BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

for a
Proposed Residential Subdivision
at

Lot 2 DP 1154170
Viney Creek Road
Tea Gardens
NSW

Prepared by: WILDTHING Environmental Consultants
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For: Wolin Investments Pty Ltd

Job No: 12360 ***Final October 2018***

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Project Name	Biodiversity Development Assessment Report for a Proposed Residential Subdivision Lot 2 DP1154170 Viney Creek Road	
Project Number	12360	
Prepared By	Ben Ellis Ecologist	
Reviewed By	Dr Kylie Bridges Ecologist	
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Disclaimer

This report has been prepared in accordance with the proposal provided by the Client and outlined within this report. All findings, conclusions or recommendations contained within this report are based upon the data and results collected under the times and conditions specified in the report and are only applicable for the proposal considered within this report. This report has been prepared for use exclusively by the Client. No responsibility for its use by any other party is accepted by WILDTHING Environmental Consultants.

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APPENDICIES

1.0 INTRODUCTION

This Biodiversity Development Assessment Report (BDAR) has been prepared for Wolin Investments Pty Ltd to inform the preparation of a Development Application (DA) for Stages 1, 2 and 3 of a proposed Subdivision within the southern portion of Lot 2 DP 1154170 Viney Creek Road, Tea Gardens NSW (the study area). A location map of the study area has been provided in Figure 1.1.

1.1 OBJECTIVE

This BDAR has been prepared in accordance with the Biodiversity Assessment Methodology (BAM) (OEH 2017) by Wildthing Environmental Consultants on behalf of Wolin Investments Pty Ltd. The primary objective of this assessment is to use the guidelines and methodology provided in the BAM to determine the impact the project would have on biodiversity, avoid and mitigate these impacts and then calculate the project's biodiversity offset requirement.

This BDAR has two broad stages consistent with the BAM methodology:

Stage 1 – Biodiversity Assessment

- assessment of landscape features,
- assessment of native vegetation; and
- assessment of threatened species and populations

Stage 2 – Impact Assessment

- avoid and minimise impacts on biodiversity values,
- consider impact and offset thresholds; and
- determine and calculate offset requirements

In addition, assessment was also undertaken having regard to Matters of National Environmental Significance (MNES) listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), the NSW Biosecurity Act 2015 and relevant State Environmental Planning Policies.

Based on assessment of the BAM 2017 and consultation with the NSW OEH, the site has been determined to qualify for a Streamlined (Paddock Tree) Assessment. As such the methodology, assessment and BDAR adheres to the BAM 2017 for Streamlined (Paddock Tree) Assessment.

All aspects of this biodiversity assessment has been undertaken in accordance with the BAM. This BDAR has been prepared by Accredited Assessor Ben Ellis (BAAS18078).

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0 1 2 km

Map Projection GDA94 MGA Zone 56

Data Sources: LPI (2018),Tattersall Lander (2018)

Figure 1.1

Location Map

Viney Creek Road
Tea Gardens, NSW

10 October 2018

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1.2 DESCRIPTION OF THE DEVELOPMENT FOOTPRINT

The proposed development seeks the Torrens title subdivision of the study area, creating 226 residential lots, 2 public reserves, 2 drainage basins, several public roads linking residential dwellings and a bicycle track that forms a circuit around the proposed development. The proposed development will involve bulk earthworks, installation of residential building envelopes within each subdivided lot, road alignments and installation of ancillary structures and additional civil works. It is expected that all vegetation and habitat within the scope of the aforementioned development components will require removal, aside from the bicycle circuit which will be aligned to avoid the removal of remnant native vegetation.

The detailed design of the development layout has been prepared to retain the majority of native vegetation within the study area, to avoid significant biodiversity values where possible and will be located primarily within areas of non-native pasture.

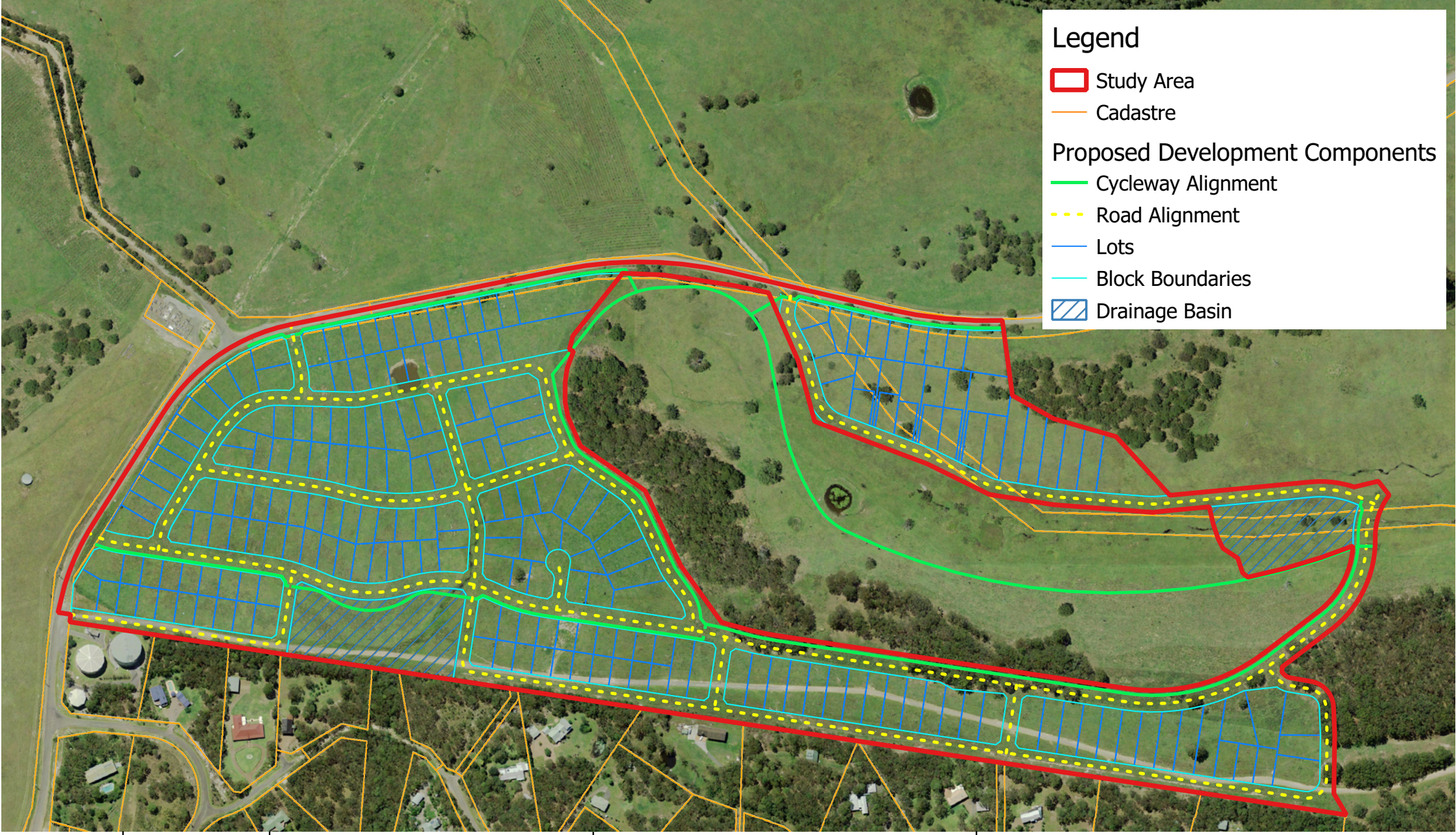
Impact on biodiversity values from the above project have been assessed in Part 2 of this report. The above stages of development within the southern portion of Lot 2 DP 1154170 are hereafter collectively referred to as the proposed development. The proposed development layout is provided in Figure 1.2

1.3 DEFINITION OF THE STUDY AREA

The majority of the study area consists of paddocks of improved pasture with remnant scattered individual trees or small patches of remnant vegetation. The study area's southern extent adjoins to an area of pre-existing residential development, this area was noted to be vegetation in between land parcels and would contain connectivity to larger areas of undisturbed vegetation to the south of the study area. Small areas of derived native grassland/shrubland (in poor condition) are present within the study area.

The majority of the remnant vegetation throughout the site has been disturbed and is composed of a mixed native/exotic understorey due to grazing and pasture improvement practices. Plantings of native species have been used as wind breaks and for rehabilitation along the site's northern extent adjacent to Viney Creek Road. These plantations are a mix of Eucalypts representative of vegetation that would be found in the wider landscape including individuals of *Eucalyptus pilularis* (Blackbutt), *Eucalyptus robusta* (Swamp Mahogany) and *Eucalyptus haemastoma* (Scribbly Gum).

An unnamed private road runs from Viney Creek Road in the study area's west to the study area's eastern extent. This road was noted to be frequently trafficked by residents of neighbouring residential developments. A number of minor drainage lines and one artificial farm dam was present within the study area.



Job Ref	12360
A4 Scale	1:5,000

0 100 200 m

Map Projection GDA94 MGA Zone 56

Data Sources: LPI (2018),Tattersall Lander (2018)

Figure 2.1

Development Layout

Viney Creek Road
Tea Gardens, NSW

10 October 2018

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Location

The 32.56 ha study area is located in the Mid Coast Council LGA, approximately 4km north of the township of Tea Gardens (Figure 1.1). The study area is situated on the northern side of the Shearwater Residential Development, and is bounded by predominately agricultural land to the north and bushland and the Myall River to the east.

Zoning of the study area

The study area is zoned R2 Low Density Residential under the Mid Coast Council 2014 Local Environmental Plan (Mid Coast Council 2014). The objective of the R2 Low Density Residential zone is:

- To provide for the housing needs of the community within a low density residential environment.
- To enable other land uses that provide facilities or services to meet the day to day needs of residents

Land Tenure Information

The study area consists of a single parcel of land which is wholly owned by Wolin Investments Pty Ltd

1.4 INFORMATION SOURCES

A list of the resources used to inform this BDAR, the date they were accessed and the spatial extent captured, where relevant, is provided in Table 1.1.

Table 1.1: Desktop Resources

Resource	Date Reviewed	Spatial Extent
Previous Ecological Studies		
Key Habitats and Corridors for Forest Fauna A Landscape Framework for Conservation in North-east New South Wales (Scotts 2003)	23 October 2018	-
Zoning and Regulatory Maps		
Greater Taree Local Environmental Plan - Land Zoning Map (Mid Coast Council 2010)	23 October 2018	Entire study area
Biodiversity Values and Landscape Maps		
NSW Biodiversity Values Map (OEH 2018a)	17 October 2018	Entire study area
SIX Maps -Base Map - LPI 1:25,000 digital topographic databases (DTDB) (LPI 2018) -Cadastral data LPI digital cadastral database (DCDB) (LPI 2018)	17 October 2018	Entire study area
NSW SEED Mapping (NSW Gov 2018)	September - October 2018	Entire study area
BioNet NSW (Mitchell) Landscapes – Version 3.1 (OEH 2016a)	10 October 2018	Entire study area
NSW Interim Biogeographic Regions of Australia (IBRA region and sub-regions) – Version 7 (OEH 2016b)	10 October 2018	Entire study area
Atlas of Groundwater Dependent Ecosystems (BoM 2018)	17 October 2018	Entire study area

Soil Landscapes of the Port Stephens 1:100 000 Sheet Map. (Murphy 1995).	17 October 2018	Entire study area
Threatened Species, Vegetation and Landscape Databases		
BioNet Atlas of NSW Wildlife (BioNet) (OEH 2018b)	2 October 2018	10x10km radius of study area
Commonwealth Protected Matters Search Tool (PMST) (DoEE 2018a)	29 October 2018	10x10km radius of study area
Commonwealth species profiles and threats database (SPRAT) (DoEE 2018b)	29 October 2018	-
OEH Profiles of threatened species, population, and ecological communities (OEH 2018c)	29 October 2018	-
OEH BioNet Threatened Biodiversity Data Collection (TBDC) (OEH 2018d)	28 October 2018	-
OEH BioNet vegetation classification database (OEH 2018e)	17 October 2018	-
PlantNet NSW (The Royal Botanic Gardens and Domain Trust 2018).	October - November 2018	-
Directory of Important Wetlands in Australia (DIWA) (DoEE 2018c)	10 October 2018	-
Estuaries of NSW: Physical characteristics, tidal surveys and hydrographic surveys (OEH 2018e)	10 October 2018	-
Geological sites of NSW (Cartoscope 2018)	10 October 2018	-
OEH BioNet Vegetation Classification Database (VIS) (OEH 2018h)	10 October 2018	-
Survey and Reporting Methodology		
Biodiversity Assessment Method (BAM) (OEH 2017)	October 2018	-
Biodiversity Assessment Method Operational Manual – Stage 1 (OEH 2018f)	October 2018	-
Threatened species survey and assessment guidelines: field survey methods for fauna – amphibians (OEH 2009)	October 2018	-
NSW Guide to Surveying Threatened Plants (OEH 2016)	October 2018	-
OEH Threatened Biodiversity Survey and Assessment Guidelines. Guidelines for Developments and Activities (OEH 2004)	October 2018	-
Biodiversity Assessment Method Credit Calculator (BAM-CC) (OEH, 2018g)	October 2018	-
Climactic Data		
061.54 Nelson Bay WWTP (BoM 2018)	October 2018	-
Development Footprint Design		
Proposed Residential Subdivision Plans (Tattersall Lander 2018).	October 2018	Entire development footprint

2.0 LEGISLATIVE CONTEXT

This chapter provides a brief outline of the key biodiversity legislation and government policy considered in this assessment.

2.1 COMMONWEALTH ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The purpose of the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) is to ensure that actions likely to cause a significant impact on Matters of National Environmental Significance (MNES) undergo a process of assessment. Under the EPBC Act, an action includes a project, undertaking, development or activity that may impact MNES. An action that 'has, will have or is likely to have a significant impact on a MNES' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Commonwealth Minister for the Department of the Environment and Energy (DoEE). MNES categories listed under the EPBC Act are:

- world heritage properties;
- national heritage places;
- wetlands of international importance (Ramsar wetlands);
- threatened species and ecological communities (Section 18 and 18A);
- migratory species;
- commonwealth marine areas;
- nuclear actions (including uranium mining); and
- a water resource, in relation to coal seam gas development and large coal mining development.

Initially, MNES protected under the EPBC Act are assessed in accordance with the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (DoE 2013). This is performed to determine if there is likelihood for an action to have a significant impact on MNES. An action will require referral to, and may require the approval of, the Commonwealth Minister for the Environment (in addition to any local or state government consent or approval) if that action will have, or is likely to have, a significant impact on the environment or on a MNES.

The project is unlikely to have a significant impact on MNES and is, therefore, not required to be referred to DoEE for consideration. Further information on this matter is provided in Appendix A of this report. An extract of the Protected Matters Search Tool used for this assessment has been provided in Appendix B.

2.2 NSW ENVIRONMENTAL PLANNING AND ASSESSMENT AMENDMENT ACT 2017

The *Environmental Planning & Assessment Act 1979* (EP&A Act) was legislated to require the consideration and management of impacts of proposed development and land use change on the environment and the community.

Part 1 Section 1.7 of the EP&A Act requires consideration of the proposed development under Part 7 of the Biodiversity Conservation Act 2016 (BC Act).

The EP&A Act is also supported by other statutory environmental planning instruments, including State Environmental Planning Policies (SEPPs). The following SEPPs are relevant to this report:

State Environmental Planning Policy (SEPP) 44 Koala Habitat Protection

SEPP 44 aims to encourage 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 and to reverse the current trend of koala-population decline. It applies to areas of native vegetation greater than one hectare and in Councils listed in Schedule 1 of SEPP 44. The study area is located in the Mid- Coast LGA, as such the requirements of SEPP 44 are relevant to the assessment. Further information on Koala conservation within the study area has been provided in Appendix A of this report.

Coastal Management SEPP

The State Environmental Planning Policy (Coastal Management) 2018 (CM SEPP) updates and consolidates into one integrated policy SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection), including clause 5.5. of the Standard Instrument – Principal Local Environmental Plan. These policies are now repealed.

The aim of this Policy is to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the Coastal Management Act 2016, including the management objectives for each coastal management area, by:

- managing development in the coastal zone and protecting the environmental assets of the coast, and
- establishing a framework for land use planning to guide decision-making in the coastal zone, and
- mapping the 4 coastal management areas that comprise the NSW coastal zone for the purpose of the definitions in the Coastal Management Act 2016.

These coastal management areas are:

- the coastal wetlands and littoral rainforests area,
- the coastal vulnerability area,
- the coastal environment area, and
- the coastal use area.

The study area was not located within littoral rainforests/coastal wetlands, coastal vulnerability or coastal use management areas, however the study area is located within a mapped coastal environment area. Further information on this matter is provided in Appendix A of this report.

2.3 NSW BIODIVERSITY CONSERVATION (BC) ACT 2016

The BC Act and supporting regulations establish a modern and integrated legislative framework for land management and conservation in NSW. The purpose of the BC Act is "*to establish a pathway to avoid, minimise and offset the impacts of proposed development and land use change on biodiversity and to establish a scientific method for assessing the likely impacts on biodiversity values of proposed development and land use change, for calculating measures to offset those impacts and for assessing improvements in biodiversity values*".

In accordance with the BC Act, the BAM (OEH 2017c) and entry into the Biodiversity Offsets Scheme (BOS) is applicable to certain development activities based on specific criteria. Preparation of a Biodiversity Development Assessment Report (BDAR) is required for a development application that meets any of the following criteria:

- Part 4 development activities deemed to be 'State Significant' under the NSW Environmental Planning and Assessment Act 1979 (NSW EP&A Act);
- Development activities that have the potential to impact Areas of Outstanding Biodiversity Value (AOBV) as listed under Part 3 of the BC Act;
- Development activities that have the potential to cause a significant impact on a threatened species, population or ecological community, listed under Schedules 1 and 2 of the BC Act, as determined by application of a five-part-test of significance in accordance with Section 7.3 of the BC Act;
- Development activities that have the potential to impact areas mapped as having 'high biodiversity value' as indicated by the NSW Biodiversity Values Map (BV Map); and
- Development activities that involve clearing of native vegetation that exceeds the Biodiversity Offset Scheme thresholds (BOS thresholds) as determined by the NSW BC regulation.

As the proposed development will require removal of native vegetation which exceeds the BOS clearing threshold detailed in Section 7.2 of the Biodiversity Conservation Regulation 2017, a BDAR is required to support a development application for the proposed development. This report has been prepared according to the methodology detailed within the BAM.

2.4 NSW BIOSECURITY ACT 2015

The NSW Biosecurity Act 2015 (BS Act), amongst other considerations, provides regulatory controls and powers to manage noxious weeds in NSW. For weed management, this Act divides NSW into regions based on combined LGAs and priority weeds for a region are listed. Some weeds are managed at a state level as they form part of a broader containment strategy. The legislation compliments listed Weeds of National Significance (WoNS). Four priority weed species listed under the BS Act were identified within the study area. Further information on this matter is provided in Appendix A of this report.

2.5 LICENCING AND CERTIFICATES

Fieldwork undertaken by Wildthing Environmental Consultants was carried out under the NPWS Scientific Investigation Licence SL 100345 and under Animal Care and Ethics Approval: Animal Research Authority Issue by the Director General of NSW Agriculture (File No. TRIM 13/251) for the Fauna Survey for Biodiversity and Impact Assessment.

STAGE 1 - BIODIVERSITY ASSESSMENT

The proposed development is consistent with the definition of a site-based development under the Biodiversity Assessment Methodology. Paddock trees throughout the development site were assessed under the streamlined assessment module– clearing paddock trees (Appendix 1 of the BAM) and incorporated into this report. They are considered both in terms of ecosystem credits and as habitat for threatened species and any credits generated are additional to those created by applying the full BAM.

3.0 LANDSCAPE CONTEXT

This Section of the report describes the landscape context, including the landscape features present within the study area and a 1500 metre buffer from the edge of the study area, as required by the BAM (OEH 2017).

3.1 IBRA BIOREGION & SUBREGION

Interim Biogeographic Regionalisation for Australia (IBRA) Bioregions are large, geographically distinct areas of land with common characteristics such as geology, landform patterns, climate, ecological features, and flora and fauna communities. The study area is located within the NSW North Coast (NNC) IBRA Bioregion and the Karuah Manning IBRA Subregion (OEH 2016b). Both IBRA and IBRA Subregional Boundaries do not occur near the study area and hence are not shown within Figure 1.1.

3.2 NSW LANDSCAPE REGION

The study area falls entirely within the Sydney Newcastle Barriers and Beaches (SB Coastal Barriers) BioNet Landscape (formerly Mitchell Landscapes) (OEH 2016a). The Mitchell Landscapes within the vicinity of the study area are shown in Figure 1.1.

3.3 RIVERS AND STREAMS

The study area is located within the Hunter Central Rivers Catchment According to the NSW Government SEED mapping. Several first order non-incised ephemeral streams were present within the study area. Water present within the streams found on site were slow moving and primarily persisted as wet vegetated soaks. These streams would provide marginalised aquatic habitat potential for fish and other threatened vertebrates. Similarly one artificial farm dam occurs within the study area and offers marginal aquatic habitat. Streams within the vicinity of the study area are displayed in Figure 3.1.

3.4 WETLANDS

The study area is located in close proximity (approximately 500m to the west) to Myall River, this area is mapped as part of the greater Port Stephens Estuary, which is included in the Directory of Important Wetlands of Australia (DIWA) (DoEE 2018c).

The Port Stephens Estuary is 30 253 hectares in area and was listed on the DIWA for the following reasons:

- It is a good example of a wetland type occurring within a biogeographic region in Australia.
- It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.
- The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.

The study area is also located approximately 2km to the south east of the Ramsar listed wetland Myall Lakes. Ramsar wetlands are representative, rare or unique wetlands, or are important for conserving biological diversity. The Myall Lakes Wetland is a listed Ramsar Wetland for the following reasons:

- Criterion 1: The Myall Lakes are a relatively unmodified large coastal brackish lake system. The Myall Lakes are significant because they represent a unique association of at least 18 Ramsar wetland types, ranging from fresh to marine waters, with the entire association covering an extensive area, with minimal structural and hydrological disturbance and supporting ecosystems and processes in near-natural condition. They are one of the two largest brackish-freshwater barrier estuaries in the South East Coast Drainage Division, and are an excellent, representative example of this wetland type within the bioregion; and they contain a unique co-existence of deep and shallow water macrophytes and the organic lake-floor muds known as gyttja.
- Criterion 2: The Myall Lakes Ramsar site supports five wetland dependent species which are listed as nationally threatened under the Environment Protection and Biodiversity Conservation Act 1999, or listed as internationally threatened in the IUCN Red List including the Australasian bittern, Freycinet's frog, Green and gold bell frog, Green thighed frog and Stuttering frog
- Criterion 3: The Ramsar site's large area of 44,612 ha supports a rich biodiversity, containing a range of undisturbed terrestrial vegetation communities and wetland types. As a consequence it supports a high diversity of terrestrial plants and animals in the South East Coast Drainage Division and aquatic plants and animals in the Manning Shelf Bioregion.

The location of the DWIA, Ramsar and Coastal Wetlands in relation the study area are shown in Figure 3.1.

3.5 CONNECTIVITY FEATURES

Habitat function within the study area and surrounds are primarily associated with coastal sclerophyll forest. The majority of the vegetation within the study was found to be composed of isolated islands of vegetation surrounded by exotic pasture and linked by scattered remnant trees. This fragmentation of vegetation limited the habitat connectivity within the study area to highly mobile species of fauna and those which are transient in their use of resources.

A narrow fringe of vegetation within the south of the study area was noted to adjoin to larger areas of vegetation to the study areas south. The potential for fauna movement through this area would be impeded by a number of residential dwellings and associated cleared asset protection zones present within the directly connecting bushland and would be restricted to highly mobile fauna and fauna which are tolerant of suburban environments. Habitat connectivity in relation to the study area is shown in Figure 3.1.

3.6 GEOLOGY TOPOGRAPHY AND SOILS

The study area is located on the Port Stephens soil landscape and is composed of undulating to rolling low hills on mudstones and minor interbeds of lithic sandstones of the Wootton Beds There are no karst, caves, cliffs or other areas of geological significance within the study area or within the surrounding assessment area.

3.7 HIGH AND OUTSTANDING BIODIVERSITY AREAS

The NSW Biodiversity Values Map was consulted on 17 October 2018, at this time it was observed that the study area does not fall within an area of high biodiversity value. Therefore, there are currently no declared areas of Outstanding Biodiversity Value under the NSW Biodiversity Conservation Regulation 2017 associated with the study area.

3.8 NATIVE VEGETATION EXTENT IN THE BUFFER AREA

The Biodiversity Assessment Method Operational Manual Stage 1 (OEH 2018f) defines 'Native Vegetation Cover' as:

the amount of native vegetation (woody and non-woody vegetation including regrowth and plantations comprised of plants native to New South Wales) that is estimated to remain in the landscape proximal to the assessment area. It is used:

- *as a filter by the Calculator to predict threatened species likely to occur or use habitat on a site; and*
- *to define the intrinsic rate of increase in species richness and plant cover as part of the assessment of future vegetation condition on a biodiversity stewardship site*

Native vegetation extent within a 1500m buffer from the edge of the study area was estimated from review of aerial mapping interpretation and spatial data from the forest ecosystem distribution map Mid North Coast Vegetation (EcoLogical Version). VIS_ID 3886 (EcoLogical 2006). Supplementary iterations and amendments were made to the mapped vegetation extent to conform with the study area scale vegetation extent as mapped by Wildthing (Section 4).

Thirteen forest ecosystem types were mapped within the 1500 m buffer, including:

- Banksia
- Coastal Sands Blackbutt
- Dry Grassy Blackbutt-Tallowwood
- Heath
- Mangrove
- Paperbark
- Saltmarsh
- Smoothbarked Apple
- South Coast Shrubby Grey Gum
- South Coast Tallowwood-Blue Gum

- Swamp
- Swamp Mahogany
- Swamp Oak

Native vegetation cover within the buffer area (including the survey area) was determined as the sum of all areas of mapped native vegetation that are likely to be derived from the mapped woodland communities. Approximately 681.80 ha of native vegetation was mapped within the 1248.78 ha buffer area. Native vegetation cover within the buffer area is approximately 54.60%.

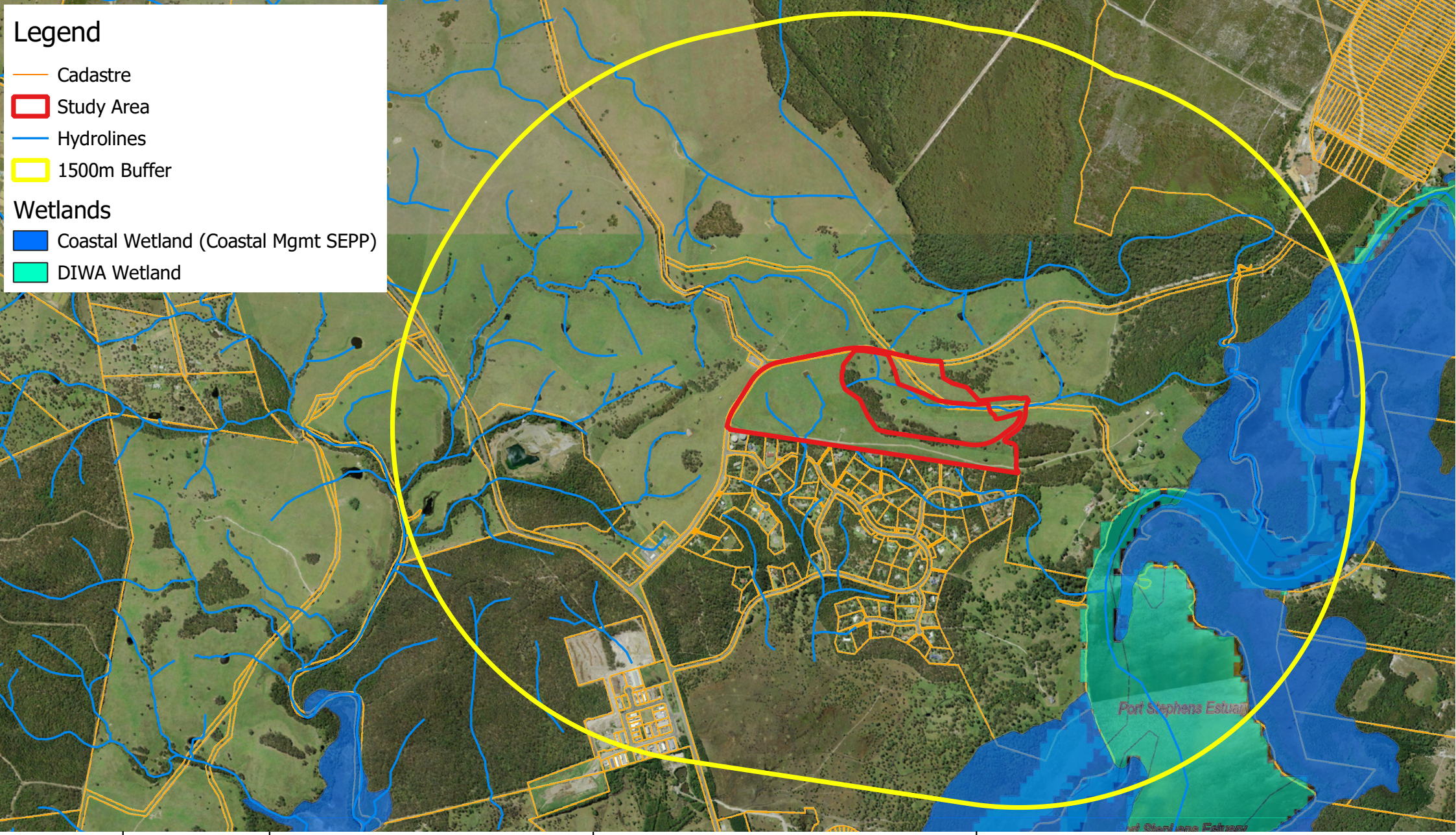
Native vegetation contained within a 1500m buffer of the study area is shown in Figure 3.2

3.9 CLEARED AREAS

Areas not containing native vegetation within the landscape buffer include roads, agricultural lands existing development, and waterbodies and waterways (natural and man-made).

3.10 DIFFERENCES BETWEEN MAPPED VEGETATION EXTENT AND AERIAL IMAGERY

There were no significant differences between the mapped vegetation extent and that present within available aerial imagery.



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0 0.5 1 km

Map Projection GDA94 MGA Zone 56

Data Sources: LPI (2018), Tattersall Lander (2018)

Figure 3.1

Landscape Map

Viney Creek Road
Tea Gardens, NSW

10 October 2018

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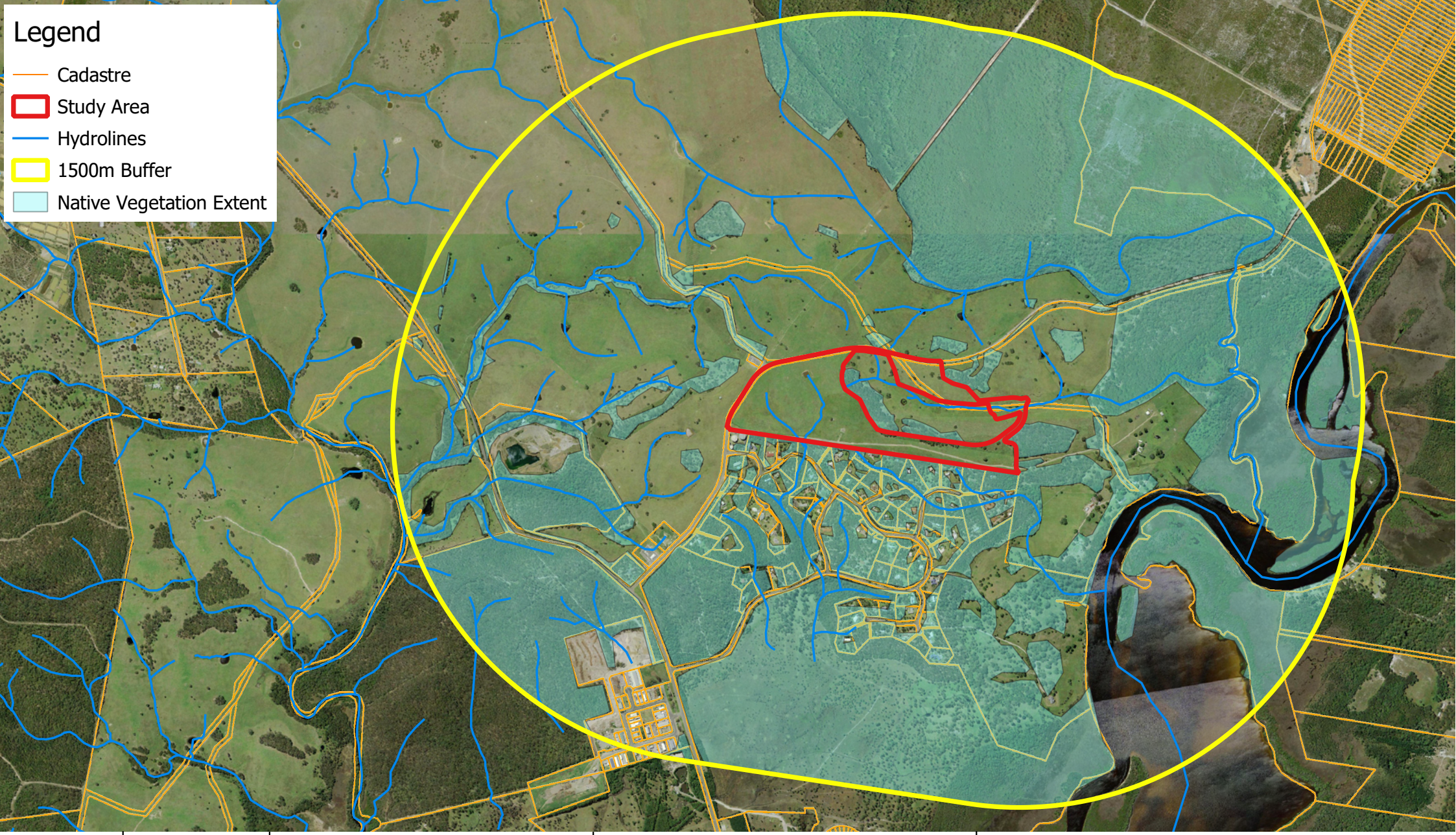

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0 0.5 1 km

Map Projection GDA94 MGA Zone 56

Data Sources: LPI (2018), Tattersall Lander (2018)

Figure 4.1

Native Vegetation Map

Viney Creek Road
Tea Gardens, NSW

10 October 2018

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4.0 STUDY AREA CONTEXT

This Section describes the vegetation extent present within the study area, as required by the BAM (OEH 2017). The habitats and vegetation within the study area are a small subset of those in the wider landscape. A full inventory of the flora and fauna species identified within the study area has been provided in Appendix C and D respectively.

4.1 NATIVE VEGETATION EXTENT IN THE STUDY AREA

Approximately 2.5 ha of native vegetation was mapped within the 32.57 ha study area. Native vegetation cover within the study area is approximately 7.68%. The remainder of the site was covered in areas of exotic pasture and native paddock trees. Section 5 provides details of the native vegetation extent recorded within the study area, as assessed during the Vegetation Integrity Assessment undertaken in October 2018. This is inclusive of all areas of native vegetation (treed woodland, derived native ground covers, paddock trees and planted native vegetation).

Areas not detailed within Section 5 as native vegetation are not included for further assessment in accordance with Section 5.1.1.5 of the BAM unless these areas are determined within Section 8 of this report to be consistent with habitat for candidate species credit species as detailed within Section 6.4.1.37 of the BAM.

4.2 STREAMLINED ASSESSMENT - PADDOCK TREES

This section provides justification for using the streamlined assessment module of the BAM for this Project. To qualify for a streamlined assessment for paddock trees, scattered trees within the study area have to be defined under the following criteria:

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

[1]Stage release of the regulatory land mapping is occurring under the new Local Land Service Act 2016 (LLS Act). Stage 1b has not been yet been published. During the transitional period, land categories are to be determined in accordance with the definitions of regulated land in the LLS Act. In this case, the paddock trees are located on land with native vegetation present since January 1990, surrounded by land that has been cleared of native vegetation since January 1990.

Under the definitions above 27 paddock trees occur throughout the study area. Paddock trees were assessed under the streamlined assessment module – clearing paddock trees (Appendix 1 of the BAM) and incorporated into this report. They are considered both in terms of ecosystem credits and as habitat for threatened species and any credits generated are additional to those created by applying the full BAM.

4.3 DIFFERENCES BETWEEN MAPPED VEGETATION EXTENT AND AERIAL IMAGERY

Native vegetation extent and internal ecotone boundaries between communities were 'ground truthed' and mapped during fieldwork using a handheld Geographic Positioning System (GPS). During the survey period no notable differences between vegetation extent displayed in aerial imagery and what was observed during the surveying period were found.

5.0 PLANT COMMUNITY TYPES AND PADDOCK TREES

This Section describes the attribution of vegetation community profile descriptors to vegetation surveyed within the study area in accordance the NSW Plant Community Types (PCTs) held within the NSW BioNet Vegetation Information System (BioNet VIS) database.

5.1 PLANT COMMUNITY TYPE (PCT) ASSESSMENT METHOD

Existing site reports as well as database searches (See Section 1.3) were reviewed to inform the study area investigations. In addition, a search was undertaken of the BioNet VIS Database (OEH 2018h) and NSW SEED mapping to access existing vegetation mapping information within the study area. It was determined that the mapping dataset, Mid North Coast Vegetation (EcoLogical Version). VIS_ID 3886 (EcoLogical 2006), was the most appropriate to use for the context of the study area as it was both fine scale, current and contains the broader context of vegetation types present in the locality. Accordingly, this mapping data (VIS_ID 3886) was adopted as a 'base map' to inform field studies of vegetation extent and type within the study area and representation of the extent within the region. Based on the results of the background review and the requirements of the BAM with respect to this BDAR, appropriate surveys were designed for the study area.

The vegetation base map was used to guide a floristic assessment of the study area. Supplementary iterations and amendments were made to the base map throughout the fieldwork period, in accordance with Section 5.2 of the BAM, via hand-held GPS units and aerial photo interpretation. Iterations to the base map were based on observation of broad vegetation composition, landform, physiography and on quantitative data collection through identification of all plants encountered to the species level.

The vegetation types observed were compared to the base map and cross-referenced with the community profile descriptors (and diagnostic species tests) held within the BioNet VIS Database (OEH 2018h) with an assessment of consistency being conducted. Details of the most consistent PCTs selected are detailed in Section 5.2 below.

5.2 PCTS IDENTIFIED WITHIN THE STUDY AREA

One Plant Community Type (PCT) was determined to be present within the study area, being:

- PCT 1548 - Tallowwood - Small-fruited Grey Gum - Kangaroo Grass grassy tall open forest on foothills of the lower North Coast

A comprehensive description of this PCT present within the study area is provided in Table 5.1 below. Where relevant the PCTs identified in the field were equated to Threatened Ecological Communities (TECs/EECs) listed under the EPBC Act and BC Act respectively. Figure 5.1 provides a map of the PCT within the study area.

Table 5.1: Details of PCT 1548

Tallowwood - Small-fruited Grey Gum - Kangaroo Grass grassy tall open forest on foothills of the lower North Coast (PCT 1548)	
Vegetation Formation	Wet Sclerophyll Forests (Grassy sub-formation)
Vegetation Class	Northern Hinterland Wet Sclerophyll Forests
Extent within study area	2.5 ha comprises all native treed vegetation, derived vegetation and native planted vegetation within the study area that did not fit the definition of paddock trees
Associated Species*	***Eucalyptus microcorys*** *, Eucalyptus propinqua* , ***Eucalyptus carnea*** , ***Corymbia maculata*** / ***Allocasuarina torulosa*** *, Polyscias sambucifolia , Rubus parvifolius* / ***Imperata cylindrica*** , ***Themeda australis*** , ***Poa labillardierei*** , *Oplismenus aemulus* , ***Lomandra longifolia*** , ***Dianella caerulea*** , ***Pratia purpurascens*** , ***Desmodium rhytidophyllum*** , ***Vernonia cinerea*** *The associated species above which occurred within the study area and informed assignment of this PCT have been made bold
Justification of PCT	The forest within the study area was composed of a diverse range of flora far exceeding the list of typically associated species above. The PCT assigned to this forest was initially determined by entering dominant canopy species and the IBRA bioregion into the BioNet vegetation classification database, a shortlist of two PCTs was collected that were considered to have potential to occur within the locality, these were: • PCT-1548 - Tallowwood - Small-fruited Grey Gum - Kangaroo Grass grassy tall open forest on foothills of the lower North Coast • PCT 1262 - Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast The short list of PCTs above were cross referenced with the floristic inventory collected for the study area. It was found that both PCTs were highly consistent with the flora inventory taken within the site. As such the associated species credit species with each PCT was then cross referenced with the records present within the Atlas BioNet data base. From this cross reference it was found that PCT 1262 contained a number of flora and fauna species with distributions that did not extend to the study area and were typically more common within areas north of Port Macquarie. As such PCT 1548 was chosen as the most consistent PCT prescriptive of the study area.
TEC Status	This PCT is not likely to form part of a TEC
Estimate of % Cleared	40%

Example of PCT 1548 within the study area

5.3 PADDOCK TREE ASSESSMENT METHOD

The Paddock Tree streamline assessment was carried to record all Paddock trees in the study area. Each Paddock tree was recorded visually from the ground and mapped via a hand-held GPS unit. For each paddock tree the following attributes were recorded.

- Species,
- diameter at breast height;
- height of tree; and
- presence/absence of hollows and other habitat features e.g. termite nests).

This information was used to determine the assessment class of each tree.

The Classes are as follows:

- Class1: paddock tree that are<20cm DBH,
- Class 2: Paddock trees that are>20cm DBH and less than the large tree benchmark for the most likely plant community type; and
- Class 3: Paddock trees that are greater than or equal to the Large tree benchmark for the most likely plant community type.

Paddock Trees within the study area were composed of species derived from surrounding vegetation types. As such, PCT 1548 - Tallowwood - Small-fruited Grey Gum - Kangaroo Grass grassy tall open forest on foothills of the lower North Coast was assigned to the Paddock Trees identified.

Trees classed as Class 2 and Class 3 were all assessed for habitat suitability for threatened species associated with the PCT the tree species are most likely to represent.

Threatened species that would use the paddock trees are assumed to be the same threatened species that are returned by the BAM Calculator for the vegetation zones. Where targeted fauna surveys were required for the BAM Calculations, paddock trees were also included in the surveys. Assessment of threatened species that would use the paddock trees as habitat have also been incorporated into this BDAR under Section 7 and 8.

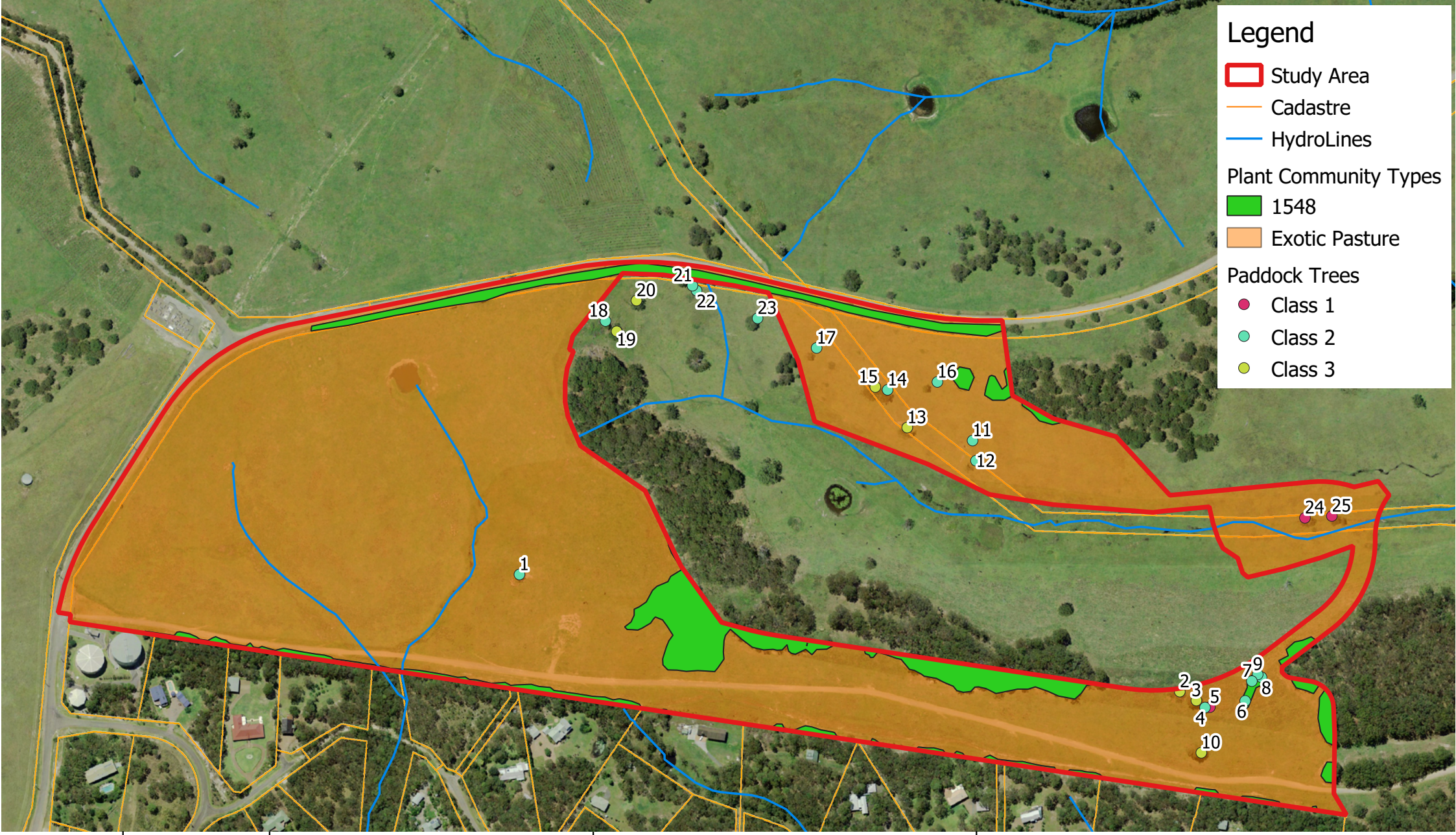
The paddock trees occurring in the development footprint are shown in Figure 5.1 and detailed within Table 5.2.

Table 5.2: Paddock Tree Details

ID	Species	Common Name	Height	DBH	DBH Above Benchmark	Hollows Present	Paddock Tree Class	Removal Required
1	*Eucalyptus botryoides*	Bangalay	12	0.64	No	No	Class 2	Tree likely to require removal as a result of the proposed development
2	*Corymbia gummifera*	Red Bloodwood	17	0.85	Yes	Yes	Class 3	Tree likely to require removal as a result of the proposed development
3	*Eucalyptus fergusonii*		16	0.87	Yes	No	Class 3	Tree likely to require removal as a result of the proposed development
4	*Allocasuarina littoralis*	Black Sheoak	7	0.31	No	No	Class 2	Tree likely to require removal as a result of the proposed development
5	*Eucalyptus fergusonii*		6	0.13	No	No	Class 1	Tree likely to require removal as a result of the proposed development
6	*Eucalyptus carnea*	Thick-leaved Mahogany	11	0.57	No	No	Class 2	Tree likely to require removal as a result of the proposed development
7	*Eucalyptus microcorys*	Tallowwood	12	0.78	No	No	Class 2	Tree likely to require removal as a result of the proposed development
8	*Eucalyptus microcorys*	Tallowwood	8	0.33	No	No	Class 2	Tree likely to require removal as a result of the proposed development
9	*Eucalyptus fergusonii*		13	0.45	No	No	Class 2	Tree likely to require removal as a result of the proposed development
10	*Eucalyptus microcorys*	Tallowwood	20	1.11	Yes	Yes	Class 3	Tree likely to require removal as a result of the proposed development

11	Unknown	Dead Stag	8	0.70	No	Yes	Class 2	Tree likely to require removal as a result of the proposed development
12	*Eucalyptus carnea*	Thick-leaved Mahogany	9	0.41	No	Yes	Class 2	Tree likely to require removal as a result of the proposed development
13	*Eucalyptus microcorys*	Tallowwood	18	1.01	Yes	Yes	Class 3	Tree likely to require removal as a result of the proposed development
14	*Eucalyptus microcorys*	Tallowwood	14	0.74	No	Yes	Class 2	Tree likely to require removal as a result of the proposed development
15	*Eucalyptus microcorys*	Tallowwood	12	0.85	Yes	Yes	Class 3	Tree likely to require removal as a result of the proposed development
16	*Corymbia maculata*	Spotted Gum	18	0.44	No	No	Class 2	Tree likely to require removal as a result of the proposed development
17	*Corymbia maculata*	Spotted Gum	16	0.42	No	No	Class 2	Tree likely to require removal as a result of the proposed development
18	*Eucalyptus carnea*	Thick-leaved Mahogany	12	0.45	No	No	Class 2	Tree likely to be retained within the scope of the proposed development
19	*Eucalyptus microcorys*	Tallowwood	11	0.85	Yes	No	Class 3	Tree likely to be retained within the scope of the proposed development
20	*Eucalyptus caniculata*	Grey Gum	12	0.82	Yes	No	Class 3	Tree likely to be retained within the scope of the proposed development
21	*Eucalyptus carnea*	Thick-leaved Mahogany	9	0.45	No	No	Class 2	Tree likely to be retained within the scope of the proposed development
22	*Glochidion ferdinandi*	Cheese Tree	7	0.25	No	No	Class 2	Tree likely to be retained within the scope of the proposed development

23	*Corymbia maculata*	Spotted Gum	18	0.75	No	No	Class 2	Tree likely to be retained within the scope of the proposed development
24	*Casurina glauca*	Swamp Oak	12	0.15	No	No	Class 1	Tree likely to require removal as a result of the proposed development
25	*Casurina glauca*	Swamp Oak	11	0.15	No	No	Class 1	Tree likely to require removal as a result of the proposed development



Job Ref	12360
A4 Scale	1:5,000

Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, no guarentee is given that the information protrayed is free from error or omission. In addition the spatial accuracy of the map is wholly dependant on source data. Please verify the accuracy of all information prior to use. Development footprint areas should be used for indicative areas only.

0 100 200 m

Map Projection GDA94 MGA Zone 56

Data Sources: LPI (2018),Tattersall Lander (2018)

Figure 5.1

PCT and Paddock Tree Map

Viney Creek Road
Tea Gardens, NSW

30 October 2018

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6.0 VEGETATION ZONES

This Section describes the attribution of vegetation zones to PCTs identified within Section 4.0 of this report. Designation of vegetation zones was undertaken accordance with the methodology for vegetation integrity assessment outlined within Section 5.3 of the BAM (OEH, 2017).

6.1 VEGETATION ZONES ASSESSMENT METHOD

Detailed floristic surveys were undertaken on 4, 25 and 26 October 2018. This survey included the establishment of vegetation integrity plots across the study area. The survey effort (number of vegetation integrity plots established, per vegetation zone) was undertaken in accordance with Table 2 in the BAM (OEH, 2017). Data on the composition, structure and function of the vegetation was collected utilising the methodology presented in the (BAM, 2017) by persons trained in the BAM and under the direction of persons accredited under the BAM. The field data collected during the vegetation integrity assessment can be found in Appendix E.

One PCT was identified in the study area. This PCT was considered in terms of if it should be further stratified into separate vegetation zones on the basis of current condition state or other environmental variables. The random meander, overview inspection and detailed floristic plots have been used to inform the stratification of this PCT into vegetation zones. PCT1548 was stratified on the basis of the broad presence/absence of key strata over the study area, vegetation zones were attributed with a vegetation zone ID, which are

- 1548_Disturbed
- 1548_Derived
- 1548_Planted

An aerial photo showing the extent of the three Vegetation Zones present within the study area, the intersection of vegetation zones with the proposed developments project components and the location of the vegetation integrity plots is shown in Figure 6.1. Polygons of vegetation zone extent and internal ecotone boundaries were mapped in accordance with Subsection 5.3.1 of the BAM, using a combination of field observations and aerial imagery interpretation at a minimum scale of 1:10,000. Table 6.1 provides details of the vegetation zones within the study area. The plot data from the vegetation integrity survey plots were entered into the BAM credit calculator (BAM-CC). The results from the vegetation integrity assessment are provided in Table 6.2.

6.2 PATCH SIZE

Patch size is defined in the BAM (OEH, 2017) as an area of intact native vegetation that:

- *occurs on the study area or biodiversity stewardship site, and*
- *includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition vegetation (or ≤30m for non woody ecosystems). Patch size may extend into adjoining land that is not part of the study area or biodiversity stewardship site.*

The BAM (OEH, 2017) defines 'intact native vegetation' as:

- *Intact vegetation: vegetation where all tree, shrub, grass and/or forb structural growth form groups expected for a plant community type are present.*

As described in Section 6.1 above PCT 1548 was stratified broadly into three condition classes by the absence of key structural layers, which are:

- 1548_Low
- 1548_Derived
- 1548_Planted

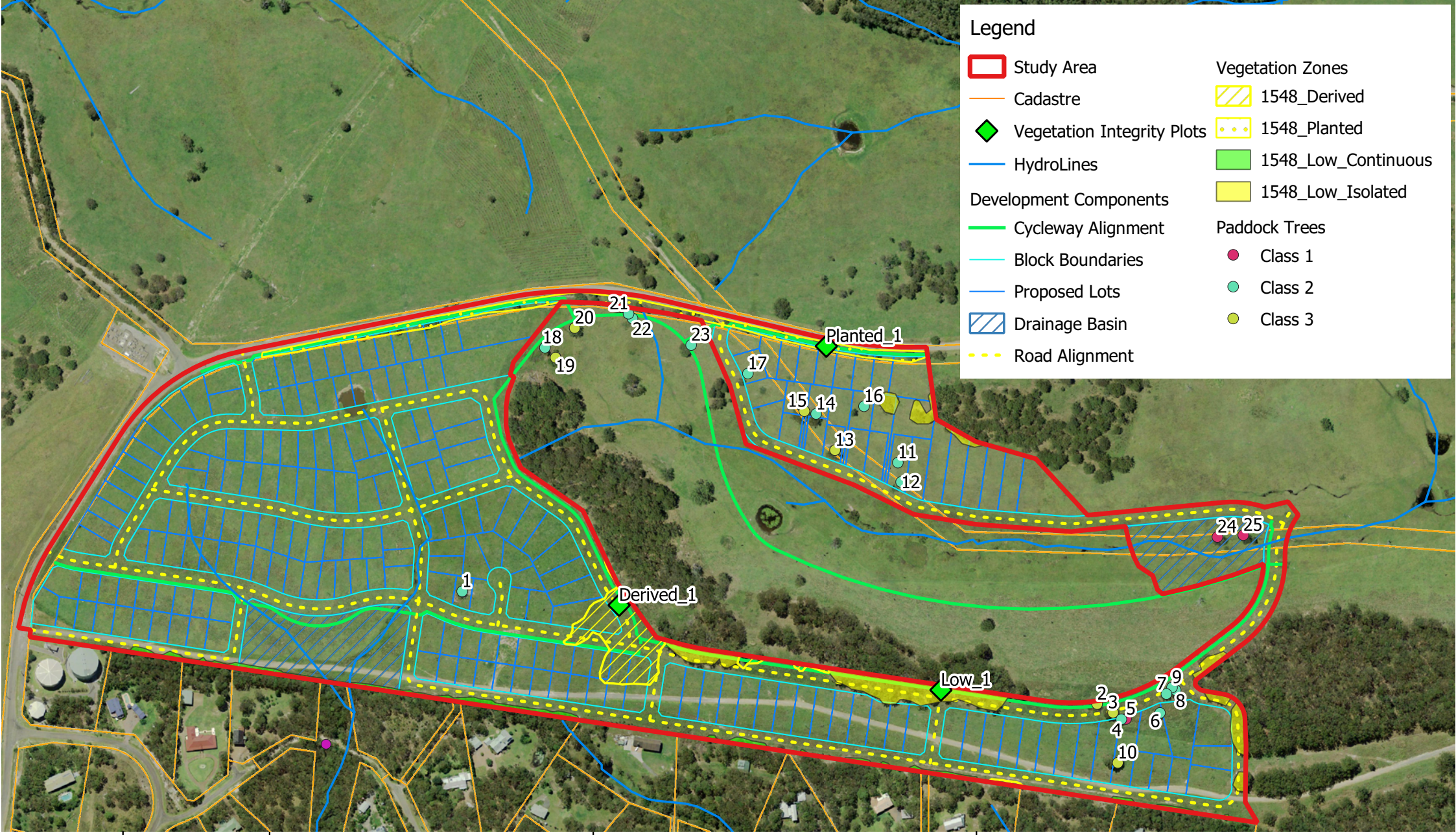
Both vegetation zones 1548_Derived and 1548_Planted contained all growth form groups expected for PCT 1548, however vegetation zone 1548_Derived did not contain any species categorised under the tree growth form group. As such, this vegetation zone was considered not intact under the definitions of the BAM and was attributed with a patch size of zero.

Vegetation Zone 1548_Low was found to be comprised of several fragmented patches of vegetation with differing patch sizes, a number being isolated patches of vegetation within the centre of the study area and another being a small area of fringe vegetation in the study areas south with connectivity to large areas of similar vegetation outside of the site.

As such, in accordance with the BAM Operational Manual – Stage 1 (OEH 2018f) this vegetation zone was separated into two zones attributed with the following patch size classes:

- 1548_Low_Isolated (Patch Size 5 ha)
- 1548_Low_Continuous (Patch Size >101ha)

Both of these vegetation zones were represented with the same Plot data obtained from the floristic surveys detailed within Section 6.1. Patch sizes classes for all vegetation zones present within the study area have been detailed within Table 6.1.



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A4 Scale	1:5,500

Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, no guarentee is given that the information protrayed is free from error or omission. In addition the spatial accuracy of the map is wholly dependant on source data. Please verify the accuracy of all information prior to use. Development footprint areas should be used for indicative areas only.

0 100 200 m

Map Projection GDA94 MGA Zone 56

Data Sources: LPI (2018),Tattersall Lander (2018)

Figure 5.1

Vegetation Zones Map

Viney Creek Road
Tea Gardens, NSW

30 October 2018

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Table 6.1: Details of Vegetation Zones within the Study Area

Vegetation Zone ID/Condition	No. of Vegetation Integrity Plots Established	Area Total (ha)	Patch Size (ha)	Example of Vegetation Zone
1548_Low_Isolated This vegetation zone was dominated by the canopy species *Eucalyptus fergonsonii, Eucalyptus carnea* (Thick leaved Mahogany) and contained isolated occurrences of co-dominant *Eucalyptus microcorys* (Tallowwood), *Angophora costata* (Smooth-barked Apple) and *Corymbia gummifera*. The mid-storey was largely absent and contained scattered occurrences of *Callistemon rigidus* (Stiff Bottlebrush) and *Acacia.* The understorey of this community was a heterogeneous mix of native and exotic pasture species which were common within the surrounding cleared pasture habitat. This vegetation zone was comprised of isolated patches of fragmented woodland	1	0.74	5	
1548_Low_Continuous This vegetation zone was dominated by the canopy species *Eucalyptus fergonsonii, Eucalyptus carnea* (Thick leaved Mahogany) and contained isolated occurrences of co-dominant *Eucalyptus microcorys* (Tallowwood), *Angophora costata* (Smooth-barked Apple) and *Corymbia gummifera*. The mid-storey was largely absent and contained scattered occurrences of *Callistemon rigidus* (Stiff Bottlebrush) and *Acacia.* The understorey of this community was a heterogeneous mix of native and exotic pasture species which were common within the surrounding cleared pasture habitat. This vegetation zone was connected to larger areas of bushland to the south of the study area.		0.32	>101	

Vegetation Zone ID/Condition	No. of Vegetation Integrity Plots Established	Area Total (ha)	Patch Size (ha)	Example of Vegetation Zone
1548_Derived This vegetation was in a state of stalled recovery and consisted of a heterogeneous mix of native shrub/groundcover species and common exotic pasture species representative of vegetation zone 1548_Low_Isolated. No treed vegetation was present within this community.	1	0.64	0	
1548_Planted This vegetation zone was located in the road reserve present within the north of the study area and adjacent to Viney Creek Road. This vegetation zone was composed of a number of planted native Eucalypt species which would be representative of those found within the wider landscape but did not form the composition of a naturally occurring Plant Community Type. Such species included *Eucalyptus pilularis* (Blackbutt), *Melaleuca quinquenervia* (Broad-leaved Paperbark), *Eucalyptus robusta* (Swamp Mahogany) and *Eucalyptus haemastoma* (Scribbly Gum). The understorey of this community was a heterogeneous mix of native and exotic pasture species which were common within the surrounding cleared pasture habitat.	1	0.58	0.58	

Table 6.2: Vegetation integrity Scores

Vegetation Integrity Plot ID	Vegetation Zone ID	Composition Score	Structure Score	Function Score	Vegetation Integrity Score
Low_1	1548_Low_Continuous	59.4	44.4	61.8	54.6
	1548_Low_Isolated				
Planted_1	1548_Planted	26.3	4.5	43	17.2
Derived_1	1548_Derived	7.7	2.9	0.3	1.8

6.3 EXCLUSION OF VEGETATION ZONES FROM FURTHER ASSESSMENT

As outlined in Section 3.1.1.3 of the BAM if a vegetation zone has a vegetation integrity score of:

- *<15 where the PCT is representative of an endangered or critically endangered ecological community, or*
- *<17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community.*
- *<20 where the PCT is not representative of a TEC or associated with threatened species habitat.*

then for that vegetation zone:

- *assessment of native vegetation is not required beyond Section 5.4* (determining vegetation integrity score), and
- *an assessment of threatened species habitat according to Section 6.2 and Paragraph 6.2.1.4* (Assessing habitat suitability for species that can be predicted by habitat surrogates (ecosystem credits)) *is not required.*

Vegetation zone 1548_Derived is not a TEC, however it is associated with some threatened species habitat. As such, with a vegetation integrity score of 1.8 (ie. ≤17), further assessment of habitat suitability for ecosystem credit species associated with this vegetation zone within Section 7.0 of this report is not required.

7.0 ECOSYSTEM CREDIT SPECIES

This Section identifies and assesses the suitability of habitat constraints within the study area for ecosystem credit species. Ecosystem credit species are threatened species where the likelihood of occurrence of a species or elements of the species' habitat can be predicted by habitat surrogates and landscape features, or for which targeted survey has a low probability of detection. Targeted survey is not required for these species.

Ecosystem credit species are pre-determined by OEH in the BAM-CC (OEH, 2018g) based on the data collected and displayed in Section 3.6 of this report.

The BAM methodology defines a two-step process of habitat suitability assessment for ecosystem credit species, these are:

1) identify ecosystem credit species for assessment; and
2) assessment the habitat constraints and vagrant species on the subject land

These steps have been carried out in the following Sections.

7.1 ECOSYSTEM CREDIT SPECIES FOR ASSESSMENT (STEP 1)

A total of 24 ecosystem credit species have been generated from the BAM-CC (OEH 2018) as requiring assessment and are listed in Table 7.1. Relevant databases and literature was reviewed (See Table 1.1) for additional ecosystem credit species for assessment. One additional ecosystem credit species was added for assessment, namely *Ephippiorhynchus asiaticus* (Black-necked Stork) due to recent records being present within adjacent land which was representative of habitat within the study area (OEH 2018b). Of the species in Table 7.1, 17 have been recorded within a 10km radius of the study area.

Table 7.1: Ecosystem Credit Species for Assessment

Scientific Name	Common Name	Conservation Status		BAM-CC Vegetation Association or Recorded Database
		BC Act	EPBC Act	
Callocephalon fimbriatum	Gang-gang Cockatoo (Foraging)	V	E	Pct_1548
Calyptorhynchus lathami[2]	Glossy Black-Cockatoo (Foraging)	V		Pct_1548
Ephippiorhynchus asiaticus	Black-necked Stork	E		BioNet
Daphoenositta chrysoptera	Varied Sittella	V		Pct_1548
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Pct_1548
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		Pct_1548
Glossopsitta pusilla	Little Lorikeet	V		Pct_1548
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	V		Pct_1548
Kerivoula papuensis	Golden-tipped Bat	V		Pct_1548
Lathamus discolor	Swift Parrot (Foraging)	E	CE	Pct_1548
Lophoictinia isura	Square-tailed Kite (Foraging)	V		Pct_1548
Miniopterus australis	Little Bentwing-bat (Foraging)	V		Pct_1548
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat (Foraging)	V		Pct_1548
Mormopterus norfolkensis	Eastern Freetail-bat	V		Pct_1548
Ninox connivens	Barking Owl (Foraging)	V		Pct_1548
Ninox strenua	Powerful Owl (Foraging)	V		Pct_1548
Petaurus australis	Yellow-bellied Glider	V		Pct_1548
Phascolarctos cinereus	Koala (Foraging)	V	V	Pct_1548
Potorous tridactylus	Long-nosed Potoroo	V	V	Pct_1548
Pseudomys gracilicaudatus	Eastern Chestnut Mouse	V		Pct_1548
Pteropus poliocephalus	Grey-headed Flying-fox (Foraging)	V		Pct_1548

Scientific Name	Common Name	Conservation Status		BAM-CC Vegetation Association or Recorded Database
		BC Act	EPBC Act	
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		Pct_1548
Scoteanax rueppellii	Greater Broad-nosed Bat	V		Pct_1548
Tyto novaehollandiae	Masked Owl (Foraging)	V		Pct_1548

Legend
E=Endangered Species
V=Vulnerable Species
CE=Critically Endangered
Cells highlighted blue indicate species has been previously recorded as occurring within a 10km radius of the study area within databases reviewed within Section 1.3 of this report.

7.2 ECOSYSTEM CREDIT SPECIES ASSESSMENT (STEP 2)

Under this step of the BAM the assessor may opt to undertake an additional assessment of the habitat constraints on the subject land for the ecosystem credit species predicted by the BAM-CC.

All species that were associated with PCT_1548 were assumed to occur and generate ecosystem credits.

8.0 SPECIES CREDIT SPECIES

This Section identifies and assesses the suitability of habitat present within the study area for species credit species. Species credit species are threatened species where the likelihood of occurrence of a species or elements of suitable habitat for the species cannot be confidently predicted by vegetation surrogates and landscape features and can be reliably detected by survey. Targeted survey is required for these species which are not excluded from assessment in Section 8.2.

Species credit species are pre-determined by the BAM-CC based on the data collected and displayed in Section 3.6 of this report. The residual impact on the species' habitat from development, clearing is measured in biodiversity credits using the vegetation integrity score for each vegetation zone.

The BAM assessment defines a six step process for identifying habitat suitability for species credit species, this is:

1) identify species credit species for assessment,
2) assess the habitat constraints for species credit species on the Subject land,
3) identify candidate species credit species for further assessment,
4) determine presence or absence of a candidate species credit species,
5) determine the area or count, and location of suitable habitat for a species credit species; and
6) determine the habitat condition within the species polygon for species assessed by area.

These steps have been carried out in Sections 8.1- 8.7 below.

8.1 SPECIES CREDIT SPECIES FOR ASSESSMENT (STEP 1)

A total of 33 species credit species have been generated from the BAM-CC (OEH, 2018) as requiring assessment and are listed in Table 8.1. Relevant databases and literature was reviewed (See Table 1.1) for additional species credit species for assessment, no additional species credit species were added for assessment. Of the species in Table 8.1, 14 have been recorded within a 10km radius of the study area.

Table 8.1: Species Credit Species for Assessment

Scientific Name	Common Name	Conservation Status[1]		Serious and Irreversible Impact Entity (SAII)
		BC Act	EPBC Act	
Aepyprymnus rufescens	Rufous Bettong	V		No
Callocephalon fimbriatum	Gang-gang Cockatoo (Breeding)	V		No
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	V		No
Cercartetus nanus	Eastern Pygmy-possum			No
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Yes
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	No

Scientific Name	Common Name	Conservation Status[1]		Serious and Irreversible Impact Entity (SAII)
		BC Act	EPBC Act	
Diuris flavescens	Pale Yellow Doubletail	CE	CE	Yes No threshold or spatial data provided
Diuris praecox	Rough Doubletail	V	V	No
Hakea archaeoides	Big Nellie Hakea	V	V	No
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	V		No
Hoplocephalus bitorquatus	Pale-headed Snake	V		No
Hoplocephalus bitorquatus	Pale-headed Snake			No
Lathamus discolor	Swift Parrot (Breeding)	E	CE	Yes Mapped important areas - contact OEH for maps
Litoria brevipalmata	Green-thighed Frog	V		No
Lophoictinia isura	Square-tailed Kite (Breeding)	V		No
Macropus parma	Parma Wallaby	V		No
Miniopterus australis	Little Bentwing-bat (Breeding)	V		Yes No threshold or spatial data provided
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat (Breeding)	V		Yes No threshold or spatial data provided
Mixophyes balbus	Stuttering Frog	E	V	Yes Only applies to Sydney Basin and South Coast Bioregions populations
Mixophyes iteratus	Giant Barred Frog	E	E	No
Myotis macropus	Southern Myotis	V		No
Ninox connivens	Barking Owl (Breeding)	V		No
Ninox strenua	Powerful Owl (Breeding)	V		No
Petaurus norfolcensis	Squirrel Glider	V		No

Scientific Name	Common Name	Conservation Status[1]		Serious and Irreversible Impact Entity (SAII)
		BC Act	EPBC Act	
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Yes No threshold or spatial data provided
Phascogale tapoatafa	Brush-tailed Phascogale	V		No
Phascolarctos cinereus	Koala (Breeding)	V	V	No
Phascolarctos cinereus - endangered population	Koala, Hawks Nest and Tea Gardens population	E1		No
Planigale maculata	Common Planigale	V		No
Pomaderris queenslandica	Scant Pomaderris	E		
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	V	V	No
Turnix maculosus	Red-backed Button-quail			
Rhizanthella slateri	Eastern Australian Underground Orchid	V	E	Yes No threshold or spatial data provided
Tyto novaehollandiae	Masked Owl (Breeding)	V		No

Legend E=Endangered Species
E1=Endangered Population
V=Vulnerable Species
CE=Critically Endangered

* Cells highlighted blue indicate species has been previously recorded as occurring within a 10km radius of the study area within databases reviewed within Section 1.3 of this report.

8.2 ASSESSMENT OF HABITAT CONSTRAINTS FOR SPECIES CREDIT SPECIES (STEP 2)

For the species credit species predicted to occur in Step 1, for which habitat constraints are listed, an assessment was undertaken for the presence of the habitat constraints within the study area. Habitat constraints for species credit species are identified in the BAM-CC and the Threatened Species Biodiversity Data Collection (TBDC). The absence of habitat constraints for species credit species precludes the species from requiring further assessment in Steps 3-6. This assessment is not applicable to a species where no habitat constraints are listed in the BAM-CC and TBDC, e.g. threatened flora.

The methodology for the habitat constraints survey is provided below in Section 8.3. The results of the habitat constraints survey and an evaluation of species credit species for further assessment is provided in Table 8.3.

8.3 METHODOLOGY FOR DETERMINING HABITAT CONSTRAINTS

Significant Tree Inventory

A significant tree inventory was conducted by Wildthing Environmental Consultants over the entire study area and immediately adjacent habitat. The survey identified the presence of any significant habitat attributes or characteristics of all trees present within assessed vegetation zones, this included the following:

- the size and number of any hollows, woodland bird nests or eyries present; and
- the presence or evidence of any breeding camps of megachiropteran bats

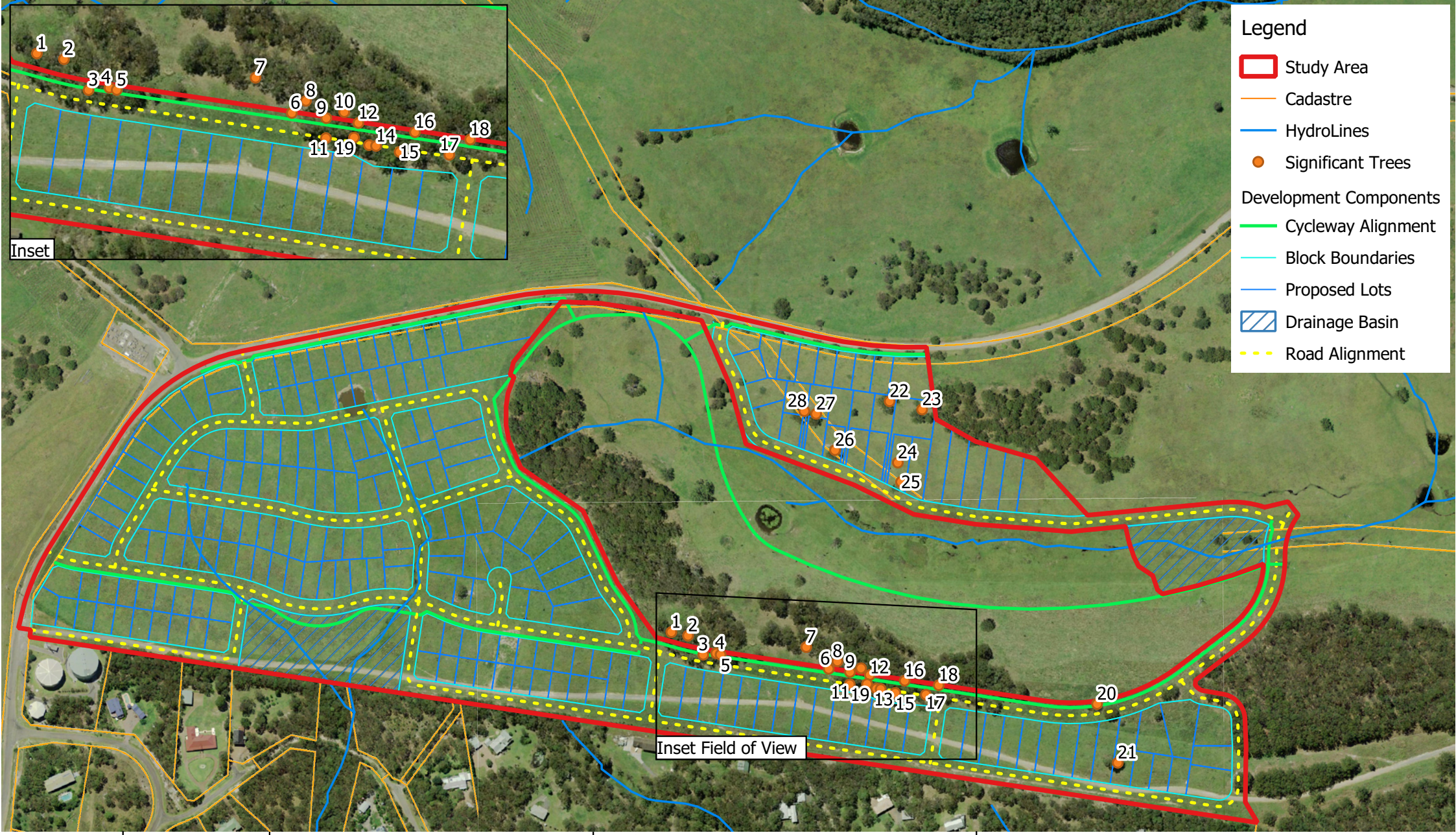
A map of recorded significant trees is provided in Figure 8.1. Table 8.2 provides details of all hollow-bearing trees recorded.

Table 8.1: Significant Trees within Study Area

Tree No	Species	DBH (m)	Height (m)	Class 1	Class 2	Class 3	Class 4	Removal Required	Comments
1	Corymbia gummifera (Red Bloodwood)	0.55	11		1			Unlikely to require removal as a result of the proposed development	
2	Angophora costata (Smooth-barked Apple)	0.25	20		2			Unlikely to require removal as a result of the proposed development	
3	Eucalyptus carnea (Thick-leaved Mahogany)	0.30	20			1		Tree likely to require removal as a result of the proposed development	
4	Dead Stag	0.20	9			1		Tree likely to require removal as a result of the proposed development	
5	Thick-leaved Mahogany	0.30	18			1		Tree likely to require removal as a result of the proposed development	Hollow at head height - well-worn entrance
6	Dead Stag	0.50	15			1		May require removal as a result of the proposed development	
7	Dead Stag	0.40	14			1		Unlikely to require removal as a result of the proposed development	
8	Dead Stag	0.25	20			1		Unlikely to require removal as a result of the proposed development	
9	Thick-leaved Mahogany	0.18	15		1			May require removal as a result of the proposed development	
10	Thick-leaved Mahogany	0.50	21		1			Unlikely to require removal as a result of the proposed development	Termite mound with Kingfisher cavity. Kookaburra observed bringing food into hollow to feed begging chicks.
11	Thick-leaved Mahogany	0.80	23		1			Tree likely to require removal as a result of the proposed development	
12	Thick-leaved Mahogany	0.25	20		1			May require removal as a result of the proposed development	Eastern Rosella observed leaving hollow

Tree No	Species	DBH (m)	Height (m)	Class 1	Class 2	Class 3	Class 4	Removal Required	Comments
13	Dead Stag	0.15	5			1		Tree likely to require removal as a result of the proposed development	
14	Eucalyptus microcorys (Tallowwood)	0.30	20		1			Tree likely to require removal as a result of the proposed development	
15	Dead Stag	0.40	10			1		Tree likely to require removal as a result of the proposed development	
16	Dead Stag	0.50	19		1			May require removal as a result of the proposed development	
17	Dead Stag	0.30	14		1			Tree likely to require removal as a result of the proposed development	
18	Dead Stag	0.20	22			1		May require removal as a result of the proposed development	
19	Dead Stag	0.10	10			1		Tree likely to require removal as a result of the proposed development	
20	Red Bloodwood	0.85	17				1	Tree likely to require removal as a result of the proposed development	Tree is also Paddock Tree 2
21	Tallowwood	1.11	20		2			Tree likely to require removal as a result of the proposed development	Tree is also Paddock Tree 10
22	Tallowwood	1.01	20		2	2	3	Tree likely to require removal as a result of the proposed development	Tree is also Paddock Tree 11
23	Grey Gum	0.98	17				1	Tree likely to require removal as a result of the proposed development	Tree is also Paddock Tree 12
24	Dead Stag	0.70	8	1				Tree likely to require removal as a result of the proposed development	Tree is also Paddock Tree 13
25	Thick-leaved Mahogany	0.41	9		1		3	Tree likely to require removal as a result of the proposed development	Tree is also Paddock Tree 14
26	Tallowwood	1.01	18		1	2	4	Tree likely to require removal as a result of the proposed development	Tree is also Paddock Tree 15
27	Tallowwood	0.74	14		2		2	Tree likely to require removal as a result of the proposed development	Tree is also Paddock Tree 16

Tree No	Species	DBH (m)	Height (m)	Class 1	Class 2	Class 3	Class 4	Removal Required	Comments
28	Tallowwood	0.85	12				1	Tree likely to require removal as a result of the proposed development	Tree is also Paddock Tree 17



Job Ref	12360
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Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, no guarentee is given that the information protrayed is free from error or omission. In addition the spatial accuracy of the map is wholly dependant on source data. Please verify the accuracy of all information prior to use. Development footprint areas should be used for indicative areas only.

0 100 200 m

Map Projection GDA94 MGA Zone 56

Data Sources: LPI (2018),Tattersall Lander (2018)

Figure 8.1

Significant Trees Map

Viney Creek Road
Tea Gardens, NSW

30 October 2018

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Searches for Fallen/Standing Dead Timber

The presence of fallen and standing dead timber within each vegetation zone was qualitatively assessed for its potential to provide significant refuge resources to ground dwelling mammals, birds amphibians and reptiles.

Searches for Significant Geological Features and Suitable Artificial Structures

The presence of significant geological features and/or suitable artificial structures within each vegetation zone was qualitatively assessed for its potential to provide significant refuge resources to saxicolous (rock dwelling) and cave dwelling fauna such as microchiropteran bats, reptiles and some marsupials.

Searches for Habitat Constraints within the Landscape

The occurrence of some species credit species can be defined by the presence of specific habitat constraints within the greater landscape outside of the confines of the study area. These species credit species are generally highly mobile species with a large range/territory i.e. Microchiropteran bats (microbats), woodland birds and some terrestrial mammals.

Information collected in Section 3.6 has been used to inform the likely presence/absence of habitat constraints within the landscape, with justification of the determination reached provided in Table 8.2. Where the presence/absence of habitat features within the locality could not be determined with a high level of confidence or justified from desktop assessment resources a conservative approach has been used and the habitat constraint has been assumed present within the landscape.

Mapped Breeding Habitat

For a small number of species, a habitat constraint may refer to a mapped location. Mapped locations identify areas that are considered important for the species (e.g. breeding areas or sites where multiple records have been located over multiple years). As defined in Section 6.4 of the BAM, if the study area is in a mapped location for a species, no targeted survey or further assessment is required (unless otherwise indicated in the TBDC); the species is considered to be present and the area of the subject land within the mapped location forms the species polygon used to generate species credits. Any remaining habitat on the subject land (e.g. foraging, unmapped locations) used by these species is assessed for ecosystem credits.

Table 8.2: Assessment of Habitat Constraints for Species Credit Species

Scientific Name	Common Name	Are paddock trees important habitat	Habitat Constraint Category	Habitat Constraint Description	Habitat Constraint or geographic limitation represented within the study area	Justification
Aepyprymnus rufescens	Rufous Bettong	No	Geographic	North of Gloucester	No	The study area is south east of Gloucester
Callocephalon fimbriatum	Gang-gang Cockatoo (Breeding)	No	Hollow bearing trees	Eucalypt tree species with hollows greater than 9 cm diameter (OEH, 2018g)	Yes	The study area contains this habitat constraint.
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	Yes	Hollow bearing trees	Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground. (OEH, 2018g)	Yes	The study area contains this habitat constraint.
Cercartetus nanus	Eastern Pygmy-possum	No	N/A	N/A	N/A	This species has no defined habitat constraint and thus requires further assessment.
Chalinolobus dwyeri	Large-eared Pied Bat	No	Cliffs	Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels (OEH, 2018d)	No	A desktop evaluation of the landscape and geological mapping for the region indicates that the geology within 2km of the study area would not be support the formation of significant caves, overhangs, escarpments, outcrops, or crevices nor likely to have been historically mined.
Cryptostylis hunteriana	Leafless Tongue Orchid	No	N/A	N/A	N/A	This species has no defined habitat constraint and thus requires further assessment.
Diuris flavescens	Pale Yellow Doubletail	No	N/A	N/A	N/A	This species has no defined habitat constraint and thus requires further assessment.

Scientific Name	Common Name	Are paddock trees important habitat	Habitat Constraint Category	Habitat Constraint Description	Habitat Constraint or geographic limitation represented within the study area	Justification
Diuris praecox	Rough Doubletail	No	N/A	N/A	N/A	This species has no defined habitat constraint and thus requires further assessment.
Hakea archaeoides	Big Nellie Hakea	No	N/A	N/A	N/A	This species has no defined habitat constraint and thus requires further assessment.
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	Yes	Other	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines (OEH, 2018g)	Yes	The study area contains this habitat constraint.
Hoplocephalus bitorquatus	Pale-headed Snake	Yes Within 500 m of moderate to good vegetation	N/A	N/A	N/A	This species has no defined habitat constraint and thus requires further assessment.
Hoplocephalus stephensii	Stephens' Banded Snake	Yes	Other Fallen/standing dead timber including logs	Hollow bearing trees, arboreal vine tangles and Fallen/standing dead timber including logs Or within 500 m of this habitat	Yes	The study area contains this habitat constraint.
Lathamus discolor	Swift Parrot (Breeding)	Yes	Other	As per mapped areas (OEH, 2018g)	No	All mapped breeding areas for this species are located in Tasmania.

Scientific Name	Common Name	Are paddock trees important habitat	Habitat Constraint Category	Habitat Constraint Description	Habitat Constraint or geographic limitation represented within the study area	Justification
Litoria brevipalmata	Green-thighed Frog	No	N/A	N/A	N/A	This species has no defined habitat constraint and thus requires further assessment.
Lophoictinia isura	Square-tailed Kite (Breeding)	Yes	Other	Nest trees (OEH, 2018g)	No	The study area did not contain any eyrie bearing trees.
Macropus parma	Parma Wallaby	No	N/A	N/A	N/A	This species has no defined habitat constraint and thus requires further assessment.
Miniopterus australis	Little Bentwing-bat (Breeding)	No	Caves	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding (OEH, 2018g)	No	The study area did not contain caves or any other structure which was likely to provide breeding habitat.
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat (Breeding)	No	Caves	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding (OEH, 2018g)	No	The study area did not contain caves or any other structure which was likely to provide breeding habitat.
Mixophyes balbus	Stuttering Frog	No	N/A	N/A	N/A	This species has no defined habitat constraint and thus requires further assessment.
Mixophyes iteratus	Giant Barred Frog	No	Other	Land within 50m of semi permanent and permanent drainages	Yes	This species has no defined habitat constraint and thus requires further assessment.

Scientific Name	Common Name	Are paddock trees important habitat	Habitat Constraint Category	Habitat Constraint Description	Habitat Constraint or geographic limitation represented within the study area	Justification
Myotis macropus	Southern Myotis	Yes	Hollow bearing trees	Within 200 m of riparian zone/other Bridges, caves or artificial structures within 200 m of riparian zone (OEH, 2018g)	No	The study area contains this habitat constraint.
Ninox connivens	Barking Owl (Breeding)	Yes	Hollow bearing trees	Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground. (OEH, 2018g)	Yes (Paddock Trees)	No habitat trees were found to be present within vegetation zones within the study area. One paddock tree was found to contain a suitable hollow for this species. Credit generation under the paddock tree assessment has been inclusive of this species.
Ninox strenua	Powerful Owl (Breeding)	No	Hollow bearing trees	Living or dead trees with hollow greater than 20cm diameter (OEH, 2018g)	No	Suitable hollows for this species were limited to paddock trees present within the study area. As paddock trees are not important habitat for this speies its habitat constraint was not considered present.
Petaurus norfolcensis	Squirrel Glider	Yes	N/A	N/A	N/A	This species has no defined habitat constraint and thus requires further assessment.
Phascogale tapoatafa	Brush-tailed Phascogale	Yes	Hollow bearing trees	N/A	Yes	The study area contains this habitat constraint.
Phascolarctos cinereus	Koala (Breeding)	Yes	Other	Areas identified via survey as important habitat (see comments)	Yes	Clarification of what constitutes 'important Koala breeding habitat' had not been made publicly available by OEH at the time of writing this report. Due to the high amount of previous

Scientific Name	Common Name	Are paddock trees important habitat	Habitat Constraint Category	Habitat Constraint Description	Habitat Constraint or geographic limitation represented within the study area	Justification
				Important' habitat is defined by the density of koalas and quality of habitat determined by on-study area survey - contact OEH for more information. (OEH, 2018g)		records for Koala within the Atlas BioNet database, a conservative approach was taken and this habitat constraint was assumed present.
Phascolarctos cinereus - endangered population	Koala, Hawks Nest and Tea Gardens population	Yes	Other	Areas identified via survey as important habitat (see comments) (OEH, 2018g) Important' habitat is defined by the density of koalas and quality of habitat determined by on-study area survey - contact OEH for more information. (OEH, 2018g)	Yes	Clarification of what constitutes 'important Koala breeding habitat' had not been made publicly available by OEH at the time of writing this report. Due to the high amount of previous records for Koala within the Atlas BioNet database, a conservative approach was taken and this habitat constraint was assumed present.
Planigale maculata	Common Planigale	No	N/A	N/A	N/A	This species has no defined habitat constraint and thus requires further assessment.
Pomaderris queenslandica	Scant Pomaderris	No	N/A	N/A	N/A	This species has no defined habitat constraint and thus requires further assessment.
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	Yes	Other	Breeding camps (OEH, 2018g)	No	The study area did not contain any breeding camps of this species.
Turnix maculosus	Red-backed Button-quail	No	N/A	N/A	N/A	This species has no defined habitat constraint and thus requires further assessment.

Scientific Name	Common Name	Are paddock trees important habitat	Habitat Constraint Category	Habitat Constraint Description	Habitat Constraint or geographic limitation represented within the study area	Justification
Rhizanthella slateri	Eastern Australian Underground Orchid	No	N/A	N/A	N/A	This species has no defined habitat constraint and thus requires further assessment.
Tyto novaehollandiae	Masked Owl (Breeding)	Yes	Hollow bearing trees	Living or dead trees with hollows greater than 20cm diameter. (OEH ,2018g)	Yes (Paddock Trees)	No habitat trees were found to be present within vegetation zones within the study area. One paddock tree was found to contain a suitable hollow for this species. Credit generation under the paddock tree assessment has been inclusive of this species.

8.4 IDENTIFY CANDIDATE SPECIES CREDIT SPECIES FOR FURTHER ASSESSMENT (STEP 3)

After the habitat constraints assessment within Step 2 a list of candidate species credit species has been refined for further assessment. In accordance with Section 6.4.1.17 of the BAM if the assessor determines that the habitat for specific candidate species credit species is substantially degraded such that the species is unlikely to utilise the subject land (or specific vegetation zones), then that species does not require further assessment on the subject land. Table 8.3 below details candidate species credit species which have been excluded from further assessment based on subjective assessment of habitat degradation.

Table 8.3: Species Credit Species Habitat Assessment

Species Considered	Habitat Excluded from Further Assessment	Justification
• *Calyptorhynchus lathami* (Glossy Black-Cockatoo)	All vegetation zones within the study area	This species requires large patches of vegetation inclusive of intact landscapes for breeding (OEH 2018d). The vegetation zones within the study area were primarily composed of fragmented patches resulting from historical clearing within the study area and were not determined to provide suitable habitat.
• *Hoplocephalus stephensii* (Stephens' Banded Snake) • Hoplocephalus bitorquatus (Pale-headed Snake)	All vegetation zones within the study area	These species primarily utilize old primary forest with many large old hollow bearing trees. Habitat needs to be well connected and geographically large (OEH 2018d). The vegetation zones within the study area were not considered to represent the before mentioned habitat due to the amount of disturbance present across the study area.
• *Macropus parma* (Parma Wallaby)	All vegetation zones within the study area	This species preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest. The vegetation zones within the study area were not considered to represent the before mentioned habitat due to the amount of disturbance present across the study area.

The remaining species credit species will require targeted survey to confirm their presence/absence within the study area. Candidate species for further assessment are listed in Table 8.4.

Table 8.4: Candidate Species Credit Species

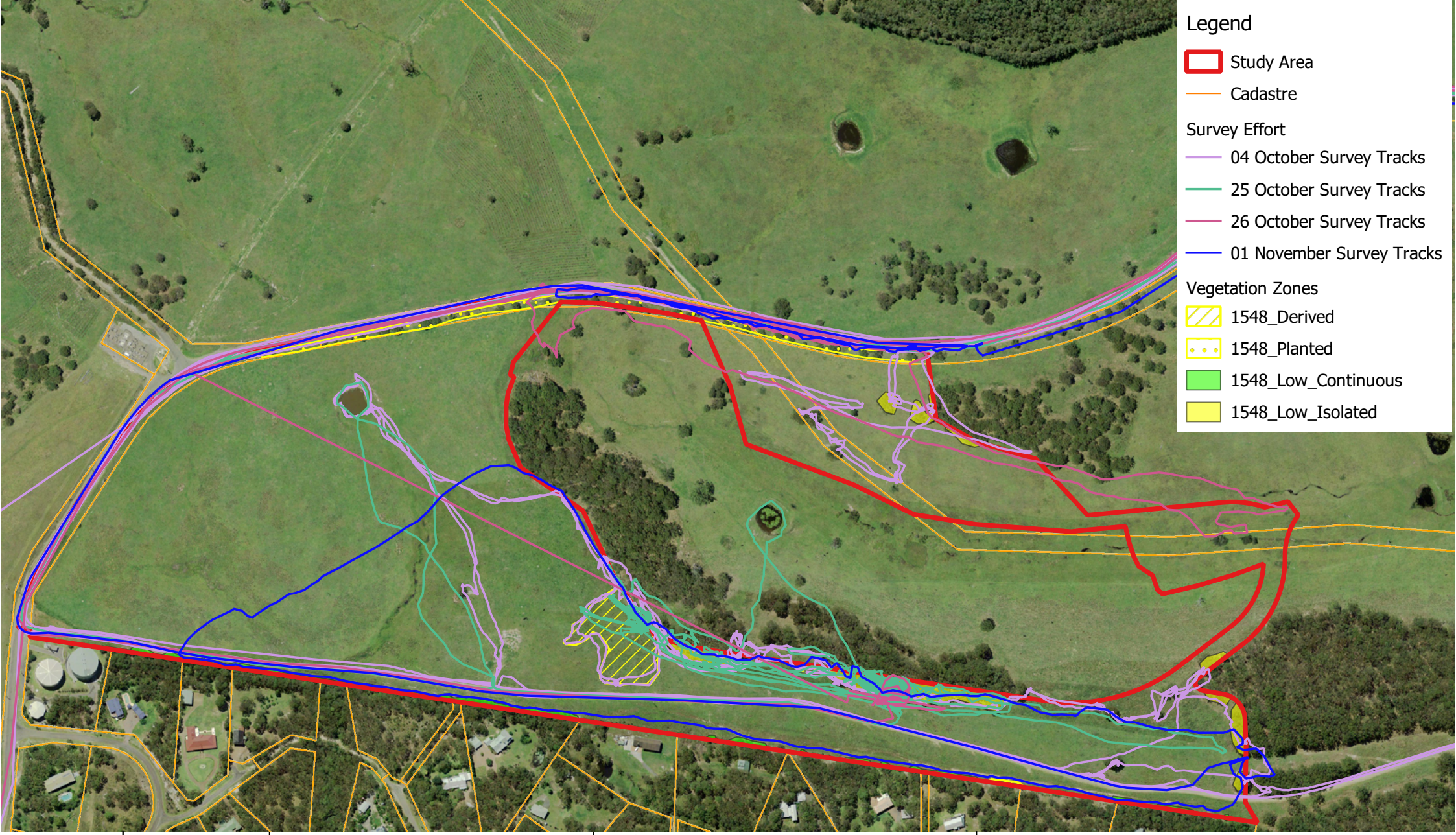
Scientific Name	Common Name	Biodiversity Risk Weighting	Survey Period	Assumed to occur/survey/expert report	Present on study area	Species polygon Area or Count
Cercartetus nanus	Eastern Pygmy-possum	2	Jan-Mar & Oct-Dec	Surveyed	No	N/A
Cryptostylis hunteriana	Leafless Tongue Orchid	1.5	Nov-Jan	Surveyed	No	N/A
Diuris flavescens	Pale Yellow Doubletail	3	Sept-Oct	Assumed Present	No	Area
Diuris praecox	Rough Doubletail	1.5	July-Sept	Surveyed	N/A	Area
Hakea archaeoides	Big Nellie Hakea	2	Any	Surveyed	No	N/A
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	2	Jul-Dec	Surveyed	No	N/A
Litoria brevipalmata	Green-thighed Frog	1.5	Oct-Mar	Surveyed	No	N/A
Mixophyes balbus	Stuttering Frog	3	Sept-Mar	Surveyed	No	N/A
Mixophyes iteratus	Giant Barred Frog	2	Oct-Mar	Surveyed	No	N/A
Myotis macropus	Southern Myotis	2	Oct-Mar (OEH 2018d)	Surveyed	No	N/A
Petaurus norfolcensis	Squirrel Glider	2	Any	Surveyed	No	N/A
Phascogale tapoatafa	Brush-tailed Phascogale	2	Any	Surveyed	No	N/A
Planigale maculata	Common Planigale	2	Any	Surveyed	No	N/A

Scientific Name	Common Name	Biodiversity Risk Weighting	Survey Period	Assumed to occur/survey/expert report	Present on study area	Species polygon Area or Count
Phascolarctos cinereus	Koala (Breeding)	2	Any	Surveyed	No	N/A
Phascolarctos cinereus - endangered population	Koala, Hawks Nest and Tea Gardens population	2	Any	Surveyed	No	N/A
Pomaderris queenslandica	Scant Pomaderris	2	High	Surveyed	No	N/A
Turnix maculosus	Red-backed Button-quail	2	High	Surveyed	No	N/A
Rhizanthella slateri	Eastern Australian Underground Orchid	3	Sept-Nov	Surveyed	No	N/A

8.5 DETERMINE PRESENCE OR ABSENCE OF A CANDIDATE SPECIES CREDIT SPECIES (STEP 4)

Targeted surveys were undertaken over the period of 4, 25 and 26 of October 2018 for the candidate species credit species above to determine their presence or absence within the study area. Surveys were conducted as per the optimum survey months defined within the BAM-CC (OEH, 2018g). Where relevant guidelines were available, targeted surveys were conducted according to taxa-specific guidelines. For all other species, targeted survey was conducted in accordance with OEH Threatened Species Survey and Assessment Guidelines.

The survey effort, timing, prevailing weather conditions are summarised in Table 8.5. A figure detailing the survey effort conducted within the study area is provided in Figure 8.2. Details of the survey methodology used and results for each surveyed species are provided below. Survey methodologies for candidate species credit species have been grouped where survey effort has captured multiple species.



Job Ref	12360
A4 Scale	1:5,500

Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, no guarentee is given that the information protrayed is free from error or omission. In addition the spatial accuracy of the map is wholly dependant on source data. Please verify the accuracy of all information prior to use. Development footprint areas should be used for indicative areas only.

0 100 200 m

Map Projection GDA94 MGA Zone 56

Data Sources: LPI (2018),Tattersall Lander (2018)

Figure 8.2

Survey Effort Map

Viney Creek Road
Tea Gardens, NSW

30 October 2018

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Table 8.5: Targeted Survey Effort

Date	Time (24hr)	Survey Effort (Expressed in Person Hours)	Activity	Weather
4 October 2018	0830-1230	8 (two persons)	• General Site Inspection • Vegetation Mapping • Paddock Tree Assessment • Targeted Survey for Threatened Diurnal Birds • Targeted Survey for Threatened Forbs and Shrubs	8/8 Cloud, 19.2 C (daytime temperature), SW 11km/h, 88% humidity
25 October 2018	1500-1900	4 (one persons)	• Significant Tree Inventory • Vegetation Integrity Assessment	8/8 Cloud, 17.2 C (daytime temperature), S 13km/h, 76% humidity
	1900-2100	2 (one persons)	• Targeted Survey for Threatened Microchiropteran Bats • Targeted Survey for Threatened Nocturnal Birds • Targeted Survey for Threatened Amphibians • Targeted Survey for Small Nocturnal Mammals • Targeted Survey for Koala	
26 October 2018	0830 - 1230	4 (one persons)	• Vegetation Integrity Assessment	2/8 Cloud, 18.8 C (daytime temperature), SW 19km/h, 77% humidity

01 November 2018	0930-1045	1.25 (one persons)	• Targeted Survey for Threatened Forbs and Shrubs	2/8 Cloud, 24 C, E 22km/h, 81% humidity

Targeted Survey for Threatened Forbs and Shrubs

Species Captured by Survey

- *Diuris flavescens* Pale Yellow Doubletail
- *Hakea archaeoides* Big Nellie Hakea
- *Pomaderris queenslandica* Scant Pomaderris
- *Cryptostylis hunteriana* Leafless Tongue Orchid
- *Rhizanthella slateri* Eastern Australian Underground Orchid

Survey Effort

A targeted survey for threatened forbs and shrubs was undertaken or the site on the 4 October and 1 November 2018 over a period of approximately 2.75 person hours. Suitable habitat for the threatened forbs and shrubs would be restricted to the vegetation zones with intact understorey and/or shrub layers within the study area. Targeted surveys were undertaken in accordance with the Guide to Surveying Threatened Plants (OEH, 2016) and involved walking parallel transects which were spaced at approximately 10m intervals across all potential habitat for the species above.

Survey Results

No threatened forbs and shrubs were detected during the targeted survey for the species above. As such these candidate species credit species were not considered to occur within the study area.

Targeted Survey for Threatened Amphibians

Species Captured by Survey

- *Litoria brevipalmata* Green-thighed Frog
- *Mixophyes balbus* Stuttering Frog
- *Mixophyes iteratus* Giant Barred Frog

Survey Effort

A targeted threatened amphibian survey was completed on the night of 25 October 2018 for approximately 2 person hours.

Suitable habitat for the threatened amphibians would be restricted to the man-made and naturally occurring aquatic habitat within the study area in the form of farm dams and drainage lines. Targeted surveys were undertaken in accordance with the Threatened species survey and assessment guidelines: field survey methods for fauna – amphibians (OEH 2009) and involved visiting likely aquatic habitat and listening to the characteristic calls of broadcasting male frogs.

Survey Results

No threatened amphibians were seen or heard during the survey. The following species were detected during the targeted amphibian survey:

- *Litoria fallax* Eastern Dwarf Tree Frog
- *Litoria peronii* Laughing Tree Frog
- *Litoria latopalmata* Broad-palmed Rocket Frog
- *Limnodynastes peronii* Striped Marsh Frog
- *Limnodynastes tasmaniensis* Spotted Grass Frog

As such these candidate species credit species were not considered to occur within the study area.

Targeted Survey for Threatened Diurnal Birds

Species Captured by Survey

- *Haliaeetus leucogaster* White-bellied Sea-Eagle (Breeding)
- *Turnix maculosus* Red-backed Button-quail

Survey Effort

A targeted survey for threatened diurnal birds was completed on the 4 October 2018 for a total of approximately 1.5 person hours.

Vegetation zones with an intact canopy layer which also contained relatively thick groundcover and large remnant trees was considered to provide potential breeding habitat for eyrie building raptors and also undergrowth dwelling birds.

The diurnal avifauna survey involved transects targeting potential habitat within the study areas of likely activity i.e. tall canopy trees with a perspective of the ocean and other waterbodies for fishing raptors and areas of thick undergrowth under a protective canopy of remnant trees. Surveys were conducted at peak activity periods for most avifauna species (i.e. dawn and dusk). Surveys involved listening for characteristic call of targeted species and scanning potential habitat with a pair of binoculars. Incidental observations of secondary indications of presence (i.e. platelets and distinctive feathers) were also recorded.

In addition, a full significant tree inventory was undertaken for the study area on 25 October 2018 over a period of approximately 4 person hours. This survey would have likely identified any threatened diurnal bird species displaying notable breeding behaviour (i.e. building/roosting within stick nests and eyries).

Survey Results

No threatened diurnal birds were detected during the targeted survey for the species above. As such these candidate species credit species were not considered to occur within the study area.

Targeted Survey for Small & Medium Nocturnal Mammals

Species Captured by Survey

- *Planigale maculata* Common Planigale
- *Petaurus norfolcensis* Squirrel Glider
- *Phascogale tapoatafa* Brush-tailed Phascogale
- *Cercartetus nanus* Eastern Pygmy-possum

Survey Effort

The targeted survey for the species above involved spotlighting for both arboreal and terrestrial mammals. Vegetation zones with an intact canopy layer which also contained large and hollow bearing remnant trees over a relatively dense strata of shrub and understorey species were considered to provide more likely habitat for the species above. Due to the adjacency of suitable habitat to well used private and public roads, trapping for threatened mammals was not deemed appropriate due to the likelihood of potential human interference.

Spotlighting was undertaken on foot using 100watt hand-held spotlights. The spotlighting undertaken involved walking at a slow pace conducting visual searches of undergrowth and canopy for foraging nocturnal mammals and stopping every 2 minutes, allowing the observer to hear fauna movement. Spotlighting was undertaken on 25 October 2018 for a total of approximately 2 person hours.

Survey Results

No threatened small or medium nocturnal mammals were observed during the survey. As such, these candidate species credit species were not considered to occur within the study area.

Targeted Survey for Koala Breeding Habitat

Survey Effort

A targeted Koala survey was completed on the night of 26 October 2018 for a combined total of approximately 2 person hours.

The Koala feed tree *Eucalyptus microcorys* (Tallowwood) was present in the remnant vegetation within the study area and planted specimens of *Eucalyptus robusta* (Swamp Mahogany) were present adjacent to Viney Creek Road in the study areas north. Thus all areas within the study area containing an intact canopy layer was considered potential habitat

Surveys for the Koala involved both direct observation during spotlighting and call-playback surveys and indirect observation methods during diurnal significant tree inventory consistent with the EPBC Act Referral Guidelines for the Vulnerable Koala (Department of the Environment, 2014).

Direct observation involved spotlighting using 100 watt hand-held spotlights. The spotlighting undertaken involved walking at a slow pace conducting visual searches of undergrowth and canopy for foraging nocturnal mammals and stopping every 2 minutes, allowing the observer to hear fauna movement. Pre-recorded calls of the Koala were broadcast through a megaphone, within the centre of the study area, to project the sound for at least 1km under still night conditions. An initial listening period of 10 minutes was undertaken, followed by 5 minutes of calls (repeated in four different directions). A period of two minutes of quiet listening was then employed after each 5-minute bracket of calls. At the conclusion of the call playback survey, spotlighting was carried out in the vicinity of the call playback study area.

Indirect survey techniques involved searches for scratches on tree trunks and also searches for scats, this was undertaken concurrently with the significant tree inventory across the study area.

Survey Results

No Koalas were detected during the survey and no incidental observations of Koala presence was found. As such this candidate species credit species were not considered to occur within the study area.

Targeted Survey for Threatened Microchiropteran Bats

Survey Effort

A targeted microchiropteran bat (microbat) survey was completed on the night of 25 October 2018, for a combined total of approximately 2 hours. In addition a microbat bat detector was left out overnight on the 25 October 2018 within a likely flyway for threatened microbat species for an additional 8 hours.

All vegetation zones within the study area were considered to provide potential hunting habit for microchiropteran bats.

Surveys for microchiropteran bats involved using a handheld Anabat Bat echo-location device to survey for species specific hunting pulses created by microbats. Echolocation surveys used a combination of stationary and hand held mobile surveys. Mobile surveys within the study area targeted microhabitats of potentially increased bat activity including flyways, clearings and ecotones and were conducted over one night. Stationary call activated microchiropteran bat detection was undertaken from dusk to dawn for one night.

Survey Results

Three microchiropteran bat species were recorded and identified to the species level during the survey:

- *Miniopterus australis* (Little Bentwing Bat)
- *Chalinolobus gouldii* (Gould's wattled bat)
- *Chalinolobus morio* (Chocolate Wattled Bat)

In addition three bat species of *Mormopterus sp., Nyctophilus sp. and Vespadelus* sp. were recorded which could only be identified to the genus level. One species of threatened microbat, namely Little Bentwing Bat was generated by the BAM-CC as having potential to occur within the study area and would require offset credits if breeding habitat for this species was found to occur.

The breeding habitat constraint for the Little Bentwing Bats is identified as a Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding (OEH, 2018g). This category of habitat constraint was not found to be present within the study area. As such the occurrence of this species was not considered to trigger the requirement for species credit generation and was not assessed further within Step 5.

8.6 DETERMINE THE AREA OR COUNT, AND LOCATION OF SUITABLE HABITAT FOR A SPECIES CREDIT SPECIES (STEP 5)

The targeted survey window for one threatened orchid, Rough Doubletail, was not able to be captured during the survey period for the study area. As vegetation zones 1548_Low_Continous, 1548_Low_Isolated and 1548_Planted within the study could provide potential habitat for this species, this species was assumed present. A description of the ecology of this species, its defined habitat constraint and the approach used to estimate a species polygon for this species has been provided in Table 8.6 below. The species polygon for this species is mapped in Figure 8.3.

Job Ref	12360
A4 Scale	1:5,000

Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, no guarentee is given that the information protrayed is free from error or omission. In addition the spatial accuracy of the map is wholly dependant on source data. Please verify the accuracy of all information prior to use. Development footprint areas should be used for indicative areas only.

0 100 200 m

Map Projection GDA94 MGA Zone 56

Data Sources: LPI (2018),Tattersall Lander (2018)

Figure 8.2

Species Polygon Map

Viney Creek Road
Tea Gardens, NSW

30 October 2018

WILDTHING
Environmental Consultants
(a Division of Tattersall Lander Pty Ltd)
ABN 41 003 509 215

Table 8.6: Rough Doubletail Species Credit Species Polygon

Diuris praecox **(Rough Doubletail)** **BC Act - Vulnerable** **EPBC Act - Vulnerable**	
Habitat and Distribution	Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. Exists as subterranean tubers most of the year. It produces leaves and flowering stems in winter.
Biodiversity Concern/risk Weighting	Moderate Biodiversity Concern Risk weighting - 1.50
Method used to Confirm Presence	Assumed Presence
Number and location of individuals recorded	N/A
Defined Habitat Constraints	N/A
Species Polygon Unit of Measure	Area
SAII Entity	No
Approach used to define species polygon boundary	In accordance with Section 6.4.1.28 of the BAM the species polygon for fauna species, and flora species where the unit of measure is area, according to the TBDC, the species polygon is used to measure the area and location of suitable habitat. Although this species was only assumed present its habitat as defined within the TSBDC includes woodlands which would be inclusive of all vegetation zones containing an intact native canopy within the study area. Thus the species polygon for Rough Doubletail has been extended to include the entirety of Vegetation Zones: • 1548_Low_Continuous • 1548_Low_Isolated; and • 1548_Planted Which encompasses a total area of 1.64 ha.

8.7 DETERMINE THE HABITAT CONDITION WITHIN THE SPECIES POLYGON FOR SPECIES ASSESSED BY AREA (STEP 6)

In accordance with Section 6.4.1.35 of the BAM the following table details the habitat condition of each species polygon by using the vegetation integrity score for each vegetation zone that is within the species polygon (Table 8.7).

Table 8.7: Habitat Condition for Species Polygon

Species	Vegetation Zones within Species Polygon		
	1548_Low_Continuous (VI Score)	1548_Low_Isolated (VI Score)	1548_Planted (VI Score)
Diuris praecox (Rough Doubletail)	54.6	54.6	17.2

STAGE 2 - IMPACT ASSESSMENT

This Section identifies the potential impacts of the proposed development on the biodiversity values of the study area, methods of avoidance and minimisation of impacts and a revaluation of potential impacts when considering avoidance and minimisation strategies.

9.0 ACTIONS TO AVOID/MINIMISE PROJECT IMPACTS

The proposed development is associated with a residential subdivision of the study area, it is anticipated that direct impacts to biodiversity values within the study area will be primarily restricted to the vegetation removal required for the development of residential lots, construction of ancillary development components and civil works, as detailed within Section 1.2

The principal means to reduce impacts on biodiversity within the study area has been to avoid and minimise removal of native vegetation and fauna habitat and to avoid the direct loss of significant biodiversity values and threatened matters. The potential impacts resulting from the proposed development have broken down into two phases of activity: site selection and planning and construction. Measures taken to date to avoid and minimise impacts have been summarised and recommendations to assist the proponent to design a development that further avoids and minimises have been provided.

9.1 PLANNING AND DETAILED DESIGN

The proponent has considered biodiversity values present within the study area in the planning and detailed design stages of the development layout to avoid, where possible, direct impacts to identified biodiversity values. The current development layout has been selected, in part, to minimise impacts to significant biodiversity values, threatened matters and flora and fauna habitats present within the broader study area.

As detailed within Figure 2.1 the development layout has been primarily restricted to areas of low biodiversity value exotic pasture with some scattered remnant paddock trees, with the majority of intact native vegetation being retained for within the scope of the development.

The final layout and location of the proposed development has not been able to completely avoid all biodiversity values. Biodiversity values which cannot be avoided within the scope of the development have been detailed within Section 10.1.

No further recommendations of avoidance/minimisation were relevant to this phase of the development. Assessment of the residual impact from the layout has been assessed within Section 10.

9.2 CONSTRUCTION

Construction for the proposed development will require removal of native vegetation in support of the construction of residential building envelopes and ancillary development components within the study area including roads and drainage basins.

Table 9.1 defines recommendations for further avoidance and minimisation strategies during the construction phase have been detailed below . The residual impact predicted to occur after considering the avoidance and minimisation strategy below has been detailed within Section 10.

Table 9.1: Further avoidance and minimisation strategies for the construction phase

Nature of Potential Impact	Avoidance/minimisation Strategy Proposed	Timing	Responsibility
Clearing of native vegetation	Where possible, construction works should avoid any impact to mature trees. Where unavoidable, works should minimise impacts to mature trees as follows: • clearing limits will be clearly marked to prevent unnecessary clearing beyond the extent of the development footprint. Tree clearing and disturbance will be limited to the development site; • where a tree must be disturbed the priority should be given to pruning rather than clearing; and • the clearing of any trees should be undertaken in a manner that avoids damaging adjacent vegetation i.e. all trees should be felled into disturbed areas when feasible.	Prior to and during vegetation clearing	Construction site manager
Inadvertent impact to biodiversity values	Priority will be given during construction to avoid any inadvertent impact to significant biodiversity values within the study area. Avoidance measures should include the following: • all material stockpiles, vehicle parking and machinery storage will be located within cleared areas proposed for clearing, and not in areas of native vegetation that are to be retained; • establishment of wet down areas to reduce dust generation during construction; • implementation of temporary stormwater controls during construction and to ensure that discharges to the drainage channels are consistent with existing conditions; and • temporary erosion and sediment controls (e.g. silt fences, sediment traps) should be installed prior to construction to avoid disturbance and degradation of soils and nearby features (e.g. water ways, adjacent habitat and vegetation). These should conform to the specifications in Soils and Construction 'Blue Book' (Landcom, 2004) and should be maintained throughout the construction process until soil is successfully stabilised.	Prior to and during vegetation clearing	Construction site manager
Clearing of fauna habitat, resulting	A suitably qualified and experienced ecologist should be engaged to supervise removal of all significant habitat	Prior to and	Construction site manager

in fauna injury and/or mortality	features as displayed in Figure 8.1 and maintain a vegetation clearance register which should include the location, type, size of felled habitat trees and any contact with resident fauna. The supervising ecologist will work co-operatively with the plant operator to develop an adaptive clearance methodology that should minimise impacts to potential resident fauna whilst being conducted according to safe work methods. The adaptive clearance methodology should include the following key aspects: • seeking consultation with a suitably qualified ecologist to determine the best time to schedule clearance works to avoid nesting and breeding times for resident fauna; • preclearance surveys completed on the morning of any clearance works to determine if any nesting birds or canopy dwelling mammals are within the clearance footprint; • clearing utilising a 'soft felling' technique in which trees are 'nudged' by machinery and fauna given time to leave (overnight), before slowly felling the tree the following day; • if fauna are identified within the proposed clearing area prior to clearing, or after 'nudging' the tree, operations will cease until the fauna has moved to a safe location or has been relocated. If fauna flee into a habitat tree demarcated for removal this tree should be left to fell until the following day; • any captured displaced fauna relocated to the nearest area of appropriate habitat. If arboreal, the fauna to be placed inside an artificial nest box and relocated. If the displaced fauna is nocturnal relocation to occur during dusk; and • all hollow logs and felled trees would be inspected by the ecologist before relocation into areas of similar adjacent habitat All habitat tree felling activities and results to be summarised in a tree clearance report by the supervising ecologist, including fauna injuries. Any animals injured during construction should be taken immediately to the Tea Gardens Veterinary Hospital (Open 9am-5pm weekdays) for treatment. Any animals suspected to require rehabilitation would be delivered post-veterinary care to an appropriate animal rehabilitator associated with Wildlife in Need of Care (phone # 1300 946 295). All fauna sightings/captures would be recorded and uploaded to the NSW Wildlife Atlas.	during vegetation clearing	and suitably trained fauna handler
Salvage of significant habitat features	Habitat salvage within the development footprint should be undertaken prior to and during clearance activities, with the salvage methodology including the following key aspect:	Prior to and during	Construction site manager and suitably

	• Tree limbs containing natural hollows should be relocated and restored for use by fauna in the nearest adjacent area of similar habitat by a suitably qualified ecologist. Where natural hollows cannot be relocated, an artificial nest box should be installed onto a tree in the nearest adjacent area of similar habitat by a suitably qualified ecologist at a ratio of 2:1. Where removal of woody debris is required: • dead trees and woody debris that are removed (diameter >10 cm) are to be placed in the nearest adjacent area of similar habitat by a suitably qualified ecologist.	vegetation clearing	trained fauna handler
Protection of natural water flow	Where crossings over a stream or river is required, the crossings shall be designed and constructed in a way that maintains pre-development flows and is developed in accordance with relevant DPI guidelines: • Water and DPI (Fisheries) guidelines, Policy and Guidelines for Fish Friendly Waterway Crossings (DPI 2004); and • Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (Fairfull and Witheridge, 2003).	Prior to and during vegetation clearing	Construction site manager and suitably trained fauna handler
Minimise weed infestations	The following measures should be implemented to prevent exotic plant material from entering/exiting the study area: • no imported/exported material to be permitted unless it has been inspected and confirmed to be free of dirt and mud which may contain weed seeds and vegetative material such as bulbs, root fragment, tubers or rhizomes; and • vehicles and machinery to be clean of soils, vegetation and seeds that have been brushed off or washed down prior to entering the study area • A clean down register to be maintained at the entry of the study area	Prior to and during vegetation clearing	Site Manager

10.0 ASSESSMENT OF RESIDUAL IMPACTS

In accordance with Section 9 of the BAM this section provides assessment of the extent of the residual impacts unable to be feasibly avoided and an assessment of the likelihood of residual indirect impacts which may occur after considering the avoidance and minimisation strategies proposed within Section 9.

10.1 DIRECT RESIDUAL IMPACTS

The construction phase of the proposed development has the potential to directly impact biodiversity values. This would occur through impacts such as vegetation clearance and the loss of individual significant habitat trees. These impacts will be permanent and will occur from the outset of the development works. Mitigation measures outlined in Section 9 above will help to minimise the potential impacts to biodiversity values that remain present within the study area.

The direct impacts arising from the project include:

- the removal of 0.32 ha of Vegetation Zone 1548_Low_Continuous
- the removal of 0.64 ha of Vegetation Zone 1548_Derived
- the removal of 0.58 ha of Vegetation Zone 1548_Planted
- the removal of 0.74 ha of Vegetation Zone 1548_Low_Isolated
- the removal of 17 hollow-bearing trees within Vegetation Zone 1548_Low_Isolated
- the potential removal of an additional 5 hollow bearing trees within Vegetation Zone 1548_Low_Isolated which occur near to the limit of expected vegetation removal
- the removal of 19 paddock trees as detailed within Table 10.1.

Table 10.1: Paddock Trees within Development Footprint

Class of paddock tree requiring removal	No. of paddock trees containing Hollows	No. of paddock trees not containing hollows
Class 1	0	3
Class 2	3	8
Class 3	4	1

10.2 INDIRECT RESIDUAL IMPACTS

Indirect impacts occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities and threatened species habitat beyond the study area. Impacts may also result from changes to land-use patterns. Table 10.2 provides an assessment of the potential indirect residual impacts on the study area and adjacent vegetation in accordance with Section 9.1.4.2 of the BAM.

Table 10.2: Indirect Impact Assessment

Indirect Impact	Assessment/ Likelihood of Occurrence
Inadvertent impacts on adjacent habitat or vegetation	The proposed development has the potential to result in inadvertent impacts on adjacent retained habitat or vegetation. However, the mitigation measures described above will minimise the likelihood of occurrence of this indirect impact during the construction phase of the project.
Reduced viability of adjacent habitat due to edge effects	The proposed development will likely result in an increase in edge effects impacting upon retained vegetation patches as it will result in new environmental conditions to develop along the edges of cleared environments. It is considered that establishment of weeds and modification of habitat attributes (i.e. noise and water runoff) are the most likely tangible impacts that may arise from the proposal. Such conditions often result in the simplification of biodiversity values. The proposed development will increase edge effects to a small portion of the vegetation to be retained adjacent to the study area. The majority of the vegetation has been historically disturbed and as such edge effects have been an ongoing impact. Thus although the proposal may result in an incremental increase to edge effects in retained habitat it is unlikely to result in impacts over and above existing conditions.
Reduced viability of adjacent habitat due to noise, dust or light spill	The proposed development has the potential to result in impact to fauna habitat due to noise, dust and light spill from newly constructed residential dwellings.
Transport of weeds and pathogens from the site to adjacent vegetation	The proposed development has the potential to result in an increase of weed spread within the study area and adjacent vegetation. However, the mitigation measures described above will minimise the likelihood of occurrence of this indirect impact during the construction phase of the project.
Increased risk of starvation, exposure and loss of shade or shelter	This is unlikely to occur as the proposed development will not substantially modify vegetation within the study area or surrounding habitat such that a significant loss in foraging, hunting and shelter resources would occur.
Loss of breeding habitats	Twenty Eight hollow-bearing trees were recorded within the development footprint and nineteen could potentially require removal as a result of the proposed development. However, the mitigation measures described above will ensure that no net loss of hollows will result from the proposed development within retained vegetation patches.
Trampling of threatened flora species	No threatened flora species were recorded within the development footprint or adjacent vegetation during the targeted survey period.
Inhibition of nitrogen fixation and increased soil salinity	The proposed development will not result in the removal of a substantial area of native vegetation, there are also large patches of vegetation, both within and adjacent to the study area, that will not be impacted. As such it is not considered likely that nitrogen fixation or soil salinity will be impacted.
Fertiliser drift	The proposed development may result in increased fertiliser use within the study area from the occupants of newly constructed residential dwellings.
Rubbish dumping	The proposed development may result in increased rubbish dumping use within the study area from the occupants of newly constructed residential dwellings.
Wood collection	The proposed development may result in increased wood collection within the study area from the occupants of newly constructed residential dwellings

Bush rock removal and disturbance	The study area was not found to support significant areas of bush rock.
Increase in predatory species populations	The proposed development may result in an increase in predatory species populations within the study area arising from an increase in domestic pets i.e. cats and dogs.
Increase in pest animal populations	There is no proposed change to land use that will likely lead to an increase in pest animal populations.
Increased risk of fire	There is no proposed change to land use that will likely lead to an increased risk of fire.
Disturbance to specialist breeding and foraging habitat, e.g. Beach nesting for shorebirds	No specialist breeding habitat occurs within the study area.
Fragmentation of movement corridor.	The study area is already composed of relatively fragmented patches of vegetation. The proposed development is unlikely to result in further fragmentation of movement corridors for fauna.

10.3 PRESCRIBED IMPACTS

Prescribed impacts are the impacts on biodiversity values which are not related to, or are in addition to, native vegetation clearing and habitat loss (Section 6.7 of the BAM). In general, these types of impacts identify habitat or features of the environment that are irreplaceable. Assessment of prescribed biodiversity impacts are outlined and addressed in Table 10.3 below.

Table 10.3 Prescribed Impacts Assessment

Prescribed impact	Assessment / likelihood of occurrence
Impacts of development on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other features of geological significance.	No karst, caves, crevices, cliffs and other features of geological significance will be impacted by the proposed works.
Impacts of development on the habitat of threatened species or ecological communities associated with rocks.	No significant clusters of rocks were present within the study area.
Impacts of development on the habitat of threatened species or ecological communities associated with human made structures.	No human made structures likely to provide habitat for threatened species will be impacted by the proposed development.
Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation.	Non-native vegetation within the study area was composed primarily of introduced pasture grasses and exotic weeds. This vegetation type is well represented within the wider landscape and is unlikely to provide significant habitat resources for a specific resident population of threatened fauna or flora.
Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range.	As outlined in Table 10.1 the proposed development is unlikely to result in inducing vegetation fragmentation or impacting the connectivity of different areas of habitat.
Impacts of the development on movement of threatened species that maintains their life cycle	The movement of threatened species throughout the study area is not expected to be adversely affected given the recommendations of avoidance and minimisation of impacts within Section 9.
Impacts of development on water quality, water bodies and hydrological processes that sustain	No waterbodies or waterways present within the study area are likely to provide significant habitat for aquatic threatened species. Recommendations have

Prescribed impact	Assessment / likelihood of occurrence
threatened species and threatened ecological communities (including subsidence or upsidence resulting from underground mining or other development)	been made within Table 9.1 to ensure that pre-development flows will be maintained for any potential river crossings and to reduce the potential impacts to water quality arising during the construction phase.
Impacts of wind turbine strikes on protected animals	N/A
Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	Vehicle strikes on threatened species have the potential to occur from the increased amount of vehicle traffic which will arise within the study area.

10.4 SERIOUS AND IRREVERSIBLE IMPACTS (SAII)

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

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

No threatened matter consistent with a SAII candidate species identified as likely to occur or to contain significant habitat within the study area is likely to be impacted by the proposed development

10.5 ADAPTIVE MANAGEMENT STRATEGY

No adaptive management strategy is proposed for the development.

11.0 BIODIVERSITY CREDITS

This section outlines the thresholds for assessment and offsetting in accordance with Section 10 of the BAM.

11.1 IMPACTS ON VEGETATION ZONES NOT REQUIRING OFFSETS

A 0.64 ha area of derived vegetation associated with vegetation zone 1548_derived (Vegetation Integrity Score – 1.8) was present within the centre of the study area and will require complete removal during construction. As outlined in Section 10.3.1 of the BAM, offset credit value under the BOS is required to be determined for all impacts of development on vegetation zones that have a vegetation integrity score of:

- *≥15 where the PCT is representative of an endangered or critically endangered ecological community, or*
- *≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or*
- *≥20 where the PCT is not representative of a TEC or associated with threatened species habitat.*

Vegetation zone 1548_derived is not a TEC, however it could potentially provide habitat for threatened species. As such, with a vegetation integrity score of 1.8 (ie. ≤17), offsets are not required or impact to this vegetation zone.

11.2 IMPACTS REQUIRING OFFSETS UNDER THE BIODIVERSITY OFFSETS SCHEME

The following Sections provide a breakdown of the credit requirement for the proposed development in accordance with Section 10 of the BAM.

Ecosystem Credits

The PCTs and vegetation zones requiring offset credits and the ecosystem credits required are documented in Table 11.1. The paddock trees zones requiring offset credits and the ecosystem credits required are documented in Table 11.2.

Table 11.1 Ecosystem Credits Required for Impacts to Vegetation Zones

Vegetation Zone	Total Area Area Proposed for Removal	Current Vegetation Integrity Score	Change in Vegetation Integrity Score	Loss of Hollow Bearing Trees	Ecosystem Credits Required
1548- Tallowwood - Small-fruited Grey Gum - Kangaroo Grass grassy tall open forest on foothills of the lower North Coast					
1548_Low_Continuous	0.32	54.6	-54.6	0	7
1548_Low_Isolated	0.74	54.6	-54.6	22 (5 hollow bearing trees may be able to be retained within the scope of the proposed development)	0
1548_Planted	0.58	17.2	-17.2	0	4
1548_Derived	0.64	1.8	-1.8	0	15
			Total	22	**27**

Table 11.2 Ecosystem Credits Required for Impacts to Paddock Trees

Class of paddock tree requiring removal	No. of paddock trees proposed for removal	Total Ecosystem Credits Required
Class 1	3	0
Class 2	11	8
Class 3	5	8
	Total	**16**

Species credits

An offset is required for the threatened species assumed to be present within the study area. These species and the species credits required are documented in Table 11.3.

Table 11.3 Species credit species that require offsets

Species credit Species	Biodiversity Risk Weighting	Area of habitat or count of individuals lost	Species credits required
Diuris praecox (Rough Doubletail)	1.5	1.64 ha	26

A total of the offsets credits required to be retired, as generated by the BAM-CC, has been provided in Appendix F of this report.

11.3 OFFSETS REQUIRED UNDER THE EPBC ACT

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

12.0 CONCLUSION

Wildthing Environmental Consultants have prepared this BDAR on behalf of the proponent for a proposed subdivision in Tea Gardens, NSW. The purpose of this BDAR was to address the requirements of the BAM in particular detailing how the project will avoid and mitigate impacts to biodiversity values.

In this BDAR, biodiversity impacts have been assessed through:

- Comprehensive mapping and assessment of biodiversity values completed in accordance with the BAM,
- The identification of potential threatened species within the development site,
- Avoidance and mitigation measures which have been outlined to reduce the impacts to biodiversity; and
- The generation of 42 Ecosystem Credits within the study area for impacts to native vegetation and paddock trees
- The generation of 26 Species credits within the study area to allow for the assumption that Rough Doubletail is present within the study area

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

(a) retiring credits under the Biodiversity Offsets Scheme

(b) making payments into the Biodiversity Conservation Fund

(c) funding a biodiversity action

13.0 BIBLIOGRAPHY

- DoEE 2018c *Directory of Important Wetlands* (DIWA) Accessed on October 2018 via <http://www.environment.gov.au/water/wetlands/australian-wetlands-database>
- DECC (2009) *Threatened species survey and assessment guidelines: field survey methods for fauna – amphibians*. State of New South Wales and Office of Environment and Heritage. NSW Australia
- DoEE (2018a) *Commonwealth Protected Matters Search Tool* (PMST) Accessed on October 2018 via < http://www.environment.gov.au/epbc/pmst/>
- DoEE 2018b *Commonwealth species profiles and threats database* (SPRAT) Accessed on October 2018 via < http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>
- EcoLogical (2006) *A vegetation Map for the Mid North Coast of NSW* EcoLogical NSW, Australia
- Keith, D.A. (2004). '*Ocean Shore to desert dunes: the native vegetation of New South Wales and the ACT.*' NSW Department of Environment and Conservation, Sydney.
- Landcom (2004) *Soils and Construction 'Blue Book*. NSW Government. NSW, Australia
- Lunney et al (1998). *Determining the distribution of koala habitat across a Shire as a basis for conservation: a case study from Port Stephens, New South Wales*. Pacific Conservation Biology 4: 186-96
- Mid Coast Council (2010) *Greater Taree Local Environmental Plan - Land Zoning Map*. Mid Coast Council NSW, Australia
- Murphy, C. L. (1995). *Soil Landscapes of the Port Stephens 1:100 000 Sheet Map*. Department of Land and Water Conservation, Sydney.
- NSW Gov (2018) *Sharing and Enabling Environmental Data NSW Mapping* Accessed on October 2018 via < https://www.seed.nsw.gov.au/>
- NSW LPI (2018) *Spatial Information Exchange (SIX) Maps* Accessed on October 2018 via < https://maps.six.nsw.gov.au/>
- OEH (2004) *Threatened Biodiversity Survey and Assessment Guidelines. Guidelines for Developments and Activities* State of New South Wales and Office of Environment and Heritage. NSW Australia
- OEH (2016) *NSW Guide to Surveying Threatened Plants* State of New South Wales and Office of Environment and Heritage. NSW Australia
- OEH (2016a) *Sharing and Enabling Environmental Data NSW Mapping* - BioNet NSW (Mitchell) Landscapes – Version 3.1 Accessed on October 2018 via < https://www.seed.nsw.gov.au/>
- OEH (2016b) *NSW Interim Biogeographic Regions of Australia* (IBRA region and sub-regions) – Version 7 Accessed on October 2018 via < https://www.seed.nsw.gov.au/>
- OEH (2017) *Biodiversity Assessment Method (BAM)* State of New South Wales and Office of Environment and Heritage. NSW Australia
- OEH (2018c) *Profiles of threatened species, population, and ecological communities* Accessed on October 2018 via <http://www.environment.nsw.gov.au/threatenedspeciesapp/>
- OEH (2018d) OEH BioNet Threatened Biodiversity Data Collection (TBDC) Accessed on October 2018 via < http://www.bionet.nsw.gov.au/>
- OEH (2018f) Biodiversity Assessment Method Operational Manual – Stage 1. State of New South Wales and Office of Environment and Heritage. NSW Australia
- OEH (2018g) Biodiversity Assessment Method Credit Calculator (BAM-CC) Accessed on October 2018 via < http://plantnet.rbgsyd.nsw.gov.au/ >
- OEH 2018e Estuaries of NSW: Physical characteristics, tidal surveys and hydrographic surveys Accessed on October 2018 via < http://www.environment.nsw.gov.au/estuaries/list.htm >
- OEH *BioNet vegetation classification database* (OEH 2018e) Accessed on October 2018 via < http://www.environment.nsw.gov.au/research/Visclassification.htm>
- PlantNet NSW (2018) *The Royal Botanic Gardens and Domain Trust.* Accessed on October 2018 via < http://plantnet.rbgsyd.nsw.gov.au/ >

- Scotts (2003) *Key Habitats and Corridors for Forest Fauna A Landscape Framework for Conservation in North-east New South Wales*. NSW National Parks and Wildlife Service. Hurstville, N.S.W
- Tattersall Lander (2018) *North Shearwater Subdivision Proposed Residential Subdivision Plans.* Tattersall Lander Surveyors NSW, Australia
- Cartoscope (2018) *Geological sites of NSW* Accessed on October 2018 via < http://www.geomaps.com.au/ >
- Harden, G (1991-2000). *Flora of New South Wales. Vols 1-4.* NSW University Press.
- BoM (2018) *061054 Nelson Bay WWTP* Accessed on October 2018 via < http://www.bom.gov.au/climate/data/>
- OEH (2018a) *NSW Biodiversity Values Map* Accessed on October 2018 via < https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap>
- OEH 2018b *BioNet Atlas of NSW Wildlife* Accessed on October 2018 via < <http://www.bionet.nsw.gov.au/>
- DoEE (2013) *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance*
- DPI (2004) *Policy and Guidelines for Fish Friendly Waterway Crossings*. Department of Primary Industries. NSW, Australia
- Fairfull &Witheridge (2003) *Why Do Fish Need to Cross the Road*? Fish Passage Requirements for Waterway Crossings. NSW Fisheries. Cronulla, Australia

APPENDIX A
ASSESSMENT AGAINST BIODIVERSITY LEGISLATION

This appendix gives consideration to supporting biodiversity legislation relevant to the study area and the proposed development. The following legislative frameworks have been addressed in this Appendix:

- Environment Protection and Biodiversity Conservation Act 1999
- Coastal Management SEPP
- State and Environment Planning Policy (SEPP) 44 – Koala Habitat Protection
- Biosecurity Act 2015

A 1.0 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

An assessment of habitat attributes on site has been undertaken for the threatened species listed under the EPBC Act 1999 considered to have potential habitat within 10km of the study area according to the DoEE database search. An assessment of the impacts of the proposed development on Matters of National Environmental Significance, against heads of consideration outlined in Commonwealth of Australia (2013) was prepared to determine whether referral of the project to the Commonwealth Minister for the Environment is required. MNES relevant to the project are summarised in Table A1.

Table A1: MNES relevant to the study area

MNES	Project Specifics	Potential For Significant Impact
Threatened species	No nationally significant flora or fauna species were observed within the site. The study area was found to contain habitat of varying degrees for a number of nationally significant fauna with potential to occur. However the presence of the majority of these fauna within the site have been largely discounted resulting from targeted surveys conducted detailed within the body of this report. The most likely nationally listed species likely to occur within the study area was found to be the Koala. This species was not detected within the study area despite targeted surveys conducted. An assessment of the potential habitat value within the study area for this species has been conducted within Section A.1.1 of this Appendix in addition considerations have been given to State and Environment Planning Policy (SEPP) 44 – Koala Habitat Protection in Section A.2. A likelihood of occurrence assessment has been conducted on all species with potential to occur. The assessment has been based on the criteria outlined in Table A2 and the results of the assessment are displayed in Table A3. Given the relatively small impact resulting from the proposed development and the recommendations of avoidance, minimisation and offsetting provided in Stage 2 of this report it is considered unlikely that the proposed development would result in a significant impact for any nationally listed threatened species.	Significant impact unlikely to result from the proposed development.
Threatened Ecological Communities	A review of the most relevant mapping dataset for the study area (see Section 5.1) and the locality showed that no nationally listed threatened ecological communities were present within the study area, this was verified via detailed floristic and vegetation surveys conducted within the study area to inform the body of this report.	Significant impact unlikely to result from the proposed development.

MNES	Project Specifics	Potential For Significant Impact
Migratory species	One migratory species, *Gallinago hardwickii* (Latham's Snipe) was recorded within the study area during surveys. 30 other migratory bird species (excluding pelagic species given the lack of suitable habitat within the study area) have been recorded or are predicted to occur in the locality. The study area does not provide nationally important habitat for any of these species.	Significant impact unlikely to result from the proposed development.
World Heritage properties	The proposed development is not considered to affect any World Heritage properties.	Significant impact unlikely to result from the proposed development.
Wetlands of international importance (Ramsar)	The study area is within the Myall Lakes Ramsar site. There is no hydrological connection between the study area and the Myall Lakes Wetland, hence the proposal is unlikely to a significant impact on these wetlands.	Significant impact unlikely to result from the proposed development.
Nuclear activities	The proposal does not involve any type of nuclear activity.	Significant impact unlikely to result from the proposed development.
Commonwealth marine environment	The proposal does not involve the modification of the Commonwealth marine environment.	Significant impact unlikely to result from the proposed development.

On this basis, no significant impacts are predicted to result from the proposed development and referral of the Project to the Australian Government Minister for the Environment will not be required.

Table A2: Definitions of likelihood of occurrence criteria.

Likelihood of Occurrence	Threatened Fauna	Threatened Flora
Unlikely	Suitable habitat is absent from the study area and/or the study area is outside of the species known distribution	
Low	• The species has not been recorded in the locality (10km) within the last five years; and/or • Although suitable habitat is present in the study area the suitable habitat is in a highly modified, limited or degraded state; and/or • This species may be an occasional visitor, but habitat similar or of higher quality is widely distributed in the local area.	• The species has not been recorded in the locality (10km) within the last five years, and/or • Although suitable habitat is present in the study area the suitable habitat is in a highly modified or degraded state
Moderate	• The species has been recorded in the locality (10km) within the last five years; and/or • It is unlikely to be dependent on habitat within the study area (i.e. for breeding or important life cycle periods) or to maintain a permanent resident population. However, the species may seasonally, opportunistically or occasionally use resources within the study area; and/or • Although suitable habitat is present in the study area the suitable habitat is in a moderately modified, limited or degraded state This category includes fauna species that were targeted by seasonal surveys and were not recorded, wide ranging species which may fly-over' the site, regardless of the habitat types present and generalist species with non-specific habitat requirements	• The species has been recorded in the locality (10km) within the last five years; and/or. • Although potential habitat is present in the study area the suitable habitat is in a moderately modified or degraded state. This category includes flora species that were targeted by seasonal surveys and were not recorded.
High	• The species has been recorded in the locality (10km) within the last five years; and/or • It is highly likely that the species inhabits the study area and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods) and is likely to maintain a resident population. This includes species that are known to visit the study area during regular seasonal movements or migration.	• The species has been recorded in the locality (10km) within the last five years; and/or • It is highly likely to inhabit the study area and is dependent on identified suitable habitat.
Known	The species was observed in the study area during the current survey and/or was recorded during a survey conducted on the site during the last 5 years.	

Table A3: Habitat Assessment for Threatened Species under the EPBC Act 1999.

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELIHOOD OF OCCURRENCE ON SITE
Plants			
Cryptostylis hunteriana Leafless Tongue Orchid	BC Act – V EPBC Act – V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*) often in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*).	**Low**
Diuris praecox Rough Doubletail	BC Act – V EPBC Act – V	Found in eucalypt forests on hilltops or slopes, and is widespread in grassy habitats.	**Low**
Phaius australis Lesser Swamp Orchid	BC Act-E1 EPBC Act-E	Swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas. Occurs in Queensland and north-east NSW as far south as Coffs Harbour. Historically, it extended farther south, to Port Macquarie.	**Unlikely**
Tetratheca juncea Black-eyed Susan	BC Act - V EPBC Act – V	Heath and Dry Sclerophyll Forests on low nutrient soil with a dense understorey of grasses. Is most commonly found associated with species including *Angophora costata* (Smooth-barked Apple), *Eucalyptus globoidea* (White Stringybark), *Corymbia gummifera* (Red Bloodwood) and *Acacia myrtifolia* (Myrtle Wattle).	**Unlikely**
Prostanthera densa Villous Mintbush	BC Act - V EPBC Act – V	This species is known to occur on clay soils on volcanic hills and on sandy soils occurring as a shallow mantle over volcanic hills. It has been reported generally from sclerophyll forest and shrubland on coastal headlands and near-coastal ranges, chiefly on sandstone.	**Low**
Angophora inopina Charmhaven Apple	BC Act – V EPBC Act – V	Found in shallow sandy soils within open woodland/forest assemblages in co-dominant distribution with *Eucalyptus haemastoma* (Scribbly Gum), *Corymbia gummifera* (Red Bloodwood) and *Eucalyptus capitellata* (Brown Stringybark), as well as within wet-dry heath, and swamp forest communities. The main occurrences of this species are in the Wyong and Lake Macquarie LGA. Disjunct populations have also been found south of Karuah in the Port Stephens LGA and north of Karuah in the Great Lakes LGA.	**Low**
Eucalyptus parramattensis subsp. *decadens* Drooping Red Gum	BC Act - V EPBC Act – V	Occurs in woodland on sandy soils in wet sites. In the Port Stephens area, the Drooping Red Gum occurs in open wet sclerophyll woodland on heavy, often waterlogged, inter-barrier depression soils.	**Low**.
Melaleuca biconvexa Biconvex Paperbark	BC Act-V EPBC Act-V	May occur in dense stands adjacent to watercourses, in association with other *Melaleuca* species or as an understorey species in wet forest.	
Syzygium paniculatum Magenta Lilly Pilly	BC Act – E1 EPBC Act – V	Occurs in a narrow coastal distribution in rainforests on sandy soils or stabilised coastal dunes from Jervis Bay to Bulahdelah in NSW.	**Unlikely**
Grevillea parviflora subsp. *parviflora* Small Flower Grevillea	BC Act – V EPBC Act – V	Grows in sandy or light clay soils usually over thin shales. Occurs in a range of vegetation types from heath and shrubby woodland to open forest and is found over a range of altitudes	**Low-Moderate**

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELIHOOD OF OCCURRENCE ON SITE
		from flat, low-lying areas to upper slopes and ridge crests. Common canopy species vary greatly with community type but generally are species that favour soils with a strong lateritic influence including *Eucalyptus fibrosa, E. parramattensis, Angophora bakeri* and *Eucalyptus sclerophylla.*	
Asperula asthenes Trailing Woodruff	BC Act - V	Damp Sites, often along riverbanks (DEC, 2006). The major portion of the distribution of this species occurs in the Great Lakes LGA. Populations are known from North Karuah and The Branch areas (Great Lakes Council, 2003).	**Low-Moderate**
Thesium australe Austral Toadflax	BC Act-V EPBC Act-V	Found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Occurs in grassland or grassy woodland often found in damp sites in association with Kangaroo Grass (*Themeda australis*).	**Low**
Frogs			
Litoria aurea Green and Golden Bell Frog	BC Act-E1 EPBC Act-V	This frog species inhabits swamps, lagoons, streams and ponds as well as dams, drains and storm water basins.	**Unlikely**
Mixophyes balbus Stuttering Frog	BC Act-E1 EPBC Act-V	Occurs in wet forest regions of south-eastern Queensland, Eastern NSW and Victoria. In late spring, eggs are deposited among leaf litter on the banks of streams and subsequently are washed into the water during heavy rain.	**Unlikely**
Birds			
Apus pacificus Fork-tailed Swift	EPBC Act – M	Inhabits the airspace over open country from semi deserts to coasts.	**Moderate**
Actitis hypoleucos Common Sandpiper	EPBC Act - M	Shallow pebbly, muddy or sandy edges of rivers and streams, coastal and inland; dams, lakes, sewage ponds, margins of tidal rivers, waterways in mangroves or saltmarsh; mudflats; rocky or sandy beaches.	**Unlikely**
Arenaria interpres Ruddy Turnstone	EPBC Act – M	Tidal reefs and pools; weed-covered rocks; pebbly, shelly and sandy shores with stranded seaweed; mudflats; occasionally inland shallow waters; sewage ponds and open or ploughed ground.	**Unlikely**
Calidris canutus Red Knot	EPBC Act – E, M	Tidal mudflats, sandflats, beaches, saltmarshes, flooded pastures, ploughed lands.	**Unlikely**
Calidris ferruginea Curlew Sandpiper	EPBC Act – CE, M	Tidal mudflats; saltmarsh; fresh, brackish or saline wetlands; sewage ponds.	**Unlikely**
Calidris melanotos Pectoral Sandpiper	EPBC Act – M	Prefers shallow fresh to saline wetlands. Usually found in coastal or near coastal habitat but occasionally found further inland, preferring wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire.	**Unlikely**
Calidris ruficollis Red-necked Stint	EPBC Act - M	Tidal mudflats; saltmarsh; fresh, brackish or saline wetlands; sewage ponds.	**Unlikely**

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELIHOOD OF OCCURRENCE ON SITE
Calidris tenuirostris Great Knot	EPBC Act – CE, M	Inhabits beaches, coastal mudflats, bay shores, estuarine environments; sometimes freshwater wetlands.	**Unlikely**
Charadrius bicinctus Double-banded Plover	EPBC Act -M	Wide beaches, tidal mudflats, saltmarsh, sparsely vegetated margins of shallow saline and freshwater.	**Unlikely**
Charadrius mongolus Lesser Sand Plover	EPBC Act – E, M	Inhabits sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats.	**Unlikely**
Gallinago hardwickii Latham's Snipe	EPBC Act – M	Utilises a variety of habitats, such as soft wet ground or shallow water with tussock and other green and dead vegetation, and scrub or open wetland from sea-level to alpine bogs.	**Known**
Gallinago megala Swinhoe's Snipe	EPBC Act - M	Wetlands, such as wet paddy fields, swamps and freshwater streams.	**Moderate**
Gallinago stenura Pin-tailed Snipe	EPBC Act – M	The species distribution within Australia is not well understood. There are confirmed records from NSW, south-west Western Australia, Pilbara and the Top End.	**Moderate**
Limosa lapponica Bar-tailed Godwit	EPBC Act – M	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas.	**Unlikely**
Limosa limosa Black-tailed Godwit	EPBC Act – M	Habitat utilised by this species includes tidal mudflats, river edges, sandy beaches, brackish swamps as well as the shallows of lakes, reservoirs and sewage farms.	**Unlikely**
Numenius madagascariensis Eastern Curlew	EPBC Act – CE, M	Within Australia, the Eastern Curlew has a primarily coastal distribution. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass.	**Unlikely**
Numenius minutus Little Curlew	EPBC Act – M	Dry grasslands, floodplains, margins of drying swamps; tidal mudflats, crops and sewage ponds.	**Low-Moderate**
Numenius phaeopus Whimbrel	EPBC Act – M	Estuaries, tidal flats, coral cays, exposed reefs, flooded paddocks, sewage ponds and lawns.	**Unlikely**
Pandion haliaetus Osprey	EPBC Act – M	Open and swamp forest adjacent to the coast or estuaries, fishing mainly in brackish or salt water. This species is known to inhabit the Port Stephens area.	**Low-Moderate**
Pluvialis fulva Pacific Golden Plover	EPBC - M	Estuaries, tidal mudflats, saltmarshes, mangroves; rocky reefs, margins of shallow open inland swamps, sewage ponds.	**Unlikely**
Pluvialis squatarola Grey Plover	EPBC Act -M	Mudflats, saltmarsh, tidal reefs and estuaries.	**Unlikely**

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELIHOOD OF OCCURRENCE ON SITE
Tringa brevipes Grey-tailed Tattler	EPBC Act – M	Estuaries, tidal mudflats, mangroves, wave-washed rocks, and reefs; shallow river margins, coastal and inland.	**Unlikely**
Tringa nebularia Common Greenshank	EPBC Act – M	Inhabits a wide variety of inland permanent and temporary wetlands and sheltered coastal habitats of varying salinity.	**Unlikely**
Tringa stagnatilis Marsh Sandpiper	EPBC Act – M	Salt; fresh, brackish or saline wetlands; sewage ponds, mangroves, tidal flats and estuaries.	**Unlikely**
Xenus cinereus Terek Sandpiper	EPBC Act – M	Tidal Mudflats, estuaries, shores, reefs and coastal swamps.	**Unlikely**
Rostratula australis Australian Painted-snipe	BC Act-E EPBC Act-V & M	Margins of swamps and streams, chiefly those covered with low and stunted vegetation.	**Low**
Hirundapus caudacutus White-throated Needletail	EPBC Act – M	Inhabits the airspace above forests, woodlands, farmlands, plains, lakes, coasts and towns. Breeds within Siberia, Himalayas and east. to Japan and is a regular summer migrant to eastern Australia arriving from mid October and departing by mid April.	**Moderate**
Botaurus poiciloptilus Australasian Bittern	BC Act-E EPBC Act-E	Favours permanent fresh-waters dominated by sedges, rushes, reeds or cutting grasses (eg. Phragmites, Scirpus, Eleocharis, Juncus, Typha, Baumea and Gahnia).	**Low**
Dasyornis brachypterus Eastern Bristlebird	BC Act-E EPBC Act-E	Habitat is characterised by dense, low vegetation including heath and open woodland with a heathy understorey; in northern NSW occurs in open forest with tussocky grass understorey.	
Cuculus optatus Oriental Cuckoo	EPBC Act - M	Inhabits a range of forests, typically feeding on insects and larvae.	Moderate
Monarcha melanopsis Black-faced Monarch	EPBC Act-M	Utilises a range of habitats including rainforests, eucalypt woodlands, coastal scrubs (Pizzey & Knight, 2001).	Moderate
Monarcha trivirgatus Spectacled Monarch	EPBC Act-M	Wet forests, thickly wooded gullies, waterside vegetation and mangroves.	Moderate
Myiagra cyanoleuca Satin Flycatcher	EPBC Act – M	Heavily vegetated gullies in forests and taller woodlands. During migration this species also utilises coastal forests, woodlands, mangroves, remnant trees in paddocks and gardens.	Moderate
Rhipidura rufifrons Rufous Fantail	EPBC Act-M	Utilises a range of habitats including rainforests, wet sclerophyll forests, monsoon forests, scrubs, mangroves, watercourses, parks and gardens. During migration this species also utilises farms, street trees and buildings (Pizzey & Knight, 2001).	Moderate
Lathamus discolor Swift Parrot	BC Act – E1 EPBC Act – CE	Open Forest to Woodland, also street trees and in parks and gardens, winter flowering eucalypts for feeding. This species nests in Tasmania during the summer months.	**Low**
Anthochaera phrygia Regent Honeyeater	BC Act-CE EPBC Act- CE	Temperate woodlands and open forest, including forest edges, preferring to forage on large-flowered Eucalypts.	**Low**
Grantiella picta Painted Honeyeater	BC Act - V EPBC Act - V	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. Diet typically consists of mistletoes growing on woodland acacias and eucalypts. Nests from spring to autumn in nests built on outer drooping branches of eucalypts,	**Unlikely**

SPECIES	STATUS	HABITAT DESCRIPTION AND LOCALLY KNOWN POPULATIONS	LIKELIHOOD OF OCCURRENCE ON SITE
Erythrotriorchis radiates Red Goshawk	BC Act-E4A EPBC Act - V	In NSW, preferred habitats include mixed subtropical rainforest, *Melaleuca* swamp forest and riparian *Eucalyptus* forest of coastal rivers.	**Unlikely**
Mammals			
Dasyurus maculatus ssp. *maculatus* Tiger Quoll	BC Act – V EPBC Act – E	Inhabits sclerophyll forests, rainforests and coastal woodlands. Nests are made in rock caves and hollow logs or trees, and basking sites are usually found nearby.	**Low**
Phascolarctos cinereus Koala	BC Act – V EPBC Act – V	Coastal woodland and open forest containing suitable food trees.	**High**
Petauroides volans Greater Glider	EPBC Act - V	The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria. The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands.	**Unlikely**
Petrogale penicillata Brush-tailed Rock-wallaby	BC Act – E EPBC Act – E	Found in steep rocky sites in sclerophyll forests with a grassy understorey.	**Unlikely**
Potorous tridactylus tridactylus Long-nosed Potoroo	BC Act-V EPBC Act – V	This species is known from a variety of habitats, including Rainforest, Open Forests and Woodlands with dense groundcover, and dense, wet coastal heathlands. Soft (often sandy) substrates are preferred by this species.	**Unlikely**
Pseudomys novaehollandiae New Holland Mouse	EPBC Act – E	Known to inhabit open heathlands, open woodlands with a heathland understorey and vegetated sand dunes.	**Low**
Pteropus poliocephalus Grey-headed Flying-Fox	BC Act – V EPBC Act – V	Wet and Dry Sclerophyll Forests, Rainforest, Mangroves and Paperbark swamps and Banksia Woodlands.	**Moderate**
Chalinolobus dwyeri Large-eared Pied Bat	BC Act – V EPBC Act – V	Occupies dry sclerophyll forest and woodland. Roosts in caves, abandoned mud-nests of Fairy Martins and mine tunnels.	**Moderate**
*Due to the absence of suitable habitat within the study area all marine mammals, sharks, turtles, pelagic birds identified on the database have not been addressed in this report.			

A 1.1 KOALA HABITAT ASSESSMENT

The habitat assessment tool categorises five primary koala habitat attributes: Koala occurrence, vegetation composition, habitat connectivity, existing threats and recovery value. Each habitat attribute is scored between zero and two and the scores are added together to give a total out of 10, providing an indication of the overall value of habitat in the impact area. Impact areas that score five or more using the habitat assessment tool for the Koala contain habitat critical to the survival of the Koala. Impact areas that score four or less do not contain habitat critical to the survival of the Koala. The context of the assessment for the purpose of this report is Coastal. The Koala habitat assessment tool has been completed for the site in Table A4 below:

Table A4: Koala habitat assessment tool.

Attribute	Score	Habitat Appraisal	
Koala occurrence	**+1 (Medium)**	Desktop	The BioNet Atlas of NSW Wildlife (OEH, 2018) search showed no records from within the site itself, however there was a Koala recorded 100m north of the study area in September 2016 (just outside of the two year threshold). Three other records from 2013, 2010 and 2010 are present to the south and southwest of the site within 5km, however no other records are present within the vicinity of the site within the past 10 years.
		On-ground	No direct sightings or secondary evidence (Such as scats at the base and scratches on trunks of trees on site) consistent with Koala activity were recorded in the proposed development area.
Vegetation structure and composition	**+2 (High)**	Desktop	Vegetation mapping for the area defined remnant vegetation within the study area as containing foothills spotted gum complex. This was not found to be consistent with the vegetation present on site after mapping was ground thruthed.
		On-ground	On-ground Koala Feed Tree surveys found that the food tree *Eucalyptus microcorys* (Tallowood) was the co-dominant canopy species in localised patches of vegetation present within the study area. Planted specimens of *Eucalyptus robusta* were present in the north of the study area adjacent to Viney Creek Road.
Habitat connectivity	**0**	Vegetation within the study area was largely isolated patches that will be retained within the scope of the development. Vegetation fringing the south of the study area was located within backyards. Although vegetation to the immediate south and east of the study area is considered to be a contiguous landscape of > 500ha, vegetation within the study area was isolated from this landscape. Vegetation within the south of the study area was part of a larger fragmented landscape that also does not constitute >300ha due to the presence of Tea Gardens township, Tea Gardens Road and Kore Kore Creek.	

Attribute	Score	Habitat Appraisal
Key Existing Threats	**+1 (Medium)**	Although little evidence of recent dog- or vehicle-related Koala mortality exists in the immediate vicinity of the study area, the presence of illuminated signs warning about Koala presence, notably along Myall Way indicates irregular vehicle-related mortality in the area. The presence of domestic dogs was also noted within the backyards of properties adjoining the southern boundary of the study area.
Recovery Value	**+1 (Medium)**	Given the nature of the isolated patches of vegetation within the study area and the highly fragmented native vegetation within Tea Gardens itself it is unclear how much impact upon the already constrained potential for Koala movement on and around the site would apply as a result of the proposed development.
Total	**5**	**Decision: Although a score of 5 was given, the proposal will result in the clearing of <2 ha of vegetation containing Koala Feed Trees. Therefore referral not recommended.**

A 1.2 SECTION 7

As per the results of Table A4 within this report, assessment under this section is not required.

A 1.3 SECTION 8

As per the results of Table A4 within this report, assessment under this section is not required.

A 1.4 SECTION 9

The likelihood of the proposed action having a significant impact on the koala will come down two key considerations outlined in the referral guidelines:

• *Adversely affecting habitat critical to the survival of the koala (Section 7) AND/OR*

DECISION: As determined by the Koala habitat assessment tool, assessment of the proposal under Section 7 was not required – Referral Not Recommended.

• *Interfering substantially with the recovery of the koala through the introduction or exacerbation of key threats in areas of habitat critical to the survival of the koala (section 8).*

DECISION: As determined by the Koala habitat assessment tool, assessment of the proposal under Section 7 was not required – Referral Not Recommended.

Hence referral is not recommended for adversely affecting habitat critical to the survival of the Koala.

A.2 CONSIDERATIONS UNDER STATE ENVIRONMENT PLANNING POLICY 44 – 'KOALA HABITAT PROTECTION'

The principal aim of State Environment Planning Policy (SEPP) 44 - Koala Habitat Protection is to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and to reverse the current trend of Koala population decline.

This policy applies to areas of more than one hectare or an area which has, together with any adjoining land in the same ownership, an area of more than 1 hectare, whether or not the development application applies to the whole or only part of the land. In addressing SEPP44 there are two questions to be considered, regarding the occurrence of 'Potential' and 'Core' Koala Habitat on site.

6.1 FIRST CONSIDERATION - IS THE LAND 'POTENTIAL KOALA HABITAT'?

'Potential Koala Habitat' is defined in SEPP44 as "...an area of native vegetation where trees of the type listed in Schedule 2 (Koala feed tree species) constitute at least 15% of the total number of trees in the upper or lower strata of the tree component".

Eucalyptus microcorys (Tallowwood) was a codominant canopy species within the vegetation patches present within the study area. Planted specimens of *Eucalyptus robusta* (Swamp Mahogany) were also planted within the north of the site. Both species are designated Koala feed trees and were found to exceed the 15% requirement of Koala feed tree species within the study area. Subsequently, the vegetation on site represents 'Potential Koala Habitat' and therefore the second question is considered.

8.2 SECOND CONSIDERATION – IS THE LAND CORE KOALA HABITAT?

Core Koala Habitat is defined in SEPP 44 as "… 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 and historical records of a Koala population.

No koalas were identified during site surveys nor was there any recent evidence such as scats and scratches to suggest recent use of the site by Koalas. The BioNet Atlas of NSW Wildlife (OEH, 2018) search showed no records from within the study area itself, however there was a Koala recorded 100m north of the study area in September 2016. Three other records from 2013, 2010 and 2010 were present to the south and southwest of the site within 5km, however no other records are present within the vicinity of the study area within the past 10 years. Given that no individual koalas or breeding females (female koala with young) were observed within the study area there is insufficient evidence to suggest that the site supports a resident population. Hence the study area is not considered to constitute Core Koala Habitat. Koalas are more likely to utilise site for foraging and movement as part of a larger home range. .

In accordance with Section 9.2 of the report trees are to be visually scanned by a suitably qualified ecologist for the presence of koalas just prior to their removal and during the removal process. If a koala is observed then removal should cease until the koala has left the clearance zone on its own accord. Provided the recommendations are adhered to, it is unlikely that the proposal will result in a significant impact on the Koala that would disrupt the life cycle of the Koala such that local extinction would occur.

A.3 COASTAL MANAGEMENT SEPP

A key aim of the Coastal Management SEPP (CM SEPP) is to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the Coastal Management Act 2016, including the management objectives for each coastal management area, by:

- managing development in the coastal zone and protecting the environmental assets of the coast, and
- establishing a framework for land use planning to guide decision-making in the coastal zone, and
- mapping the 4 coastal management areas that comprise the NSW coastal zone for the purpose of the definitions in the Coastal Management Act 2016.

The Coastal Management SEPP identifies four coastal management areas that comprise the coastal zone. These are:

- the coastal wetlands and littoral rainforests area,
- the coastal vulnerability area,
- the coastal environment area, and
- the coastal use area.

The CM SEPP imposes targeted development controls for these areas to guide appropriate development within the coastal zone.

Approximately 500m^2 of the south east corner of the site is located within a mapped area of "Coastal Environment Area", therefore the development controls for this area, as listed within Division 4 of the CM SEPP have been addressed below.

(1) Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following:

- *the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,*
- *coastal environmental values and natural coastal processes,*
- *the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,*
- *marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,*
- *existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,*

- *Aboriginal cultural heritage, practices and places; and*
- *the use of the surf zone.*

The potential impacts of the proposed development are primarily restricted to the removal of approximately 2.28 ha of coastal vegetation and associated biodiversity values. Methods of avoidance, minimisation and compensatory offsetting have been detailed within this report. Given the mitigation methods detailed within this report, impacts to coastal vegetation and associated biodiversity values are expected to be of an incremental nature.

A.4 BIOSECURITY ACT 2015

The Biosecurity Act was enacted to provide for the identification, classification and control of Priority Weeds with the purpose of determining if a biosecurity risk is likely to occur, i.e.:

- The introduction, presence, spread or increase of a pest into or within the State or any part of the State.
- A pest plant has the potential to; harm or reduce biodiversity or out-compete other organisms for resources, including food, water, nutrients, habitat and sunlight.

Four Priority Weeds for NSW North Coast which includes the North Coast Council LGA that have been recorded in the study area are listed in Table A.4 along with their associated Duty.

Table A.4: Priority Weed species found within the study area.

Weed Species	Biosecurity Duty	Additional Significance
Senecio madagascariensis (Fireweed)	• General Biosecurity Duty • Prohibition on dealings	N
Conyza species (Fleabane)	• General Biosecurity Duty • Prohibition on dealings	
Chrysanthemoides monilifera subsp. Rotundata (Bitou bush)	• General Biosecurity Duty • Prohibition on dealings • **Biosecurity Zone** Within the Biosecurity Zone (all of NSW) this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone	T N
Lantana camara (Lantana)	• General Biosecurity Duty • Prohibition on dealings	T N

T – Listed as a Threatening Process under the NSW BC Act 2016.
N –Weed of National Significance.
***Priorities under the Biosecurity Act 2015**
General Biosecurity Duty - any person dealing with plant matter must take measures to prevent, minimise or eliminate the biosecurity risk (as far as is reasonably practicable).
Prohibition on dealings - Must not be imported into the State or sold

APPENDIX B
NATIONAL PROTECTED MATTERS SEARCH RESULTS

Australian Government
Department of the Environment and Energy

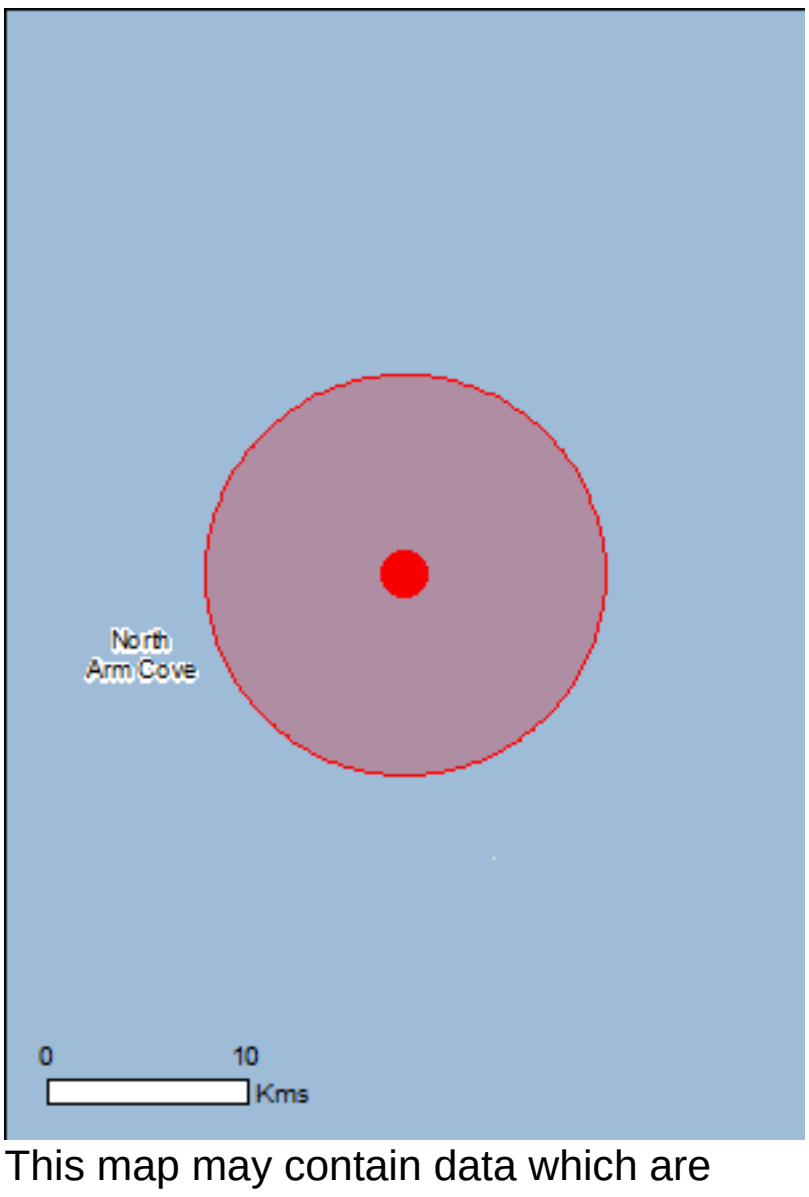
EPBC Act Protected Matters Report

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

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

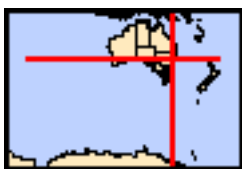
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 29/10/18 09:26:53



Coordinates

Buffer: 10.0Km



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:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	69
Listed Migratory Species:	73

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:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	98
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	5
Regional Forest Agreements:	1
Invasive Species:	42
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Myall lakes	Within Ramsar site

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion	Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour 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 likely to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
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 likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Breeding known to occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to 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	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
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 known to occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		
Angophora inopina		
Charmhaven Apple [64832]	Vulnerable	Species or species habitat known to occur within area
Asperula asthenes		
Trailing Woodruff [14004]	Vulnerable	Species or species habitat may occur within area
Cryptostylis hunteriana		
Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat known to occur within area
Cynanchum elegans		
White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Diuris praecox		
Newcastle Doubletail [55086]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus parramattensis subsp. decadens		
Earp's Gum, Earp's Dirty Gum [56148]	Vulnerable	Species or species habitat known to occur within area
Grevillea parviflora subsp. parviflora		
Small-flower Grevillea [64910]	Vulnerable	Species or species habitat may occur within area
Melaleuca biconvexa		
Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area
Phaius australis		
Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Prostanthera densa		
Villous Mintbush [12233]	Vulnerable	Species or species habitat likely to occur within area
Syzygium paniculatum		
Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area
Tetratheca juncea		
Black-eyed Susan [21407]	Vulnerable	Species or species habitat known to occur within area
Thesium australe		
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known

Name	Status	Type of Presence
		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
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea Sooty Shearwater [82651]		Breeding known to occur within area
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Ardenna tenuirostris Short-tailed Shearwater [82652]		Breeding known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Diomedea sanfordi		
Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat 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
Phoebetria fusca		
Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons		
Little Tern [82849]		Breeding likely to occur within area
Thalassarche bulleri		
Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta		
Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita		
Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis		
Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caperea marginata		
Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area

Name	Threatened	Type of Presence
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Breeding known to occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Dugong dugon		
Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lamna nasus		
Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi		
Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris		
Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca		
Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis		
Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus		
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		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

Name	Threatened	Type of Presence
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat likely 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]		Foraging, feeding or related behaviour known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Foraging, feeding or related behaviour 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 likely to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis		
Red-necked Stint [860]		Foraging, feeding or related behaviour known to occur within area
Calidris tenuirostris		
Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area
Charadrius bicinctus		
Double-banded Plover [895]		Foraging, feeding or related behaviour known to occur within area
Charadrius mongolus		
Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may occur within area
Gallinago megala		
Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
Gallinago stenura		
Pin-tailed Snipe [841]		Foraging, feeding or related behaviour 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]		Foraging, feeding or related behaviour known to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Numenius minutus		
Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
Numenius phaeopus		
Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area
Pandion haliaetus		
Osprey [952]		Breeding known to occur within area
Pluvialis fulva		
Pacific Golden Plover [25545]		Foraging, feeding or related behaviour known to occur within area
Pluvialis squatarola		
Grey Plover [865]		Foraging, feeding or related behaviour known to occur within area
Tringa brevipes		
Grey-tailed Tattler [851]		Foraging, feeding or related behaviour known 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]		Foraging, feeding or related behaviour known to occur within area
Xenus cinereus		
Terek Sandpiper [59300]		Foraging, feeding or related behaviour known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land - Australian Telecommunications Commission

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Arenaria interpres Ruddy Turnstone [872]		Foraging, feeding or related behaviour known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Foraging, feeding or related behaviour 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 likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Foraging, feeding or related behaviour known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Foraging, feeding or related behaviour known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Foraging, feeding or related behaviour known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area

Name	Threatened	Type of Presence
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]		Foraging, feeding or related behaviour may occur within area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour 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]		Foraging, feeding or related behaviour known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Foraging, feeding or related behaviour known to occur within area
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 known 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]		Foraging, feeding or related behaviour 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

Name	Threatened	Type of Presence
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]		Foraging, feeding or related behaviour likely to occur within area
Numenius phaeopus Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Foraging, feeding or related behaviour known to occur within area
Pluvialis squatarola Grey Plover [865]		Foraging, feeding or related behaviour known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Breeding known to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Puffinus tenuirostris Short-tailed Shearwater [1029]		Breeding known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Foraging, feeding or related behaviour known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna albifrons Little Tern [813]		Breeding likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed	Vulnerable	Species or species

Name	Threatened	Type of Presence
Albatross [64459]		habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Foraging, feeding or related behaviour known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Foraging, feeding or related behaviour known to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat known to occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
[Phyllopteryx taeniolatus](#) Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
[Solegnathus spinosissimus](#) Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
[Solenostomus cyanopterus](#) Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
[Solenostomus paradoxus](#) Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
[Stigmatopora argus](#) Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
[Stigmatopora nigra](#) Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
[Syngnathoides biaculeatus](#) Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
[Trachyrhamphus bicoarctatus](#) Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
[Urocampus carinirostris](#) Hairy Pipefish [66282]		Species or species habitat may occur within area
[Vanacampus margaritifer](#) Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
[Arctocephalus forsteri](#) Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
[Arctocephalus pusillus](#) Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
[Dugong dugon](#) Dugong [28]		Species or species habitat may occur within area
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

Name	Threatened	Type of Presence
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Pelamis platurus		
Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caperea marginata		
Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Delphinus delphis		
Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Grampus griseus		
Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca		
Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis		
Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Stenella attenuata		
Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus		
Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str.		
Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Corrie Island	NSW
John Gould	NSW
LNE Special Management Zone No1	NSW
Myall Lakes	NSW
Tomaree	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		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
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		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
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		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		Species or species

Name	Status	Type of Presence
Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Port Stephens Estuary	NSW

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-32.63303 152.15926

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 C

TOTAL FLORA LIST

Introduced species are indicated by an asterisk ("*").

The following standard abbreviations are used to indicate subspecific taxa:

subsp.	subspecies
var.-	variety
× -	hybrid between the two indicated species

Threatened Species - NSW Biodiversity Conservation Act 2016 (BC Act)

V	Vulnerable
E1	ENDANGERED
E2	Endangered Population
E4A	Critically Endangered Population

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

V	Vulnerable
E	ENDANGERED
CE	Critically Endangered

ROTAP (Rare or Threatened Australian Plants)

Distribution

1. – Known from only one collection
2. – Geographic range in Australia less than 100km
3. – Geographic range in Australia greater than 100km.
+ - Also occurs overseas.

Conservation Status

E. – Endangered. Species at risk of disappearing from the wild within 20 years. Includes populations of 100 or less individual plants.
V. – Vulnerable. Species not presently endangered, but at risk over 20-50 years.
R. – Rare in Australia, but not currently under threat. Includes species within a very restricted area or small populations over a wide range.
K. – Poorly known. Accurate knowledge is inadequate.
C. – Reserved. The species has at least one population within a national park or other reserve.

Size of Reserved Populations

a. – 1000 plants or more known within a conservation reserve.
i. – Less than 1000 plants known within a conservation reserve.
- - Reserved population size not accurately known.
t - Total known population reserved.

National Parks and Wildlife Act 1974 - Schedule 13 Protected Native Plants

1	Group 1
2	Group 2
3	Group 3
4	Group 4
5	Group 5

Regional Significance (Hunter Rare Plants Database – Version 1 2003)

L	endemic to Hunter Region
DA	disjunct in the Hunter Region, rare or localized (aggregated)
DB	disjunct in the Hunter Region, widespread and uncommon (broad)
R	rare but extends beyond the Hunter Region
U	everywhere uncommon
N	at northern distributional limit in the Hunter
E	at eastern distributional limit in the Hunter
S	at southern distributional limited in the Hunter
W	at western distributional limited in the Hunter
T	may be threatened in the Hunter Region
S	Probably secure in the Hunter Region

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT
CLASS FILICOPSIDA (Ferns)			
Adiantaceae syn. Sinopteridaceae			
Pellaea paradoxa			
Dennstaedtiaceae			
Pteridium esculentum	Bracken		
Pteridaceae			
Cheilanthes sieberi ssp. *sieberi*	Mulga Fern		
MAGNOLIOPSIDA: Magnoliidae			
LILOPSIDA: (Monocotyledons)			
Anthericaceae			
Caesia parviflora	Pale Grass-lily		
Laxmannia gracilis	Slender Wire Lily		
Tricoryne elatior	Yellow Rush-lily		
Commelinaceae			
Commelina cyanea	Scurvy Weed		
Cyperaceae			
Baumea rubiginosa	Soft Twigrush		
Bolboschoenus fluviatilis			
Eleocharis sphacelata	Tall Spike-rush		
Fimbristylis dichotoma	Common Fringe Sedge		
Schoenus apogon	Common Bog-rush		
Juncaceae			
**Juncus cognatus*			
Juncus kraussii	Sea Rush		
Juncus subsecundus	Finger Rush		
Juncus usitatus	Common Rush		
Lomandraceae			
Lomandra longifolia	Spiny Mat Rush		

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT
Luzuriagaceae			
Geitonoplesium cymosum	Scrambling Lily		
Orchidaceae			
Microtis parviflora	Slender Onion Orchid		
Phormiaceae			
Dianella caerulea var. *producta*	Blue Flax-lily		
Dianella revoluta	Blue Flax-lily		
Poaceae			
**Aira cupaniana*	Silvery Grass		
**Andropogon virginicus*	Whisky Grass		
Aristida vagans	Three-awn Speargrass		
**Axonopus fissifolius*	Narrow-leaved Carpet Grass		
**Briza maxima*	Quaking Grass		
**Briza minor*	Shivery Grass		
**Chloris gayana*	Rhodes Grass		
Cynodon dactylon	Common Couch		
Dichelachne micrantha	Plume Grass		
Imperata cylindrica var. *major*	Blady Grass		
Microlaena stipoides var. *stipoides*	Weeping Meadow Grass		
Panicum effusum	Hairy Panic		
**Paspalum dilatatum*	Paspalum		
**Paspalum urviillei*	Vasey Grass		
Poa labillardieri	Tussock Grass		
Rytidosperma pallidum syn. *Joycea pallida*	Red-anthered Wallaby Grass		
**Sporobolus africanus*	Parramatta Grass		
**Stenotaphrum secundatum*	Buffalo Grass		
Themeda australis	Kangaroo Grass		
Xanthorrhoeaceae			
Xanthorrhoea media	Grass Tree, Gulgadya (Cadigal)		
Apocynaceae			
**Gomphocarpus fruticosus*	Narrow-leaved Cottonbush		

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT
Asclepiadaceae now subfamily of Apocynaceae			
Asteraceae			
**Bidens pilosa*	Cobblers Pegs		
**Chrysanthemoides monilifera* subsp. *monilifera*	Boneseed		
**Cichorium intybus*	Chicory		
**Cirsium vulgare*	Spear Thistle		
**Conyza bonariensis*	Flax-leaved Fleabane		
Euchiton involucratus syn. *Gnaphalium involucratum*	Cudweed		
**Senecio madagascariensis*	Fireweed		
**Sonchus asper*	Prickly Sowthistle		
**Sonchus oleraceus*	Common Sow Thistle		
Bignoniaceae			
Pandorea pandorana	Wonga-wonga Vine		
Boraginaceae			
**Heliotropium europaeum*	Common Heliotrope		
Campanulaceae			
Wahlenbergia stricta	Australian bluebell		
Caryophyllaceae			
**Cerastium glomeratum*	Mouse Ear Chickweed		
**Petrorhagia nanteuilii*	Proliferous Pink		
**Silene gallica* var. *gallica*	French Catchfly		
Casuarinaceae			
Allocasuarina littoralis	Black She-oak		
Allocasuarina torulosa	Forest Oak		
Celastraceae			
Maytenus silvestris	Narrow leaved Orangebark		
Convolvulaceae			

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT
Convolvulus erubescens	Australian Bindweed		
Dichondra repens	Kidney Weed		
Polymeria calycina	Swamp Bindweed		
Dilleniaceae			
Hibbertia diffusa	Guinea Flower		
Hibbertia scandens	Climbing Guinea Flower		
Elaeocarpaceae			
Elaeocarpus obovatus	Hard Quandong		
Euphorbiaceae			
**Euphorbia peplus*	Petty Spurge		
Fabaceae Subfamily (Faboideae)			
Desmodium rhytidophyllum	Tick-treefoil		
Desmodium varians	Slender Tick-trefoil		
Glycine clandestina subsp. complex	Love Creeper		
Glycine tabacina sp. complex	Love Creeper		
Hardenbergia violacea	False Sarsaparilla		
Jacksonia scoparia	Dogwood		
Kennedia rubicunda	Dusky Coral Pea		
**Lotus uliginosus*	Greater Lotus		
**Trifolium repens*	White Clover		
Fabaceae (Subfamily Mimosoideae)			
Acacia irrorata subsp. *irrorata*	Green Wattle		
Acacia longifolia	Sydney Golden Wattle		
Acacia ulicifolia	Prickly Moses		
Fumariaceae now under Papaveraceae			
Gentianaceae			
**Cenaurium erythraea*	Common Centaury		

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT
Geraniaceae			
Geranium solanderi	Native Geranium		
Hypericaceae			
Hypericum gramineum	Native St Johns Wort		
Linaceae			
**Linum trigynum*	French Flax		
Lobeliaceae			
Pratia purpurascens	White Root		
Malvaceae			
**Malva parviflora*	Small-flowered Mallow		
**Sida rhombifolia*	Paddys Lucerne		
Myrtaceae			
Angophora costata	Smooth-barked Apple		
Callistemon rigidus	Stiff Bottlebrush		
Callistemon viminalis	Weeping Bottlebrush		
Corymbia gummifera	Red Bloodwood		
Corymbia maculata	Spotted Gum		
Eucalyptus agglomerata	Blue-leaved Stringybark		
Eucalyptus carnea	Grey-leaved Mahogany		
Eucalyptus fergusonii subsp. *fergusonii*	Ferguson's Ironbark		
Eucalyptus haemastoma	Scribbly Gum		
Eucalyptus microcorys	Tallowwood		
Eucalyptus pilularis ssp. *pilularis*	Blackbutt		
Eucalyptus robusta	Swamp Mahogany		
Melaleuca lineariifolia	Snow in Summer		
Melaleuca nodosa	Ball Honeymyrtle		
Melaleuca quinquenervia	Broad-leaved Paperbark		
Oleaceae			
Notelaea ovata	Mock Olive		
Oxalidaceae			

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT
Oxalis perennans	-		
Phyllanthaceae			
Breynia oblongifolia	Coffee Bush		
Glochidion ferdinandi var. *ferdinandi*	Cheese Tree		
Pittosporaceae			
Billardiera scandens	Apple Dumplings		
Bursaria spinosa subsp. *spinosa*	Blackthorn		
Pittosporum revolutum	Rough-fruit Pittosporum		
Pittosporum undulatum	Sweet Pittosporum		
Plantaginaceae			
**Plantago lanceolata*	Plantain		
Polygonaceae			
Persicaria strigosa	Spotted Knotweed		
**Rumex cripus*	Curled Dock		
Primulaceae			
**Anagallis arvensis* var. *arvensis*	Scarlet Pimpernel		
**Anagallis arvensis* var. *coerulea*	Blue Pimpernel		
Ranunculaceae			
Clematis aristida	Old Man's Beard		
Ranunculus lappaceus	Common Buttercup		
Rhamnaceae			
Alphitonia excelsa	Red Ash		
Rubiaceae			
Asperula conferta	Common Woodruff		
Rutaceae			
Zieria smithii	Sandfly Zieria		
Scrophulariaceae			

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT
**Verbascum virgatum*	Twiggy Mullein		
Veronica plebeia	Speedwell		
Verbenaceae			
**Lantana camara*	Lantana		

APPENDIX D

TOTAL FAUNA LIST

FAUNA LIST

Family sequencing and taxonomy follow for each fauna class:

Herpetofauna
Cogger (2000), Ehmann (Ed) (1997) and Barker, Grigg and Tyler (1995).

Birds
Pizzey and Knight (2012)(9th edn).

Mammals - Van Dyck & Strahan (Ed) (2008) and Churchill (2008).

Churchill, S. (2008). *Australian Bats*. (2nd edn.). Allen & Unwin Australia.

(?) - Indicates a species identified without certainty or to a Genus level only.

* - Indicates an introduced species.

The following symbols are used to indicate species recorded during previous surveys.
@ - Previous record (Wildthing Environmental Consultants, 2008a)

Threatened species addressed within this assessment appear in **bold** font.

Introduced species are indicated by an asterisk ("*").

The following standard abbreviations are used to indicate subspecific taxa:

subsp. -subspecies
var.- variety
× - hybrid between the two indicated species

Biodiversity Conservation Act 2016 (BC Act)

V Vulnerable
E1 **Endangered**
E2 Endangered Population
E4A Critically Endangered Population

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

V **Vulnerable**
E **Endangered**
CE **Critically Endangered Population**
M **Migratory**

Regionally Significant Fauna Species.

+ Region includes Gosford, Wyong, Cessnock, Maitland, Lake Macquarie, Newcastle and Port Stephens LGA's. Produced from Stage 1 of the LHCCREMS – Regional Biodiversity Conservation Strategy.

SCIENTIFIC NAME	COMMON NAME	BC ACT	EPBC ACT
Phylum - Chordata			
Subphylum - Vertebrata			
Class - Actinopterygii			
Order Cyprinodontiformes			
Family Poeciliidae			
Gambusia holbrooki	Mosquitofish		
Class Amphibia - Amphibians			
Order Salientia - Frogs			
Family Myobatrachidae - 'Southern Frogs'			
Limnodynastes peronii	Striped Marsh Frog		
Limnodynastes tasmaniensis	Spotted Grass Frog		
Family Hylidae - Tree Frogs			
Litoria fallax	Eastern Dwarf Tree Frog		
Litoria latopalmata	Broad-palmed Frog		
Litoria peronii	Peron's Tree Frog		
Class Reptilia - Reptiles			
Family Agamidae - Dragons			
Intellagama lesueurii lesueurii syn. Physignathus lesuerii lesueurii	Eastern Water Dragon		

SCIENTIFIC NAME	COMMON NAME	BC ACT	EPBC ACT
Family Scinidae - Skinks			
Lampropholis delicata	Grass Skink		
Class Aves - Birds			
Family Phasianidae			
Coturnix ypsilophora	Brown Quail		
Family Anatidae - Ducks, Swans and Geese			
Anas superciliosa	Pacific Black Duck		
Chenonetta jubata	Australian Wood Duck		
Family Columbidae - Pigeons, Doves			
**Columba livia*	Feral Pigeon		
Lopholaimus antarcticus	Topknot Pigeon		
Family Phalacrocoridae - Cormorants			
Phalacrocorax sulcirostris	Little Black Cormorant		
Family Threskiornithidae - Ibises and Spoonbills			
Threskiornis molucca	Australian White Ibis (Sacred Ibis)		
Threskiornis spinicollis	Straw-necked Ibis		
Family Accipitridae - Osprey, Hawks, Eagles and Harriers			
Aquila audax	Wedge-tailed Eagle		
Family Falconidae - Falcons			
Falco cenchroides	Nankeen Kestrel		
Family Scolopacidae			
Gallinago hardwickii	Latham's Snipe		M

SCIENTIFIC NAME	COMMON NAME	BC ACT	EPBC ACT
Family Cacatuidae - Cockatoos and Corellas			
Cacatua galerita	Sulphur-crested Cockatoo		
Cacatua roseicapilla	Galah		
Family Psittacidae - Parrots, Rosellas and Lorikeets			
Alisterus scapularis	King Parrot		
Platycercus elegans	Crimson Rosella		
Platycercus eximius	Eastern Rosella		
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet		
Trichoglossus haematodus	Rainbow Lorikeet		
Family Cuculidae - Cuckoos			
Centropus phasianinus	Pheasant Coucal		
Cacomantis flabelliformis	Fan-tailed Cuckoo		
Family Halcyonidae - Tree Kingfishers			
Dacelo novaeguineae	Laughing Kookaburra		
Todiramphus sanctus	Sacred Kingfisher		
Family Climacteridae - Treecreepers			
Cormobates leucophaea	White-throated Treecreeper		
Family Maluridae			
Malurus cyaneus	Superb Fairy-wren		
Family Pardalotidae - Pardalotes, Gerygones, Scrubwrens, Heathwrens and Thornbills			
Acanthiza pusilla	Brown Thornbill		
Gerygone olivacea	White-throated Gerygone		
Pardalotus punctatus	Spotted Pardalote		
Family Meliphagidae - Honeyeaters			
Lichenostomus chrysops	Yellow-faced Honeyeater		

SCIENTIFIC NAME	COMMON NAME	BC ACT	EPBC ACT
Manorina melanocephala	Noisy Miner		
Family Pachycephalidae - Whistlers, Shrike-tit and Shrike-thrushes			
Colluricincla harmonica	Grey Shrike-thrush		
Pachycephala pectoralis	Golden Whistler		
Family Rhipiduridae - Fantails			
Rhipidura fuliginosa	Grey Fantail		
Rhipidura leucophrys	Willie Wagtail		
Family Campephagidae - Cuckoo-shrikes and Trillers			
Coracina novaehollandiae	Black-faced Cuckoo-shrike		
Family Hirundinidae - Swallows and Martins			
Hirundo neoxena	Welcome Swallow		
Family Zosteropidae - White-eyes			
Zosterops lateralis	Silvereye		
Family Artamidae - Wood-swallows, Butcherbirds, Magpie and Currawongs			
Cracticus nigrogularis	Pied Butcherbird		
Cracticus torquatus	Grey Butcherbird		
Gymnorhina tibicen	Australian Magpie		
Strepera graculina	Pied Currawong		
Family Corvidae - Crows, Raven			
Corvus coronoides	Australian Raven		
Class Mammalia - Mammals			

SCIENTIFIC NAME	COMMON NAME	BC ACT	EPBC ACT
Subclass Marsupialia - Marsupials			
Order Diprotodontia			
Superfamily - Phalangeroidea			
Family Phalangeridae - Brushtail Possums			
Trichosurus vulpecula	Common Brushtail Possum		
Superfamily - Macropodoidae			
Family Macropodidae - Kangaroos, Wallabies			
Macropus giganteus	Eastern Grey Kangaroo		
Macropus rufogriseus	Red-necked Wallaby		
Subclass Eutheria - Eutherian Mammals			
Suborder Microchiroptera			
Family Vespertilionidae - Plain-nosed Bats			
Chalinolobus gouldii	Gould's Wattled Bat		
Chalinolobus morio	Chocolate Wattled Bat		
Miniopterus australis	Little Bentwing-bat	V	
Nyctophilus sp			
Vespadelus sp			
Order Lagomorpha			
Family Leporidae			
**Oryctolagus cuniculus*	European Rabbit		
Family Canidae			

SCIENTIFIC NAME	COMMON NAME	BC ACT	EPBC ACT
**Canis familiaris*	Dog		
Family Bovidae			
**Bos taurus*	Cattle		

APPENDIX E

BAM FIELD SHEETS

Wildthing Environmental Consultants - Office # (02) 49513311

BAM Site – Field Survey Form

Plot Identifier: 1548 - DERIVED

Midline start	Midline end	Plot Size	Date	Plot Waypoint ID				Recorders
		20x20	25/10	Start -	001	End -	002	BE
E- 420962 N- 6398497	E- 420905 N- 6399029	IBRA region	NSW NORTH_K_MANNING					
Photo# 2537	Photo# 2538	Vegetation Class	WET SCLERO					
Bearing 204 MV	Bearing 136	Vegetation Zone	NH_DNG_					

PCT #		PCT Name	
Consistent BC ACT TEC?			

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	2
	Grasses etc.	3
	Forbs	2
	Ferns	0
	Other	1
Sum of Cover of native vascular plants by growth form group	Trees	6
	Shrubs	6.6
	Grasses etc.	3.4
	Forbs	0.2
	Ferns	0
	Other	0.1
High Threat Weed cover		22.3

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		0
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
Regeneration < 5 cm		
Length of logs (m) (≥10 cm diameter, >50 cm in length)	0	

Large Tree Sizes

Dry Sclerophyll Forests - ≥50, Forested Wetlands - ≥50, Freshwater Wetlands - NA, Grasslands - NA, Grassy Woodlands - ≥50, Heathlands - ≥30, Rainforests - ≥50, Saline Wetlands - NA, Semi-arid Woodland (grassy sub-formation) ≥30, Semi-arid woodlands (shrubby sub-formation) ≥30, Wet sclerophyll forests (grassy sub-formation) ≥79, Wetland sclerophyll forests (shrubby sub-formation) ≥79

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	3	3	15	10	5	5	5	10	0	4										
Average of the 5 subplots	7.2					4.8														

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Additional Plot Comments

Wildthing Environmental Consultants - Office # (02) 49513311

400 m² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date				

GF		Species	Cover	Abund	voucher
S	1	CALLISTEMON RIGID	4.7	24	
S	2	Melaleuca NODOSA	1.9	28	
G	3	Themeda Triandra	.3	5	
HTW	4	Bidens PILOSA	.5	30	
W	5	VERBENA BONARIENSIS	.4	15	
W	6	SETARIA CURRY	5	30	
W	7	BRIZA MAX	0.2	15	
W	8	BRIZA minor	12	>500	
W greater iotus	9	CLOVER RED TRIFOLIUM	15	>1000	2541
HTW	10	TALL GRASS BRIZA SUB	5	100	2542
HTW	11	NARROW LEAF CATTLE	8	300	
W	12	PLANTAGO LANCE	2	30	
W	13	EUPHORBIA NON NATIVE	1.4	15	
W	14	BROMUS HEADERACEA	5	250	
G	15	DICHELANCHE NAL	0.1	4	
W	16	SCARLET PIMP	11	700	
W	17	LOVE GRASS ERAGROSTIS VULPIA MYROS	4	200	✓
HTW	18	CONYZA SUM	BOT	10	
G	19	CYNADON DACT	3	600	
HTW	20	SENECIO MAD	2.5	60	
W	21	VERNAL GRASS - ANTHOXANTHUM ODORATUM	20	>1000	✓
HTW	22	KIKUYU	5	600	
U	23	HYPOCHAERIS RAD	0.1	15	
W	24	DANDELION FLOWER SILLY NAME	0.2	30	2545
W	25	PROLIFERUS PINK	0.1	15	2546
HTW	26	PASPALUM DILATUM	0.4	15	
HTW	27	WHITHEY GRASS	0.2	5	
F	28	LUDWIGIA PEPLOIDES minor	0.1	10	
W	29	LOLIUM PERE	0.1	5	
W	30	JUNCUS COG	0.1	10	
W	31	JUNCUS	0.1	10	
W	32	TRIFOLIUM REPENS	0.1	5	
W	33	STOBILUS AFRI	0.3	25	
W	34	CYPERUS ERUST	0.2	12	
O	35	GLYCINE CLAN	0.1	1	
W	36	VETCH YELLOW FLOWER	0.1	4	✓
W	37	VERBENA RIGID	0.5	24	
F F	38	PURPLE FLOWER CORREA RED	0.1	5	2547
←	39	PANICUM EFFUSUM	0.1	1	
	40				
	41				
	42				
	43				
	44				

Wildthing Environmental Consultants - Office # (02) 49513311

BAM Site – Field Survey Form

Plot Identifier: 1548_PLANTED

Midline start	Midline end	Plot Size	Date	Plot Waypoint ID				Recorders
E- 420956 N- 6389311	E- 421035 N- 6389296	80 x 5	26/10	Start -	33	End -	34	BS
Photo# 2569	Photo# 2570	IBRA region						
Bearing 108	Bearing 287	Vegetation Class						
		Vegetation Zone	PLANTED					
PCT #		PCT Name						
Consistent BC ACT TEC?								

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	4
	Shrubs	3
	Grasses etc.	1
	Forbs	5
	Ferns	1
	Other	2
Sum of Cover of native vascular plants by growth form group	Trees	14.2
	Shrubs	4.4
	Grasses etc.	0.1
	Forbs	2.1
	Ferns	0.1
	Other	0.3
High Threat Weed cover		94.5

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm	✓	
20 – 29 cm	✓	
10 – 19 cm	/	
5 – 9 cm	/	
Regeneration < 5 cm	/	
Length of logs (m) (≥10 cm diameter, >50 cm in length) 2.2	0.5, 0.5, 0.5, 0.7	

Large Tree Sizes

Dry Sclerophyll Forests - ≥50, Forested Wetlands - ≥50, Freshwater Wetlands - NA, Grasslands - NA, Grassy Woodlands - ≥50, Heathlands - ≥30, Rainforests - ≥50, Saline Wetlands - NA, Semi-arid Woodland (grassy sub-formation) ≥30, Semi-arid woodlands (shrubby sub-formation) ≥30, Wet sclerophyll forests (grassy sub-formation) ≥79, Wetland sclerophyll forests (shrubby sub-formation) ≥79

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	30	40	50	60	60	20	~~10~~ 60	20	70	10						20	0	0	10	
Average of the 5 subplots	48					60														

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Additional Plot Comments

Wildthing Environmental Consultants - Office # (02) 49513311

400 m² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date				

GF		Species	Cover	Abund	voucher
T	1	E. ROBUSTA	12	~~22~~ 22	
~~T~~S	2	A. LONG	4	10	
HTW	3	LANTANA	1	5	
T	4	Melaluca Quin	1	~~1~~ 1	
T	5	G. fernandii	0.2	11	
S	6	N. ovata	0.3	~~1~~ 2	
S	7	Elaeocarpus ovata	0.1	1	
T	8	E. haemastoma	~~1~~ 1	1	
HTW	9	KIKUYU	65	>1000	
W	10	BRIZA MAX	10	400	
W	11	GOMPHOCARPUS fruti	0.2	10	
W Trifolium camp	12	Yellow clover Greater lobus	0.3	35	2571
	13	~~DESMODIUM [illegible]~~			
F	14	WHALENBURGIA minor	0.1	15	
HTW	15	BIDENS P	2	35	
W	16	PLANTAGO LANCE	2.5	90	
W	17	VERBENA BON	2	30	
HTW	18	BALL GRASS - BRIZA SUB	~~[illegible]~~ 12	~~50~~ ~~100~~ 300	
HTW	19	CHLORIS GAYANA	5	90	
W	20	SONCHUS ASPER	3	20	
W	21	Speedwell weed? STACHYS ARV	0.1	3	2572
HTW	22	CONYZA BON	3	21	
F	23	GERANIUM SOL	1	25	
F	24	TRIFOLIUM REPENS	0.1	10	
F	25	KIDNEY weed	0.8	40	2573
HTW	26	SENECIO MAD	1.2	15	
HTW	27	PASPALUM D	0.1	10	
W	28	VERBENA RIGID	5	80	
HTW	29	WHISKEY GRASS	0.1	2	
O	30	KENNEDIA RUBICUNDA	0.2	10	
O	31	PANDOREA PAND	0.1	1	
HTW	32	~~BITOU~~ BONESEED	0.1	1	
W	33	PADDYS LUCERNE	0.1	9	
W	34	BRIZA MINOR	1.9	50	
W	35	HYPOCHAERIS	2	~~38~~ 45	
W	36	LONG HAIR BROMUS - VULPIA	0.1	15	
HTW	37	LANTANA	2	6	
F	38	HYPERICUM G	0.1	1	
FERN	39	PHELLA FAL	0.1	5	
G	40	IMPERATA CYLIND	0.1	16	
HTW	41	NARROW LEAF CARPET	3	80	
W	42	Yellow flowered vetch	0.1	5	
W	43	SCARLET PIN	0.3	40	
G	44	PANICUM EFFUSUM	0.1	8	

Wildthing Environmental Consultants - Office # (02) 49513311

BAM Site – Field Survey Form | Plot Identifier: 1548_40N

Midline start	Midline end	Plot Size	Date	Plot Waypoint ID	Recorders
		20×20	25/10	Start - 003 End - 004	CE
E- 421119 N- 6538931	E- 421074 N- 6538941	IBRA region			
Photo# 2548	Photo# 2549	Vegetation Class			
Bearing 277	Bearing 097	Vegetation Zone	NSWNCT 1000_4WB		
PCT #		PCT Name			
Consistent BC ACT TEC?					

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	3
	Shrubs	4
	Grasses etc.	12
	Forbs	6
	Ferns	0
	Other	9
Sum of Cover of native vascular plants by growth form group	Trees	30
	Shrubs	1.5
	Grasses etc.	40.7
	Forbs	3.1
	Ferns	0
	Other	1.7
High Threat Weed cover		4.3

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm	✓	
30 – 49 cm	✓	
20 – 29 cm	✓	
10 – 19 cm	✓	
5 – 9 cm	✓	
Regeneration < 5 cm	✓	
Length of logs (m) (≥10 cm diameter, >50 cm in length) 53.7	6.3, 3.9, 2.5, 2.4, 3.5, 2.2, 1.9, 0.5, 2.1, 1.0, 0.5, 4.9, 5.5, 6.3, 0.5, 4.7	

Large Tree Sizes

Dry Sclerophyll Forests - ≥50, Forested Wetlands - ≥50, Freshwater Wetlands - NA, Grasslands - NA, Grassy Woodlands - ≥50, Heathlands - ≥30, Rainforests - ≥50, Saline Wetlands - NA, Semi-arid Woodland (grassy sub-formation) ≥30, Semi-arid woodlands (shrubby sub-formation) ≥30, Wet sclerophyll forests (grassy sub-formation) ≥79, Wetland sclerophyll forests (shrubby sub-formation) ≥79

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	40, 40, 65, 40, 40	5, 5, 10, 40, 10	1, 0, 0, 0, 5	2, 0, 5, 10, 15
Average of the 5 subplots	49	14	1.2	8.4

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Additional Plot Comments

0.044

0.106

S4-16 34

Wildthing Environmental Consultants - Office # (02) 49513311

400 m² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date				

GF		Species	Cover	Abund	voucher
T	1	E. MICROCORYS	20 ~~20~~	18	
T	2	E FERGONSII	5	5	
T	3	C CANNEA	5	5	
S	4	~~E. PLAUTIA~~ ACACIA LONG	0.8	3	
HTW	5	~~BITOU BUSH~~ BONE SEED	0.1	1	
S	6	MUTTON WOOD	0.1	~~8~~ 1	
O	7	XANTHORREA	0.7	5	2555
W	8	GOMPHOCARPUS FRUITCOSIS	0.2	4	
G	9	LOMANDRA MULTI	2	40	
S	10	HIBBERTIA DIFFUSA	0.4	5	
F	11	DIANELLA REV	1.2	15	
O	12	HARDENBURGIA VIOL	0.2	4	
	13	~~DITOU~~		0	
W	14	LONG ANTHER DROMUS	5	90	
W	15	SPOROBOLUS AFR	1	15	
G	16	THEMEDA AUST	~~7~~ ~~4~~ 3	~~10~~ 30	
W	17	BRIZA MAX	~~7~~ 2	40	
W	18	EUCHITON - NON NATIVE	0.2	10	
W	19	VERBENA RIGID	0.1	3	
W	20	HYPOCHARIS RAD	3 ~~15~~	50	
W ARIA CUP	21	BLOWN GRASS PANICUM ST	4	100	2551
W	22	PLANTAGO LANC	3	30	
W	23	Yellow flowered PEA / LOTUS	0.1	15	
W	24	VERNAL GRASS	~~[illegible]~~ 21	400	
S	25	ACACIA ULICI	0.2	3	
G	26	WALLABY GRASS ✓	3	40	2553
G	27	ENTOLASIA STRICT	10	30	
HTW	28	SENECIO MAD	1.5	20	
F	29	ONION ORCHID MICROTIS	0.1	2	2554
G	30	LEPIDOSPERMA LAT	0.1	1	
G	31	MICROLAENA STIP	30	>1000	
HTW	32	KIKUYU	2	25	
O	33	BILLARDIERA SCAN	0.1	8	
W	34	TRIFOLIUM REP	0.2	10	
F	35	~~[illegible]~~ GERANIUM SOL	1.5	50	
HTW	36	BIDENS P	0.7	20	
F	37	PRATIA PURP	0.1	10	
O	38	~~DIPODIUM RHYTIDO~~ Desmodium Rhytido	0.1	5	
O	39	GLYCINE TAB	0.1	5	
F	40	GALIUM - MORAL BED	0.1	30	
O	41	PANDOREA PAND	0.1	2	
G	42	PANICUM EFFUSUM	0.1	4	
W	43	EHRHARTA ✓ PANIC VELT GRASS	2	70	2552
O	44	DIPODIUM VARIANS	0.1	1	

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	45	IMPERATA CYLINDRICA	1.1	50	
	46	FIMBRYSTILIS DICHOTOMA	0.1	1	
	47	DICHELACHNE MICRANTHA	0.1	10	
	48	CONVOLVULUS CYNANCH	0.1	4	
	49	MARSDENIA ROSTRATA	0.2	4	
	50	BROMUS HEAD	2.0	50	
	51	PROLIFERUS PINK	0.1	20	
	52	GLYCINE CLAN	0.1	1	
	53	CIRSIUM VULGARE	0.1	1	
	54	POA LAB	0.1	1	
	55	LOMANDRA OBLIQUA	0.1	20	
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GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

APPENDIX E

BAM CREDIT CALCULATOR OUTPUT

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00012971/BAAS18078/18/00012972	North Shearwater Residential Subdivision	24/02/2018
Assessor Name	Report Created	BAM Data version *
Ben Ellis	30/10/2018	3
Assessor Number	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
BAAS18078		

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

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Candidate SAII	Ecosystem credits
Tallowwood - Small-fruited Grey Gum - Kangaroo Grass grassy tall open forest on foothills of the lower North Coast								
1	1548_Low_Continuous	54.6	0.3	0.25	High Sensitivity to Potential Gain	1.50		7
2	1548_Derived	1.8	0.6	0.25	High Sensitivity to Potential Gain	1.50		0
3	1548_Planted	17.2	0.6	0.25	High Sensitivity to Potential Gain	1.50		4

4	1548_Low_Isolated	54.6	0.7	0.25	High Sensitivity to Potential Gain	1.50		15
							Subtotal	**26**
							Total	**26**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Candidate SAII	Species credits
Diuris praecox / Rough Doubletail (Flora)						
1548_Low_Continuous	54.6	0.32	0.25	1.5	False	7
1548_Derived	1.8	0	0.25	1.5	False	0
1548_Planted	17.2	0.58	0.25	1.5	False	4
1548_Low_Isolated	54.6	0.74	0.25	1.5	False	15
					Subtotal	**26**

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00012971/BAAS18078/18/00012974	NorthShearwater Paddock Trees	24/02/2018
Assessor Name	**Report Created**	**BAM Data version ***
Ben Ellis	30/10/2018	3
Assessor Number		
BAAS18078		

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

Paddock Trees Credit Requirement

Class	Contains hollows	Number of trees	Ecosystem credits
1548-Tallowwood - Small-fruited Grey Gum - Kangaroo Grass grassy tall open forest on foothills of the lower North Coast			
2	False	1.0	1
3	True	1.0	1
3	True	1.0	1
2	False	1.0	1
2	False	1.0	1
2	False	1.0	1
2	True	1.0	1
2	False	2.0	1
2	True	1.0	1
3	False	1.0	1
3	True	3.0	3
3	True	1.0	1
2	True	1.0	1
2	False	2.0	1
			16
			16