is moderately undisturbed. Existing disturbance is limited to weed incursion, altered hydrology and degraded water quality from agricultural runoff.

Significance

This association represents an alliance of the TSCA Endangered Ecological Community (EEC) Swamp Sclerophyll Forest on Coastal Floodplains. The final determination listing advice for this EEC states: “On the Tweed lowlands, this community includes …***'Archontophoenix cunninghamiana-Melaleuca quinquenervia*** **very tall feather palm swamp forest'** (F9) (Pressey and Griffith 1992).” (NSW Scientific Committee, February 2011).

No significant species were recorded in this association however survey sites were limited to the southern periphery given the exclusion of this area from the development footprint.

Figure 5.3 Vegetation Association B – looking northwards from Vegetation Association D

Figure 5.4 Vegetation Association B

Figure 5.5 Vegetation Association B

Figure 5.6 Vegetation Association B interface with Vegetation Association D

5.2.3 Vegetation Association C – Tall Open/Closed Moist Sclerophyll Forest (*Lophostemon confertus*) with Rainforest Understory

This Vegetation Association occurs within the north-eastern corner of the site, south of Vegetation Association B and comprises a predominantly Brushbox (*Lophostemon confertus*) canopy with a closed rainforest understorey. The results of the quantitative assessments and floristic formations are listed in Table 5.7 and Table 5.8 respectively. The species encountered within each stratum in this vegetation unit are provided in Appendix B.

Table 5.7 Vegetation Association C Quantitative Assessments

Stratum†	Growth Form	Crown Separation Ratio	Stratum Height (m)
Upper	tree	0.25-1	18-28
Mid	tree	0-0.25	3-12
Mid 2	shrub	0-0.25	1-2
Ground	Fern/sedge	0.25-1	0.5-1.2

†Strata that were not present have been omitted.

Table 5.8 Vegetation Association C Floristic Formation

Stratum†	Species
Upper	Brushbox (*Lophostemon confertus*), Flooded gum (*Eucalyptus grandis*), Pink bloodwood (*Corymbia intermedia*), Strangler fig (*Ficus watkinsiana*)
Mid 1	Camphor laurel (*Cinnamomum camphora*)*, Bangalow palm (*Archontophoenix cunninghamiana*), Paperbark (*Melaleuca quinquenervia*), Strangler fig (*Ficus watkinsiana*)
Mid 2	Foambark (*Jagera pseudorhus*), Scentless rosewood (*Synoum glandulosum*), Red bean (*Dysoxylum mollissimum subsp. molle*), Macaranga (*Macaranga tanarius*), Tuckeroo (*Cupaniopsis anacardioides*), Umbrella tree (*Schleffera actinophylla*)*, Sweet pittosporum (*Pittosporum undulatum*), Brown kurrajong (*Commersonia bartramia*), Umbrella cheese tree (*Glochidion sumatranum*), Strangler fig (*Ficus watkinsiana*), Plum myrtle (*Pilidiostigma glabrum*), Cudgerie (*Flindersia schottiana*), White bolly gum (*Neolitsea dealbata*), Red kamala (*Mallotus philippensis*), Bennett's ash (*Flindersia bennettii*), Bangalow palm (*Archontophoenix cunninghamiana*), Camphor laurel (*Cinnamomum camphora*)*, Paperbark (*Melaleuca quinquenervia*), Rough leaved elm (*Aphananthe philippinensis*), Smooth Clerodendrum (*Clerodendrum floribundum*), Scrub turpentine (*Rhodamnia rubescens*), Birds nest fern (*Asplenium australasicum*), Lantana (*Lantana camara*)*, Cocos palm (*Syagrus romanzoffiana*)*
Mid 3	Mickey mouse plant (*Ochna serrulata*)*, Winter senna (*Senna pendula var. glabrata*)*, *Lantana camara**, Large-leaved privet (*Ligustrum lucidum*)*, Passionfruit (*Passiflora edulis*)*, Climbing Asparagus fern (*Asparagus plumosus**), Zig zag vine (*Uvaria leichhardtii*)
Ground	Gristle fern (*Blechnum cartilagineum*), Asparagus fern (*Asparagus africanus*)*, Cockspur (*Maclura cochinchinensis*), Common silkpod (*Parsonsia straminea*), Scrambling lily (*Geitonoplesium cymosum*), Prickly smilax (*Smilax australis*),

Stratum†	Species
	Rough maidenhair fern (*Adiantum hispidulum*), Blue flax lily (*Dianella caerulea*), Mat rush (*Lomandra hystrix, L. longifolia*)

†Species are listed in order of dominance.

Based on the data obtained from the quantitative assessment, the broad floristic subformation (Hnatiuk *et al*., 2009) of Vegetation Association D is: Very tall closed/open sclerophyll forest over closed to dense rainforest mid-strata over open fern groundcover.

This unit is in a successional stage with floristics generally representative of TVMS Vegetation Type 204: Brushbox open forest complex. With continued fire exclusion this association may in time resemble Lowland Subtropical Rainforest on Floodplain (TVMS Type 104).

Variation and Disturbance

This association has been subjected to clearing in the past, altering the dominant canopy floristics - and is subject to widespread weed incursion. The canopy weed, Camphor laurel, forms a sub-dominant component of the upper mid-stratum. Where Camphor laurel forms a canopy dominant, vegetation is mapped as Vegetation Association A.

Significance

The Tweed Vegetation Management Strategy (Ecograph 2004) states that Vegetation Type 204: Brushbox open forest complex represents approximately 14.88 % of the vegetated land in the shire and is adequately conserved. The conservation status of this community is therefore considered to be low to moderate.

This successional community contains floristic elements of TVMS Type 104 Lowland Rainforest on Floodplain in the understorey which represents the TSCA listed Lowland Rainforest on Floodplain EEC. However the structure of the dominant ecological layer (upper canopy) of the site's vegetation more closely resembles TVMS 204 - Brushbox open forest complex.

No significant species were recorded in this association.

Figure 5.7 Vegetation Association C

Figure 5.8 Vegetation Association C on left, Vegetation Association B on right of track

Figure 5.9 Vegetation Association C

5.2.4 Vegetation Association D – Mid-high Wet Grassland / Sedgeland

This vegetation community occurs in the cleared, lower flood prone area in the central part of the site and has been historically modified and maintained for rural purposes. The results of the quantitative assessments and floristic formations are listed in Table 5.9 and Table 5.10 respectively. The species encountered within each stratum in this vegetation unit are provided in Appendix B.

Table 5.9 Vegetation Association D Quantitative Assessments

Stratum†	Growth Form	Crown Separation Ratio	Stratum Height (m)
Upper	-	-	-
Mid	-	-	-
Ground	graminoid	0-0.25	0.3-1.2

†Strata that were not present have been omitted.

Table 5.10 Vegetation Association D Floristic Formation

Stratum†	Species
Ground	Pigeon grass (*Setaria sphacelata**), Paspalum (*Paspalum dilatatum**), Kikuyu (*Pennisetum clandestinum**), Rhodes grass (*Chloris virgata**), Water couch (*Paspalum distichum*), Crofton weed (*Ageratina adenophora**), Mistflower (*Ageratina riparia**), Blue billygoat weed (*Ageratum houstonianum**), Native wandering jew (*Commelina cyanea*), Common rush (*Juncus*

	usitatus), Cumbungi *(Typha domingensis),* Nutgrass (*Cyperus rotundus*),* Couch grass (*Cynodon dactylon*),* Cobblers pegs (*Bidens pilosa**), Cunjevoi (*Alocasia brisbanensis),* Tussock sedge (*Cyperus eragrostis*),* Sour grass (*Paspalum conjugatum*),* Broad-leaved paspalum (*Paspalum mandiocanum*),* Para grass (*Urochloa mutica**), Smartweed (*Persicaria strigosa*), White eclipta (*Eclipta prostrata), B*unchy sedge (*Cyperus polystachyos var polystachyos),* Pennywort (*Centella asiatica),* Hydrocotyle (*Hydrocotyle peduncularis),* Elephant grass *(Pennisetum purpureum*)*

†Species are listed in order of dominance.

Based on the data obtained from the quantitative assessment, the broad floristic subformation (Hnatiuk *et al*., 2009) of Vegetation Association D is: Low closed, mid-dense sedge and grassland.

The floristic composition is generally representative of Tweed VMP 2004: Code 701_Sedgeland / Rushland with a predominance of exotic graminoid flora over native species.

Variation and Disturbance

This association is considered to be disturbed and modified due to the dominance of exotic species. This map unit is similar in floristic composition to Vegetation Association E but comprises boggy areas with a sedgeland component.

Significance

No significant flora species were recorded in this association. Due to the predominance of exotic flora in this association it does not resemble a natural or significant ecological community.

Figure 5.10 Vegetation Association D

Figure 5.11 Vegetation Association D

5.2.5 Vegetation Association E – Cleared Land

This association occurs over a substantial proportion of the site which has been historically modified and currently maintained for grazing purposes. The results of the quantitative assessments and floristic formations are listed in Table 5.11 and Table 5.12 respectively. All species encountered within each stratum in this vegetation unit are provided in Appendix B. This association does not represent a natural community.

Table 5.11 Vegetation Association E Quantitative Assessments

Stratum†	Growth Form	Crown Separation Ratio	Stratum Height (m)
Emergent	tree	>3	5-12
Mid	shrub	>20	0.5-2.5
Ground	graminoid	0-0.25	0.3-0.6

†Strata that were not present have been omitted.

Table 5.12 Vegetation Association E Floristic Formation

Stratum†	Species
Upper	Camphor laurel (*Cinnamomum camphora*), Blackwood (*Acacia melanoxylon*), Bennett's ash (*Flindersia bennettii*), Tuckeroo (*Cupaniopsis anacardioides*), Foambark (*Jagera pseudorhus*), Mango *(Mangifera indica*),* Brown kurrajong *(Commersonia bartramia)*

Mid	Lantana *(Lantana camara*)*, Mickey mouse plant *(Ochna serrulata*),* Easter Cassia (*Senna pendula* var *glabrata*), Wild tobacco tree *(Solanum mauritianum*), Macaranga tanarius*, Cockspur *(Maclura cochinchinensis),* Banana *(Musa paradisiaca*),* Large-leaved privet *(Ligustrum lucidum*),* Small-leaved privet *(Ligustrum sinense*), Guava (Psidium guajava*)*
Ground	Kikuyu (*Pennisetum clandestinum**), Pigeon grass *(Setaria sphacelata*),* Rhodes grass *(Chloris gayana*),* Paspalum (*Paspalum dilatatum**), Couch grass *(Cynodon dactylon*),* Blady grass *(Imperata cylindrica),* Narrow-leaf carpet grass *(Axonopus fissifolius),* Mistflower *(Ageratina riparia*),* Cobblers pegs *(Bidens pilosa*),* Fireweed *(Senecio madagascariensis*),* Morning glory *(Ipomoea indica*),* Silver-leaved desmodium *(Desmodium uncinatum*),* Tussock sedge *(Cyperus eragrostis*),* Molasses grass *(Melinis minutiflora*),* Sour grass *(Paspalum conjugatum*),* Queensland blue couch *(Digitaria didactyla*),* Balloon cotton bush *(Gomphocarpus physocarpus*),* Crofton weed *(Ageratina adenophora*),* Blue billygoat weed *(Ageratum houstonianum*),* Fleabane *(Conyza albida*),* Chick weed *(Stellaria media*),* Whiskey grass *(Andropogon virginicus*),* Red natal grass *(Melinis repens*),* Black-berry nightshade *(Solanum nigrum*),* Groundsel bush *(Baccharis halimifolia*),* Elephant grass *(Pennisetum purpureum*),* Black thistle *(Cirsium vulgare*),* Bindii *(Soliva pterosperma*),* Stinking roger *(Tagetes minuta*),* Dandelion *(Taraxacum officinale*),* Noogoora burr *(Xanthium occidentale*),* Cunjevoi *(Alocasia brisbanensis)*

†Species are listed in order of dominance.

Figure 5.12 Vegetation Association E

Figure 5.13 Vegetation Association E

5.2.6 Conservation Significant Flora

For the purposes of this report, a significant flora species has been defined as a species that is:

- Scheduled as Critically Endangered, Endangered, Vulnerable or Conservation Dependent under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); and/or
- Scheduled as Endangered or Vulnerable under the NSW *Threatened Species and Conservation Act 1995* (TSCA).

One significant flora species was recorded during surveys – Rough shelled bush nut (*Macadamia tetraphylla*). A single juvenile specimen was recorded near the dwelling on the eastern boundary of the property in Vegetation Association A at the following coordinates (refer Figure 5.1 for location):

Easting:	550998.720	**Northing:**	6877406.447
Latitude:	-28 ° 13 ' 41.60000 ''	**Longitude:**	153 ° 31 ' 11.22000 ''

A subsequent site investigation (JWA, 2018b) found four (4) additional specimens in close proximity to this individual.

5.2.7 Endangered Ecological Communities (EECs)

Desktop investigations revealed nine (9) endangered ecological communities (EECs) potentially occurring on site (Table 4.4). One (1) of these EECs was verified to be present on the site during

surveys: Swamp sclerophyll forest on coastal floodplains. This EEC is represented on site in Vegetation Association B.

5.2.8 Weed Infestations

For the purposes of this report, a plant is considered a weed if identified as such in the *North Coast Regional Strategic Weed Management Plan 2017-2022*, published by North Coast Local Land Services ('the Plan'). The Plan provides a framework for regional weed management to support the implementation of the NSW *Biosecurity Act 2015.* The *Biosecurity Act 2015* (the Act) repeals the *Noxious Weeds Act 1993*, which previously provided regulatory controls and powers to manage noxious weeds in NSW.

Under the Act, private land owners and occupiers have a 'General Biosecurity Duty' (GBD), meaning any person dealing with biosecurity matter must take measures to prevent, eliminate or minimise the biosecurity risk (as far as is reasonably practicable). The GBD applies equally to a carrier of biosecurity matter and to any person who knows or ought to know of the biosecurity risks associated with the activity.

A total of 37 weed species were recorded within the subject site (Table 5.13) including seven (7) species identified as a biosecurity matter under the Act. Prevalent weeds are indicated in bold.

Table 5.13 Weeds observed on site

Species	Common name	Status
Ageratina adenophora	Crofton weed	O
Ageratina riparia	Mistflower	O
Ageratum houstonianum	Blue billygoat weed	O
Andropogon virginicus	Whiskey grass	P
Anredera cordifolia	Madeira vine	AP
Asparagus aethiopicus	Asparagus fern	AP
Asparagus plumosus	**Climbing asparagus fern**	AP
Baccharis halimifolia	Groundsel bush	C
Chloris gayana	**Rhodes grass**	O
Cinnamomum camphora	**Camphor laurel**	O
Conyza albida	Fleabane	O
Desmodium uncinatum	Silver-leaved desmodium	O
Gomphocarpus physocarpus	Balloon cotton bush	O
Ipomoea cairica	Coastal morning glory	O
Ipomoea indica	Morning glory	O
Lantana camara	**Lantana**	AP
Ligustrum lucidum	Large-leaved privet	O
Ligustrum sinense	Small-leaved privet	O
Melinis minutiflora	**Molasses grass**	O
Nephrolepis cordifolia	Fishbone fern	O
Ochna serrulata	**Mickey mouse plant**	O
Paspalum conjugatum	Sour grass	O
Paspalum dilatatum	**Paspalum**	O
Paspalum mandiocanum	Broad-leaved paspalum	O

Species	Common name	Status
Passiflora edulis	Passionfruit	O
Pennisetum clandestinum	Kikuyu	O
Pennisetum purpureum	Elephant grass	O
Passiflora suberosa var. suberosa	Corky passionfruit	O
Passiflora subpeltata	**White passionflower**	O
Rivina humilis	Coral berry	O
Senecio madagascariensis	Fireweed	AP
Senna pendula var. glabrata	**Winter senna**	O
Setaria sphacelata	**Pigeon grass**	O
Solanum mauritianum	**Wild tobacco tree**	O
Wedelia trilobata	Singapore daisy	O
Urochloa mutica	Para grass	O
Xanthium occidentale	Noogoora burr	O

*Status under the *North Coast Regional Strategic Weed Management Plan 2017-2022*: P = Prevention - To prevent the weed species arriving and establishing in the Region. C = Containment - To prevent the ongoing spread of the species in all or part of the Region. AP = Asset Protection - To prevent the spread of the species to key sites/assets of high economic, environmental and/or social value or to reduce impact on these values if spread has already occurred. O = Other: Either listed as a species if concern in the Plan or not listed under the Plan but recognised as an Environmental Weed by TSC by way of policy.

5.3 Methods - Fauna Survey

With consideration given to the information obtained within the desktop assessment, Burchills Environmental Scientists undertook field surveys on 10th and 11th April 2017. Relevant environmental parameters for the survey period are provided in Table 5.14. Weather observations are taken from the closest Bureau of Meteorology weather station, located at the Coolangatta airport (station number 040717) and willyweather.com.au.

Table 5.14 Environmental Parameters during Field Investigations

Parameter	10 April 2017	11 April 2017
Min. temperature	17.7ºC	11.2 ºC
Max. temperature	30.4 ºC	25.8 ºC
Rainfall (mm)	0	0
Cloud cover (9am)	0	0
Sunrise	0600	0601
First light	0537	0537
Sunset	1733	1732
Last light	1757	1756
Moon phase	Waxing Gibbous	Full
% moon visible	99	100

Where relevant, observations regarding fauna habitat values on adjacent sites were also recorded. However, as permission for access to adjacent sites had not been secured, observations of fauna habitat values external to the site were limited to those that were discernible from within the subject site and/or from publicly accessible land.

The survey methodology incorporated the following survey techniques:

- Amphibian surveys;
- Diurnal bird surveys;
- Spotlighting surveys;
- Nocturnal call playback surveys;
- Diurnal active searches;
- Nocturnal searches;
- Camera trapping;
- Opportunistic records and observations of inferential evidence; and
- Targeted searches for conservation significant species.

The following sections provide an overview of the methodology employed during fauna surveys following the Terrestrial Fauna Survey Guidelines for Queensland (Eyre et. al., 2014). Survey locations are presented in Figure 5.15.

5.3.1 Amphibian Surveys

Amphibian surveys were undertaken on the evening of April 10th 2017. Transects were walked through the site around the dam, in the wetland area and along the creek lines. Frogs were identified visually or aurally.

5.3.2 Diurnal Bird Surveys

Diurnal bird surveys were undertaken within the site for a period of 10 minutes by one observer. This was repeated six (6) times during the survey period. Two surveys were carried out within two (2) hours of sunrise, two surveys within 2–4 hours of sunrise, one survey more than four (4) hours after sunrise and one within two (2) hours of sunset. Bird species were identified through direct observations (i.e. visual sighting) and/or vocalisations.

Each survey involved the observer walking slowly and quietly through the site for ten minutes, looking and listening for birds, taking a different path through the site on each occasion.

5.3.3 Spotlighting Surveys

Spotlighting searches were undertaken through the entire site. Searches were conducted in the wetter areas of the site on foot by two (2) Burchills Environmental Scientists, using 30-watt spotlights. Other areas of the site were searched while driving at walking speed using hand-held 30-watt spotlights.

5.3.4 Nocturnal Call Playback Surveys

Nocturnal call playback surveys were undertaken adjacent the wetland area, within one hour of sunset and prior to the spotlighting survey. This survey technique involved broadcasting pre-recorded species vocalisations (Stewart, 1999) through a portable stereo system. Species calls were broadcast in a specified order, separated by a period of several minutes dedicated to listening for auditory responses.

Calls were broadcast for approximately three (3) minutes per species, with two (2) minute listening breaks between species in the following order:

- *Phascolarctos cinereus* (koala);
- *Ninox connivens* (barking owl);
- *Tyto longimembris* (eastern grass owl); and
- *Burhinus grallarius* (bush stone-curlew).

The species chosen for call-playback were based on the desktop assessment of likely threatened species occurring on the site.

After completion of all call playbacks, the immediate vicinity of the playback site was surveyed by two (2) Burchills Environmental Scientists to account for any target taxa that may have been attracted by the playbacks. Surveys were conducted on foot, using 30-watt spotlights, for duration of approximately 10 minutes. Nocturnal call playbacks were undertaken prior to the completion of spotlighting surveys to increase the chances of detecting a delayed response.

5.3.5 Diurnal Active Searches

Active searches can detect many reptile species that trapping rarely does. Active searching primarily focuses on detecting reptiles and amphibians but will also detect small terrestrial mammals and signs of other somewhat cryptic species (e.g. tracks, scats, nests and feeding signs) (Eyre et. al., 2014).

Active searching involves scanning for active animals as well as turning rocks and logs, raking through leaf litter, looking under bark and in crevices and other suitable microhabitat for cryptic animals.

Two active searches are conducted on the site; one on the eastern side of the site and the other in the west. Each search was conducted for 30 minutes during the hottest part of the day within a 50m x 50m area.

5.3.6 Nocturnal searches

Nocturnal searches were undertaken to detect reptiles and amphibians that are active during the night. These nocturnal searches were predominantly observational with little destructive searching and involved scanning for active reptiles, looking for eye-shine and listening for activity.

One nocturnal search was conducted on the site for one (1) person hour over a 100m x 100m area.

5.3.7 Camera Trapping

Camera trapping involves using a remotely triggered camera to capture images or video of animals which pass in front of the camera or are lured by bait.

Camera trapping has been demonstrated to be a far more successful method than many trapping techniques for many cryptic or wary vertebrate species including quolls, bandicoots and other small to medium-sized mammals (e.g. de Bondi et al., 2010; Claridge et al., 2010; Burnett 2010).

Studies have also shown that the use of camera traps to survey for small mammals compares favourably with Elliott and cage trapping techniques. The use of camera traps is more cost-effective, especially where the detection of the presence of a species rather than abundance is the desired project outcome (de Bondi et al., 2010).

Six (6) camera traps were set up on the site. The traps were focused at a height of 20-40cm from ground level. A wooden stake marked at 5cm intervals was placed within the focal range of the camera to provide a scale. Bait, in the form of peanut butter and honey, was attached to this stake via a tea diffuser (Figure 5.7).

Camera traps were deployed for a period of eight (8) nights (from 10 April to 19 April, 2017). Fauna species were identified from images captured over this period.

Figure 5.14 Camera Trapping Bait Lure

5.3.8 Opportunistic Records and Observations of Inferential Evidence

Observations of inferential evidence and opportunistic fauna encounters were recorded throughout the duration of flora and fauna investigations. Inferential evidence included observation of scratches, scats, tracks, shed skins, diggings and nests, as well as targeted inspections and searches for potential habitat features such as hollow bearing limbs and trunks, arboreal termite mounds with holes, nests and dreys. Opportunistic observations involved the recording of all fauna sighted or heard outside of systematic fauna surveys.

This survey technique incorporated all times outside of systematic fauna surveys.

5.3.9 Targeted Searches for Conservation Significant Species

Targeted surveys focused on the threatened fauna considered likely to be occurring on the site. The list of potential threatened species was taken from the BioNet database within 10km of the site. The likelihood of occurrence was determined based on the ecological requirements of the species and availability of suitable habitat on the site. The results of this assessment are presented in Section 6 of this report.

It was considered that the standard survey methods outlined in Section 5.3.1-5.3.7 were adequate for the detection of the other threatened species identified in the desktop assessment.

Phascolarctos cinereus (Koala) searches

In addition to spotlighting and call-playback surveys, searches were made for Koala scats to determine habitat occupancy of the species. Faecal pellets of koala and their distinctive scratch marks on smooth-barked trees, are readily identifiable and persist post-departure of the animal from the area (Woosnam-Merchez et. al., 2012). The identification of traces of koala allows for the presence of this species to be confirmed and involved minimal habitat disturbance.

Koala scat searches were conducted in accordance with Phillips and Callaghan 2011. The sampling location was selected initially on the presence of koala food trees. The sampling site was further refined by selecting a koala food tree as a central starting point. The closest 29 trees from the central tree and which had a diameter at breast height (DBH) of greater than 100m, were searched for koala evidence (scats within 1m from the base of the tree, or scratch marks on the trunks of smooth-barked trees). Survey effort dedicated to the faecal pellet search was two (2) person minutes per tree, or until a Koala faecal pellet was found – whichever occurred first.

The NSW Recovery Plan for the Koala (Department of Environment and Climate Change, 2008) provided a list of koala food trees for the North Coast Koala Management Area (in which the site falls). This has been reproduced in Table 5.15.

Table 5.15 Koala Food Tree Species in North Coast KMA

Botanical Name	Common Name
Primary Food Tree Species	
Eucalyptus tereticornis	Forest red gum
Eucalyptus microcorys	Tallowwood
Eucalyptus robusta	Swamp mahogany
Eucalyptus parramattensis	Paramatta red gum
Eucalyptus bancroftii	Orange gum
Eucalyptus amplifolia	Cabbage gum
Secondary Food Tree Species	
Eucalyptus seeana	Narrow-leaved red gum
Eucalyptus glaucina	Slaty red gum
Eucalyptus propinqua	Small-fruited grey gum
Eucalyptus resinifera	Red mahogany
Eucalyptus notabilis	Mountain mahogany
Eucalyptus moluccana	Grey box
Eucalyptus melliodora	Yellow box
Eucalytpus largeana	Craven grey box
Eucalyptus biturbinata	Grey gum
Eucalyptus canaliculata	Large-fruited grey gum
Eucalyptus rummeryi	Steel box
Eucalyptus rudderi	Rudder's box
Eucalyptus quadrangulata	White-topped box

Within the Tweed Shire, Phillips et al. (2011) determined that *Eucalyptus robusta, E. tereticornis, E. microcorys* and *E. propinqua* that were the most preferred tree species for koalas.

Due to the vegetation on the site and the heavy infestation of camphor laurel, only one location was deemed suitable for conducting a koala spot assessment.

***Calyptorhynchus lathami* (Glossy black-cockatoo) searches**

Glossy black-cockatoos inhabit open forest and woodlands of the coast and the Great Dividing Range where stands of she-oak occur. They feed almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species) (Office of Environment and Heritage, 2015). As the birds feed, they drop the remnants of the she-oak cones after stripping the cone of seeds. These distinctive 'orts' are used to determine if Glossy black-cockatoos have been feeding in the area. Within the subject site, searches were made for she-oaks. The ground underneath these trees was searched for orts.

As with other cockatoo species, the Glossy black-cockatoo is dependent on large hollow-bearing eucalypts for nest sites. Searches were made for suitable nesting trees within the subject site.

***Amaurornis moluccana* (Pale-vented bush-hen)**

The Pale-vented Bush-hen is secretive and cryptic, usually remaining in dense vegetation near watercourses or at the edges of wetlands, and often only detected by its loud, distinctive calls (NSW EH, 2017a). In areas of potential habitat for this species, call-playback techniques were employed. Suitable habitat was present along the dam margins and within the wetland area of the site.

Acid Frog Searches

Crinia tinnula, *Litoria freycineti* and *Litoria olongburensis* are collectively known as acid frogs. They are associated with acidic, tannin stained water (Robinson, 1993).

Searches were made for suitable habitat within the site. The species of frogs heard calling from within and adjacent to the site were recorded. Frog species can be distinguished based on call (Meyer *et al*., 2005). Call playback was used to encourage additional calling activity. Calls were broadcast through a handheld speaker for a period of one minute, followed by a listening period of two minutes.

N

0 200 400 600 m

FIGURE 5.15 Survey Locations
LOT 1 ON DP175234
NEWLAND DEVELOPERS PTY LTD

PROJECTION: GDA94/MGA ZONE 56
PROJECT: BE170043
DATE: APRIL 2017

LEGEND

- Site Location
- Call Playback
- Camera Trap
- Diurnal Active Search
- KSAT
- Pale-Vented Bush-Hen Call Playback

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5.3.10 Survey Limitations

It should be noted that the fauna survey that was undertaken only provides a very limited 'snap-shot' of the species present and detectable on the subject site at the time of the survey. Therefore, it is acknowledged that the full inventory of fauna species utilising the site is unlikely to have been recorded. Although assessments of habitat and species ecology do provide an additional measure to predict the presence of species (i.e. in lieu of direct observation), it should be noted that there are no methodologies that can be used to predict, with absolute certainty, the absence of a species from marginal or potential habitat.

There may be species that utilise habitats within the region like those that occur on-site, but have not been detected due to their occasional usage of the habitat types, rarity or cryptic nature. For example, some species might only occasionally visit a specific site that forms part of a much larger home range, or only visit an area during peak flowering periods. Alternatively, other species that have low detectability – as they are difficult to trap or observe directly – may tend to be under-represented in surveys that are not replicated within and across seasons and years.

5.4 Fauna Field Survey – Results

Sixty-seven species of fauna have been identified to utilise the subject site, including five (5) amphibian species, four (4) reptile species, 49 bird species and nine (9) mammal species. Sixty-three species encountered were native and four (4) are introduced (Table 5.16). Three (3) species – varied triller, rose-crowned fruit-dove and eastern tube-nosed, are listed as vulnerable under state legislation.

5.4.1 Amphibians

Five (5) species of amphibian were recorded during the field survey, one of which is the introduced cane toad (*Rhinella marina*).

Surveying at a core calling period does not guarantee that individuals will be calling at the time of the survey. Environmental conditions, such as temperature and recent rainfall, affect the calling activity of frogs. Unfavourable climatic conditions may curtail calling activity and could prevent frogs from being detected in an area where they are otherwise common (Lemckert and Mahony, 2008).

The presence of the wetland, dams and small creeks within the site provides potential amphibian breeding habitat for species tolerant of disturbed environments.

Acid Frogs

Crinia tinnula requires ephemeral or temporary water bodies that are generally shallow (i.e. >1 m), acidic (i.e. pH <6.0) and tannin stained (Meyer *et al*., 2005). It is found along drainage lines in sub-coastal wet heath, in acid Melaleuca swamps, as well as sedge swamps in areas of sandy soil and sandstone (Meyer *et al*., 2005).

Litoria olongburensis occur in fore-dune swamps and lagoon systems in areas of habitat frequently inundated with water (Lewis and Goldingay, 2005). Studies on this species have found that populations fluctuated from year to year and that timing of recent rainfall influenced habitat use by adult frogs. Adult frogs were more frequently encountered within a day of rain (Lewis and Goldingay, 2005). The site survey was *not* conducted during a period when the detectability of this species was highest. The survey was also conducted outside of the peak calling period for this species; October

and March (NSW DECC, 2009). This species requires high water levels in the sedge swamps for breeding (Lewis and Goldingay, 2005).

No acid frogs were detected during the survey period.

5.4.2 Reptiles

Four (4) species of reptiles were recorded during the field survey including the introduced *Hemidactylus frenatus* (Asian house gecko). All species observed are common with broad habitat requirements, they are tolerant of disturbed environments and are often recorded in rural-residential environments of the local region (Cogger, 2000).

5.4.3 Birds

Of the 49 bird species identified during the field survey, two (2) are listed as vulnerable under the NSW *Threatened Species Conservation Act 1995*; rose-crowned fruit-dove (*Ptilinopus regina*) and varied triller (*Daphoenositta chrysoptera*). Call playback surveys did not return any positive results for any avian target species. It is possible that the site forms part of a larger home range that may provide occasional foraging opportunities for predatory nocturnal and a larger diversity of diurnal bird species.

5.4.4 Mammals

Nine (9) mammal species was recorded from the subject site including one (1) introduced species – *Vulpes vulpes* (Red fox). Positive identification was unable to be made on two (2) of the species observed – one microbat was observed flying along the forest margins near the wetland and a flying-fox was observed flying over the site. No flying-fox roosts were noted on site. The eastern tube-nosed bat is listed as vulnerable under the NSW *Threatened Species Conservation Act 1995.*

Koala

Despite intensive efforts to determine the presence of koala on the site, no direct or indirect evidence was found. The absence of any evidence of koalas is attributable to the lack of suitable habitat on the site.

5.4.5 Threatened Species

Three (3) species of threatened fauna have been identified to utilise the subject site, including two (2) bird species and one (1) mammal species.

An assessment was made to determine the likelihood of threatened species identified in the BioNet database search, occurring on the subject site (Table 5.17). This assessment was based on the ecological requirements of each species and the availability of suitable habitat on the site. Seabirds (e.g. shearwater, albatross), shorebirds (e.g. Terek sandpiper, Little tern) and marine species (e.g. green turtle) have not been included in this assessment as suitable habitat for these species is not present on the site.

To satisfy 'Section 5A' of the *Environmental Planning and Assessment Act 1979* an assessment of significance has been performed for the threatened species observed, or considered having potential to occur on the site. These are presented in Section 6 of this report.

Locations where the threatened species were observed is presented in Figure 5.8.

Table 5.16 Fauna Species Recorded

Scientific Name	Common Name	Status*	Method	Survey Type
Amphibians				
Rhinella marina	Cane toad	I	V	AS
Crinia signifera	Common Eastern Froglet	C	H	AS
Litoria fallax	Eastern sedgefrog	C	H	OO
Limnodynastes peronii	Striped marshfrog	C	H	AS
Adelotus brevis	Tusked frog	C	H	OO
Birds				
Sphecotheres vieilloti	Australasian figbird	C	V	BS
Alectura lathami	Australian brush-turkey	C	V	BS
Cracticus tibicen	Australian magpie	C	V	BS
Pelecanus conspicillatus	Australian pelican	C	V (F/O)	OO
Threskiornis molucca	Australian white ibis	C	V (F/O)	BS
Geopelia humeralis	Bar-shouldered dove	C	V	BS
Coracina novaehollandiae	Black-faced cuckoo-shrike	C	V	BS
Entomyzon cyanotis	Blue-faced honeyeater	C	V	BS
Macropygia amboinensis	Brown cuckoo-dove	C	V	BS
Accipiter fasciatus	Brown goshawk	C	V	OO
Lichmera indistincta	Brown honeyeater	C	H	BS
Bubulcus ibis	Cattle egret	C	V	OO
Psophodes olivaceus	Eastern whipbird	C	H	OO
Eopsaltria australis	Eastern yellow robin	C	V	BS
Pachycephala pectoralis	Golden whistler	C	H	BS
Cisticola exilis	Golden-headed cisticola	C	V	OO
Rhipidura albiscapa	Grey fantail	C	V	BS

Scientific Name	Common Name	Status*	Method	Survey Type
Dacelo novaeguineae	Laughing kookaburra	C	V	BS
Meliphaga lewinii	Lewin's honeyeater	C	H	BS
Phalacrocorax sulcirostris	Little black cormorant	C	V (F/O)	BS
Cacatua sanguinea	Little corella	C	H (F/O)	BS
Grallina cyanoleuca	Magpie-lark	C	H	BS
Dicaeum hirundinaceum	Mistletoebird	C	S	BS
Philemon corniculatus	Noisy friarbird	C	H	BS
Manorina melanocephala	Noisy miner	C	V	BS
Oriolus sagittatus	Olive-backed oriole	C	V	BS
Anas superciliosa	Pacific black duck	C	H	OO
Cracticus nigrogularis	Pied butcherbird	C	V	BS
Strepera graculina graculina	Pied currawong (eastern australia)	C	V	BS
Merops ornatus	Rainbow bee-eater	C	V	BS
Trichoglossus haematodus moluccanus	Rainbow lorikeet	C	V	BS
Malurus melanocephalus	Red-backed fairy-wren	C	V	OO
Ptilinopus regina	Rose-crowned fruit-dove	V	V	BS
Pachycephala rufiventris	Rufous whistler	C	V	BS
Todiramphus sanctus	Sacred kingfisher	C	H	OO
Myzomela sanguinolenta	Scarlet honeyeater	C	H	BS
Zosterops lateralis cornwalli	Silvereye (eastern)	C	H	BS
Dicrurus bracteatus bracteatus	Spangled drongo (eastern australia)	C	V	BS
Streptopelia chinensis	Spotted dove	I	V	BS
Pardalotus striatus	Striated pardalote	C	V	BS
Cacatua galerita	Sulphur-crested cockatoo	C	V (F/O)	BS
Megalurus timoriensis	Tawny grassbird	C	V	OO

Scientific Name	Common Name	Status*	Method	Survey Type
Lopholaimus antarcticus	Topknot pigeon	C	V	BS
Corvus orru	Torresian crow	C	V	BS
Lalage leucomela	Varied triller	V	V	BS
Egretta novaehollandiae	White-faced heron	C	V (F/O)	BS
Columba leucomela	White-headed pigeon	C	V	BS
Lalage tricolor	White-winged triller	C	V	BS
Rhipidura leucophrys	Willie wagtail	C	V	BS
Mammals				
Rattus rattus	Black rat	C	V	CT
Rattus fuscipes	Bush rat	C	V	CT
Trichosurus vulpecula	Common brushtail possum	C	V	SS
Nyctimene robinsoni	Eastern tube-nosed bat	V	H	SS
Tachyglossus aculeatus	Short-beaked echidna	C	V	CT
Pteropus spp.	Flying-fox		V	SS
	Microbat spp.		V	SS
Vulpes vulpes	Red fox	I	V	CT
Wallabia bicolor	Swamp wallaby	C	V	CT
Reptiles				
Dendrelaphis punctulatus	Green tree snake	C	V	OO
Hemidactylus frenatus	House gecko	I	H	OO
Varanus varius	Lace monitor	C	V	OO
Carlia vivax	Tussock rainbow-skink	C	C	DS

Status under the NSW *Threatened Species Conservation Act 1995*: E = Endangered, V = Vulnerable, I = Introduced, C = Common

[#]Status under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*: V = Vulnerable

Method: V = Visually identified, H = Identified through call, C = Caught by hand, F/O = Flying Overhead

Survey Type: BS = Bird Survey, SS = Spotlight Survey, NS = Nocturnal Search, DS = Diurnal Active Search, CT = Camera Trap, AS = Amphibian Search, OO = Opportunistic Observation

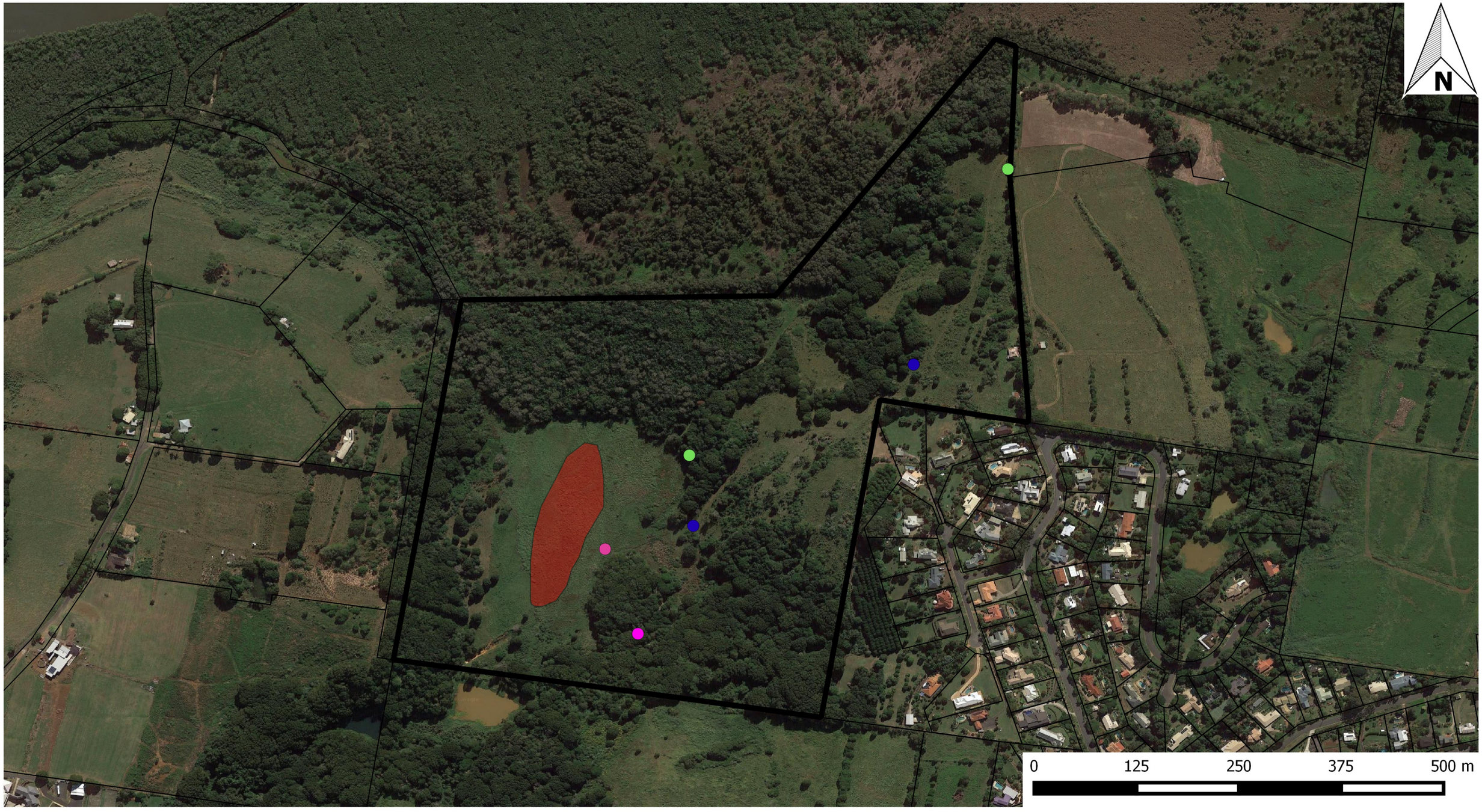

Figure 5.16 Threatened Species Observations
LOT 1 ON DP175234
NEWLAND DEVELOPERS PTY LTD

PROJECTION: GDA94/MGA ZONE 56
PROJECT: BE170043
DATE: JULY 2017

LEGEND

- Site Location
- Eastern Tube-Nosed Bat
- Flying-Fox spp.
- Flying-Fox spp.
- Rose-Crowned Fruit-Dove
- Varied Triller

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Table 5.17 Expected Threatened Species at the Subject Site

Species Name	Common Name	Status	Species Ecology	Likelihood of Occurrence
Amphibians				
Crinia tinnula	Wallum froglet	V	Currently, within the scientific literature, there is there is little information regarding non-breeding habitat requirements, factors limiting distribution, or population, structure, dynamics and genetics for this species. However, specific habitat attributes that are known requirements for this species include ephemeral to temporary water bodies. Water bodies are generally shallow (i.e. >1 m), acidic (i.e. pH <6.0) and tannin stained (Meyer *et al*., 2005). This species is found along drainage lines in sub-coastal wet heath, in acid Melaleuca swamps, as well as sedge swamps in areas of sandy soil and sandstone (Meyer *et al*., 2005).	**NOT OBSERVED – UNLIKELY TO OCCUR** Suitable habitat is not present on the site and it is considered unlikely that *C. tinnula* would utilise the site.
Litoria olongburensis	Olongburra frog	V, V[#]	*Litoria olongburensis* occur in foredune swamps and lagoon systems in areas of habitat frequently inundated with water (Lewis and Goldingay, 2005). Studies on this species have found that populations fluctuated from year to year and that timing of recent rainfall influenced habitat use by adult frogs. Adult frogs were more infrequently encountered within a day of rain (Lewis and Goldingay, 2005).	**NOT OBSERVED – UNLIKELY TO OCCUR** Suitable habitat is not present on the site and it is considered unlikely that *L. olongburensis* would utilise the site.
Birds				
Anseranas semipalmata	Magpie Goose	V,P	The magpie goose is mainly found in shallow wetlands (less than 1 m deep), dry ephemeral swamps, wet grasslands and floodplains with dense growth of rushes or sedges. It roosts in tall vegetation near the foraging areas (NSW OEH, 2016d).	**NOT OBSERVED – POTENTIAL TO OCCUR** Suitable habitat for this species exists on the site.
Ptilinopus magnificus	Wompoo Fruit-Dove	V,P	The wompoo fruit-dove occurs along the coast and coastal ranges from the Hunter River in NSW to Cape York Peninsula in Queensland (NSW EH, 2016a). It inhabits rainforests, or bushland near rainforest, low elevation moist eucalypt forest and brush box forests (NSW EH, 2016a).	**NOT OBSERVED – POTENTIAL TO OCCUR** Suitable habitat for this species exists on the site.
Ptilinopus regina	Rose-crowned Fruit-Dove	V,P	The rose-crowned fruit-dove occurs along the coast and ranges of eastern NSW and Queensland, from Newcastle to Cape York. Vagrants are occasionally found further south to Victoria (NSW OEH, 2012h).	**OBSERVED** This species was observed on the site during the survey.

Species Name	Common Name	Status	Species Ecology	Likelihood of Occurrence
			Rose-crowned fruit-doves inhabit mainly sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful (NSW OEH, 2012h).	
Ephippiorhynchus asiaticus	Black-necked Stork	E1,P	Black-necked storks have a distribution across Australia from the Pilbara, WA to eastern Qld and south along a narrow coastal strip in NSW as far as the Hunter River. It is also present in southern New Guinea (Garnett and Crowley, 2000). Black-necked storks are more commonly found in freshwater swamps and only occasionally in mangroves and on coastal mudflats (Serventy, 1985). They feed in shallow water up to 0.5m deep. Large stick nests are made in trees near foraging areas (Garnett and Crowley, 2000).	**NOT OBSERVED – POTENTIAL TO OCCUR** Suitable foraging habitat for this species exists on the site. No nests were observed on the site.
Ixobrychus flavicollis	Black Bittern	V,P	The Black Bittern has a wide distribution, from southern NSW north to Cape York and along the north coast to the Kimberley region. The species also occurs in the south-west of Western Australia (NSW OEH, 2014b). The species inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves (NSW OEH, 2014b). Black bitterns are nocturnal. During the day, it roosts in trees or on the ground amongst dense reeds (NSW OEH, 2014b).	**NOT OBSERVED – UNLIKELY TO OCCUR** While suitable foraging habitat for this species exists on the site, dense reed vegetation favoured for roosting does not.
Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P, C[#]	The White-bellied sea-eagle (*Haliaeetus leucogaster*) is distributed throughout India, southern China, South-East Asia, the Philippines, Wallacea and New Guinea to Australia. Within Australia, the White-bellied sea-eagle is distributed along the coastline of mainland Australia and Tasmania, with its distribution also extending inland along some of the larger waterways, especially in eastern Australia. White-bellied Sea-eagles are restricted to water, with nests in south-east Queensland and northern NSW being situated at a maximum distance of approximately 1km from a major waterbody, and a minimum distance of 220m to 1.1km from human settlement. (Department of the Environment, 2017).	**NOT OBSERVED – UNLIKELY TO OCCUR** Suitable foraging habitat does not exist on the site, but is within 1km. The site lacks large eucalypt species in which the species nests.

Species Name	Common Name	Status	Species Ecology	Likelihood of Occurrence
			White-bellied Sea-eagles generally choose nest trees in open forest, or remnant trees of a pasture environment. The nest is a large structure composed of sticks and lined with leaves, grass or seaweed and may be built in a variety of natural sites including tall trees (especially Eucalyptus species), bushes, mangroves, cliffs, rocky outcrops, caves, crevices, on the ground. White-bellied Sea-eagles do not nest on artificial platforms, and will only nest in large live trees such as *Eucalyptus* spp. with branching forks providing radial support for the nest. Pairs usually return to the same breeding territory each year, and often the same nest, although territories tend to contain one or two additional, less developed nests (Department of the Environment, 2017). White-bellied sea-eagles feed opportunistically on a variety of fish, birds, reptiles, mammals and crustaceans, and on carrion and offal (Department of the Environment, 2017).	
Hieraaetus morphnoides	Little Eagle	V,P	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It inhabits open eucalypt forest, woodland or open woodland (NSW OEH, 2015d). The species nests in tall living trees in a large stick nest. It preys on birds, reptiles and mammals (NSW OEH, 2015d).	**NOT OBSERVED – UNLIKELY TO OCCUR** Suitable habitat is not present on the site.
Pandion cristatus	Eastern Osprey	V,P,3	The eastern osprey has a global distribution. Eastern osprey are found right around the Australian coast line, except for Victoria and Tasmania. The species favours coastal areas, especially the mouths of large rivers, lagoons and lakes (NSW OEH, 2017a). Eastern osprey feed on fish over clear, open water (NSW OEH, 2017a).	**NOT OBSERVED – UNLIKELY TO OCCUR** No suitable foraging habitat exists on the site for this species. No nests are located on the site.
Amaurornis moluccana	Pale-vented Bush-hen	V,P	In Australia, the pale-vented bush-hen occurs mainly in coastal and sub-coastal regions from the Top End of the Northern Territory and Cape York Peninsula south through eastern Queensland to north-eastern NSW. In NSW, bush-hens are an uncommon resident from the Queensland border south to the Nambucca River (NSW OEH, 2012g). The pale-vented bush-hen inhabits tall dense understorey or ground-layer vegetation on the margins of freshwater streams and natural or	**NOT OBSERVED – POTENTIAL TO OCCUR** The preferred habitat for this species is present on the site. However, attempts to elicit a response to call playback was

Species Name	Common Name	Status	Species Ecology	Likelihood of Occurrence
			artificial wetlands, usually within or bordering rainforest, rainforest remnants or forests. It also occurs in secondary forest growth, rank grass or reeds, thickets of weeds, such as lantana (*Lantana camara*), pastures and crops or urban gardens where they border forest and streams or wetlands, such as farm dams. The species can also occur in and around mangroves, though rarely do so, if at all, in NSW (NSW OEH, 2012g). The diet of the bush-hen consists of seeds, plant matter, earthworms, insects and some frogs, taken from ground cover or by wading at edges of streams or wetlands (NSW OEH, 2012g).	unsuccessful during the survey period..
Burhinus grallarius	Bush Stone-curlew	E1,P	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania (NSW OEH, 2015a). The species inhabits open forests and woodlands with a sparse, grassy ground layer and fallen timber. It is largely nocturnal, being especially active on moonlit nights (NSW OEH, 2015a).	**NOT OBSERVED – UNLIKELY TO OCCUR** Suitable habitat for this species does not exist on the site.
Esacus magnirostris	Beach Stone-curlew	E4A,P	In Australia, the Beach Stone-curlew occurs along coastlines from about Point Cloates in Western Australia, across northern and north-eastern Australia south to north-eastern NSW, with occasional vagrants to south-eastern NSW and Victoria. Outside Australia, the species also occurs in south-eastern Asia, from the Malay Peninsula through Indonesia and southern New Guinea, the Solomon Islands, Vanuatu and New Caledonia (NSW OEH, 2016a). Beach Stone-curlews are forage in the intertidal zone and are found exclusively along the coast, on beaches, islands, reefs and in estuaries, and are often be seen at the edges of or near mangroves. Beach Stone-curlews breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass, scattered shrubs or low trees and among open mangroves (NSW OEH, 2016a).	**NOT OBSERVED – UNLIKELY TO OCCUR** Suitable habitat for this species does not exist on the site.
Irediparra gallinacea	Comb-crested Jacana	V,P	The Comb-crested Jacana occurs on freshwater wetlands in northern and eastern Australia, mainly in coastal and subcoastal regions, from the north-eastern Kimberley Division of Western Australia to Cape York Peninsula then south along the east coast to the Hunter region of NSW. Outside Australia, the Comb-crested Jacana occurs from Borneo and the Philippines, throughout Sulawesi, the Moluccas and Lesser Sunda	**NOT OBSERVED – UNLIKELY TO OCCUR** No suitable habitat for this species exists on the site.

Species Name	Common Name	Status	Species Ecology	Likelihood of Occurrence
			Islands, to the Aru Islands, New Guinea and New Britain (NSW OEH, 2012c). The species inhabits permanent freshwater wetlands, either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies, or fringing and aquatic vegetation (NSW OEH, 2012c).	
Calyptorhynchus lathami	Glossy Black-Cockatoo	V,P,2	The Glossy black-cockatoo (*Calyptorhynchus lathami*) has a patchy distribution in Australia, occurring from the coast near Eungella in eastern Queensland to Mallacoota in Victoria (NSW OEH, 2015c). Glossy black-cockatoos inhabit open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. They feed almost exclusively on the seeds of several species of she-oak (Casuarina and Allocasuarina species). The birds' presence is often indicated by a layer of cracked cones and fragments that have accumulated under favoured casuarina trees. These are referred to as orts. It is selective in its choice of food trees, choosing casuarinas that produce seeds with a high nutrient value (NSW OEH, 2015c). They are dependent on large hollow-bearing eucalypts for breeding. Breeding takes place from March to August (NSW OEH, 2015c).	**NOT OBSERVED – UNLIKELY TO OCCUR** No suitable foraging or breeding habitat for this species exists on the site.
Glossopsitta pusilla	Little Lorikeet	V,P	The little lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. Nomadic movements are common in this species and is influenced by season and food availability. The species forages primarily in the canopy of open *Eucalyptus* forest and woodland. It nests in proximity to feeding areas, most typically selecting hollows in the limb or trunk of riparian trees (NSW OEH, 2016c).	**NOT OBSERVED – UNLIKELY TO OCCUR** Potential foraging habitat for this species does not exist on the site.
Ninox connivens	Barking Owl	V,P,3	The barking owl is found throughout continental Australia except for the central arid regions (NSW OEH, 1998). It inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. The species hunts small arboreal mammals such as squirrel gliders and ringtail possums. It will also feed on birds, invertebrates and terrestrial mammals such as rodents and rabbits when arboreal mammals are limited (NSW OEH, 1998).	**NOT OBSERVED – UNLIKELY TO OCCUR** While it is possible that the site may be part of a home range of this species, the lack of tree hollows, limit the likelihood of barking owls utilising the site.

Species Name	Common Name	Status	Species Ecology	Likelihood of Occurrence
			Barking owls require very large permanent territories in most habitats. Monogamous pairs hunt over as much as 6000 hectares, with 2000 hectares being more typical in NSW habitats (NSW OEH, 1998). The species nest in the hollows of large, old eucalypt trees (NSW OEH, 1998).	Attempts to elicit a response to call-playback during the survey period was unsuccessful.
Tyto longimembris	Eastern Grass Owl	V,P,3	Eastern Grass Owls have been recorded in all mainland states of Australia but are most common in northern and north-eastern Australia. In NSW they are more likely to be resident in the north-east (NSW OEH, 2014d). Eastern Grass Owls are found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains (NSW OEH, 2014d).	**NOT OBSERVED – UNLIKELY TO OCCUR** While the site's vegetation does contain grassland pasture, grazing and the regular maintenance regime limits the suitability of the site to grass owls. It is considered unlikely that this species would occur on the site.
Todiramphus chloris	Collared Kingfisher	V,P	In Australia, the distribution of the collared kingfisher extends around the northern coasts, from Shark Bay in northern Western Australia to the estuary of the Tweed River in far north-eastern NSW. In NSW, the species is observed regularly only at Ukerebagh and nearby Cobaki Broadwater, and it breeds along the Tweed River estuary. Outside of Australia, the species is widely distributed from the Red Sea and Arabian Gulf in the Middle East, through southern and south-eastern Asia to Indonesia and New Guinea and east to the Solomon Islands, Vanuatu, Fiji, Tonga and Samoa (NSW OEH, 2012a). The species is restricted to mangrove associations of estuaries, inlets, sheltered bays and islands, and the tidal flats and littoral zone bordering mangroves (NSW OEH, 2012a). Nests are usually in holes in trunks of large, live or dead mangrove trees, though they sometimes nest in hollows or in arboreal termite nests in large eucalypts or paperbarks adjacent to mangroves or estuarine foraging habitats (NSW OEH, 2012a).	**NOT OBSERVED – UNLIKELY TO OCCUR** Foraging and nesting habitat for this species does not exist on the site.
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V,P	The eastern subspecies of the brown treecreeper lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with	**NOT OBSERVED – UNLIKELY TO OCCUR**

Species Name	Common Name	Status	Species Ecology	Likelihood of Occurrence
			drier open woodlands. It mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey (NSW OEH, 2014c). It nests in hollows in standing dead or live trees and tree stumps (NSW OEH, 2014c).	No foraging habitat exists on the site for this species.
Gavicalis fasciogularis	Mangrove Honeyeater	V,P	The mangrove honeyeater is confined to the coastal fringe and offshore islands of eastern Australia, from Townsville in Queensland, south to the northern coast of NSW (NSW OEH, 2016e). The primary habitat of the species is mangrove woodlands and shrublands but will also range into adjacent forests, woodlands and shrublands, including casuarina and paperbark swamp forests and associations dominated by eucalypts or banksias (NSW OEH, 2016e). The species nests in a densely foliaged mangrove tree (NSW OEH, 2016e).	**NOT OBSERVED – UNLIKELY TO OCCUR** Suitable habitat for this species does not exists on the site, however, potential habitat is present to the north.
Daphoenositta chrysoptera	Varied Sittella	V,P	The varied sittella inhabits most of mainland Australia except the treeless deserts and open grasslands. Foraging and nesting habitat for this species are eucalypt forests and woodlands, where there are rough-barked trees like stringybarks and ironbarks or mature trees with hollows or dead branches (NSW OEH, 2016h).	**OBSERVED** This species was observed foraging on the site.
Coracina lineata	Barred Cuckoo-shrike	V,P	Barred cuckoo-shrike are distributed along coastal eastern Australia from Cape York to the Manning River in NSW. It is considered rare in NSW (NSW OEH, 2012b). The species is found in rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses (NSW OEH, 2012b).	**NOT OBSERVED – POTENTIAL TO OCCUR** Suitable foraging habitat for this species exists on the site, however, it was not observed during the survey period.
Carterornis leucotis	White-eared Monarch	V,P	The white-eared monarch occurs in the coastal lowlands and eastern slopes of the Great Divide of eastern Australia, extending from Cape York Peninsula south to north-eastern NSW. In NSW, white-eared monarchs are generally found from the Queensland border south to Iluka at the mouth of the Clarence River, and inland as far as the Richmond Range (NSW OEH, 2012i).	**NOT OBSERVED – POTENTIAL TO OCCUR** Suitable foraging habitat for this species exists on the site, however, it was not observed during the survey period.

Species Name	Common Name	Status	Species Ecology	Likelihood of Occurrence
			In NSW, the species inhabits littoral rainforest, wet and dry sclerophyll forests, swamp forest and regrowth forest. They appear to prefer the ecotone between rainforest and other open Vegetation Associations or the edges of rainforest (NSW OEH, 2012i). They breed from about September to March, usually nesting high in the canopy, and often at the edge of patches of rainforest (NSW OEH, 2012i).	
Mammals				
Dasyurus maculatus	Spotted-tailed Quoll	V,P, E#	The spotted-tailed quoll is found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania (NSW OEH, 2017b). The species has been recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites (NSW OEH, 2017b).	**NOT OBSERVED – UNLIKELY TO OCCUR** No suitable habitat for this species exists on the site.
Planigale maculata	Common Planigale	V,P	The common planigale occupies a range of habitats including rainforests, sclerophyll forests, savanna woodlands, heathlands, sedgelands, grasslands and rocky areas (Denny 1982). In northern NSW, native vegetation on sandy soils of the coastal plain constitute core habitat particularly swamp forests, banksia woodlands, wallum heaths and dry and moist open forests (Milledge 1991; Miller, 1998). Higher than average leaf litter cover and logs were important habitat features for common planigales (Miller, 1998).	**NOT OBSERVED – POTENTIAL TO OCCUR** Suitable habitat for this species is present on the site.
Phascolarctos cinereus	Koala	V,P, V#	*Phascolarctos cinereus* inhabits dry open sclerophyll forests and woodlands occurring on fertile soils (Van Dyck, 1995; Menkhorst and Knight, 2001; Environmental Protection Agency, 2006). Communities containing denser vegetation and larger trees are generally preferred; however *Phascolarctos cinereus* can also inhabit less optimal habitat such as young forests, highly fragmented vegetation communities, and small remnants (Environmental Protection Agency, 2006). They mainly feed on *Eucalyptus* species, along with some *Corymbia*, *Angophora*, *Lophostemon*, *Melaleuca*, and *Leptospermum* species (Environmental Protection Agency, 2006).	**NOT OBSERVED – UNLIKELY TO OCCUR** This species was not recorded during surveys and no scats of *P. cinereus* were found. There is very limited habitat for this species on the subject site.

Species Name	Common Name	Status	Species Ecology	Likelihood of Occurrence
Nyctimene robinsoni	Eastern Tube-nosed Bat	V,P	The eastern tube-nosed bat is distributed along the coastal areas of north-eastern Australia from Cape York south to the far north-east corner of NSW (NSW OEH, 2012f). The species favours streamside habitats within coastal subtropical rainforest and moist eucalypt forests with a well-developed rainforest understorey (NSW OEH, 2012f).	**OBSERVED** This species was heard during spotlighting surveys on the site.
Pteropus poliocephalus	Grey-headed Flying-fox	V,P, V[#]	The grey-headed flying-fox occurs in the coastal belt from Rockhampton to Melbourne. The grey-headed flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, *Melaleuca* swamps and *Banksia* woodlands (Eby, 1998). None of the vegetation communities used by the Grey-headed Flying-fox produce continuous foraging resources throughout the year, so the species selectively forages where food is available. Consequently, patterns of occurrence and relative abundance within its distribution vary widely between seasons and between years. At a local scale, the species is generally present intermittently and irregularly (Eby & Lunney, 2002). The Grey-headed Flying-fox roosts in aggregations of various sizes on exposed branches. They most frequently travel around 15km from a roost site to feed (Tidemann, 1998), although can travel up to 50km as food resources change (Eby, 1991).	**POTENTIAL TO OCCUR** No roost sites were found on-site, however, the grey-headed flying-fox would forage on the flowering trees on site at appropriate times of the year. A flying-fox was observed flying over the site during the spotlighting surveys, however, positive identification was unable to be made.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V,P	The yellow-bellied sheathtail-bat is a wide-ranging species found across northern and eastern Australia. It roosts singly or in groups of up to six, in tree hollows and buildings (NSW OEH, 2016i).	**NOT OBSERVED – POTENTIAL TO OCCUR** It is possible that the site makes up part of a foraging range for this species.
Mormopterus lumsdenae	Northern Free-tailed Bat	V	The northern free-tailed bat is widely distributed across northern Australia from Western Australia to Queensland, extending south to the north-east corner of NSW (NSW OEH, 2016f). The species occurs in a range of Vegetation Associations in northern Australia, from rainforests to open forests and woodlands, and are often recorded along watercourses (NSW OEH, 2016f).	**NOT OBSERVED – POTENTIAL TO OCCUR** It is possible that the site makes up part of a foraging range for this species.

Species Name	Common Name	Status	Species Ecology	Likelihood of Occurrence
			Roost sites are mainly in tree hollows but relatively large colonies have been found under house roofs in urban areas in Queensland. The only confirmed record in NSW is of a colony found in the roof of a house in Murwillumbah, however, calls have been detected from a few other locations in the far north east of the State (NSW OEH, 2016f).	
Mormopterus norfolkensis	Eastern Freetail-bat	V,P	The eastern freetail-bat is found along the east coast from south Queensland to southern NSW. It occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range (NSW OEH, 2015b). The species roost mainly in tree hollows but will also roost under bark or in man-made structures (NSW OEH, 2015b).	**NOT OBSERVED – POTENTIAL TO OCCUR** It is possible that the site makes up part of a foraging range for this species.
Chalinolobus nigrogriseus	Hoary Wattled Bat	V,P	The hoary wattled bat is widely distributed across northern Australia, although is absent from the arid centre. In north east NSW, it extends from Port Macquarie in the south, north to the Queensland border (NSW OEH, 2014e). In NSW, the Hoary Wattled Bat occurs in dry open eucalypt forests, favouring forests dominated by spotted gum, boxes and ironbarks, and heathy coastal forests where red bloodwood and scribbly gum are common (NSW OEH, 2014e). The species roosts in hollows and rock crevices (NSW OEH, 2014e).	**NOT OBSERVED – UNLIKELY TO OCCUR** Suitable habitat for this species does not exist on the site.
Miniopterus australis	Little Bentwing-bat	V,P	The little bentwing-bat occurs along the east coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW (NSW OEH, 2014f). It inhabits moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, melaleuca swamps, dense coastal forests and banksia scrub. It is generally found in well-timbered areas (NSW OEH, 2014f). Little bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats (NSW OEH, 2014f).	**NOT OBSERVED – POTENTIAL TO OCCUR** It is possible that the site makes up part of a foraging range for this species.

Species Name	Common Name	Status	Species Ecology	Likelihood of Occurrence
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V,P	Eastern Bentwing-bats occur along the east and north-west coasts of Australia (NSW OEH, 2016b). The species forages in a range of habitats including rainforest, wet and dry schlerophyll forest, open woodland, paperbark forests and grasslands (Churchill, 1998). Caves are the primary roosting habitat, but the species will also use derelict mines, storm-water tunnels, buildings and other man-made structures (Churchill, 1998).	**NOT OBSERVED – POTENTIAL TO OCCUR** While suitable foraging habitat exists on the site for this species, roosting habitat is not present.
Myotis macropus	Southern Myotis	V,P	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 (NSW OEH, 2016g). The species generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage (NSW OEH, 2016g). Southern myotis forage over streams and pools catching insects and small fish by raking their feet across the water surface (NSW OEH, 2016g).	**NOT OBSERVED – UNLIKELY TO OCCUR** No suitable foraging or roosting habitat exists on the site.
Nyctophilus bifax	Eastern Long-eared Bat	V,P	This species is found from Cape York through eastern Queensland to the far north-east corner of NSW. In NSW, they appear to be confined to the coastal plain and nearby coastal ranges, extending south to the Clarence River area (NSW OEH, 2012e). The species inhabits lowland subtropical rainforest and wet sclerophyll and swamp eucalypt forest, extending into adjacent moist eucalypt forest (NSW OEH, 2012e). Eastern long-eared bats roosts in tree hollows, the hanging foliage of palms, in dense clumps of foliage of rainforest trees, under bark and in shallow depressions on trunks and branches, among epiphytes, in the roots of strangler figs, among dead fronds of tree ferns and less often in buildings (NSW OEH, 2012e).	**NOT OBSERVED – POTENTIAL TO OCCUR** Suitable foraging and roosting habitat is present on the site.
Invertebrates				

Species Name	Common Name	Status	Species Ecology	Likelihood of Occurrence
Thersites mitchellae	Mitchell's Rainforest Snail	E1, CE[#]	This species is found in remnant vegetation on the coastal plain between the Richmond River and Tweed River on the NSW north coast. It occupies remnant areas of lowland subtropical rainforest and swamp forest on alluvial soils. The slightly higher ground around the edges of wetlands with palms and fig trees are particularly favoured habitat (NSW EH, 2017o). This species is usually found amongst leaf litter on the forest floor, and occasionally under bark in trees where it feeds on leaf litter, fungi and lichen (NSW EH, 2017o).	**NOT OBSERVED – POTENTIAL TO OCCUR** Suitable habitat for this species exists on the site.

*****Status under the Commonwealth EPBC Act: V = Vulnerable, E = Endangered, C = Listed under the CAMBA, J = Listed under JAMBA, K = Listed under RoKAMBA.
[#]Status under the *Threatened Species Conservation Act 1995* unless otherwise noted.
E1 Endangered **E2** Endangered Population **E3** Endangered Ecological Community **E4** Presumed Extinct **E4A** Critically Endangered **E4B** Critically Endangered Ecological Community **P** Protected (*National Parks & Wildlife Act 1974*) **V** Vulnerable **V2** Vulnerable Ecological Community **1** Sensitivity Class 1 (Sensitive Species Data Policy) **2** Sensitivity Class 2 (Sensitive Species Data Policy) **3** Sensitivity Class 3 (Sensitive Species Data Policy).

6. Assessment of Impacts of Proposed Development

An assessment on the presence or absence of environmentally significant areas on the site, based on desktop and field investigations has been made. The potential impacts of the development are discussed within the following sections. Table 6.1 provides a summary of these findings.

Table 6.1 Summary of Matters of Environmental Significance

Schedule of Matters of Environmental Significance	Site Characteristics
Threatened Ecological Communities, Populations or Species, as identified under the Commonwealth EPBC Act.	Threatened Ecological Communities listed under the Commonwealth EPBC Act have been identified on the site. The Endangered Ecological Community (EEC) Swamp Sclerophyll Forest on Coastal Floodplains. Is represented on site as Vegetation Type B. **Threatened fauna species have been observed foraging on the site.** **One (1) threatened flora species was recorded on site – *Macadamia tetraphylla* (Vulnerable under the TSC Act).**
The presence of World or National Heritage properties as identified under the EPBC Act.	The site is not a national or world heritage property
Wetlands of international importance (Ramsar sites).	No Ramsar sites are located on the site.
Areas providing essential habitat for species listed under JAMBA, CAMBA, RoKAMBA and the Bonn Convention.	The subject site is not considered to provide essential habitat for any species listed under JAMBA, CAMBA, RoKAMBA and/or the Bonn Convention.
Areas subject to a Conservation Plan.	No areas within the study site are subject to a Conservation Plan.
Ecologically sensitive areas or of high ecological value are identified on site.	**Areas that have high ecological value and ecological sensitivity are present on the site.**
Areas providing core habitat for threatened species under the *Threatened Species Conservation Act, 1995*	No core habitat for threatened species is present within the development footprint of the site.
Wetlands identified under *State Planning Policy Coastal Management 2018* or the Tweed *Vegetation Management Strategy 2004*	**Coastal wetlands identified under SEPP Coastal Management are mapped within the site.**
Areas owned or managed by the Tweed Shire Council for nature conservation purposes.	The subject site is not owned or managed by the Tweed Shire Council for nature conservation purposes.
Areas containing environmental corridors required to link matters of environmental significance	The site does not provide a critical link to areas containing environmentally significant areas external to site.

6.1 General Impacts on Native Vegetation and Habitat

The development footprint falls within the predominantly cleared areas of the site avoiding impacts on ecologically significant areas. Some clearing is required to facilitate the development, however this vegetation is highly modified/disturbed and/or well represented in protected remnant vegetation in the local and regional area.

The final location of the proposed development ensures that the development footprint:

- does not impact on retained vegetation;
- does not require the clearing of habitat trees; and
- does not occur within an ecologically significant area.

The ecological impacts of the proposed development upon vegetation within a local and regional context are negligible and able to be mitigated through restoration.

Notwithstanding the above, uncontrolled clearing operations undertaken during the Construction Phase have the potential to impact upon vegetation to be retained within the construction site. Recommendations have been provided to mitigate this impact during the construction phase (refer to Section 8).

6.2 Impacts on Significant Flora Species - Assessment of Significance

6.2.1 *Macadamia tetraphylla* (Rough-shelled bushnut)

NSW TSC Act Status: Vulnerable

Table 6.2 Assessment of Significance for *Macadamia tetraphylla* (Rough-shelled bushnut)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The NSW OEH Bionet Atlas database holds 29 valid records for this species within a 10km radius of the subject site and 270 valid records in the Tweed LGA. One (1) specimen was recorded during site investigations and a further four (4) specimens were detected during subsequent site investigations (JWA, 2018b). Two (2) specimens were recorded on the adjoining development to the east by JWA (2013). This species is found in subtropical rainforest and has a very limited natural range. It is recorded from the north of the Richmond River in north-east NSW, to just across the border into south east Qld (NSW NPWS, 2002 and OEH 2018). The specimens detected on the subject site will be translocated to more suitable habitat (protected area away from earthworks) in accordance with the translocation plan (JWA 2019). The translocation management plan includes provisions for planting of additional *Macadamia tetraphylla* plants and surrogate habitat. Additional contingency plantings are also required in the event that the translocation of individual plants is deemed infeasible. These additional plantings and contingency measures will ensure a net gain of

Factors of Assessment	Response
	this species and this species' habitat results from the proposed development. It is highly unlikely that the proposed development will result in the local extinction of this species.
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 action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The primary habitat of the Rough-shelled bushnut is subtropical rainforest near the coast in the Richmond and Tweed Valleys (PlantNET 2018). This ecological community type was not recorded on the subject site. A lowland rainforest community that will provide suitable surrogate habitat for this species will be restored within a conservation reserve as part of the larger estate development. Details with regard to this project are provided in the Altitude Aspire Revised Vegetation Management and Rehabilitation Plan (JWA 2018).
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species. A targeted strategy for managing this species has been developed under the OEH *Saving Our Species* program. This species is allocated to the 'Site-managed' management stream under this program. Species threats and management objectives / actions identified as part of the SOS include: • Risk of adverse fire/wildfire: reduce risk of fire through site-based weed control • Residential development: Ensure land management is sympathetic to the long-term requirements of the species through negotiation of land management agreements. Implementation of the Altitude Aspire Revised Vegetation Management and Rehabilitation Plan (JWA 2018) will meet the SOS objectives and actions for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	A "threatening process" means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of a species, population or ecological community. Key Threatening Processes are listed in Schedule 3 of the TSC Act (1995). Relevant Key Threatening Processes for this species and the proposed development include: • Weed invasion; • Vegetation clearing; • Altered fire regime; and • Infection by *Phytophthora cinnamomi*. The implementation of the Altitude Aspire Revised Vegetation Management and Rehabilitation Plan (JWA 2018) will mitigate these potential impacts and ensure effective management of the restored habitat for this species.

6.3 Impacts on Significant Ecological Communities - Assessment of Significance

An assessment of significance is designed to improve the standard of consideration afforded to ecological communities through the planning and assessment process. The assessment of significance allows a qualitative analysis of the likely impacts, and ultimately, whether further assessment needs to be undertaken through a species impact statement.

Desktop investigations and site surveys determined that a threatened ecological community, at least in part, occurs on the subject site. An assessment of significance was performed and the results are provided in Table 6.2.

Table 6.3 Assessment of Significance - Endangered Ecological Community - Swamp Sclerophyll Forest

Factors of Assessment	Response
In the case of an endangered ecological community or critically endangered ecological community whether the action proposed: (i) ecological community such that its local occurrence is likely to be placed at risk of extinction; and (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.	The extent of the EEC is outside of the development footprint and protected from the proposed works by an appropriate (50m) buffer. The local occurrence of this EEC will not be reduced or impacted by the proposed works. The proposed works will not impact the EEC such that its local occurrence is likely to be placed at risk of extinction. Additionally, the proposed development will not substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction. The implementation of an approved restoration plan will ensure the ecological function and values of the EEC are not impacted by the proposed development.
In relation to the habitat of a threatened species, population or ecological community: (iii) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and (iv) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (v) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The proposed works will not remove / modify / fragment or isolate the existing EEC provided appropriate management actions are implemented including: • Retain a buffer of at least 50m to the EEC; and • Implement best practise construction management, stormwater quality management, weed management and habitat restoration management.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this EEC.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	A “threatening process” means a process that threatens, or may have the capability to threaten, the survival or evolutionary development of a species, population or ecological community. Key Threatening Processes are listed in Schedule 3 of the TSC Act (1995). Relevant Key Threatening Processes for this species and the proposed development include: • Weed invasion;

Factors of Assessment	Response
	• Vegetation clearing; • Altered fire regime; and • Infection by *Phytophthora cinnamomi*. The implementation of an approved vegetation management plan will mitigate these potential impacts and ensure effective protection of this EEC.

6.4 Threatened Fauna Confirmed On-Site - Assessment of Significance

The fauna survey design incorporated a concentrated survey effort within the proposed disturbance footprint and surrounding areas to ensure that the potential impacts of the proposed development could be accurately identified and evaluated.

The assessment of significance is designed to improve the standard of consideration afforded to threatened species and their habitats through the planning and assessment process, and to ensure that the consideration is transparent. The assessment of significance allows a qualitative analysis of the likely impacts, and ultimately, whether further assessment needs to be undertaken through a species impact statement.

For each of the threatened species positively identified as occurring on the site, an assessment of significance (7-part test) has been conducted. These assessments are presented in the following sections.

6.4.1 *Ptilinopus regina* (Rose-crowned fruit-dove)

NSW Status: Vulnerable

Rose-crowned fruit-dove were observed foraging in camphor laurel on the subject site.

Table 6.4 Assessment of Significance for *Ptilinopus regina* (Rose-crowned fruit-dove)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The rose-crowned fruit-dove occurs along the coast and ranges of eastern NSW and Queensland, from Newcastle to Cape York (NSW OEH, 2012h). Rose-crowned Fruit-doves occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest (NSW OEH, 2012h). They feed entirely on fruit from a variety of plants. Some populations are migratory in response to food availability - numbers in north-east NSW increase during spring and summer then decline in April or May (NSW OEH, 2012h). The potential habitat for this species is outside of the building footprint. It is therefore unlikely that the proposed development would place the local population of the rose-crowned fruit-dove at risk of extinction. However, the rose-crowned fruit-dove feeds on camphor laurel and the removal of all of these

Factors of Assessment	Response
	weeds from the site will reduce the foraging potential of this species.
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 action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The key habitat of the rose-crowned fruit-dove is outside of the building footprint. The key habitat of this species will not be modified, fragmented or isolated. However, additional foraging resources (camphor laurel) will be removed from the site. The loss of this resource will be offset with the rehabilitation of existing key habitat areas.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The threats to this species are listed as: • Clearing and fragmentation of low to mid-elevation rainforest. • Logging and roading in moist eucalypt forest with well-developed rainforest understorey. • Burning of remnant rainforest habitat. • Invasion of habitat by introduced weed species. • Removal of Camphor Laurel food source without appropriate mitigation measures (NSW OEH, 2012h). It is unlikely that the proposed development will contribute to increased impacts from these threats. The implementation of a restoration plan will assist in the re-establishment of native foraging resources as camphor laurel is systematically removed from the site.

6.4.2 *Daphoenositta chrysoptera* (Varied sittella)

NSW Status: Vulnerable

Varied sittella were observed and heard foraging in the heavily vegetated areas of the site.

Table 6.5 Assessment of Significance for *Daphoenositta chrysoptera* (Varied sittella)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The varied sittella inhabits most of mainland Australia except the treeless deserts and open grasslands. It inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland (NSW OEH, 2016h).

Factors of Assessment	Response
	The varied sittella inhabits eucalypt forests and woodlands where it feeds on arthropods gleaned from the bark of the trees (NSW OEH, 2016h). Clearing outside of the key foraging habitat for this species is excluded from the development footprint. Impacts to this species are therefore expected to be minimal and the local population is unlikely to be placed at risk of extinction.
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 action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The primary habitat of the varied sittella is outside of the development footprint. The habitat of this species will therefore, not be modified, fragmented or isolated.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The threats to this species are listed as: Habitat destruction. • Dominance of noisy miners in woodland patches. • Infestation of habitat by invasive weeds. • Inappropriate fire regimes. • Climate change impacts including reduction in resources due to drought. • Overgrazing by stock impacting on leaf litter and shrub layer (NSW OEH, 2016h). It is unlikely that the proposed development will contribute to increased impacts from these threats. The implementation of a restoration plan will assist in the control of weeds to bushland areas of the site.

6.4.3 *Nyctimene robinsoni* (Eastern tube-nosed bat)

NSW Status: Vulnerable

Eastern tube-nosed bats were heard flying over the wetland areas during the spotlighting survey.

Table 6.6 Assessment of Significance for *Nyctimene robinsoni* (Eastern tube-nosed bat)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The eastern tube-nosed bat inhabits coastal areas of north-eastern Australia from Cape York south to the far north-east corner of NSW. There are few records from NSW, including the Nightcap, Tweed and Burringbar Ranges and in the vicinity of Mt Warning (NSW OEH, 2012f). The species favours streamside habitats within coastal subtropical rainforest and moist eucalypt forests with a well-developed rainforest understorey (NSW OEH, 2012f). At night, they fly rapidly and with great manouverability just above or below the forest canopy, making a distinctive, high-pitched whistling call. They feed mainly on fruit and nectar from trees in the rainforest canopy (NSW OEH, 2012f). Primarily a rainforest species, it roosts either singly or in small groups amongst the foliage. Roost sites are generally close to feeding areas and have been recorded in primary and secondary forest and mangroves (Australian Museum, 2017). Foraging and roosting habitat is available on the subject site. However, as the proposed development is restricted to the cleared areas of the site, it is unlikely that the local population of eastern tube-nosed bats would be placed at risk of extinction.
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 action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The primary habitat of the eastern tube-nosed bat is outside of the building footprint. The habitat of this species will therefore, not be modified, fragmented or isolated.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The threats to this species are listed as: • Clearing and fragmentation of rainforest and wet eucalypt forest for agriculture and residential development.

Factors of Assessment	Response
	• Loss and degradation of habitat due to disturbance of rainforest and wet eucalypt forest from timber harvesting. • Invasion of rainforest habitat by introduced weeds. • Destruction of Black Bean, an important food tree, because the seeds are toxic to cattle. • Predation by cats particularly while foraging on low hanging fruit and flowers. • Entanglement on barbed wire fences, particularly around feed trees, along wildlife corridors, over/near water and new fences. It is unlikely that the proposed development will contribute to increased impacts from these threats. The implementation of a restoration plan will assist in the control of weeds to bushland areas of the site. As there is no planned exclusion of domestic animals from the development site, the risk of predation from uncontrolled cats remains.

6.4.4 *Pteropus poliocephalus* (Grey-headed flying-fox)

NSW Status: Vulnerable

Commonwealth Status: Vulnerable

One flying-fox was spotlighted flying over the site during the spotlighting survey. While positive identification was unable to be made, a precautionary approach has been adopted and it is assumed that the flying-fox observed was a grey-headed flying-fox.

Table 6.7 Assessment of Significance for *Pteropus poliocephalus* (Grey-headed flying-fox)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The grey-headed flying-fox roosts and breeds in large aggregations. These are not present on the subject site. Foraging resources for this species are often widely distributed and seasonally abundant. The removal of isolated trees upon which flying-foxes may seasonally feed, will not impact this species on a local level. As the development footprint is largely restricted to the cleared areas of the site, there will be few trees required to be cleared. One flying-fox was seen flying over the site during the survey period and it will be assumed to be a grey-headed flying-fox as a precaution.
In relation to the habitat of a threatened species, population or ecological community:	No roosting/breeding habitat will be affected by the proposed development. Given the vastness of the foraging ranges of this species, the removal of isolated trees to facilitate the

Factors of Assessment	Response
(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	construction of the proposed development, will not fragment, isolate or significantly modify the habitat.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	A draft National Recovery Plan for this species has been produced. The proposed development does not compromise any of the actions listed within this recovery plan.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	Threats to this species are listed as: • Loss of roosting and foraging sites. • Electrocution on powerlines, entanglement in netting and on barbed-wire. • Heat stress. • Conflict with humans. Roosting sites are not impacted by this development as they are not present on the site or in adjacent areas. Conflict with humans is not believed to be an issue. Minimal foraging resources (flowering trees) will be removed as a result of this development proceeding.

6.5 Fauna Potentially Occurring On-Site – Assessment of Significance

An assessment of significance was conducted for all those species that were considered having *potential* to occur on the site. A species was considered to potentially occur on the site based on its distribution, database recordings within 10 km of the subject site and availability of habitat on site.

Under sections 53-55 of the *Threatened Species Conservation Act 1995*, four declarations of critical habitats are in force including:

- Gould's Petrel - critical habitat declaration
- Little penguin population in Sydney's North Harbour
- Mitchell's Rainforest Snail in Stott's Island Nature Reserve
- Wollemi Pine - critical habitat declaration

None of these critical habitats are applicable to the subject site.

6.5.1 *Anseranas semipalmata* (Magpie goose)

NSW Status: Vulnerable

Table 6.8 Assessment of Significance for *Anseranas semipalmata* (Magpie goose)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The Magpie Goose is widespread throughout coastal northern and eastern Australia. It can be seen from Fitzroy River, Western Australia, through northern Australia to Rockhampton, Queensland, and has been extending its range into coastal New South Wales to the Clarence River and further south (Birdlife, 2015). Key foraging habitats for this species are wetlands, mainly those on floodplains of rivers and large shallow wetlands formed by run-off. Breeding mostly breeding occurs in monsoonal areas. Breeding is unlikely in NSW. It roosts in tall vegetation (NSW OEH, 2016d). Potential foraging habitat for this species exists on the subject site. However, the wetland area is ephemeral and this foraging area would only be available periodically throughout the year. The key nesting habitat for this species is outside of the building footprint and is buffered from development. It is therefore unlikely that the proposed development would place the local population of magpie geese at risk of extinction.
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 action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The key foraging habitat of magpie geese is only periodically available after heavy and/or prolonged rain. It is considered that the potential foraging habitat for this species on the subject site is insignificant over a local or regional scale.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The threats to this species are listed as: • Inappropriate hydrological regimes of wetland habitats through drainage of swamps, ponds, dams and other wetlands for agricultural and other human purposes. • Degradation of habitat through water pollution (e.g. salinity, chemicals, eutrophication). • Modification of habitat and nest loss from trampling and overgrazing. • Predation on eggs and goslings. • Too-frequent burning of wetlands (NSW OEH, 2016d).

Factors of Assessment	Response
	The implementation of the stormwater management plan will reduce the risk of water quality and hydrology changes to the waterways near the site.

6.5.2 *Ptilinopus magnificus* (Wompoo fruit-dove)

NSW Status: Vulnerable.

Table 6.9 Assessment of Significance for *Ptilinopus magnificus* (Wompoo fruit dove)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The wompoo fruit-dove occurs along the coast and coastal ranges from the Hunter River in NSW to Cape York Peninsula (NSW OEH, 2012j). The species occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests. It is most often seen in mature forests, but also found in remnant and regenerating rainforest (NSW OEH, 2012j). Wompoo fruit-doves feed on a diverse range of tree and vine fruits and is locally nomadic - following ripening fruit (NSW OEH, 2012j). The potential habitat for this species is outside of the building footprint. It is therefore unlikely that the proposed development would place the local population of the wompoo fruit-dove at risk of extinction. However, the wompoo fruit-dove feeds on camphor laurel and the removal of all of these weeds from the site will reduce the foraging potential of this species.
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 action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The key habitat of the wompoo fruit-dove is outside of the building footprint. The habitat of this species will not be modified, fragmented or isolated. However, additional foraging resources (camphor laurel) will be removed from the site. The loss of this resource will be offset with the rehabilitation of existing key habitat areas.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the	The threats to this species are listed as:

Factors of Assessment	Response
operation of, or increase the impact of, a key threatening process	• Clearing and fragmentation of low to mid-elevation rainforest due to coastal development and grazing. • Logging and creating roads in moist eucalypt forest with well-developed rainforest understorey. • Increased fire regime. • Infestation of rainforest habitat by invasive weeds (NSW OEH, 2012j). It is unlikely that the proposed development will contribute to increased impacts from these threats. The implementation of a restoration plan will assist in the re-establishment of native foraging resources as camphor laurel is systematically removed from the site.

6.5.3 *Ephippiorhynchus asiaticus* (Black-necked stork)

NSW Status: Endangered

Table 6.10 Assessment of Significance for *Ephippiorhynchus asiaticus* (Black-necked stork)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	In Australia, Black-necked Storks are widespread in coastal and subcoastal northern and eastern Australia, as far south as central NSW (NSW EH, 2014a). The key habitat for this species are floodplain wetlands (swamps, billabongs, watercourses and dams). Black-necked storks build nests in tall trees close to water. The species forages for vertebrate and invertebrate prey in water 5-30 cm deep (NSW EH, 2014a). Potential foraging habitat for this species exists on the subject site. However, the wetland area is ephemeral and this foraging area would only be available periodically throughout the year. It is therefore unlikely that the proposed development would place the local population of black-necked stork at risk of extinction.
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 action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	Potential foraging habitat for this species is ephemeral and this foraging area would only be available periodically throughout the year after heavy or prolonged rainfall. However, given the home range of this species is estimated to average 9,000 ha (NSW OEH, 2014a), it is likely that this habitat would be used only on an occasional basis, if at all.

Factors of Assessment	Response
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	Threats for these species have been listed as: • Powerlines, especially close to wetlands or over floodplains. • Modification or degradation of wetlands through changes in natural water flows. • Loss of wetland habitat through clearing and draining for development. • Loss of key habitat as a result of wetland drainage for flood mitigation and agricultural development. • Degradation of wetland habitats through pollution. • Loss of paddock trees used for nesting. • Degradation of wetlands as a result of salinity (NSW OEH, 2014a). The implementation of the stormwater management plan will reduce the risk of water quality and hydrology changes to the waterways on and in close proximity to the site.

6.5.4 *Amaurornis moluccana* (Pale-vented bush-hen)

NSW Status: Vulnerable

Table 6.11 Assessment of Significance for *Amaurornis moluccana* (Pale-vented bush-hen)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	In Australia, the pale-vented bush-hen occurs mainly in coastal and sub-coastal regions from the Top End of the Northern Territory and Cape York Peninsula south through eastern Queensland to north-eastern NSW. In NSW, bush-hens are an uncommon resident from the Queensland border south to the Nambucca River (NSW OEH, 2012g). Outside Australia, the species occurs in the Moluccas, western and southern New Guinea, the Bismarck Archipelago and the Solomon Islands. The pale-vented bush-hen inhabits tall dense understorey or ground-layer vegetation on the margins of freshwater streams and natural or artificial wetlands, usually within or bordering rainforest, rainforest remnants or forests. It also occurs in rank grass or reeds, thickets of weeds, pastures and crops or urban gardens where they border forest and streams or wetlands, such as farm dams. The species can also occur in and around mangroves (NSW OEH, 2012g).

Factors of Assessment	Response
	While the habitat of this species does exist on the site, it is largely excluded from the building footprint. Areas of dense native vegetation within the site will be retained, buffered and rehabilitated. It is therefore unlikely that the local population of pale-vented bush-hen will be placed at risk of extinction.
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 action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The primary habitat of the pale-vented bush-hen is outside of the building footprint. The habitat of this species will therefore, not be modified, fragmented or isolated.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The threats to this species are listed as: • Clearing, filling and draining of wetlands. • Pollution of wetlands from agricultural, urban and industrial run-off, including herbicides and pesticides. • Changes to wetlands caused by weed invasion, often associated with sedimentation or grazing. • Predation by introduced, feral and domestic predators, particularly red foxes (*Vulpes vulpes*) and cats (*Felis catus*). • Destruction of habitat and predation by feral pigs (*Sus scrofa*). • Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands. • Loss of dense and rank understorey vegetation near streams and wetlands with clearing associated with urban and semi-rural developments (NSW OEH, 2012g). The implementation of the stormwater management plan will reduce the risk of water quality and hydrology changes to the waterways on and in close proximity to the site.

Factors of Assessment	Response
	As there are no planned restrictions on domestic pets in the proposed development, the risk of predation by uncontrolled dogs and cats remains. Loss of dense rank understorey vegetation around the site's dam and in the wetland area will occur as a result of the development. However, the rainforest habitat will be buffered and rehabilitated, potentially increasing the long-term habitat availability for this species.

6.5.5 *Coracina lineata* (Barred cuckoo-shrike)

NSW Status: Vulnerable

Table 6.12 Assessment of Significance for *Coracina lineata* (Barred cuckoo-shrike)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The barred cuckoo-shrike occurs in coastal eastern Australia from Cape York to the Manning River in NSW. Barred Cuckoo-shrikes are generally uncommon in their range, and are rare in NSW (NSW OEH, 2012b). The species inhabits rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses. They are usually seen in pairs or small flocks foraging among foliage of trees for insects and fruit (NSW OEH, 2012b). Suitable foraging habitat exists on the site. However, this habitat is outside of the development footprint, so it is unlikely that the local population would be placed at risk of extinction as a result of the development. However, the removal of camphor laurel from the site may reduce the foraging resources for this species.
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 action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The key habitat of the barred cuckoo-shrike is outside of the building footprint. The habitat of this species will not be modified, fragmented or isolated. The implementation of a habitat restoration plan and the staged removal of camphor laurel will result in a net gain of foraging habitat for this species.

Factors of Assessment	Response
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The threats to this species are listed as: Reduction of habitat, particularly rainforest, due to clearing for agriculture, development and timber harvesting (NSW OEH, 2012b). It is unlikely that the proposed development will contribute to increased impacts from these threats as the rainforest habitat is excluded from development and buffered. The implementation of a restoration plan will assist in the control of weeds to bushland areas of the site.

6.5.6 *Carterornis leucotis* (White-eared monarch)

NSW Status: Vulnerable

Table 6.13 Assessment of Significance for *Carterornis leucotis* (White-eared monarch)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The white-eared monarch occurs in the coastal lowlands and eastern slopes of the Great Divide of eastern Australia, extending from Cape York Peninsula south to north-eastern NSW. In NSW, white-eared monarchs are generally found from the Queensland border south to Iluka at the mouth of the Clarence River, and inland as far as the Richmond Range (NSW OEH, 2012i). In NSW, the species inhabits littoral rainforest, wet and dry sclerophyll forests, swamp forest and regrowth forest. They appear to prefer the ecotone between rainforest and other open Vegetation Associations or the edges of rainforest (NSW OEH, 2012i). Suitable foraging and nesting habitat exists on the site. However, this habitat is outside of the development footprint, so it is unlikely that the local population would be placed at risk of extinction because of the development.
In relation to the habitat of a threatened species, population or ecological community: (iv) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and (v) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	The key habitat of the white-eared monarch is outside of the building footprint. The habitat of this species will not be modified, fragmented or isolated.

Factors of Assessment	Response
(vi) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The threats to this species are listed as: • Clearing and increasing fragmentation and isolation of habitat, especially low-elevation subtropical rainforest, littoral rainforest and wet sclerophyll forest. • Forest management that results in conversion of multi-aged forests to young, even-aged stands. • Invasion of forests by weeds. • Inappropriate fire regimes that degrade habitat or allow invasion by weeds. • Degradation or loss of habitat through grazing of stock (NSW OEH, 2012i). It is unlikely that the proposed development will contribute to increased impacts from these threats. The implementation of a restoration plan will assist in the control of weeds to bushland areas of the site.

6.5.7 *Planigale maculate* (Common planigale)

NSW Status: Vulnerable

Table 6.14 Assessment of Significance for *Planigale maculate* (Common planigale)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The common planigale is found in coastal north-eastern NSW, coastal eastern Queensland and Arnhem Land (NSW OEH, 2012d). The species is known to inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water. They are active at night and during the day shelter in saucer-shaped nests built in crevices, hollow logs, beneath bark or under rocks (NSW OEH, 2012d). Foraging habitat for this species exists on the site. However, as the proposed development is restricted to the cleared areas of the site, it is unlikely that the local population of common planigale would be placed at risk of extinction.

Factors of Assessment	Response
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 action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The primary habitat of the common planigale is outside of the building footprint. The habitat of this species will therefore, not be modified, fragmented or isolated.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The threats to this species are listed as: • Predation by foxes. • Predation by cats • Predation and poisoning by cane toads • Loss and fragmentation of habitat through clearing for agriculture and development in coastal areas. • Frequent burning that reduces ground cover such as hollow logs and bark. • Over grazing that reduces ground cover • Disturbance of vegetation surrounding water bodies (NSW OEH, 2012d). It is unlikely that the proposed development will contribute to increased impacts from these threats. However, as there are no planned restrictions on domestic animals in the development, the risk of predation by uncontrolled dogs and cats remains.

6.5.8 *Saccolaimus flaviventris* (Yellow-bellied sheathtail-bat)

NSW Status: Vulnerable

Table 6.15 Assessment of Significance for *Saccolaimus flaviventris* (Yellow-bellied sheathtail-bat)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. It forages in most habitats across its very wide range, with and without trees.

Factors of Assessment	Response
	The species appears to defend an aerial territory (NSW OEH, 2016i). When foraging for insects, yellow-bellied sheathtail-bats fly high and fast over the forest canopy, but lower in more open country (NSW OEH, 2016i. The yellow-bellied sheathtail-bat roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows (NSW OEH, 2016i). Breeding has been recorded from December to mid-March, when a single young is born (NSW OEH, 2016i). Given the broad foraging habitat for this species, potential foraging habitat exists on the site. However, as the proposed development is restricted to the cleared areas of the site, it is unlikely that the local population of yellow-bellied sheathtail-bats would be placed at risk of extinction.
In relation to the habitat of a threatened species, population or ecological community: (vi) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and (vii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (viii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	Given the broad habitat requirements of this species, the proposed development will have a negligible impact on the species at a local or regional scale. The habitat of this species will not be fragmented or isolated.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The threats to this species are listed as: • Disturbance to roosting and summer breeding sites. • Foraging habitats are being cleared for residential and agricultural developments, including clearing by residents within rural subdivisions. • Loss of hollow-bearing trees; clearing and fragmentation of forest and woodland habitat. • Pesticides and herbicides may reduce the availability of insects, or result in the accumulation of toxic residues in individuals' fat stores. It is unlikely that the proposed development will contribute to increased impacts from these threats. Woodland and rainforest foraging habitat is buffered from the development. The implementation of a restoration plan will assist in the control of weeds to bushland areas of the site.

Factors of Assessment	Response
	The provision of artificial nest boxes would potentially increase roosting locations for this species.

6.5.9 *Mormopterus lumsdenae* (Northern free-tailed bat)

NSW Status: Vulnerable

Table 6.16 Assessment of Significance for *Mormopterus lumsdenae* (Northern free-tailed bat)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The northern free-tailed bat is widely distributed across northern Australia from Western Australia to Queensland, extending south to the north-east corner of NSW. The only confirmed record in NSW is of a colony found in the roof of a house in Murwillumbah, however, calls have been detected from a few other locations in the far north east of the State (NSW OEH, 2016f). The species is found in a range of Vegetation Associations in northern Australia, from rainforests to open forests and woodlands, and are often recorded along watercourses. Northern free-tailed bats are known to roost mainly in tree hollows but relatively large colonies have been found under house roofs in urban areas in Queensland (NSW OEH, 2016f). Foraging habitat for this species exists on the site. However, as the proposed development is largely restricted to the cleared areas of the site, it is unlikely that the local population of northern freetail-bats would be placed at risk of extinction.
In relation to the habitat of a threatened species, population or ecological community: (ix) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and (x) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (xi) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The primary habitat of the northern freetail-bat is outside of the building footprint. The habitat of this species will therefore, not be modified, fragmented or isolated.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the	The threats to this species are listed as: • Loss of hollow-bearing trees. • Loss of foraging habitat.

Factors of Assessment	Response
operation of, or increase the impact of, a key threatening process	• Application of pesticides in or adjacent to foraging areas (NSW EH, 2017m). It is unlikely that the proposed development will contribute to increased impacts from these threats. Foraging habitat is buffered from the development, reducing disturbance. The implementation of a restoration plan will assist in the control of weeds to bushland areas of the site. The provision of artificial nest boxes would potentially increase roosting locations for this species.

6.5.10 *Mormopterus norfolkensis* Eastern freetail-bat

NSW Status: Vulnerable

Table 6.17 Assessment of Significance for *Mormopterus norfolkensis* (Eastern freetail-bat)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The eastern freetail-bat is found along the east coast from south Queensland to southern NSW (NSW OEH, 2015b). The species inhabits dry sclerophyll forest, woodland, swamp forests and mangrove forests. They are known to roost mainly in tree hollows but will also roost under bark or in man-made structures (NSW OEH, 2015b). Foraging habitat for this species exists on the site. However, as the proposed development is largely restricted to the cleared areas of the site, it is unlikely that the local population of eastern freetail-bats would be placed at risk of extinction.
In relation to the habitat of a threatened species, population or ecological community: (xii) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and (xiii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (xiv) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The primary habitat of the eastern freetail-bat is outside of the building footprint. The habitat of this species will therefore, not be modified, fragmented or isolated.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the	The threats to this species are listed as: • Loss of hollow-bearing trees.

Factors of Assessment	Response
operation of, or increase the impact of, a key threatening process	• Loss of foraging habitat. • Application of pesticides in or adjacent to foraging areas. • Artificial light sources spilling onto foraging and/or roosting habitat. • Large scale wildfire or hazard reduction burns on foraging and/or roosting habitat (NSW OEH, 2015b). It is unlikely that the proposed development will contribute to increased impacts from these threats. Foraging habitat is buffered from the development, reducing light spill and disturbance. The implementation of a restoration plan will assist in the control of weeds to bushland areas of the site. The provision of artificial nest boxes would potentially increase roosting locations for this species.

6.5.11 *Miniopterus australis* (Little bentwing-bat)

NSW Status: Vulnerable

Table 6.18 Assessment of Significance for *Miniopterus australis* (Little bentwing bat)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	Little bentwing-bats are known to forage for insects in rainforest, Melaleuca swamps and dry sclerophyll forests (NSW OEH, 2014f). These habitat types are not impacted by the proposed development, which is largely restricted to the cleared areas of the site. It is considered unlikely, given the habitat of this species is not within the development footprint, that the survivability of local populations of little bentwing-bat will be impacted.
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 action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	No foraging or roosting habitat will be impacted by the proposed development. The habitat of this species will not be modified, fragmented or removed.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	Threats for this species have been listed as: • Disturbance of colonies, especially in nursery or hibernating caves, may be catastrophic. • Destruction of caves that provide seasonal or potential roosting sites. • Changes to habitat, especially surrounding maternity/nursery caves and winter roosts. • Pesticides on insects and in water consumed by bats bio accumulates, resulting in poisoning of individuals. • Predation from foxes, particularly around maternity caves, winter roosts and roosts within culverts, tunnels and under bridges. • Predation from feral cats, particularly around maternity caves, winter roosts and roosts within culverts, tunnels and under bridges • Introduction of exotic pathogens such as the white-nosed fungus. • Hazard reduction burning and wildfire during the breeding season.

Factors of Assessment	Response
	• Large scale wildfire or hazard reduction burning can impact on foraging resources. • Poor knowledge of reproductive success and population dynamics (NSW OEH, 2014f). It is considered unlikely that the proposed development will result in or increase these threats.

6.5.12 *Miniopterus schreibersii oceanensis* (Eastern bentwing bat)

NSW Status: Vulnerable

Table 6.19 Assessment of Significance for *Miniopterus schreibersii oceanensis* (Eastern bentwing bat)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	Eastern bentwing-bats occur along the east and north-west coasts of Australia (NSW OEH, 2016b). The species is known to forage in freshwater wetlands and grassy woodlands in the Northern Rivers area of NSW. Limestone caves are the primary roosting habitat, but they will also use derelict mines, storm-water tunnels, buildings and other man-made structures (NSW OEH, 2016b). Maternity caves are used in spring and summer. At other times of the year, the populations can disperse up to 300 km from the maternity caves (NSW OEH, 2016b). No maternity caves or potential roost sites are present on the subject site. Foraging habitat for this species exists on the site. However, as the proposed development is restricted to the cleared areas of the site, it is unlikely that the local population of eastern bentwing-bats would be placed at risk of extinction.
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 action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The primary habitat of the eastern bentwing-bat is outside of the building footprint. The habitat of this species will therefore, not be modified, fragmented or isolated.

Factors of Assessment	Response
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The threats to this species are listed as: • Disturbance by recreational cavers and general public accessing caves and adjacent areas particularly during winter or breeding. • Loss of high productivity foraging habitat. • Introduction of exotic pathogens, particularly white-nose fungus. • Cave entrances being blocked for human health and safety reasons, or vegetation (particularly blackberries) encroaching on and blocking cave entrances. • Hazard reduction and wildfire fires during the breeding season (NSW OEH, 2016b). It is unlikely that the proposed development will contribute to increased impacts from these threats. The implementation of a restoration plan will assist in the control of weeds to bushland areas of the site.

6.5.13 *Nyctophilus bifax* (Eastern long-eared bat)

NSW Status: Vulnerable

Table 6.20 Assessment of Significance for *Nyctophilus bifax* (Eastern long-eared bat)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	The eastern long-eared bat is found from Cape York through eastern Queensland to the far north-east corner of NSW. In NSW they appear to be confined to the coastal plain and nearby coastal ranges, extending south to the Clarence River area, with a few records further south around Coffs Harbour (NSW OEH, 2012e). The key habitat for this species is coastal rainforest and patches of coastal scrub. It roosts in tree hollows, the hanging foliage of palms, in dense clumps of foliage of rainforest trees, under bark and in shallow depressions on trunks and branches, among epiphytes, in the roots of strangler figs, among dead fronds of tree ferns and less often in buildings (NSW OEH, 2012e). The broad habitat for this species is found on the subject site. However, as the proposed development is restricted to the cleared areas of the site, it is unlikely that the local population of eastern long-eared bats would be placed at risk of extinction.

Factors of Assessment	Response
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 action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The primary habitat of the eastern long-eared bat is outside of the building footprint. The habitat of this species will therefore, not be modified, fragmented or isolated.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The threats to this species are listed as: • Clearing, fragmentation and isolation of lowland subtropical rainforest, wet and swamp eucalypt forest and coastal scrub, particularly forest and scrub close to the coast. • Loss of hollow-bearing trees and stands of palms and rainforest trees used for roosting and maternity sites. • Invasion of habitat by weeds. • Use of pesticides (NSW OEH, 2012e). It is unlikely that the proposed development will contribute to increased impacts from these threats. The implementation of a restoration plan will assist in the control of weeds to bushland areas of the site.

6.5.14 *Thersites mitchellae* (Mitchell's rainforest snail)

NSW Status: Endangered

Commonwealth Status: Critically Endangered

Table 6.21 Assessment of Significance for *Thersites mitchellae* (Mitchell's rainforest snail)

Factors of Assessment	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	Mitchell's rainforest snail is found in remnant vegetation on the coastal plain between the Richmond River and Tweed River on the NSW north coast. It inhabits remnant areas of lowland subtropical rainforest and swamp forest on alluvial soils. It favours slightly higher ground around the edges of wetlands with palms and fig trees (NSW OEH, 2014g).

Factors of Assessment	Response
	This species is typically found amongst leaf litter on the forest floor, and occasionally under bark in trees. It is active at night and feeds on leaf litter, fungi and lichen (NSW OEH, 2014g). The broad habitat for this species is found on the subject site. However, as the proposed development is restricted to the cleared areas of the site, it is unlikely that the local population of Mitchell's rainforest snail would be placed at risk of extinction.
In relation to the habitat of a threatened species, population or ecological community: (iv) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and (v) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (vi) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	The primary habitat of Mitchell's rainforest snail is outside of the building footprint. The habitat of this species will therefore, not be modified, fragmented or isolated.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	There is no recovery or threat abatement plan for this species.
Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	The threats to this species are listed as: • Clearing of lowland rainforest, swamp forest and wetland margins for agriculture. • Clearing of lowland rainforest, swamp forest and wetland margins for urban development. • Damage to remnant areas of habitat from grazing by domestic stock. • Damage to remnant areas of habitat by fire. • Damage to remnant areas of habitat by weed invasion. • Predation of snails by introduced rats. • Habitat fragmentation increasing edge effects including increasing the severity of disturbance from fire, weeds and predation by introduced rats. • Use of herbicides and pesticides in and near areas of habitat. • Impacts on habitat as a result of dieback caused by root rot fungus (*Phytophthora cinnamomi*). • Loss of coastal populations from sea level rise and climate change. • Damage to habitat from changes in hydrology. • Poor knowledge of species distribution.

Factors of Assessment	Response
	• Lack of awareness of the species within the community (NSW OEH, 2014g). It is unlikely that the proposed development will contribute to increased impacts from these threats. The implementation of a restoration plan will assist in the control of weeds to bushland areas of the site.

6.6 Tweed Coast Comprehensive Koala Plan of Management

The proposed development has been assessed against the Tweed Coast Comprehensive Koala Plan of Management.

The site falls with the Tweed Coast Koala Management Area (KMA). The objectives of the Tweed Coast KMA are:

- To minimise harm to remaining animals through habitat retention and other protective measures.
- To ensure that any development affecting koala habitat contributes to koala recovery being undertaken elsewhere on the Tweed Coast.
- To periodically review the management intent for this area in the event that koala numbers are observed to increase.

North of the Tweed River, there is evidence of a highly depleted koala population on the brink of local extinction. The recovery of the koala population in this area does not appear possible due to lack of suitable habitat to support a long-term population and ongoing urban intensification (TCCKPM, 2015).

Surveys for koala were conducted using the following methodologies:

- Call-playback
- Spotlighting
- Faecal pellet and signs searches.

Faecal pellets of koala and their distinctive scratch marks on smooth-barked trees, are readily identifiable and persist post-departure of the animal from the area (Woosnam-Merchez et. al., 2012). The identification of traces of koala allows for the presence of this species to be confirmed and involved minimal habitat disturbance.

Despite intensive search efforts, no koala or koala sign were located. It was concluded that suitable habitat with primary or secondary food trees of koala was not present on the site.

7. Recommendations

Several actual and potential impacts associated with the proposed development have been identified. All actual and potential impacts are minor, and none of these impacts are inconsistent with the applicable planning provisions. Most of these impacts, can be mitigated during the construction and operational phases. The following sections outline the recommendations for minimising the impact of the proposed development on environmental values associated with the site and surrounding area.

7.1 Vegetation

The proposed development requires vegetation clearing within the development footprint. Field surveys have determined that this vegetation is highly modified and disturbed. Significant vegetation (Swamp Sclerophyll Forest EEC) is the northern part of the site is proposed to be protected and buffered.

One (1) threatened flora species was recorded during the surveys – Rough-shelled bushnut (*Macadamia tetraphylla*). A single juvenile specimen (1.2m high) was recorded in Vegetation Association A, on the site's eastern boundary in close vicinity to the existing dwelling. A subsequent site investigation (JWA, 2019) found four (4) specimens in this location. All specimens of *Macadamia tetraphylla* will be translocated prior to earthworks commencing in accordance with the Translocation Plan (JWA, 2019).

To mitigate potential impacts to retained vegetation in adjacent areas during construction, all clearing will be undertaken in accordance with an approved Vegetation Plan and conditions of a Vegetation Clearing Permit issued under the *Preservation of Trees or Vegetation Tweed Development Control Plan – Section A16* (DCP A-16). It is anticipated that appropriate protection measures for retained vegetation will be identified during this process.

To minimise waste from the site, it is recommended that all felled vegetation be recycled (milled, chipped or mulched) and where feasible incorporated into the landscape features, batter stabilisation techniques or other approved site works. Any hollows should be translocated into the protected areas of the site.

To compensate for the loss of any floristic values from the site, landscaping and revegetation will incorporate species from the site's preclearing ecosystems.

As camphor laurel is an important food source to many native species, including the vulnerable bird species identified on the site during the surveys, it is recommended to stage the removal of this species. The preparation and implementation of a habitat restoration plan is recommended for this site.

7.2 Fauna

To mitigate the risk of injury and / or death to fauna during construction operations, the site will be assessed by an experienced ecologist prior to the commencement of any clearing activities. Where necessary, a Spotter-Catcher or experienced ecologist, should be present on-site during clearing operations. A restoration program should incorporate relocation of habitat features (hollows, logs etc.) from the development footprint and habitat supplementation through installation of custom-designed nest boxes in appropriate areas.

8. Conclusions

Flora and fauna surveys were undertaken across the site during April-May 2017. A total of 163 species of flora were identified within the site, comprising 108 native species and 55 non-native species. The vegetation communities were verified and mapped through ground truthing and classified as follows:

Type A. Tall Closed Forest (*Cinnamomum camphora*);
Type B. Tall Open/Closed Swamp Sclerophyll Forest (*Archontophoenix cunninghamiana*,-*Melaleuca quinquenervia*);
Type C. Tall Open/Closed Moist Sclerophyll Forest with Rainforest Understorey;
Type D. Mid-high Wet Grassland / Sedgeland
Type E. Maintained Anthropogenic Grassland.

Vegetation Type B – Tall Closed Swamp Sclerophyll Forest (*Archontophoenix cunninghamiana* / *Melaleuca quinquenervia*) represents an alliance of the TSCA Endangered Ecological Community (EEC) Swamp Sclerophyll Forest on Coastal Floodplains. This vegetation will be protected and buffered as part of the proposed development.

One (1) threatened flora species was recorded during the surveys – Rough-shelled bushnut (*Macadamia tetraphylla*). A single juvenile specimen (1.2m high) was recorded in Vegetation Association A, on the site's eastern boundary in close vicinity to the existing dwelling. A subsequent site investigation (JWA, 2019) found four (4) specimens in this location. All specimens of *Macadamia tetraphylla* will be translocated prior to earthworks commencing in accordance with the Translocation Plan (JWA, 2019).

Three (3) significant species of fauna were encountered on-site: *Ptilinopus regina* (Rose-crowned fruit-dove), *Daphoenositta chrysoptera* (Varied sittella), and *Nyctimene robinsoni* (Eastern tube-nosed bat). These highly mobile species will not be impacted by the proposed development. The proposed restoration works will increase the available habitat for these species.

Under Section 5A of the *Environmental Planning and Assessment Act 1979*, assessments of significance were performed for all threatened species recorded on the site. In addition, threatened fauna with potential to occur on the site were also assessed. For all species and threatened ecological communities, it was concluded that the proposed development design would not contribute to a reduction in the local population nor remove any critical foraging or breeding habitat.

The site is mapped as containing potential koala habitat. However, it was concluded that the site does not contain suitable habitat for this species.

The proposed development incorporates a buffer to the coastal wetlands to the north (identified on the SEPP Coastal Management 2018 mapping). To ensure the efficacy of this buffer, a habitat restoration program should be undertaken in the disturbed parts of the wetland vegetation. The program should target weeds and supplement existing habitat to improve the existing ecological function of the buffer and the bioregional corridor that passes through the site.

In summary, it is not expected that the proposed development will have a significant impact on the local and regional ecology provided all recommendations in this report are adopted.

9. Definitions

DCP	Development Control Plan
DBH	Diameter at Breast Height
EA	Ecological Assessment
EH	Department of Environment and Heritage
EPA Act	*Environmental Protection and Assessment Act 1979*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
LEP	Local Environmental Plan
MNES	Matters of National Environmental Significance
RBH	Radius at Breast Height
SAT	Spot Assessment Technique
SEPP	State Environmental Planning Policy
SMP	Stormwater Management Plan
TSC Act	*Threatened Species Conservation Act 1995*
TVMS	Tweed Vegetation Management Strategy

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Appendix A – EPBC Act Protected Matters Search Results

EPBC Act Protected Matters Report

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

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

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

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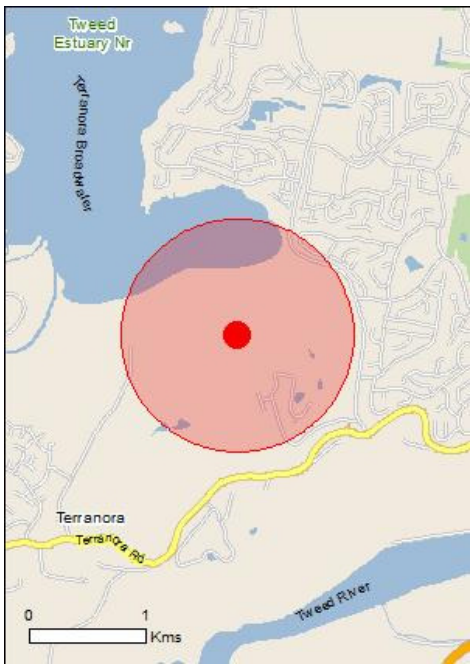

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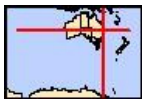

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	67
Listed Migratory Species:	56

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	67
Whales and Other Cetaceans:	2
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	1
Invasive Species:	31
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Cyclopsitta diophthalma coxeni Coxen's Fig-Parrot [59714]	Endangered	Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Poephila cincta cincta Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat may occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat likely to occur within area
Fish		

Name	Status	Type of Presence
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat may occur within area
Frogs		
Litoria olongburensis Wallum Sedge Frog [1821]	Vulnerable	Species or species habitat may occur within area
Insects		
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area
Phyllodes imperialis smithersi Pink Underwing Moth [86084]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat likely to occur within area
Other		
Thersites mitchellae Mitchell's Rainforest Snail [66774]	Critically Endangered	Species or species habitat likely to occur within area
Plants		
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area
Baloghia marmorata Marbled Balogia, Jointed Baloghia [8463]	Vulnerable	Species or species habitat may occur within area
Cryptocarya foetida Stinking Cryptocarya, Stinking Laurel [11976]	Vulnerable	Species or species habitat likely to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Diploglottis campbellii Small-leaved Tamarind [21484]	Endangered	Species or species habitat likely to occur within area
Endiandra hayesii Rusty Rose Walnut, Velvet Laurel [13866]	Vulnerable	Species or species habitat likely to occur within area
Gossia fragrantissima Sweet Myrtle, Small-leaved Myrtle [78867]	Endangered	Species or species habitat likely to occur within area
Hicksbeachia pinnatifolia Monkey Nut, Bopple Nut, Red Bopple, Red Bopple Nut, Red Nut, Beef Nut, Red Apple Nut, Red Boppel Nut, Ivory Silky Oak [21189]	Vulnerable	Species or species habitat may occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area
Macadamia tetraphylla Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut [6581]	Vulnerable	Species or species habitat likely to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat likely to occur within area
Randia moorei Spiny Gardenia [10577]	Endangered	Species or species habitat likely to occur within area
Sophora fraseri [8836]	Vulnerable	Species or species habitat may occur within area
Syzygium hodgkinsoniae Smooth-bark Rose Apple, Red Lilly Pilly [3539]	Vulnerable	Species or species habitat likely to occur within area
Syzygium moorei Rose Apple, Coolamon, Robby, Durobby, Watermelon Tree, Coolamon Rose Apple [12284]	Vulnerable	Species or species habitat likely to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Delma torquata Adorned Delma, Collared Delma [1656]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Furina dunmalli Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Lepidochelys olivacea		
Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat likely to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor		
Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta		
Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat likely to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area

Name	Threatened	Type of Presence
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting known to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Breeding likely to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Roosting known to occur within area

Name	Threatened	Type of Presence
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting known to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat likely to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area

Extra Information

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		

Name	Status	Type of Presence
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus africanus Climbing Asparagus, Climbing Asparagus Fern [66907]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Protasparagus plumosus Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-28.2265 153.51718

Acknowledgements

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

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

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

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

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Appendix B – Flora Species Recorded on Site

Family	Species	Common name	Status	A	B	C	D	E
Acanthaceae	*Pseuderanthemum variabile*	Pastel flower				X		X
Amaryllidaceae	*Crinum pedunculatum*	Crinum lily			X			
Anacardiaceae	*Euroschinus falcata*	Ribbonwood				X		
Anacardiaceae	*Mangifera indica*	Mango	Y	X		X		X
Apiaceae	*Centella asiatica*	Pennywort		X			X	X
Apiaceae	*Hydrocotyle peduncularis*	Hydrocotyle					X	X
Apocynaceae	*Melodinus australis*	Southern melodinus				X		
Apocynaceae	*Parsonsia straminea*	Common silkpod		X	X	X		
Apocynaceae	*Tabernaemontana pandacaqui*	Banana bush				X		
Araliaceae	*Astrotricha latifolia*	Broad-leaf flannel bush		X				
Araliaceae	*Polyscias elegans*	Celerywood				X		
Araliaceae	*Schefflera actinophylla*	Umbrella tree		X		X		
Arecaceae	*Archontophoenix cunninghamiana*	Bangalow palm			X	X		
Asclepiadaceae	*Gomphocarpus physocarpus*	Balloon cotton bush	Y					X
Asteraceae	*Ageratina adenophora*	Crofton weed	Y	X	X	X	X	X
Asteraceae	*Ageratina riparia*	Mistflower	Y	X	X	X	X	X
Asteraceae	*Ageratum houstonianum*	Blue billygoat weed	Y	X		X	X	X
Asteraceae	*Baccharis halimifolia*	Groundsel bush	Y				X	X
Asteraceae	*Bidens pilosa*	Cobblers pegs	Y	X			X	X
Asteraceae	*Cirsium vulgare*	Black thistle	Y	X	X		X	X
Asteraceae	*Conyza albida*	Fleabane	Y			X	X	X
Asteraceae	*Crassocephalum crepidioides*	Thickhead	Y					X
Asteraceae	*Eclipta prostrata*	White eclipta					X	X
Asteraceae	*Hypochaeris radicata*	Flatweed	Y				X	X
Asteraceae	*Senecio madagascariensis*	Fireweed	Y				X	X
Asteraceae	*Soliva pterosperma*	Bindii	Y					X
Asteraceae	*Tagetes minuta*	Stinking roger	Y				X	X

Family	Species	Common name	Status	A	B	C	D	E
Asteraceae	*Taraxacum officinale*	Dandelion	Y					X
Asteraceae	*Wedelia trilobata*	Singapore daisy	Y	X		X		
Asteraceae	*Xanthium occidentale*	Noogoora burr	Y					X
Basellaceae	*Anredera cordifolia*	Madeira vine	Y	X				
Caesalpiniaceae	*Senna pendula var. glabrata*	Winter senna	Y				X	
Caesalpinioideae	*Caesalpinia subtropica*	Corky prickle vine		X		X		
Caryophyllaceae	*Stellaria media*	Chick weed	Y					X
Casuarinaceae	*Allocasuarina littoralis*	Black she-oak		X				
Celastraceae	*Denhamia celastroides*	Denhamia		X		X		
Convolvulaceae	*Ipomoea cairica*	Coastal morning glory	Y	X		X		
Convolvulaceae	*Ipomoea indica*	Morning glory	Y	X				
Cunoniaceae	*Caldcluvia paniculosa*	Soft corkwood		X	X	X		
Dioscoreaceae	*Dioscorea transversa*	Native yam		X	X	X		
Elaeocarpaceae	*Elaeocarpus obovatus*	Hard quandong				X		
Elaeocarpaceae	*Sloanea woollsii*	Yellow carabeen				X		
Euphorbiaceae	*Baloghia inophylla*	Brush bloodwood				X		
Euphorbiaceae	*Breynia oblongifolia*	Coffee bush				X		
Euphorbiaceae	*Glochidion ferdinandi var. ferdinandi*	Cheese tree				X		
Euphorbiaceae	*Glochidion sumatranum*	Umbrella cheese tree		X				
Euphorbiaceae	*Homalanthus populifolius*	Native bleeding heart				X		
Euphorbiaceae	*Macaranga tanarius*	Macaranga		X		X		X
Euphorbiaceae	*Mallotus claoxyloides*	Green Kamala				X		
Euphorbiaceae	*Mallotus philippensis*	Red kamala		X		X		
Fabaceae	*Desmodium uncinatum*	Silver-leaved desmodium	Y	X			X	X
Faboideae	*Castanospermum australe*	Black bean				X		
Lauraceae	*Cinnamomum camphora*	Camphor laurel	Y	X	X	X		X
Lauraceae	*Cryptocarya microneura*	Murrogun				X		

Family	Species	Common name	Status	A	B	C	D	E
Lauraceae	*Cryptocarya obovata*	Pepperberry tree				X		
Lauraceae	*Cryptocarya triplinervis var pubens*	Three-veined laurel		X		X		
Lauraceae	*Neolitsea dealbata*	White bolly gum				X		
Lauraceae	*Pratia purpurascens*	White root					X	X
Meliaceae	*Dysoxylum mollissimum subsp. molle*	Red bean		X		X		
Meliaceae	*Synoum glandulosum*	Scentless rosewood				X		
Menispermaceae	*Stephania japonica*	Snake vine			X	X		
Mimosaceae	*Acacia maidenii*	Maiden's wattle		X				
Mimosaceae	*Acacia melanoxylon*	Blackwood wattle		X				X
Moraceae	*Ficus coronata*	Creek sandpaper fig			X			
Moraceae	*Ficus macrophylla*	Moreton bay fig		X	X	X		
Moraceae	*Ficus watkinsiana*	Strangler fig			X			
Moraceae	*Maclura cochinchinensis*	Cockspur		X	X	X		X
Moraceae	*Streblus brunonianus*	Whalebone tree		X				
Moraceae	*Trophis scandens*	Burny vine				X		
Musaceae	*Musa paradisiaca*	Banana	Y					X
Myrtaceae	*Acmena smithii*	Common lilly pilly				X		
Myrtaceae	*Corymbia intermedia*	Pink bloodwood				X		
Myrtaceae	*Lophostemon suaveolens*	Swamp box			X			
Myrtaceae	*Lophostemon confertus*	Brushbox				X		
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved paperbark			X			
Myrtaceae	*Pilidiostigma glabrum*	Plum myrtle				X		
Myrtaceae	*Syzygium oleosum*	Blue lilly pilly			X	X		
Ochnaceae	*Ochna serrulata*	Mickey mouse plant	Y	X	X	X		X
Oleaceae	*Ligustrum lucidum*	Large-leaved privet	Y	X	X	X		X
Oleaceae	*Ligustrum sinense*	Small-leaved privet	Y	X	X	X		X
Oleaceae	*Notelaea longifolia*	Large mock olive		X		X		

Family	Species	Common name	Status	A	B	C	D	E
Passifloraceae	*Passiflora edulis*	Passionfruit	Y					X
Passifloraceae	*Passiflora suberosa var. suberosa*	Corky passionfruit	Y	X	X	X		X
Passifloraceae	*Passiflora subpeltata*	White passionflower	Y	X	X	X		X
Phytolaccaceae	*Rivina humilis*	Coral berry	Y	X	X	X		
Pittosporaceae	*Pittosporum multiflorum*	Orange thorn		X		X		
Pittosporaceae	*Pittosporum revolutum*	Hairy pittosporum				X		
Pittosporaceae	*Pittosporum undulatum*	Sweet pittosporum		X		X		
Polygonaceae	*Persicaria strigosa*	Smartweed			X		X	
Proteaceae	*Macadamia tetraphylla*	Rough-shelled bush nut	V	X				
Ranunculaceae	*Ranunculus inundatus*	River buttercup					X	X
Rhamnaceae	*Alphitonia excelsa*	Red ash		X	X	X		
Rubiaceae	*Morinda jasminoides*	Morinda				X		
Rubiaceae	*Psychotria loniceroides*	Hairy psychotria		X		X		
Sapindaceae	*Elattostachys nervosa*	Green tamarind			X			
Sapindaceae	*Guioa semiglauca*	Guioa		X		X		
Sapindaceae	*Jagera pseudorhus*	Foambark		X	X	X		X
Sapindaceae	*Mischocarpus pyriformis*	Yellow pear fruit				X		
Sapotaceae	*Pouteria chartacea*	Thin-leaved coondoo		X	X			
Solanaceae	*Solanum mauritianum*	Wild tobacco tree	Y	X				X
Solanaceae	*Solanum nigrum*	Black-berry nightshade	Y	X	X	X		X
Solanaceae	*Solanum seaforthianum*	Brazilian nightshade	Y		X	X		
Sterculiaceae	*Commersonia bartramia*	Brown kurrajong		X		X		X
Thymelaeaceae	*Wikstroemia indica*	Wikstroemia				X		
Ulmaceae	*Aphananthe philippinensis*	Rough–leaved elm		X		X		
Verbenaceae	*Lantana camara*	Lantana	Y	X	X	X		X
Vitaceae	*Cissus antarctica*	Water vine			X	X		
Vitaceae	*Cissus hypoglauca*	Five-leaf water vine			X			

Family	Species	Common name	Status	A	B	C	D	E
Adiantaceae	*Adiantum hispidulum*	Rough maidenhair		X	X	X		
Aspleniaceae	*Asplenium australasicum*	Bird's nest fern		X		X		
Blechnaceae	*Blechnum cartilagineum*	Gristle fern				X		
Blechnaceae	*Blechnum indicum*	Swamp water fern			X			
Blechnaceae	*Doodia aspera*	Rasp fern				X		
Cyatheaceae	*Cyathea leichhardtiana*	Prickly tree fern			X			
Davalliaceae	*Nephrolepis cordifolia*	Fishbone fern	Y	X				X
Dennstaedtiaceae	*Pteridium esculentum*	Bracken		X		X	X	
Pteridaceae	*Acrostichum speciosum*	Mangrove fern			X			
Araceae	*Alocasia brisbanensis*	Cunjevoi					X	X
Asparagaceae	*Asparagus aethiopicus*	Asparagus fern	Y	X	X	X		X
Asparagaceae	*Asparagus plumosus*	Climbing asparagus fern	Y	X		X		
Asteliaceae	*Cordyline petiolaris*	Broad-leaved palm lily			X			
Asteliaceae	*Cordyline rubra*	Red-fruited palm lily			X			
Commelinaceae	*Commelina cyanea*	Native wandering jew					X	
Cyperaceae	*Baumea articulata*	Jointed twig-rush			X			
Cyperaceae	*Baumea juncea*	Bare twig-rush			X			
Cyperaceae	*Baumea rubiginosa*	Soft twig-rush			X			
Cyperaceae	*Cyperus eragrostis*	Tussock sedge	Y				X	X
Cyperaceae	*Cyperus polystachyos var polystachyos*	Bunchy sedge					X	
Cyperaceae	*Cyperus rotundus*	Nutgrass	Y				X	X
Cyperaceae	*Lepidosperma laterale*	Variable sword-sedge				X		
Cyperaceae	*Schoenus brevifolius*	Zig-zag bog rush			X			
Flagellariaceae	*Flagellaria indica*	Whip vine			X			
Juncaceae	*Juncus usitatus*	Common rush					X	X
Lomandraceae	*Lomandra longifolia*	Long-leaved matrush		X	X	X		
Luzuriagaceae	*Eustrephus latifolius*	Wombat berry				X		

Family	Species	Common name	Status	A	B	C	D	E
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling lily		X		X		
Philydraceae	*Philydrum lanuginosum*	Frogsmouth						
Phormiaceae	*Dianella caerulea*	Blue flax lily		X	X	X	X	
Poaceae	*Andropogon virginicus*	Whiskey grass	Y					X
Poaceae	*Axonopus fissifolius*	Narrow-leaf carpet grass	Y					X
Poaceae	*Chloris gayana*	Rhodes grass	Y				X	X
Poaceae	*Cynodon dactylon*	Couch grass	Y				X	X
Poaceae	*Digitaria didactyla*	Queensland blue couch	Y				X	X
Poaceae	*Digitaria parviflora*	Small-flowered finger grass					X	X
Poaceae	*Entolasia stricta*	Wiry panic		X		X		
Poaceae	*Hemarthria uncinata*	Matgrass					X	X
Poaceae	*Imperata cylindrica*	Blady grass		X	X	X	X	X
Poaceae	*Ischaemum australe*	Swamp grass					X	
Poaceae	*Leersia hexandra*	Swamp ricegrass			X		X	
Poaceae	*Megathyrsus maximus*	Guinea grass	Y					X
Poaceae	*Melinis minutiflora*	Molasses grass	Y					X
Poaceae	*Melinis repens*	Red natal grass	Y	X				X
Poaceae	*Paspalum conjugatum*	Sour grass	Y				X	X
Poaceae	*Paspalum dilatatum*	Paspalum	Y	X			X	X
Poaceae	*Paspalum distichum*	Water couch					X	X
Poaceae	*Paspalum mandiocanum*	Broad-leaved paspalum	Y				X	X
Poaceae	*Pennisetum clandestinum*	Kikuyu					X	X
Poaceae	*Pennisetum purpureum*	Elephant grass						X
Poaceae	*Phragmites australis*	Common reed			X			
Poaceae	*Setaria sphacelata*	Pigeon grass	Y				X	X
Poaceae	*Urochloa mutica*	Para grass	Y				X	X
Ripogonaceae	*Ripogonum album*	White supplejack			X			

Family	Species	Common name	Status	A	B	C	D	E
Smilacaceae	*Smilax australis*	Prickly smilax			X	X		
Smilacaceae	*Smilax glyciphylla*	Smooth smilax				X		
Typhaceae	*Typha domingensis*	Bulrush					X	